Under the auspices of the
President of the Republic of Serbia
H.E. Mr. Aleksandar Vucic

5th ANNUAL MEETING
of Serbian Neurosurgical Society

SNSS Annual meeting 2019
with international participation

October 24th - 27th 2019, Kragujevac, Serbia

Venue: Hotel Sumarice, Kragujevac

96th Anniversary of Neurosurgery in Serbia

81th Anniversary of Clinic for Neurosurgery, Clinical center of Serbia

35th Anniversary of Department of Neurosurgery, Clinical center of Kragujevac

PROGRAM & ABSTRACT BOOK

Joint Venture with
EANS Section for Vascular Neurosurgery
HUNGARIAN Neurosurgical Society and
JAPAN Neurosurgical Society,
Section for Vascular Neurosurgery

Organized by
Serbian Neurosurgical Society
in conjunction with
Croatian Society for Cerebrovascular and Endovascular Neurosurgery
Joint meeting with
Southeast Europe Neurosurgical Society and
WFNS Cerebrovascular Diseases & Therapy Committee

NEUROVASCULAR SUPERSESSIONS:
Exo? Endo? Hybrid? Quo vadis?

EACCME® 27 credits
SHC 15 credits

20 BEST ABSTRACTS GRANTS

Discounts available for EANS Individual Members!

www.vascularneuro.talkb2b.net

Endorsed by
Ministry of Health, Republic of Serbia
Ministry of Education, Science and Technological Development
Cabinet of Minister without a portfolio in charge of demography and population policy, Republic of Serbia
The National Council for Coordination of Cooperation with the Russian Federation and the People's Republic of China
Faculty of Medicine, University of Belgrade
Faculty of Medical Sciences, University of Kragujevac
Serbian Academy of Sciences and Arts
Clinical Centre of Kragujevac
City of Kragujevac

Supported by
National tourism organisation of Serbia
Tourist Organization of Kragujevac
Serbia Convention Bureau

NURONORM

LICA® + kompleks vitamina B

COMPLETE NEUROVASCULAR SUPPORT FOR MICROCIRCULATION AND NERVE FUNCTION

ADOC

Under the auspices of the President of the Republic of Serbia H.E. Mr. Aleksandar Vucic

5th ANNUAL MEETING of Serbian Neurosurgical Society

SNSS Annual Meeting 2019
with international participation

NEUROVASCULAR SUPERSESSIONS:
Exo? Endo? Hybrid? Quo vadis?

October 24th - 27th 2019, Kragujevac, Serbia

Venue: Hotel Sumarice, Kragujevac

JOINT VENTURE WITH
EANS Section for Vascular Neurosurgery,
HUNGARIAN Neurosurgical Society and
JAPAN Neurosurgical Society, Section for Vascular Neurosurgery

ORGANIZED BY
Serbian Neurosurgical Society

IN CONJUNCTION WITH
Croatian Society for Cerebrovascular and Endovascular Neurosurgery

JOINT MEETING WITH
Southeast Europe Neurosurgical Society and
WFNS Cerebrovascular Diseases & Therapy Committee

96th Anniversary of Neurosurgery in Serbia
81th Anniversary of Clinic for Neurosurgery, Clinical center of Serbia
35th Anniversary of Department of Neurosurgery, Clinical center of Kragujevac

www.vascularneuro.talkb2b.net

Under the auspices of the

President of the Republic of Serbia
H.E. Mr. Aleksandar Vucic

ENDORSED BY

Ministry of Health, Republic of Serbia

Ministry of Education, Science and Technological Development

Cabinet of Minister without a portfolio in charge of demography and population policy, Republic of Serbia

The National Council for Coordination of Cooperation with the Russian Federation and the People's Republic of China

Faculty of Medicine, University of Belgrade

Faculty of Medical Sciences, University of Kragujevac

Serbian Academy of Sciences and Arts

Clinical Centre of Kragujevac

City of Kragujevac

SUPPORTED BY

National tourism organisation of Serbia

Tourist organization of Kragujevac

Serbia Convention Bureau

Thank You

SNSS gratefully acknowledges our Industry Allies Council Partners for their continued support.

INDUSTRY AMBASSADOR

ADOC

INDUSTRY PREMIER PARTNER

makler

INDUSTRY PARTNERS COUNCIL

Elekta
Galenika
VEMAX PHARMA
Medtronic

INDUSTRY ALLIES COUNCIL

BORMIAMED Think Care Innovate
Stiga
ACIBADEM A CLASS HEALTHCARE SERVICES
Hemofarm STADA GRUPA
KOÇ HEALTHCARE
TERUMO INTERVENTIONAL SYSTEMS
XORAN
RTM

INDUSTRY SUPPORTER

ALPHA IMAGING
TRIVAX
BIOSTENT
magforce THE NANOMEDICINE COMPANY
WORWAG PHARMA
austroline
APTUS
Meditech
B BRAUN SHARING EXPERTISE
neomedica

Thank You

SNSS gratefully acknowledges our Friends for their continued support.

FRIENDSHIP AND SUPPORT

СРБИЈАГАС

Swisslion Takovo

telenor

Eurobank

COMTRADE

Hotel Zlatibor

VML d.o.o.

romax trade

moravčević vojnović i partneri
u saradnji sa schonherr

Atović Sterling

Sky Topeco

Podravka

Atlantic Grupa

WBM WestBalkansMachinery

Simex

Čoka Vinarija

Turistička agencija Zlateks - Zlatibor

EURO BGD PLUS DOO

Tecom

GOSI International

Grafostil

ADVOKATSKA KANCELARIJA TODOROVIC SEBEK

International Transport Inter Luta Belgrade, Serbia

MILIĆ AGRUMI

TOTEM STKR Uzice

Златиборац

Comp Comerc

Stolarium Invest

Tipografija plus

Дом здравља

asw

Turistička organizacija Kragujevac

Gradska turistička organizacija Kragujevac

Thank You

SNSS gratefully acknowledges our Industry Allies Council Partners for their continued support in educational activities.

EDUCATION GRANTS SUPPORT

ADOC
makler
Elekta
Galenika
VEMA PHARMA
Medtronic
BORMIAMED Think Care Innovate
Stiga
ACIBADEM A CLASS HEALTHCARE SERVICES
Hemofarm STADA GRUPA
KOÇ HEALTHCARE
TERUMO INTERVENTIONAL SYSTEMS
XORAN EUROPE
PTM
ALPHA IMAGING
TRIVAX
BIOSTENT
magforce THE NANOMEDICINE COMPANY
WORWAG PHARMA
austeline
APTUS
Meditech
B BRAUN SHARING EXPERTISE
neomedica

Thank You

SNSS gratefully acknowledges our Media and Strategic partners for their continued support.

MEDIA PARTNERS

SERBIAN NEUROSURGICAL SOCIETY STRATEGIC PARTNERS

STANIC I PARTNERI
AOD Beograd

SERBIAN NEUROSURGICAL SOCIETY OFFICIAL PHOTO & VIDEO PARTNERS AND ARCHIVE

MAR ARTIKS
KODAK DIGITAL SO

STUDIO
ARSIC

WELCOME ADDRESSES

Dear colleagues and friends,

It is my honor, privilege and pleasure to invite you to the upcoming **5th Annual Meeting of Serbian Neurosurgical Society** with international participation **"Neurovascular supersessions: Exo? Endo? Hybrid? Quo vadis?"** which will be held in **Kragujevac, Serbia, on October 24th-27th, 2019.**

We are pleased that the 5th Annual Meeting of Serbian Neurosurgical Society will be held as a joint venture with **EANS Section for Vascular Neurosurgery, Hungarian Neurosurgical Society** and **JAPAN Neurosurgical Society, Section for Vascular Neurosurgery**, in conjunction with **Croatian Society for Cerebrovascular and Endovascular Neurosurgery, Southeast Europe Neurosurgical Society and WFNS Cerebrovascular Diseases & Therapy Committee**.

Cerebrovascular diseases represent the second most common cause of the mortality and morbidity. Vascular neurosurgery, as an area that includes surgical treatment of aneurysms, arteriovenous malformations AVM), cavernous angiomas and other vascular pathological brain formations, requires a combination of decision making process, intensive care, microsurgical skills and advanced surgical technologies. Successful treatment of brain vascular anomalies has always been a challenging venture for which it is necessary to use a multidisciplinary approach and a multidisciplinary team of experts.

Serbian Neurosurgical Society is delighted that The Fifth Annual Meeting of Serbian Neurosurgical Society will feature renowned international and national experts from the field of vascular neurosurgery, who will gather together in Kragujevac, in order to improve the quality of neurosurgical service and education today, for the sake of a better tomorrow.

Thereby we are also marking three important anniversaries 96 years since the founding of neurosurgery in Serbia, 81 years of the Clinic of Neurosurgery at the Clinical Center of Serbia and 35 years of the Department of Neurosurgery, Clinical Center of Kragujevac.

In many ways the city of Kragujevac can be called "the first in Serbia" - it was the first capital of the modern Serbian state and the first gymnasium and the lyceum, the forerunner of the University of Belgrade, were founded in this beautiful city, as well as the first court, theater, newspaper, pharmacy, picture gallery, museum and library.

The host city of Kragujevac is a significant economic, cultural, educational and health center of Sumadija and it is well known for its hospitality. I am confident that this event will open new perspectives and result in a memorable mind and soul enriching interprofessional and interpersonal exchange.

It is my great pleasure to invite you to share your expert opinions and perspectives and participate in this event.

Lukas Rasulić

Prof. Dr
Lukas Rasulic
Honorary President
of the Meeting
President of the SNSS
President of the SeENS

WELCOME ADDRESSES

Dear colleagues and friends,

It is a pleasure and honor to welcome you to this joint **Neurovascular Session** within the **5th Annual Meeting** of our Serbian Neurosurgical friends. Lukas Rasulic has made a great effort to gather a renowned international faculty to discuss the presence and future of Neurovascular Surgery.

The topic is timley since Europe has to address important topics in this field.

Should Neurosurgeons engage into Endovascular therapies or should they leave the field to Interventionlists?

Which cases will remain for Open Microcsurgery and how can we train the future generation?

What are the clinical and academic fields in the future where Neurovascular Surgeons should engage additional to the classic ones?

I am convinced that many of these questions will be addressed successfully and I sincerely hope to see you at this meeting.

Prof. Dr.
Peter Vajkoczy
Honorary President
of the Meeting
EANS Vascular
Section

WELCOME ADDRESSES

Dear Colleagues,

It is a great honor for the Vascular Section of the Hungarian Neurosurgical Society to be invited to the 5th Annual Meeting of the Serbian Neurosurgical Society.

On behalf of the Head of our Vascular Section, Professor István Szikora, as well as the Community of the Hungarian Neurosurgeons I warmly welcome you all to this event.

One of the most important topics for the Neurosurgical Community worldwide is vascular neurosurgery; future developments in this field will absolutely define the path our profession will follow.

The decision on individual care for a patient as well as the those on institutional investments, structure of clinical care for vascular diseases are burning issues that shape up the future of global neurosurgery.

It is my strong belief that this meeting not only will help to improve our knowledge and skills but also to expand our involvement in the field of the treatment of neurovascular diseases covering the whole spectrum of ischemic and hemorrhagic stroke as well as preventive interventions.

The prestigious faculty invited and the reputation of our hosts will guarantee a prosperous, important and significant meeting!

Hope to see you soon in Serbia!

Prof. dr
Andras Buki
President of the
Hungarian
Neurosurgical
Society

WELCOME ADDRESSES

Dear Colleagues,

On behalf of Japanese Neurosurgical Society, it is a great honor for our team to join the meeting in Kragujevac, Serbia. Because of a good historical relationship between two countries, we would like to continue support for the every aspects of neurosurgery as we can.

In this time, our team, Japanese neurosurgeons, who consist of the majority of subspecialties willing to participate and gathering for a great neurosurgical meeting in Kragujevac.

The philosophy of joining is providing academic knowledge and principle technique to all participants. Demonstration of trip and technique from the masters will be the clue of improving the treatment outcome.

I hope this conference will succeed and welcome you all to attend in this conference. I am looking forward to seeing you all soon.

Prof. Dr. Yoko Kato
Professor and Chair, Department of Neurosurgery
Fujita Health University Banbuntane Hotokukai Hospital
Board of Directors, Japan Neurosurgical Society
Executive Board, WFNS Foundation
Chairman, WFNS Fund-Raising Committee
President, Asian Congress of Neurological Surgeons

WELCOME ADDRESSES

Dear Colleagues,
Ladies and Gentlemen,

As the Honorary President of SouthEast Europe Neurosurgical Society and President of Croatian Society for Cerebrovascular and Endovascular Neurosurgery, it is my great pleasure and honor to announce and invite You to to the **5th Annual meeting of the Serbian Neurosurgical Society with international participation and joint meeting "NEUROVASCULAR SUPERSESSIONS: Exo? Endo? Hybrid? Quo vadis?"** in conjunction with Croatian Society for Cerebrovascular and Endovascular Neurosurgery and joint meeting with the Southeast Europe Neurosurgical Society to be held in **Kragujevac, Serbia, on October 24-27, 2019.**

The Southeast Europe Neurosurgical Society (SeENS, www.seens.eu) has been founded in 2012. SeENS has succeeded to rebuilt liaisons and to make new once after a period of almost 20 years of poor communication between colleagues in the SE Europe region. Currently SeENS is gathering neurosurgeons from 14 countries of the Southeast Europe region.

Since 2012, when we were established, we are providing around 10 continuous medical education events in the Southeast Europe region per year.

The meeting in Kragujevac, organized by the Serbian neurosurgical society and Croatian Society for Cerebrovascular and Endovascular Neurosurgery represents a continuation of this good practice and result of the intensive collaboration between Serbian and Croatian neurosurgeons.

Concerning the attractiveness of vascular neurosurgery the list of the invited speakers at this Joint meeting is impressive and includes the EuroAsian and World's leading experts in the field of neurosurgery. Over 100 active participants are expected to attend the Joint meeting.

It is my great honor to invite You to participate at this Joint meeting, to discover and enjoy the beautiful city of Kragujevac and experience and share noteworthy scientific and social moments.

Sincerely,

Prof. Dr.
Kresimir Rotim
Honorary Presdent of the Meeting
Croatian Society for Cerebrovascular and Endovascular Neurosurgery
President
SeENS Honorary President
WFNS Second Vice-President et Large

HONORARY PRESIDENTS OF THE MEETING

Prof. Dr
Lukas Rasulic,
Serbia
SNSS President
SeENS President

Prof. Dr.
Peter Vajkoczy,
Germany
EANS
Vascular Section

Prof. Dr.
Kresimir Rotim,
Croatia
CSCEN President
SeENS
Honorary
President
WFNS Second
Vice-President et
Large

HONORARY COMMITTEE

Doc. Dr. Zlatibor Loncar
Minister of Health of the Republic of Serbia

Mr. Mladen Sarcevic
Minister of Education, Science and Technological Development, Republic of Serbia

Prof. Dr Slavica Djukic Dejanovic
Minister without a portfolio in charge of demography and population policy, Republic of Serbia

Mr. Tomislav Nikolic
former President of the Republic of Serbia
The National Council for Coordination of Cooperation with the Russian Federation and the People's Republic of China, President

Prof. Dr. Nenad Filipovic
Rector, University of Kragujevac, Serbia

Prof. Dr. Vladimir Jakovljevic
Dean, Faculty of Medical Sciences, University of Kragujevac, Serbia

Prof. Dr. Predrag Sazdanovic
Director, Clinical Center of Kragujevac

Mr. Radomir Nikolic
Mayor of Kragujevac

ORGANIZING COMMITTEE

Doc. dr Radivoje Nikolic
Chairman of the Organizing Committee

Dr Milorad Veljkovic

Dr Ljubomir Krstic

Ass. dr Miodrag Peulic

Prof. dr Milan Mijailovic

Dr Milan Todosijevic

Dr Vojin Kovacevic

Dr Marko Petrovic

Prof. Dr Petar Vulekovic

Prof. Dr Nebojsa Stojanovic

Doc. Dr Ljubodrag Minic

Doc. Dr Milan Spaic

Ass. Dr Vojislav Bogosavljevic


Dr Andrija Savic


Dr Milan Lepic


Dr Jagos Golubovic


Dr Mladen Karan


Dr Filip Vitosevic


Dr Domagoj Gajski


Dr Bojan Jelaca


Dr Nebojsa Lasica


Dr Ante Rotim


Dr Nemanja Jovanovic


Dr Zarko Petrovic


Dr Mirko Micovic


Dr Marko Gregovic


Dr Dragoslav Nestorovic


Dr Filip Vrban


Dr Luka Berilazic


Dr Nikola Repac


Dr Aleksandar Janicijevic


Dr Filip Pajicic


Dr Miroslav Fimic

SCIENTIFIC COMMITTEE

Prof. Dr Goran Tasic
Co-chairman of the Scientific Committee

Dr Svetlana Milosevic Medenica
Co-chairman of the Scientific Committee

Doc. Dr Djula Djilvesi
Co-chairman of the Scientific Committee

Prof. Dr
Ioan Stefan Florian

Prof. Dr
Aleksandros Andreou

Doc. Dr
Tomislav Sajko

Prof. Dr
Miodrag Rakic

Prof. Dr
Miroslav Samardzic

Prof. Dr
Ihsan Solaroglu

Prof. Dr
Vaso Antunovic

Prof. dr
Snezana Lukic

Dr Ivan
Vukasinovic

Dr Vladimir
Kalousek

Assoc. Prof.
Milija Mijajlovic

Dr Zeljko
Zivanovic

Dr Ibrahim
Omerhodzic

FACULTY

Arnautovic Kenan, USA
Aydin Kubilay, Turkey
Baltsavias Gerasimos, Germany
Banczerowski Peter, Hungary
Bascarevic Vladimir, Serbia
Bogosavljevic Vojislav, Serbia
Boskovic Matic Tanja, Serbia
Bosnjak Roman, Slovenia
Brigante Luciano, Italy
Caparoski Aleksandar, North Macedonia
Cenzato Marco, Italy
Charbel Fady, USA
Cvetic Vladimir, Serbia
Culafic Slobodan, Serbia
Cinara Ilijas, Serbia
David Carlos, USA
Demetriades Andreas, UK
Destrieux Christophe, France
Dubovoy Andrey, Russia
Djilvesi Djula, Serbia
Djurovic Branko, Serbia
Emmez Hakan, Turkey
Ercegovic Zlatko, Bosnia & Herzegovina
Ferraresi Stefano, Italy
Filipovic Nenad, Serbia
Florian Ioan Stefan, Romania
Fontanella Marco, Italy
Foroglou Nicolas, Greece
Fountas Konstantinos, Greece
Freyschlag Christian, Austria
Golubovic Jagos, Serbia
Gruber Andreas, Austria
Hanggi Daniel, Germany
Hoit Daniel, USA
Ilic Aleksandra, Serbia
Ivanov Marcel, UK
Izumo Tsuyoshi, Japan
Jacquesson Timothée, France
Jekic Djole, Serbia
Jelaca Bojan, Serbia
Jovanovic Dejana, Serbia
Jovanovic Vladimir, Serbia
Kasuya Hidetoshi, Japan
Kawashima Akitsugu, Japan
Kiris Talat, Turkey
Koncar Igor, Serbia
Kovacevic Vojin, Serbia
Kurita Hiroki, Japan
Laakso Aki, Finland
Lakicevic Novak, Montenegro
Lavrnic Dragana, Serbia
Lepic Milan, Serbia
Lepic Toplica, Serbia
Lukic Snezana, Serbia
Lukshin Vasily, Russia
Maldonado Igor, France
Mandic-Rajcevic Stefan, Serbia
Markovic Aleksandar, Serbia
Masotto Barbara, Italy
Matos Bostjan, Slovenia
Meling Torstein, Norway/ Switzerland

Mijailovic Milan, Serbia
Mijajlovic Milija, Serbia
Milakovic Branko, Serbia
Milivojevic Natasa, Slovenia
Milosevic Zoran, Slovenia
Milosevic Medenica Svetlana, Serbia
Misra Basant, India
Netuka David, Czech Republic
Niiya Yoshimasa, Japan
Novak Laslo, Hungary
Novosel Luka, Croatia
Omerhodzic Ibrahim, Bosnia & Herzegovina
Papic Vladimir, Serbia
Paterno Vincenzo, Germany
Pavlicevic Goran, Serbia
Pavlovic Aleksandra, Serbia
Peker Selcuk, Turkey
Prestigiacomo Charles, USA
Raco Antonino, Italy
Radovanovic Ivan, Canada
Radulovic Danilo, Serbia
Rasulic Lukas, Serbia
Roitberg Ben, USA
Rotim Kresimir, Croatia
Rzaev Jamil, Russia
Sajko Tomislav, Croatia
Sames Martin, Czech Republic
Samii Madjid, Germany
Sanada Yasuhiro, Japan
Shucht Philippe, Switzerland
Seifert Volker, Germany
Smolanka Volodymyr, Ukraine
Solaroglu Ihsan, Turkey
Spaic Milan, Serbia
Splavski Bruno, Croatia
Stojanovic Nebojsa, Serbia
Szikora Istvan, Hungary
Tasic Goran, Serbia
Tasiou Anastasia, Greece
Tomasello Francesco, Italy
Tomasovic Sanja, Croatia
Ussesli Murat Imre, Turkey
Vajkoczy Peter, Germany
Velinov Nikolay, Bulgaria
Velnar Tomaz, Slovenia
Volovici Victor, The Netherlands
Vorsic Matjaz, Slovenia
Vrabec Matej, Slovenia
Vukasinovic Ivan, Serbia
Vukic Miroslav, Croatia
Vulekovic Petar, Serbia
Walsh Daniel, UK
Yoshimura Shinichi, Japan
Zivanovic Zeljko, Serbia

ACCREDITATION

EUROPEAN ACCREDITATION COUNCIL FOR CONTINUING MEDICAL EDUCATION (EACCME®)

"The Neurovascular supersessions: Exo? Endo? Hybrid? Quo vadis?, Kragujevac, Serbia, 24/10/2019-27/10/2019 has been accredited by the European Accreditation Council for Continuing Medical Education (EACCME®) with **27** European CME credits (ECMEC®s). Each medical specialist should claim only those hours of credit that he/she actually spent in the educational activity."

"Through an agreement between the Union Européenne des Médecins Spécialistes and the American Medical Association, physicians may convert EACCME® credits to an equivalent number of AMA PRA Category 1 CreditsTM. Information on the process to convert EACCME® credit to AMA credit can be found at:
www.ama-assn.org/education/earn-credit-participation-international-activities.

"Live educational activities, occurring outside of Canada, recognised by the UEMS-EACCME® for ECMEC®s are deemed to be Accredited Group Learning Activities (Section 1) as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada."

EACCME® credits

Each participant can only receive the number of credits he/she is entitled to according to his/her actual participation at the event once he/she has completed the feedback form. Cf. criteria 9 and 23 of UEMS 2016.20.

THE HEALTH COUNCIL OF THE REPUBLIC OF SERBIA

The **5th SNSS Annual Meeting with international participation "Neurovascular supersessions: Exo? Endo? Hybrid? Quo vadis?"** has been accredited by the Health Council of the Republic of Serbia as an International Congress, decision No.: 153-02-01685/2019-01 dated on August 19th, 2019, document number A-1-1769/19, with the following number of credits:

Lecturers:	**15 credits**
Oral presentations:	**13 credits**
Poster presentations:	**11 credits**
Passive participation:	**10 credits**

NEUROVASCULAR SUPERSESSIONS: Exo? Endo? Hybrid? Quo vadis?

MAIN SCIENTIFIC PROGRAM
Pros and Cons

Non ruptured aneurysms
- Natural history
- Surgery
- Endovascular procedure

Giant and large aneurysms - anterior circulation:
- Surgery
- Endovascular techniques
- By-pass surgical techniques

Giant and large aneurysms - posterior circulation:
- Surgery
- Endovascular techniques
- By-pass surgical techniques

MCA aneurysms:
- Non ruptured
- Bleeding
- Microsurgical vs. endo-vascular treatment

Dural AVFs:
- embolization
- surgery

Cerebral AVM
- Non ruptured
- Bleeding
- Symptomatic
- Asymptomatic
- Surgery
- Endovascular procedure
- Radiosurgery

BRAIN CAVERNOMAS
Brain Cavernomas in eloquent region
- Non ruptured
- Bleeding
- Natural history vs. surgery vs. radiosurgery

Stroke
- Treatment acute vs. delayed

Carotid surgery
- Exo
- Endo
- Hybrid

Quality of life

MEETING OVERVIEW

5th Annual Meeting of Serbian Neurosurgical Society
with international participation
NEUROVASCULAR SUPERSESSIONS:
Exo? Endo? Hybrid? Quo vadis?
Kragujevac, Serbia, October 24th-27th, 2019

The 5th SNSS Annual Meeting is hosted and organized by the Serbian Neurosurgical Society (SNSS), joint venture with EANS Section for Vascular Neurosurgery, Hungarian Neurosurgical Society and Japan Neurosurgical Society, Section for Vascular Surgery, in conjunction with Croatian Society for Cerebrovascular and Endovascular Neurosurgery, joint meeting with Southeast Europe Neurosurgical Society and WFNS Cerebrovascular Diseases & Therapy Committee.

The invited speakers at this event will include the world's leading experts in the field of vascular neurosurgery, who will contribute to the exchange of new knowledge and skills, so we may expect over 300 active participants in this Meeting.

This event will be held under the auspices of the President of the Republic of Serbia, H.E. Mr. Aleksandar Vucic, and will have the patronage and support of all relevant institutions of Republic Serbia.

The 5th SNSS Annual Meeting - Neurovascular supersessions: Exo? Endo? Hybrid? Quo vadis?, Kragujevac, Serbia, 24/10/2019-27/10/2019 has been accredited by the European Accreditation Council for Continuing Medical Education (EACCME®) and Health council of the Republic of Serbia.

114 Faculty Members with the individual participation of numerous Presidents of National, Continental and International Societies, as well as Honorary presidents of the WFNS.

Rich and dynamic scientific program:

3 MULTIMODAL EXPERT FORUM, 2 NEUROVASCULAR SUPERSESSIONS,
7 EXO VS. ENDO VS. HYBRID DISCUSSION SESSIONS,
2 HOW I DO IT SESSIONS, 1 QUO VADIS SESSION, 2 STROKE SYMPOSIA,
1 CAROTID SURGERY SYMPOSIA
2 PRE-MEETING WORKSHOPS, 2 RAPID CROSSFIRE SESSIONS,
1 SCIENTIFIC RESEARCH COURSE, 2 ORAL PRESENTATION SESSIONS,
YOUNG NEUROSURGEONS' AWARDS, NURSING SYMPOSIUM

HOST CITY
Kragujevac, Serbia

The location of the City of Kragujevac and its vicinity was settled in prehistoric times as demonstrated by numerous objects and archaeological monuments.

Kragujevac was first mentioned in 1476, after the fall under Turkish rule, in the Tapu-Defter. It consisted of a public square built in a settlement with 32 houses. From that time on it was desolated like all of Sumadija. Kragujevac was revived in the second half 15th century when Turks erected a new settlement on the left bank of the river Lepenica.

Kragujevac began to prosper in 1818 when it was proclaimed the capital of the new Serbian State on May 6th, St. George's Day. Because of its favorable central geographical position, nationally homogeneous population, unlike Belgrade which had a heavy Turkish population, Prince Milos chose Kragujevac to become the center of the state.

When the capital was moved to Belgrade in 1841, a period of stagnation in Kragujevac began. Between the two World Wars, the development of a military industry impacted the spatial development of Kragujevac. During World War II, Kragujevac was exposed to devastation. One of the gravest tragedies was a mass killing of the civilian population, including 300 pupils of the grammar school on October 21, 1941.

Despite all the hardships it faced, Kragujevac and its citizens always maintained hope for the future.

Today, Kragujevac is a city with an infrastructure, a geostrategic position and an available labor force that can guarantee successful business development. Along with two centuries of industrial tradition, Kragujevac is recognized for its openness to new ideas, educated young population, and its experienced, productive work force.

HOTEL ACCOMMODATION

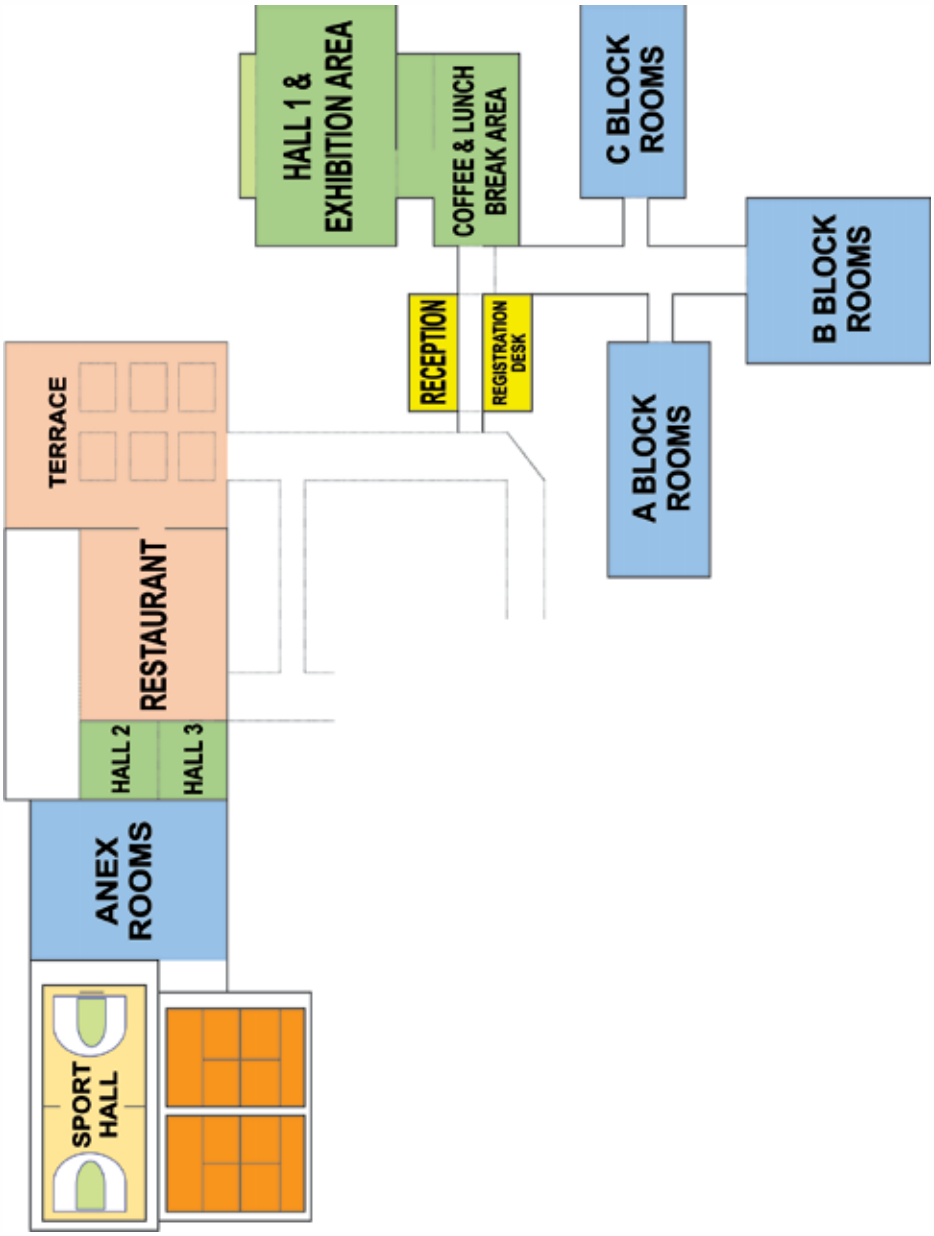
Meeting venue: Hotel Sumarice
Desankin venac bb
34000 Kragujevac, Srbija


Hotel Zelengora
Branka Radicevica 22
34000 Kragujevac, Serbia

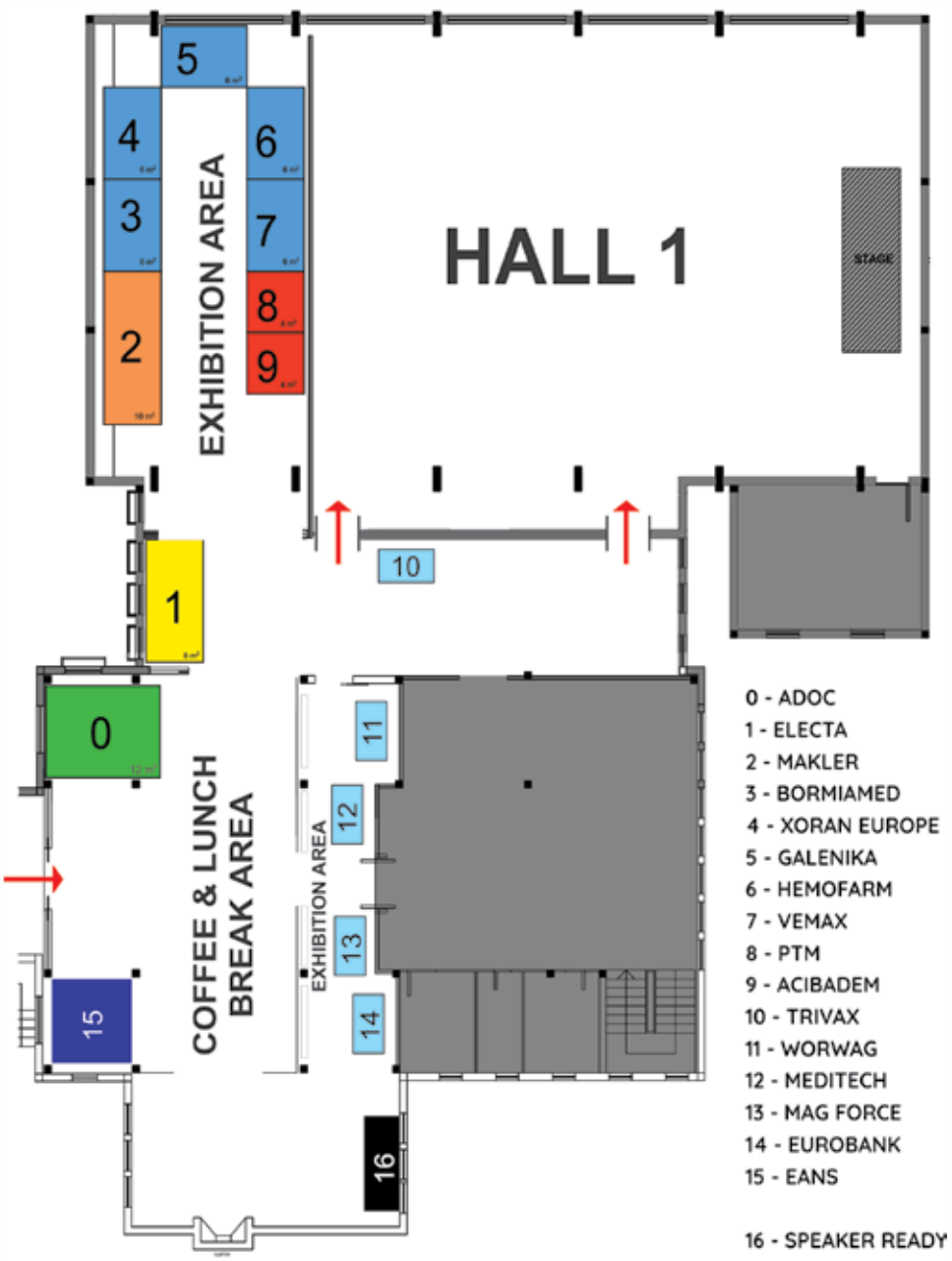

Hotel Kragujevac
Kralja Petra I No.18
34000 Kragujevac, Serbia


IN ORDER TO BOOK ACCOMMODATION
PLEASE FILL IN THE HOTEL BOOKING FORM AND SEND TO
vascularneuro@snss.org.rs

FLOOR PLAN SUMARICE



EXHIBITION FLOOR PLAN



PROGRAM AT A GLANCE

Thursday, October 24th 2019

Faculty of medical sciences Room 1		Faculty of medical sciences Room 2	
Registration			
08.50 11.00	NEUROVASCULAR SURGICAL ANATOMY WORKSHOP	09.00 11.00	WORKSHOP: NEUROSONOLOGY IN NEUROINTENSIVE CARE
11.00 11.30	Coffee break		
11.30 12.30	NEUROVASCULAR SURGICAL ANATOMY WORKSHOP	11.00 11.30	Coffee break
12.30 13.45	Lunch	11.30 13.00	WORKSHOP: NEUROSONOLOGY IN NEUROINTENSIVE CARE
13.45 15.00	NEUROVASCULAR SURGICAL ANATOMY WORKSHOP		
15.00 15.30	Coffee break	13.00 14.00	Lunch break
15.30 16.40	NEUROVASCULAR SURGICAL ANATOMY WORKSHOP	14.00 16.00	PRACTICAL PRESENTATIONS OF NEUROSONOLOGY METHODS IN NEUROINTENSIVE CARE
19.30 21.00	OPENING CEREMONY		

- **Prof. Dr. Lukas Rasulic**, Honorary President of the Meeting, SNSS President, SeENS President
- **Doc. Dr. Zlatibor Loncar**, Minister of Health of the Republic of Serbia
- **Mr. Mladen Sarcevic**, Minister of Education, Science and Technological Development, Republic of Serbia
- **Prof. Dr. Slavica Djukic Dejanovic**, Minister without a portfolio in charge of demography and population policy, Republic of Serbia
- **Mr. Tomislav Nikolic**, former President of the Republic of Serbia, The National Council for Coordination of Cooperation with the Russian Federation and the People's Republic of China, President
- **Prof. Dr Basant Misra**, President of the Asian Australasian Society of Neurological Surgeons, 1st Vice President, World Federation of Neurosurgical Societies
- **Prof. Dr Andreas Demetriades**, EANS President - Elect
- **Prof. Dr Kenan Arnautovic**, AANS, Chair, International Collaboration Committee
- **Prof. Dr. Kresimir Rotim**, Honorary President of the Meeting, SeENS Honorary President
- **Prof. Dr Peter Banczerowski**, Semmelweis University, Department of Neurosurgery, Head of Department, Hungary
- **Prof. Dr Hidetoshi Kasuya**, Department of Neurosurgery, Tokyo Women's Medical University Medical Center East, Japan
- **Prof. Dr. Nenad Filipovic**, Rector, University of Kragujevac, Serbia
- **Prof. Dr. Vladimir Jakovljevic**, Dean, Faculty of Medical Sciences, University of Kragujevac, Serbia
- **Prof. Dr. Predrag Sazdanovic**, Director, Clinical Center of Kragujevac
- **Doc. dr Radivoje Nikolic**, Organising Committee President
- **AWARD CEREMONY**
- **Mr. Radomir Nikolic**, Mayor of Kragujevac

21.00 23.00	Welcome reception	Restaurant Kafana Balkan

PROGRAM AT A GLANCE

Friday, October 25th 2019

	Hall 1	Hall 2	Hall 3
	Registration		
07.50 08.00	Opening remarks		
08.00 09.45	MULTIMODAL EXPERT FORUM 1		
09.45 10.15	SPECIAL GUEST LECTURE Madjid Samii		
10.15 12.00	EXO VS. ENDO VS. HYBRID DISC. - ANTERIOR CIRCULATION ANEURYSMS		
12.00 13.45	STROKE SYMPOSIA	EDUCATION AND TRAINING - YOUNG NS AWARD	
13.45 14.30	Lunch		
	Southeast Europe Neurosurgical Society – SEENS EC Business Meeting — Salon first floor		
14.30 16.15	HOW I DO IT SESSION	14.30 15.30 RAPID CROSSFIRE SESSION 1	14.30 19.30 SCIENTIFIC RESEARCH IN NEURO-SURGERY: FACING THE 21ST CENTURY CHALLENGES
16.15 16.30	Coffee break	15.30 17.18 ORAL PRESENTATIONS 1	
16.30 18.00	EXO VS. ENDO VS. HYBRID DISC. - NEW FRONTIERS	17.18 17.30 Coffee break	
18.00 20.15	CAROTID SURGERY SYMPOSIA	17.30 19.45 NEUROVASCULAR SUPERSESSION 1	
21.00 00.00	Serbian traditional dinner — Hotel Sumarice		

PROGRAM AT A GLANCE

Saturday, October 26th 2019

	Hall 1	Hall 2	Hall 3
	Registration		
08.00 09.30	EXO VS. ENDO VS. HYBRID DISCUSSION - MCA ANEURYSMS		
09.30 09.45	SPECIAL GUEST LECTURE Nenad Filipovic		
09.45 10.00	Coffee break		
10.00 12.30	HOW I DO IT SESSION		
12.30 14.00	MULTIMODAL EXPERT FORUM 2	12.30 14.00 STROKE SYMPOSIA	
			08.30 10.40 NURSING SYMPOSIUM
			10.40 11.00 Coffee break
			11.00 14.00 NURSING SYMPOSIUM
14.00 14.30	Lunch		
	Serbian Neurosurgical Society – SNSS EC Business Meeting		Salon first floor
14.30 15.45	QUO VADIS? - BYPASS SUPERSESSION	14.30 15.45 RAPID CROSSFIRE SESSION 2	
15.45 17.30	EXO VS. ENDO VS. HYBRID DISCUSSION - POSTERIOR CIRCULATION ANEURYSMS	15.45 18.15 NEUROVASCULAR SUPERSESSION 2	
17.30 17.45	Coffee break	18.15 18.30 Coffee break	Sports hall
17.45 20.15	EXO VS. ENDO VS. HYBRID DISCUSSION - OUTCOME	18.30 20.12 ORAL PRESENTATION 2	19.30 20.30 Sports tournament Basketball 3x3
21.00 00.00	Social dinner		Hotel Sumarice

PROGRAM AT A GLANCE

Sunday, October 27th 2019	
Hall 1	
Registration	
08.00 09.45	EXO VS . ENDO VS . HYBRID DISCUSSION - AVM
09.45 10.15	MEET THE EXPERTS - KOC HEALTHCARE SESSION: TEAMWORK IN NEUROVASCULARY SURGERY
10.15 12.00	EXO VS. ENDO VS. HYBRID DISCUSSION CAVERNOMA
12.00 13.00	MULTIMODAL EXPERT FORUM 3
13.00 13.15	Closing and awards ceremony

SOCIAL PROGRAM

Opening ceremony

Thursday, October 24th 2019
19.30
Faculty of Medical Science,
University of Kragujevac

Welcome Reception

Thursday, October 24th, 2019
21.00
Venue: Restaurant Balkan
(walking distance from Faculty of Medical Science)

Serbian Traditional Dinner

Friday, October 25th, 2019
21.00
Venue: Hotel Sumarice, Kragujevac

Social Dinner

Saturday, October 26th, 2019
21.00
Venue: Hotel Sumarice, Kragujevac

5th ANNUAL MEETING
of Serbian Neurosurgical Society
SNSS Annual meeting 2019
with international participation

NEUROVASCULAR SUPERSESSIONS:
Exo? Endo? Hybrid?
Quo vadis?

October 24th - 27th 2019
Kragujevac, Serbia
Venue: Hotel Sumarice, Kragujevac

PRE-MEETING WORKSHOPS

Thursday, October 24th 2019

Faculty of Medical Sciences, University of Kragujevac

Registration

Room 1

08:50-16:40 NEUROVASCULAR SURGICAL ANATOMY WORKSHOP

08:50-09:00 **Introduction**
Lukas Rasulic

09:00-09:30 **Skull base anatomy**
Christophe Destrieux

09:30-09:50 **Arterial embryology**
Christophe Destrieux

09:50-11:00 **Arterial anatomy and angiography**
Igor Maldonado
- ICA anatomy
- MCA anatomy
- ACA anatomy
- VA anatomy
- BA anatomy
- PCA anatomy

11:00-11:30 Coffee break

11:30-12:30 **Venous anatomy – interactive session**
Christophe Destrieux
- Superficial and Deep venous anatomy
- Sinus anatomy
- Cavernous sinus anatomy

12:30-13:45 Lunch

13.45-14.15 **Anterior fossa vascular approaches**
Timothée Jacquesson

14.15-14.30 **Applied anatomy, clinical cases, real scenarios – interactive session 1**
Igor Maldonado

14.30-15.00	**Middle fossa vascular approaches** Timothée Jacquesson
15.00-15.30	Coffee break
15.30-15.45	**Applied anatomy, clinical cases, real scenarios – interactive session 2** Igor Maldonado
15.45-16.15	**Posterior fossa vascular approaches** Timothée Jacquesson
16.15-16.30	**Applied anatomy, clinical cases, real scenarios – interactive session 3** Igor Maldonado
16.30-16.40	**Closing remarks**

Room 2

09:00-16:00	**WORKSHOP: NEUROSONOLOGY IN NEUROINTENSIVE CARE** Introduction: Lukas Rasulic Chairs: Milija Mijajlovic, Branko Milakovic, Vojislav Bogosavljevic
09.00-09.30	**Role of extracranial echosonograpy in neurointensive unit** Djole Jekic
09.30-10.00	**Transcranial Doppler in subarchnoid haemorrhage** Aleksandra Pavlovic
10.00-10.30	**Role of transcranial color coded duplex in intracerebral haemorrhage** Zeljko Zivanovic
10.30-11.00	**Optic nerve sheath diameter ultrasonography and the diagnosis of increased intracranial pressure** Milija Mijajlovic
11.00-11.30	Coffee break
11.30-12.00	**Ultrasound in brain death** Dejana Jovanovic
12.00-12-30	**Detection of microembolic signals and cerevral vaso reactivity in neurosurgery** Toplica Lepic
12.30-13.00	**Echocardiography in neurointensive care** Aleksandra Ilic
13.00-14.00	Lunch break
14.00-16.00	**Practical presentations of neurosonology methods in neurointensive care** All lecturers

5th ANNUAL MEETING
of Serbian Neurosurgical Society
SNSS Annual meeting 2019
with international participation

NEUROVASCULAR SUPERSESSIONS:
Exo? Endo? Hybrid?
Quo vadis?

October 24th - 27th 2019
Kragujevac, Serbia
Venue: Hotel Sumarice, Kragujevac

SCIENTIFIC PROGRAM

Thursday, October 24th 2019

Faculty of Medical Sciences, University of Kragujevac

19:30-21:00 OPENING CEREMONY

- **Prof. Dr. Lukas Rasulic,** Honorary President of the Meeting, SNSS President, SeENS President
- **Doc. Dr. Zlatibor Loncar,** Minister of Health of the Republic of Serbia
- **Mr. Mladen Sarcevic,** Minister of Education, Science and Technological Development, Republic of Serbia
- **Prof. Dr. Slavica Djukic Dejanovic**, Minister without a portfolio in charge of demography and population policy, Republic of Serbia
- **Mr. Tomislav Nikolic,** former President of the Republic of Serbia, The National Council for Coordination of Cooperation with the Russian Federation and the People's Republic of China, President
- **Prof. Dr Basant Misra**, President of the Asian Australasian Society of Neurological Surgeons, 1st Vice President, World Federation of Neurosurgical Societies
- **Prof. Dr Andreas Demetriades**, EANS President - Elect
- **Prof. Dr Kenan Arnautovic**, AANS, Chair, International Collaboration Committee
- **Prof. Dr. Kresimir Rotim,** Honorary President of the Meeting, SeENS Honorary President
- **Prof. Dr Peter Banczerowski,** Semmelweis University, Department of Neurosurgery, Head of Department, Hungary
- **Prof. Dr Hidetoshi Kasuya,** Department of Neurosurgery, Tokyo Women's Medical University Medical Center East, Japan
- **Prof. Dr. Nenad Filipovic**, Rector, University of Kragujevac, Serbia
- **Prof. Dr. Vladimir Jakovljevic**, Dean, Faculty of Medical Sciences, University of Kragujevac, Serbia
- **Prof. Dr. Predrag Sazdanovic**, Director, Clinical Center of Kragujevac
- **Doc. dr Radivoje Nikolic**, Organising Committee President
- **AWARD CEREMONY**
- **Mr. Radomir Nikolic**, Mayor of Kragujevac

Restaurant Kafana Balkan, Kragujevac

21:00-23:00 WELCOME RECEPTION

Friday, October 25th 2019

Hotel Sumarice, Kragujevac

	Registration **Hall 1**
07:50-08:00	**Opening remarks:** Lukas Rasulic, Kresimir Rotim, Istvan Szikora, Hidetoshi Kasuya
08:00-09.45	**MULTIMODAL EXPERT FORUM 1** Chairs: Lukas Rasulic, Kresimir Rotim
08:00-08:15	SNSS TRIBUTE: Madjid Samii Lecture 1 **From packing the cavity to changing the flow: a 12 years clinical experience with flow diverter technology** Istvan Szikora
08:15-08:30	**AVM surgery** Fady Charbel
08:30-08:45	**ICA blister aneurisms** Torstein Meling
08:45-09:00	**Neurosurgical treatment of ACM aneurysms** Kresimir Rotim
09:00-09:15	**Trapping with bypass for ICA blister aneurysms** Akitsugu Kawashima
09:15-09:30	**Role of EBM in neurovascular surgery: Quality of literature, nature of medical publishing** Ben Roitberg
09:30-09:45	**Extradural selective anterior clinoidectomy for IC paraclinoid aneurysms** Hidetoshi Kasuya
09:45-10:15	**SPECIAL GUEST LECTURE** **Surgical management of intracranial cavernomas** Madjid Samii / via Skype /

* Coffee and refreshment will be served in Hall 1

10:15-12:00	**EXO VS. ENDO VS. HYBRID DISCUSSION - ANTERIOR CIRCULATION ANEURYSMS** Chairs: Goran Tasic, Zoran Milosevic
10:15-10:30	**Rapid ventricular pacing - Advanced intraoperative CBF manipulation during surgery of complex intracranial aneurysms** Volker Seifert
10:30-10:45	**Anterior brain circulation aneurysm surgery - single center experience** Goran Tasic
10:45-11:00	**Various Cerebral Blood Flow Control Techniques in Clipping Surgery for Complicated Cerebral Aneurysms** Yoshimasa Niiya
11:00-11.15	**Microsurgery of Very Large & Giant Anterior Circulation Aneurysm** Basant Misra
11.15-11:30	**Perforating arteries of brain** Luciano Brigante
11:30-11:45	**Pretemporal transcavernous skull base approach to circle of Willis aneurysms** Kenan Arnautovic
11:45-12:00	Discussion
12:00-13:45	**STROKE SYMPOSIA** Chairs: Gerasimos Baltsavias, Tomislav Sajko
12:00-12:15	**Surgical management of spontaneous intracerebral haemorrhage: why and when?** Vladimir Bascarevic
12:15-12:30	**Frontline of acute stroke intervention** Shinichi Yoshimura
12:30-12:45	**The role of neurosurgeon in the stroke treatment** Matjaz Vorsic
12:45-13:00	**The clinical significance of the scale in the assesment of outcome after intracerebral haemorrhage** Zeljko Zivanovic
13:00-13:15	**Endovascular treatment of acute ischemic stroke** Gerasimos Baltsavias
13:15-13:30	**IPSL - ADOC: Complete neurovascular support for microcirculation and nerve function – Nuronorm** Dragana Lavrnic
13.30-13:45	Discussion
13:45-14:30	Lunch

14:30-16:15	**HOW I DO IT SESSION** Chairs: Hidetoshi Kasuya, Djula Djilvesi
14:30-14:45	**Anterior circulation nuances in temporal clipping** Tomislav Sajko
14:45-15:00	**The surgical management of previously Endovascular treated aneurysms** Carlos David
15:00-15:15	**Strategies in brain AVM endovascular treatment** Gerasimos Baltsavias
15:15-15:30	**Vascular cases: how to move past a friendship fight and eat some "humble pie"** Stefano Ferraresi
15:30-15:45	**Endovascular coil embolization of very small intracranial aneurysms** Milan Mijailovic
15:45-16:00	**Multiple bilateral intracranial aneurysms treated by a single craniotomy: an indication for microsurgery? 2D video** Francesco Tomasello
16:00-16:15	Discussion
16:15-16:30	Coffee break
16:30-18:00	**EXO VS. ENDO VS. HYBRID DISCUSSION - NEW FRONTIERS** Chairs: Petar Vulekovic, Ivan Radovanovic
16:30-16:45	**Temporal pattern of intracranial aneurism rupture** Petar Vulekovic
16:45-17:00	**Management of cerebral vasospasm** Konstantinos Fountas
17:00-17:15	**Brain aneurysms : surgery vs endovascular between common sense, economicity and opportunity** Stefano Ferraresi
17:15-17:30	**Current Options and Development of Minimally Invasive Transcranial Approaches for Tumoral and Vascular Pathologies** Ivan Radovanovic
17:30-17:45	**Early Brain Injury Following SAH** Ihsan Solaroglu
17:45-18:00	**IPSL - MEDTRONIC: Endovascular treatment aneurysms with wide neck on bifurcation with Web system** Slobodan Culafic

18:00-20:15	**CAROTID SURGERY SYMPOSIA** Chairs: David Netuka, Konstantinos Fountas
18:00-18:15	**Interim results: prevention of brain infarctions during internal carotid endarterectomy detected using magnetic resonance (sonobirdie mr) trial – a randomized controlled trial** David Netuka
18:15-18:30	**Intraoperative monitoring in extracranial carotid artery surgery** Volodymyr Smolanka
18:30-18:45	**Improving safety in Carotid Endarterectomies** Philippe Schucht
18:45-19:00	**Treatments of carotid/intracranial artery stenosis** Shinichi Yoshimura
19:00-19:15	**Extra and intracerebral dissections** Laszlo Novak
19:15-19:30	**Preliminary results of urgent carotid surgery** Ilijas Cinara
19:30-19.45	**Endovascular treatment of Carotid artery disease – presentations of different cases from Serbian Clinical Center** Vladimir Cvetic
19:45-20:00	**Stroke after CEA** Igor Koncar
20:00-20:15	Discussion
	Salon - first floor
13:45-14:30	**Southeast Europe Neurosurgical Society – SEENS EC Business Meeting**
	* Lunch will be served during the meeting
21:00-00:00	**Serbian traditional dinner**, Hotel Sumarice

Hall 2

12:00-13:45	**EDUCATION AND TRAINING - YOUNG NEUROSURGEONS AWARD** Chairs: Andreas Demetriades, Hakan Emmez, Djula Djilvesi, Ibrahim Omerhodzic
12:00-12.15	**Education in Neurosurgery** Francesco Tomasello
12.15-12.30	**Education and Training: a Roadmap from the EANS** Andreas Demetriades
12.30-13.45	**PRESENTATION OF THE BEST SELECTED PAPERS:**
12.30-12.37	**Flow diverters in endovascular treatment of aneurysms beyond the circle of willis–our experience** Filip Vitosevic
12.37-12.44	**Multiple intracranial aneurysms – 20 years of experience in Cluj-Napoca** Cristina Aldea
12.44-12.51	**Results of surgical treatment of spontaneous intracerebral hemorrhage - personal experience** Andrija Savic
12.51-12.58	**Vertebral artery injury secondary to cervical gunshot** Duygu Dolen
12.58-13.05	**A day in the life with Brain Cavernous Malformation** Enrico Gambatesa
13.05-13.12	**Giant cavernous malformation with unusually aggressive clinical course: case report** Jovan Grujic
13.12-13.19	**The role of TNF-α-based models in prognostication of the outcomes after ICH: a pilot study** Vladimir Rendevski
13.19-13.26	**The influence of early craniectomy and microsurgical treatment of ruptured MCA aneurysm on neurological recovery accompained with extracranial complication** Fahrudin Alic
13.26-13.33	**Computed tomography volumetric analysis of aneurysmal subarachnoid haemorrhage in modified Fisher scale graded patients: A strong delayed cerebral ischemia predictor?** Jagos Golubovic

13.33-13.40	**Angiographic vasospasm and its prognostic significance within operative treated patients after the rupture of intracranial aneurysms** Luka Berilazic
13.40-13.47	**Maxillary and middle meningeal artery insonation in by - pass evaluation** Milan Lepic
13:47-14:30	Lunch
14:30-15:30	**RAPID CROSSFIRE SESSION 1** **Case presentation and expert discussion** Presenters: Andrija Savic, Bojan Jelaca, Nebojsa Lasica Moderators: Volker Seifert, Gerasimos Baltsavias, Tomislav Sajko
	Case 1: Surgical treatment of the cavernous angioma - case report Andrija Savic
	Case 2: Treatment for Intracranial Aneurysmal Hemorrhage in Elderly Patients Bojan Jelaca
	Case 3: Patient with saccular right ICA and two fusiform aneurysms of the left vertebral and basilar artery Nebojsa Lasica
15:30-17:18	**ORAL PRESENTATION 1** Chairs: Aki Laakso, Laszlo Novak
15.30-15.36	**Complications, comorbidity, and quality of life in patients with angiogram negative spontaneous subarachnoid hemorrhage** Aleksandar Kostic et al.
15.36-15.42	**Eyebrow keyhole versus pterional craniotomy for clipping of anterior circulation cerebral aneurysms** Dario Muzevic et al.
15.42-15.48	**Challenges in endovascular treatment of wide neck aneurysms** Menka Lazareska et al.
15.48-15.54	**Thrombectomy in children why not?** Ivan Vukasinovic et al.
15.54-16.00	**Surgical Management of Paraclinoid Aneurysms in Solo Neurosurgical Practice** Hotetsu Shimamoto

16.00-16.06	**Unruptured mca bifurcation aneurysm - case report** Andrija Savic
16.06-16.12	**Medical Image Segmentation Using Deformable Models and Local Fitting Binary** Emmanuel Gadzama Hamatu
16.12-16.18	**Endovascular treatment of brain AVMs: pearls and pitfalls** Ivan Vukasinovic et al.
16.18-16.24	**Pure DVA patient presented with Intracerebral Hematoma: A rare case** Utku Ozgen et al.
16.24-16.30	**Case report: Surgical treatment of Deep-seated Occipital Paramedian Ruptured AVMs** Adina Mihaela Popa
16.30-16.36	**Familial cerebellar cavernoma in 13-year-old child: case report** Bojana Zivkovic et al.
16.36-16.42	**Basilar artery occlusion and unknown-onset stroke, a tied hands situation or not? Case report** Dmitar Vlahovic et al.
16.42-16.48	**Intra-arterial tirofiban thrombolysis after flow-diverter stent thrombosis: case report** Slavko Djuraskovic et al.
16.48-16.54	**Challenges of Anesthesia in Endovascular Mechanical Thrombectomy** Inga Mladic Batinica et al.
16.54-17.00	**Seizures in epilepsy in people with cerebral cavernomas** Lazar Stankovic et al.
17.00-17.06	**Epilepsy as an initial factor of the clinical presentation of arteriovenous malformations of the brain – natural history and risk factors** Abousabie Z. et al.
17.06-17.12	**The natural course of spontaneous intracerebral brain hemorrhage localized in the basal ganglia of the brain - the analysis of a series of 39 patients** Almzeogi M. et al.
17.12-17.18	**Predictor morphological factors for rupture of arteriovenous brain malformations** Zivanovic Jelena et al.
17.18-17.30	**Coffee break**

17:30-19:45	**NEUROVASCULAR SUPERSESSION 1** Chairs: Istvan Szikora, Akitsugu Kawashima
17:30-17:45	**Avoiding ICA injury in endonasal surgery of invasive cavernous sinus adenomas. A single case of endonasal CS-ICA clipping** Roman Bosnjak
17:45-18.00	**ACM: to clip or coil?** Antonino Raco
18:00-18:15	**Surgical strategy for bilateral large vertebral artery dissecting aneurysms. Lessons form a case** Yasuhiro Sanada
18:15-18:30	**Natural history of brain AVMs** Aki Laakso
18:30-18:45	**Impact of flow diverters on peri-aneurysmal flow: mechanical properties and flow effects by measurements and simulation** Istvan Szikora
18:45-19:00	**Microvascular Decompression of Dolychovertebro basilar Artery in Patients with Trigeminal Neuralgia** Jamil Rzaev
19:00-19:15	**Anesthesia in surgery of cerebrovascular diseases** Branko Milakovic
19.15-19.30	**The overall outcome influence of rebleeding vasospasm and hydrochephalys in patients with spontaneous subanarchoid hemorrage and the factors determining their onset** Goran Pavlicevic
19:30-19.45	Discussion

21:00-00:00 **Serbian traditional dinner**, Hotel Sumarice

Hall 3

14:30-19:30 SCIENTIFIC RESEARCH IN NEUROSURGERY: FACING THE 21ST CENTURY CHALLENGES

DESCRIPTION:

Course duration: 5 hours
Price: Included into the Registration fee with compulsory online pre-registration: (https://ultramarine.vcongress.de/vascularneuro2019/_home)
Number of participants: up to 20

COURSE INTRODUCTION:

Introduction
Lukas Rasulic, Kresimir Rotim, Ben Roitberg

Importance of Publishing: Insight into the Functioning of a Scientific Journal
Ben Roitberg

Scientific plagiarism, Acta Clinica Croatica experience
Kresimir Rotim

How to Convince a Reviewer?
Ihsan Solaroglu

Elements of a Scientific Paper
Stefan Mandic-Rajcevic

HANDS-ON TRAINING:

Stefan Mandic-Rajcevic, Milan Lepic, Jagos Golubovic, Bojan Jelaca

1. **Topic, title, abstract, keywords, authors, affiliations and author contributions**

2. **Introduction**
   - From an idea to the literature search
   - Structure
   - PubMed and MeSH terms
   - Alternative sources

- Title and abstract screening
- Writing the Introduction
- Reference management and citing
- Plagiarism

3. Material and methods

- Structure
- Types of studies
- Ethical approval and informed consent
- Statistics
- Reproducibility

4. Results

- Structure
- Tables
- Figures
- Descriptions
- Interpretation of results

5. Discussion and Conclusions

- Structure
- Introduction vs Discussion
- Study limitations
- Future studies
- Lazy writing

6. Choosing the right Journal

- Journal and author metrics
- Journal suggestion systems

21:00-00:00 **Serbian traditional dinner**, Hotel Sumarice

Saturday, October 26th 2019

Hotel Sumarice, Kragujevac

Registration

Hall 1

08.00-09.30	**EXO VS. ENDO VS. HYBRID DISCUSSION - MCA ANEURYSMS** Chairs: Peter Banczerowski, Svetlana Milosevic Medenica
08:00-08:15	**MCA endovascular vs surgical treatment** Nikolay Velinov
08:15-08:30	**Redefining the Guidelines in Ruptured MCA Aneurysms Treatment** Djula Djilvesi
08:30-08:45	**Indications for proper treatment selection of middle cerebral artery aneurysms: institutional experience** Bruno Splavski
08:45-09:00	**Clipping versus coiling for ruptured intracranial aneurysms: single institution experience** Zlatko Ercegovic
09:00-09:15	**MCA aneurysms treatment in 21st century** Fady Charbel
09:15-09:30	**IPSL - Vemax: Novel emerging therapeutical supplements in treatment of neurovascular disorders; augmentation biases in regeneration and sanation of the oxydative stress-myth or reality** Lukas Rasulic
09:30-09:45	**SPECIAL GUEST LECTURE:** **Computer modeling of patient-specific intracranial aneurysms** Nenad Filipovic
09:45-10.00	Coffee break

10:00-12:30	**HOW I DO IT SESSION** Chairs: Martin Sames, Stefano Ferraresi
10:00-10:15	**Intramedullary cavernous malformations. Microneurosurgical treatment. How I do it.** Marcel Ivanov
10:15-10:30	**Endovascular management of Vein of Galen aneurysm malformation- case reports and followup period of 7 Years** Snezana Lukic
10:30-10:45	**Vein of Galen aneurismal malformations - Three cases report** Matos Bostjan
10:45-11:00	**In-situ occlusion of arteriovenous malformations in highly eloquent locations** Daniel Walsh
11:00-11:15	**Exoscopical anuerysm surgery: The future?** Daniel Hanggi
11:15-11:30	**Management of giant and large carotid-opthalmic aneurysms** Martin Sames
11:30-11:45	**Treatment Options for Ruptured and Unruptured Aneurysms in UHC Sestre Milosrdnice** Luka Novosel
11:45-12:00	**Radiosurgery for Large AVM's** Hakan Emmez
12:00-12:15	**Flow diverting stents in endovascular treatment of large, giant and fusiform aneurysms: breaking limitations of endovascular repair** Svetlana Milosevic-Medenica
12:15-12:30	**Surgery of the vascular lesions surrounding fourth ventricle** Ibrahim Omerhodzic

12:30-14:00	**MULTIMODAL EXPERT FORUM 2** Chairs: Francesco Tomasello, Volker Seifert
12:30-12:45	**SNSS TRIBUTE: Milivoje Kostic Lecture 1** **Giant aneurysma management** Peter Vajkoczy
12:45-13:00	**Tandem Fenestration of lamina terminalis and membrane of Lillequist during microsurgical clipping of anterior circulation aneurysms: Does it reduce shunt dependent hydrocephalus following SAH?** Francesco Tomasello
13:00-13:15	**Progressive Foix-Alajouanine syndrome in case of tethered cord patient with complex spinal developmental disease** Peter Banczerowski
13:15-13:30	**Microsurgery of unruptured aneurysms - still a valid option** Ioan Stefan Florian
13:30-13:45	**Efficacy of Preoperative Embolization with Onyx for Intracranial AVM Surgery From a Direct Surgeon's Point of View** Tsuyoshi Izumo
13:45-14:00	**Treatment of a giant vertebral aneurysm with antegrade vascular reconstruction** Yasuhiro Sanada
14:00-14:30	Lunch
14:30-15:45	**QUO VADIS? - BYPASS SUPERSESSION** Chairs: Basant Misra, Hiroki Kurita
14:30-14:45	**Rationale for cerebral multibarrel revascularization** Vasily Lukshin
14:45-15:00	**Parent artery occlusion under bypass protection for the management of complex intracranial aneurysms** Andreas Gruber
15:00-15:15	**Bypass Surgery for Blood Blister-like Aneurysms** Yoshimasa Niiya
15:15-15:30	**Posterior fossa bypasses** Peter Vajkoczy
15:30-15:45	Discussion

15:45-17:30	**EXO VS. ENDO VS. HYBRID DISCUSSION - POSTERIOR CIRCULATION ANEURYSMS** Chairs: Torstein Meling, Andreas Gruber
15:45-16:00	**Combined Neurovascular Approach ("Hybrid Repair") for Complex Large/Giant Basilar Apex Aneurysms** Hiroki Kurita
16:00-16:15	**Microsurgery of Very Large & Giant Posterior Circulatio Aneurysm** Basant Misra
16.15-16:30	**The role of bypass in surgery of complex aneurysms (anterior and posterior circulation)** Andrey Dubovoy
16:30-16:45	**Bypass surgery for aneurysms in posterior circulation** Akitsugu Kawashima
16:45-17:00	**Management of dissecting and fusiform vertebral artery aneurysms involving the PICA origin** Andreas Gruber
17:00-17:15	**Endovascular Treatment of intracranial bifurcation aneurysms** Kubilay Aydin
17:15-17:30	Discussion
17.30-17.45	Coffee break
17:45-20:15	**EXO VS. ENDO VS. HYBRID DISCUSSION - OUTCOME** Chairs: Kenan Arnautovic, Vincenzo Paterno
17:45-18:00	**Aneurysms by the Numbers: Mathematical Modeling to Predict Rupture Status** Charles Prestigiacomo
18:00-18:15	**Evolution of aneurysm surgery in the endovascular era** Victor Volovici
18:15-18:30	**Our approach and experience with adult brainstem cavernous malformations** Murat Imre Ussesli
18:30-18:45	**Hybrid OR, future of neurosurgery** Zoran Milosevic
18:45-19:00	**Surgical outcome in poor grading SAH patients** Anastasia Tasiou

19:00-19:15	**Neurosurgical treatment for multiple aneurysms** Branko Djurovic
19:15-19:30	**Association between Circle of Willis Configuration and Rupture of Cerebral Aneurysms** Nebojsa Stojanovic
19:30-19:45	**The vascular, endovascular and cognitive approach to cerebral aneurysm surgery** Milan Spaic
19:45-20:00	**Long term cognitive outcome after ruptured aneurysm clipping** Vladimir Papic
20:00-20:15	**The Influence of Intraoperative Rupture of Cerebral Aneurysms on the Outcome of Microsurgical Intervention** Novak Lakicevic

Salon - first floor

14:00-14:30	**Serbian Neurosurgical Society - SNSS EC Business Meeting**

Sports hall

19:30-20:30	Sports tournament - Basketball 3x3

21.00-00.00 **Social dinner**, Hotel Sumarice

	Hall 2
12:30-14:00	**STROKE SYMPOSIA** Chairs: Sanja Tomasovic, Natasa Milivojevic
12:30-12:45	**Outcome prediction by volume of ischemic brain in malignant middle cerebral artery infarction treated by decompressive hemicraniectomy** Christian Freyschlag
12:45-13:00	**IPSL Bormia- Vesalio: New technologies in stroke treatment** Luka Novosel
13:00-13:15	**Malignant middle cerebral artery (MCA) infarction and decompressive hemicraniectomy- to do or not to do?** Natasa Milivojevic
13:15-13:30	**Anticoagulant therapy for acute ischemic stroke** Tanja Boskovic Matic
13:30-13:45	**Indications for surgery and surgical strategies for spontaneous intracerebral hemorrhage** Vojin Kovacevic
13:45-14:00	**IPSL- Hemofarm: Hospital infections in the era of hybrid OR** Aleksandar Markovic
14:00-14:30	Lunch
14:30-15:45	**RAPID CROSSFIRE SESSION 2** **Case presentation and expert discussion** Presenters: Nemanja Jovanovic, Milan Lepic, Filip Pajicic Moderators: Ioan Stefan Florian, Djula Djilvesi, Nikolay Velinov

Case 1: Giant basilar artery aneurysm
Nemanja Jovanovic

Case 2: Diffuse spinal AVM
Milan Lepic

Case 3: Posterior fossa vascular lesion presenting with severe cerebellar symptoms
Filip Pajicic

15:45-18.15	**NEUROVASCULAR SUPERSESSION 2** Chairs: Philippe Schucht, Miroslav Vukic
15:45-16:00	**IPSL Galenika**: **Contemporary and Practical Management of the enigmatic process: microcirculation and delayed nerve tissue ischemia** Vojin Kovacevic
16:00-16:15	**Origin of Sylvian hematoma** Hidetoshi Kasuya
16:15-16:30	**Treatment of spinal dural AV fistulas: surgery vs embolization** Miroslav Vukic
16:30-16:45	**CEA: how to do it** Philippe Schucht
16:45-17:00	**Surgical Management of Complex Aneurysms using Skull Base Techniques** Tsuyoshi Izumo
17:00-17:15	**Spinal cord hemangioblastoma** Vincenzo Paterno
17:15-17:30	**Surgical practice in tertiary care centre for vascular lesions** Danilo Radulovic
17:30-17:45	**MCA aneurysm: Proximal or distal?** Vojislav Bogosavljevic
17.45-18.00	**Management and evaluation of clinical outcome in patients with middle cerebral aneurysms treated with surgical clipping versus endovascular coiling** Aleksandar Caparoski
18.00-18.15	**Incidence of hypopituitarism after spontaneous subarachnoid hemorrhage of aneurysmal origin** Vladimir Jovanovic
18.15-18:30	Coffee break
18:30-20:12	**ORAL PRESENTATIONS 2** Chairs: Ihsan Solaroglu, David Netuka
18.30-18.36	**Intraventricular cerebral cavernomas: natural history and surgical outcome** Vincenzo Fontana et al.
18.36-18.42	**Dual trained vascular neurosurgeon - a paradigm shift** Adnan Cickusic et al.
18.42-18.48	**The unusual timing of the cerebral vasospasm and ischemic neurological deficit in a patient with aneurismal subarachnoid hemorrhage** Slavko Zivkovic et al.

18.48-18.54	**Neurosurgical treatment of intracranial aneurysms** Ante Subasic
18.54-19.00	**Skull-base osseous arteriovenous malformation – a rare clinical entity in pediatric patients** Srdjan Nikolovski et al.
19.00-19.06	**Diagnostic and Therapeutic flow-chart for treatment of Cerebral Cavernous Malformations** Pier Paolo Berti et al.
19.06-19.12	**Endovascular treatment od AVM- case report** Andrija Savic et al.
19.12-19.18	**Can EEG Test Helps in Identifying Brain Tumor?** Emmanuel Gadzama Hamatu
19.18-19.24	**Endovascular treatment of large and giant aneurysms: use of intraoperative monitoring and post-surgery rescue techniques** Ivan Vukasinovic et al.
19.24-19.30	**Mechanical Thrombectomy in stroke- our ten months experience** Menka Lazareska et al.
19.30-19.36	**Surgical Outcomes of Pons Cavernomas Operated with Subocipital Craniectomy** Utku Ozgen
19.36-19.42	**Transorbital Hybrid Approach for Endovascular Occlusion of indirect Carotid-Cavernous Fistulas - case report** Ivan Vukasinovic
19.42-19.48	**Should we restore oral anticoagulant therapy after intracerebral hemorrhage, when and how?** Goran Knezovic
19.48-19.54	**Goal directed fluid therapy during intracranial aneurysm surgery- fashion or need?** Sanja Maricic Prijic
19.54-20.00	**Predictable Morphometric Parameters for Rupture of Intracranial Aneurysms** Nikolic I. et al.
20.00-20.06	**Natural flow of arterio-venous malformations of the brain** Repac N. et al.
20.06-20.12	**Cavernous malformations of the brain stem – the clinical features and surgical approaches** Janicijevic A. et al

Hall 3

08:30-13:45 **NURSING SYMPOSIUM**
Chairs: Cecilija Rotim, Zana Djuric, Bojana Nedeljkovic

NURSING SYMPOSIUM SUPPORTED BY

08:30-08:40	**Opening remarks** Lukas Rasulic Kresimir Rotim
08:40-08:52	**Decision making in a nursing profession** Cecilija Rotim
08:52-09:04	**Specificities in the work of a nurse on stereotaxic radiosurgery - Gamma Knife** Zana Djuric
09:04-09:16	**Scrub nurse procedures during intracranial aneurysm surgery** Novka Lipovcan
09:16-09:28	**Cerebral aneurysm-intraoperative nursing care** Vesna Svircevic
09:28-09:40	**Importance of early recognition of complications after treatment of cerebrovascular diseases** Ivana Dondo
09:40-09:52	**Nursing care of severe disabled patients after spontaneus intracranial haemorrhage** Bojana Nedeljkovic
09:52-10:04	**Nursing care of patients with cerebral aneurysm** Marija Magdic, Mirjana Orsic
10:04-10:16	**Postoperative care of patients with cerebral aneurysm** Ljiljana Nesovic
10:16-10:28	**Nursing care of patients with AV malformation** Marija Knezovic
10:28-10:40	**Endovascular treatment of intracranial aneurysm-perioperative nursing care for patients** Lorena Manovic
10:40-11:00	Coffee break

Chairs: Vesna Svircevic, Svetlana Delic, Novka Lipovcan

11:00-11:12	**Technical organisation of a neurosurgical operating room** Sanja Lesnjak
11:12-11:24	**Nursing role in diagnostic procedures in patients with spontaneous subarachnoid haemmorhage** Svjetlana Stojisavljevic
11:24-11:36	**Standardized procedures in children with intracranial hemorrhage** Enisa Rizic
11:36-11:48	**Scrub nurse procedures during neurosurgical treatment of intracerebral hemathomas** Ivana Balic Strbac
11:48-12:00	**The role of scrub nurse during stereotactic brain biopsy procedure** Branislava Sirar
12:00-12:12	**Technological innovations – challenges in scrub nursing profession** Ivana Galic
12:12-12:24	**Learning curve in brain aneurysm surgery for nurses working in operating room** Aleksandar Minev
12:24-12:36	**Nursing role in preoperative procedures for endovascular interventions** Jovana Gvozdenovic
12:36-12:48	**Importance of scrub nurses´ communication skills in treatment of neurosurgical patient** Zrinka Gabrilo
12:48-13:00	**The connection between depression and strokes- the challenges nurses face in their work** Mateo Kosier
13:00-13:12	**Standardized activities in patients with intracranial hemorrhage** Svetlana Delic
13:12-13:24	**Intrathecal Baclofen Therapy (ITB)- our experience** Martina Kolacko
13.24-13.40	**Discussion**
13.40-14.00	**Closing and award ceremony**

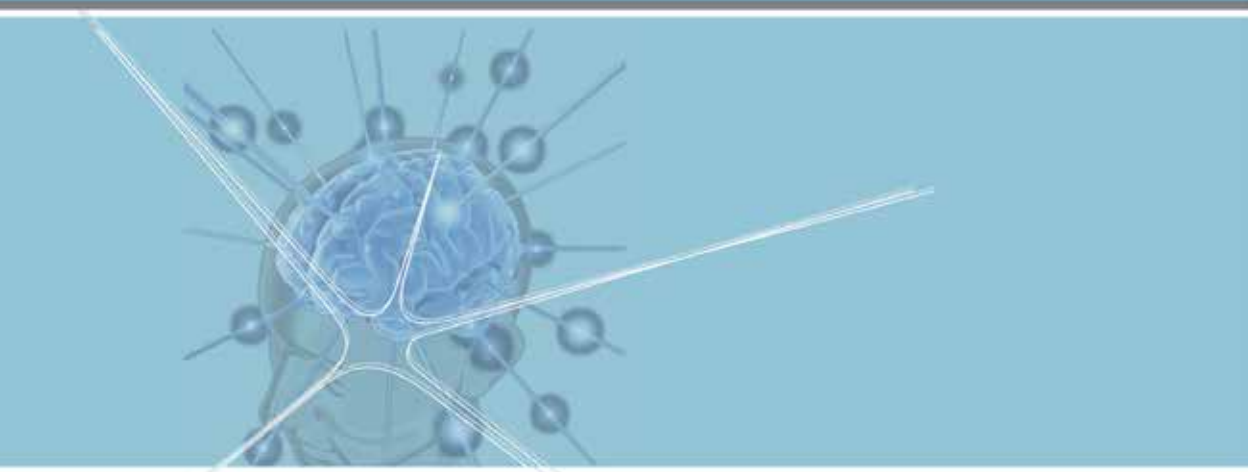
Sunday, October 27th 2019

Hotel Sumarice, Kragujevac

	Registration
	Hall 1
08:00-09:45	**EXO VS. ENDO VS. HYBRID DISCUSSION - AVM** Chairs: Ioan Stefan Florian, Marco Cenzato
08:00-08:15	**Vascular malformations at the pediatric age** Ioan Stefan Florian
08:15-08:30	**Endovascular treatment of spinal dural AVFs: possibilities and limits** Ivan Vukasinovic
08:30-08:45	**Dural AVF's – a case study** Sanja Tomasovic
08:45-09:00	**Unruptured AVMs** Marco Cenzato
09:00-09:15	**Biology and Genetics of Human Brain Arteriovenous Malformations: A Path towards Targeted Therapies** Ivan Radovanovic
09:15-19:30	**The importance of Telestroke network in swift treatment of ruptured AVMs** Tomaz Velnar
09:30-09:45	Discussion
09:45-10:15	**MEET THE EXPERTS - KOC HEALTHCARE SESSION: Teamwork in Neurovasculary Surgery** Chair: Talat Kiris, Lukas Rasulic
	Endovascular treatment of Wide-necked intracranial bifurcation aneurysms Kubilay Aydın **Radiosurgery for cerebral neurovascular problems** Selcuk Peker **Team Approach for Vascular Pathologies: Case Discussions** İhsan Solaroglu
	*Coffee and refreshment will be served in Hall 1

10:15-12:00	**EXO VS. ENDO VS. HYBRID DISCUSSION CAVERNOMA** Chairs: Ivan Radovanovic, Ihsan Solaroglu
10:15-10:30	**Brainstem cavernomas** Marco Cenzato
10:30-10:45	**MR Imaging of cavernomas** Matej Vrabec
10:45-11:00	**Surgical treatment of cavernomas** Nicolas Foroglou
11:00-11:15	**Brainstem cavernomas** Barbara Masotto
11:15-11:30	**Radiosurgery for brainstem cavernomas** Selcuk Peker
11:30-11:45	**Cerebral Cavernomas a new grading scale for surgical decision-making** Marco Fontanella
11:45-12:00	Discussion
12:00-13:00	**MULTIMODAL EXPERT FORUM 3** Chairs: Torstein Meling, Lukas Rasulic
12:00-12:15	SNSS TRIBUTE: Milivoje Kostic Lecture 2 **Hybrid cerebrovascular surgery in 21th century - Quo vadis?** Torstein Meling
12:15-12:30	SNSS TRIBUTE: Madjid Samii Lecture 2 **The Current Status and Future of Direct AVM Surgery** Hiroki Kurita
12:30-12:45	**New endovascular aneurysm treatment** Daniel Hoit
12:45-13:00	**Intraoperative imaging of cerebral vessels during neurosurgical operations** Talat Kiris
13:00-13:15	**Closing and awards ceremony**

www.seens.eu



SOUTHEAST EUROPE NEUROSURGICAL SOCIETY

S^eENS

Southeast Europe Neurosurgical Society - S^eENS

- Background
- Past events
- Current activities
- Looking forward to
- Up to date

EDITORIAL

DOWNLOAD LINK:

http://snss.rs/Editorijal%202012-2018.pdf

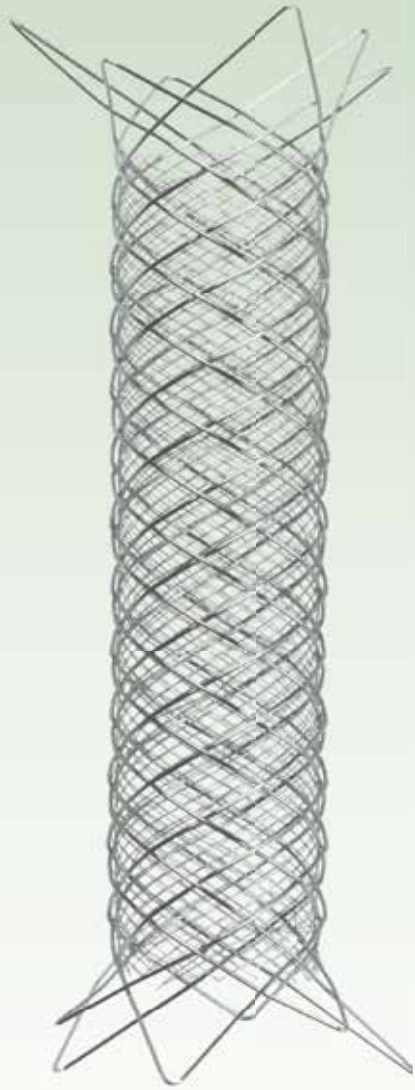
5th ANNUAL MEETING
of Serbian Neurosurgical Society
SNSS Annual meeting 2019
with international participation

NEUROVASCULAR SUPERSESSIONS:
Exo? Endo? Hybrid?
Quo vadis?

October 24th - 27th 2019
Kragujevac, Serbia
Venue: Hotel Sumarice, Kragujevac

ABSTRACT BOOK

TERUMO
INTERVENTIONAL
SYSTEMS



LIFE IS IN THE DETAIL

Terumo's ROADSAVER® Stent.
Sustained embolic protection. Featuring the unique double layer micromesh scaffold.

Roadsaver®
Carotid Artery Stent

IS521GB1115ITII

www.terumo-europe.com

Thursday, October 24th, 2019

WORKSHOP: NEUROSONOLOGY IN NEUROINTENSIVE CARE

Room 2

ROLE OF TRANSCRANIAL COLOR-CODED DUPLEX IN INTRACEREBRAL HAEMORRHAGE

Zeljko Zivanovic1, 2

[1]Clinic of Neurology, Clinical Centre of Vojvodina
[2]University of Novi Sad - Faculty of Medicine

Intracerebral hemorrhage (ICH) is responsible for 9% to 27% of all strokes, associated with high rate of mortality and poor functional outcome. Secondary consequences of ICH, such as hematoma expansion, the midline shift, and intraventricular hemorrhage are related with clinical deterioration and poor prognosis. The head computed tomography (CT) is the reference imaging modality in diagnosis and monitoring of patients with ICH. However, transcranial color-coded duplex sonography (TCCS) provides a useful and ideal method for diagnosis and monitoring purposes.

TCCS is a noninvasive diagnostic tool that provides simultaneous a 2-dimensional imaging of brain parenchyma and a color-coded imaging of the intracranial arteries. Usually, TCCS was performed transtemporally in a projection to the orbitomeatal line, using a 2.5-MHz sector transducer. The ICH is visualized by TCCS as a lesions with homogeneously increased echo density that are most often sharply delineated from normal brain tissue. In many studies TCCS showed a good correlation against CT in patients with ICH within 24 hours of onset. TCCS is useful for evaluating hematoma volume. In the acute phase, hematoma enlargement should be able to evaluate at the bedside. Some studies showed that hematoma volume measured with TCCS was an independent predictor of poor outcome with a predictive power similar to that of CT. Furthermore, TCCS allows the assessment of the hemorrhage in the third or the lateral ventricles as well as the midline shift. Several studies validated TCCS as an alternative bedside, noninvasive and reproducible technique to detect the midline shift in many neurological disorders, such as ICH. TCCS allows to calculate the value of the midline shift and that this value is not significantly different from the value obtained by CT scan.

TCCS is a noninvasive and a useful method for evaluating patients with acute ICH. TCCS can be performed many times at beside and the cost is cheaper than CT. Thus, TCCS in a valuable modality to be applied in neurointensive care units.

OPTIC NERVE SHEATH DIAMETER ULTRASONOGRAPHY AND THE DIAGNOSIS OF INCREASED INTRACRANIAL PRESSURE

Milija Mijajlovic

Neurology Clinic Clinical Center of Serbia and
Faculty of Medicine University of Belgrade

The diagnosis of raised intracranial pressure (ICP) is important in many critically ill patients. The optic nerve sheath is contiguous with the subarachnoid space; thus, an increase in ICP results in a corresponding increase in the optic nerve sheath diameter. Hence the logical extension would be that an increase in CSF pressure would expand the sheath and this change would be dynamic. It thus presents neuroscientists an unique window to measure the optic nerve sheath diameter (ONSD) which would predict dysfunctional intracranial compliance in real time. It is measured by placing a liner transducer probe (13-7.5 MHz) over the closed eyelid to obtain an image of the optic nerve sheath as a hypodense area behind the globe of the eye.

The ONSD is measured at a depth of 3 mm from the posterior pole of the eyeball as this point is the most reflective of the changes in ICP. While sonographic ONSD measurement is easy to learn and non-cumbersome, it has certain limitations. It is contraindicated in clinically commonly encountered lesions such as tumors of the orbit, inflammation of eye, sarcoidosis (one of the leading causes of inflammatory eye disease), Graves' disease, diseases affecting the optic nerve sheath diameter and patients with legions of the optic nerve. Despite the limitations, measurement of ONSD has been established as a useful bedside modality to predict increased intracranial pressure and there have been a slew of studies in neuroanaesthesia and neuro-intensive care to establish that ONSD is of actual utility in the management of intracranial hypertension. Available evidence suggests an ONSD of 4.5 to 5.5 mm to be indicative of intracranial hypertension. Meta-analysis showed that ocular sonography shows good diagnostic test accuracy for detecting raised ICP compared to CT: specifically, high sensitivity for ruling out raised ICP in a low-risk group and high specificity for ruling in raised ICP in a high-risk group. This noninvasive point-of-care method could lead to rapid interventions for raised ICP, assist centers without CT, and monitor patients during transport or as part of a protocol to reduce CT use.

ULTRASOUND IN BRAIN DEATH

Jovanovic Dejana

Neurology Clinic, Clinical Centre of Serbia

The diagnosis of brain death is based on clinical criteria. However, ancillary testing is required when it is impossible to complete minimum of clinical criteria or when it is required by the law. Pathophysiological basis of brain death means the existence of cerebral circulatory arrest (CCA) which can be detected with transcranial Doppler (TCD). Compared to other complementary methods, benefits of TCD in confirming brain death are that it is cheap, safe and noninvasive method, without contrast media, which can be easily performed at the bedside of patients, and most importantly the TCD findings is not affected by the sedation, metabolic disorders or hypothermia.

Typical TCD records in the presence of CCA are bi-directional (oscillating, reverberating) signal with anterograde and retrograde flow component or presence of systolic spikes, sharp unidirectional signals in early systole without diastolic signal in other parts of the cardiac cycle. The absence of TCD signal is not reliable finding for the diagnosis of CCA, as it may be due to difficulties in the transmission of ultrasound through the temporal bone. CCA may be confirmed in the presence of typical TCD records, bilaterally or over 3 arteries of different vascular territories, mandatory in the anterior and posterior circulation. TCD has a high degree of specificity (97-100%) and sensitivity (86-91%) in the confirmation of brain death.

The disadvantage of this method is that it can show cerebral blood flow only in some segments of the great arteries.

DETECTION OF MICROEMBOLIC SIGNALS AND CEREBRAL VASOREACTIVITY IN NEUROSURGERY

Toplica Lepic

Microembolic signals have been detected in a number of clinical settings: carotid artery stenosis, aortic arch plaques, atrial fibrillation, myocardial infarction, prosthetic heart valves, patent foramen ovale, valvular stenosis, and in certain systemic diseases.

Transcranial Doppler can detect microembolic signals which are characterized by unidirectional high intensity increase, short duration, random occurrence, and a "whistling" sound. This feature allows for the evaluation in these specific diseases, as well as during invasive procedures including: angiography, percutaneous transluminal angioplasty, carotid surgery, cardiopulmonary bypass, and orthopedic procedures.

Patients with cerebral microembolism have higher cognitive decline due to the cumulative effect of embolism. Even minor neuropsychological impairment should not be underestimated and the presence of an embolic source should be regarded as the possible cause, and a possibl treatment target.

Cerebral blood flow is regulated by two critical mechanisms, cerebral autoregulation and neurovascular coupling (NVC). Cerebral autoregulation maintains a constant blood flow within the physiological range of systemic pressures, which is primarily conducted through myogenic response. Such a morphological arrangement ensures rapid spatial and temporal increases in cerebral blood flow in response to neuronal activation, known as NVC. A broad range of metabolic factors, vascular active agents, and neuronal activities are involved in the processes of autoregulation and NVC through affecting vascular reactivity.

Transcranial doppler may be used for the cerebral blood flow autoregulation and vasoreactivity assessment through the variety of tests including the most common: breath holding and acetazolamide tests. The measurement of cerebral vasoreactiviy is a useful tool for assessment of cerebrovascular reserve capacity in patients with high grade stenoses and occlusions of the internal carotid artery. Therefore TCD may be helpful in identification of patients with inadequate collateralization and increased risk of hemodynamic stroke who may benefit from surgery.

ECHOCARDIOGRAPHY IN NEUROINTENSIVE CARE

Aleksandra Ilic

University of Novi Sad
Institute of Cardiovascular Diseases of Vojvodina

Embolism from the heart often leads to clinically significant morbidity and mortality due to transient ischemic attack, stroke or occlusion of peripheral arteries. Transthoracic and transesophageal echocardiography are the key diagnostic modalities for evaluation, diagnosis, and management of cardiac sources of embolism.

Embolism of cardiac origin accounts for 15-40% of all ischemic strokes.

In patients who are at risk for, or have already had potentially embolic strokes, the primary role of echocardiography is to establish the existence of a source of embolism, determine the likelihood that such a source is a plausible cause of stroke or systemic embolism, and guide therapy in an individual patient.

Cardiac sources of embolism include blood clots, tumor fragments, infected and noninfected vegetations, calcified particles, and atherosclerotic debris. Conditions that are known to lead to systemic embolization are subdivided into a high-risk and a low-risk group on the basis of their embolic potential. Sources of embolism with high embolic potential are: intracardiac thrombi, vegetations and tumors. Atrial arrhythmias, ischemic heart disease, nonischemic cardiomyopathies and prosthetic valves and devices are common causes for occurrence of intracardiac thrombi. Prosthetic valves and devices are also, as well as native valvular diseases, predilection sites for vegetation.

Intracardiac calcifications, spontaneous echocardiographic contrast without atrial fibrillation, patent foramen ovale, atrial septal defect and atrial septal aneurysm are associated with low-risk of embolic events.

Suspected cardiac mass as cardiovascular source of embolus, initial evaluation of suspected infective endocarditis (IE) with positive blood culture results or new murmur, reevaluation of IE at high risk for progression or complication or with

a change in clinical status or cardiac examination results, are appropriate criteria for performing echocardiography. Transasesophageal and three-dimensional echocardiography, as well as administration of a transpulmonary contrast agent, allow a more accurate evaluation of all these changes. Otherwise, transient fever without evidence of bacteremia or new murmur, transient bacteremia with a pathogen not typically associated with IE and/or a documented nonendovascular source of infection, routine surveillance of uncomplicated IE when no change in management is contemplated, are not criteria for echocardiography.

In all cases of suspected or proven cardioembolism, a team consisting of a neurologist, neurosurgeon, cardiologist cardiac surgeon, radiologist, infectologist, general practitioner, must be involved in the diagnosis and treatment of these patients. Echocardiography plays an important role not only in the diagnosis but also in the treatment and prevention of cardiac sources of embolism, as well as in interventional procedures such as percutaneous closure of the patent foramen ovale, atrial septum defect and left atrial appendage.

Friday, October 25th, 2019

MULTIMODAL EXPERT FORUM 1

Hall 1

FROM PACKING THE CAVITY TO CHANGING THE FLOW: A 12 YEARS CLINICAL EXPERIENCE WITH FLOW DIVERTER TECHNOLOGY

Istvan Szikora, Agnes Vadász, Zsolt Kulcsar, Zsolt Berentei, Miklós Marosfői, Istvan Gubucz, Arvin Aradurai

National Institute of Clinical Neurosciences & Semmelweis University
Budapest, Hungary

This presentation aims to demonstrate the rational, expectations and achievements of flow modifying technologies for the endovascular treatment of intracranial aneurysms.

Early experience demonstrated that while aneurysm packing is effective in preventing from rupture/rerupture, it may not permanently inhibit aneurysm growth/recanalization. With better understanding of perianeurysmal flow dynamics, flow modifying technologies were introduced to treat the causes rather than the results of the pathology.

Clinical trials on intravascular flow diverters have demonstrated occlusion rates between 87-95% and no recurrences up to 5 years. Retrospective surveys and large metaanalysis studies found a strong relationship between treatment related morbi-mortality and aneurysm size and morphology, ranging from 4,4% for small up to 17% for large and giant lesions, the majority of this is related to either thromboembolic complications, delayed aneurysm rupture or remote parenchymal hemorrhages. Our own experience with 272 aneurysms treated with flow diverters confirms the published data, demonstrating 83% occlusion rate at 6 months and 95% at 5 years, with no recurrences and 5,47% combined permanent morbidity and mortality (0% for small, 9% for large and 14% for giant). The main reasons for morbi-mortality include device thrombogenicity, imperfections of wall apposition and lack of device endothelialization. Further product developments should focus on and are on the way to improve device features in relation to these drawbacks.

TRAPPING WITH BYPASS FOR ICA BLISTER ANEURYSMS

Akitsugu Kawashima MD.PhD.

Department of Neurosurgery,
Tokyo Women's Medical University Yachiyo medical center
Chiba, Japan

A characteristics of the internal carotid artery (ICA) blister aneurysm is its fragile wall and high risk of rebleeding. No consensus on how to treat it has been obtained. We have some options to treat it, endovascular treatment, direct clipping, and surgical trapping with bypass. We report our experience of treatment of ICA blister aneurysms using treatment of surgical trapping with bypass. Five of 8 cases had good outcome (mRS≧2). The results are acceptable, however some problems are also included. Surgical procedures, strong point, and weak point of this strategy for ICA blister aneurysm are demonstrated in this presentation.

ROLE OF EBM IN NEUROVASCULAR SURGERY: QUALITY OF LITERATURE, NATURE OF MEDICAL PUBLISHING

B Roitberg, MD

Professor and Chair, Department of Neurosurgery,
Case Western Reserve University MetroHealth campus
Editor in Chief; Neurological Research (a Taylor&Francis Journal)

We are encouraged to rely on scientific evidence in selecting treatment for our patients. This approach is called "evidence-based medicine". The concept is evolving, and we begin to recognize the need to tailor the principles of EBM to Neurosurgery. Without correct assessment of the quality of published data, articles may fail to convince us to accept changes in clinical practice. Sometimes we must face changes that were not based on solid science. In this presentation I review several aspects of quality in medical literature. We will start with the difficulty of obtaining valid and convincing evidence in neurosurgery using some well-known studies in vascular neurosurgery as examples. Focus on the limitations of "randomized controlled trials" in surgical fields, understanding of the evolving system of rating articles by level of evidence. We will discuss the need for further adaptation of the concept of level of evidence. Finally, I will talk about the nature of medical journals, the peer review and selection process.

EXTRADURAL SELECTIVE ANTERIOR CLINOIDECTOMY FOR IC PARACLINOID ANEURYSMS

Hidetoshi Kasuya

Anterior clinoidectomy is technically challenging. For extradural resection of the anterior clinoid process and surrounding bone, we should know the surrounding structure of anterior clinoid process: optic nerve, optic canal, optic strut, optic sheath, superior orbital fissure, anterior clinoid process, cavernous sinus, oculomotor nerve, ophthalmic nerve, internal carotid artery, superior orbital fissure, lessar wing, greater wing, meningo-orbital foramen, meningo-orbital band/frontotemporal dural fold. After frontotemporal craniotomy, extradural anterior clinoidectomy consists of three steps: dissecting and cutting of meninigo-orbital band, drilling of optic roof, anterior clinoid from inside, and lateral wall of optic canal (optic strut) with eggshell technique, and dissecting and removal of anterior clinoid process. For clipping of IC paraclinoid aneurysm, optic nerve should be carefully dissected, ophthalmic and superior hypophyseal arteries should be identified.

Friday, October 25th, 2019

EXO VS. ENDO VS. HYBRID DISCUSSION - ANTERIOR CIRCULATION ANEURYSMS

Hall 1

RAPID VENTRICULAR PACING ADVANCED INTROPERATIVE CBF MANIPULATION DURING SURGERY OF COMPLEX INTRACRANIAL ANEURYSMS

Volker Seifert,
Juergen Konczalla, Nina Brawanski, Stephan Fichtlscherer und Ulrich Strouhal

Department of Neurosurgery, Department of Cardiology ,Department of Anesthesiology, University Hospital Frankfurt, Goethe-University, Frankfurt am Main Germany

Surgery of complex unruptured intracranial aneurysms (UIAs) frequently requires specific intraoperative techniques of temporary cerebral blood flow manipulation. The methods applied over the years have varied over a wide range from simple carotid artery compression to parent artery clipping up to cardiac arrest under deep hypothermia and more recently the use of adenosine for short time cardiac arrest. In this presentation on advanced concepts of surgical repair of complex UIAs we present our continous growing experiences in the application of rapid ventricular pacing (RVP) as an advanced method of intraoperative CBF manipulation. RVP is a method routinely applied by interventional cardiologists e.g. for the percutanous deployment of aortic valves during cardiac valve replacement. Pacemaker induced RVP enforces ventricular tachycardia thereby inducing compromise of ventricular filling, stroke volume and cardiac output, leading to a significant blood pressure decrease without inducing cardiac arrest. Based on our initial report on this technology (JNS 128(6):1741-1752,2018), we present our actual data of our continous prospective interdisciplinary, joined neurosurgical, anesthesiologic and cardiological trial of RVP use in patients with intracranial complex unruptured aneurysms, detailing the intraoperative RVP application to facilitate microsurgical clip-reconstruction

57 patients with complex UIA, out of a series of 335 patients with UIA treated over almost 5 years were prospectively enrolled and both safety and efficacy of RVP were evaluated recording cardiovascular events and outcome of the patients as well as the amount of aneurysm occlusion after the surgical clip-reconstruction procedure. In 49 patients successful clip reconstruction under RVP was possible. In 7 patients intraoperative decision of clip reconstruction without RVP was made with successful aneurysm occlusion in 6 patients. In 1 patient no clip application

was possible because of complex perforator anatomy. Thus, complete or near complete aneurysm occlusion was achieved in 56 of 57 patients. There was no treatment associated morbidity and mortality

RVP is an elegant and safe technique that facilitates intraoperative clip-reconstruction, which should be included into advanced concepts of surgical repair of complex unruptured intracranial aneurysms. Yet, as extensive preoperative cardiological work-up of the patient and an experienced neurosurgical and neuro-anesthesiologic team with high cerebrovascular expertise are required, it should be reserved for selected cases and highly specialized centers.

SURGERY OF BRAIN ANEURYSM, AVM S AND CAVERNOUS MALFORMATION – SINGLE CENTER EXPERIENCE

Tasic G, Nikolic I, Repac N, Janicijevic A, Zivanovic J, Stankovic L, Almzeogi M, Abousabie Z.

Surgery of brain aneurysms, arteriovenous malformations, and cavernous angiomas is a surgical challenge. Because it is a benign pathology, and surgery means healing, the surgical technique and the experience of the surgeon is of crucial importance.

Our experience is based on more than 1000 operated aneurysms of the anterior and posterior circulation, more than 100 arteriovenous malformations of different localizations and sizes and more than 150 operated caverns of different localizations in the period 2008-2018.

Surgical resection of arteriovenous malformation and cavernomas is the method of choice, whereas in patients with intracranial aneurysms, the modality of treatment should be decide individually for each patient.

Key words: brain aneurysm, AVM, cavernous malformation.

VARIOUS CEREBRAL BLOOD FLOW CONTROL TECHNIQUES IN CLIPPING SURGERY FOR COMPLICATED CEREBRAL ANEURYSMS

Yoshimasa Niiya, M.D.1), Sumire Echizenya, M.D.1), Kouji Furukawa, M.D.1), Motoyuki Iwasaki, M.D.1), Kiyohiro Houkin, M.D.2), Shoji Mabuchi, M.D.1)

1) Department of Neurosurgery, Otaru General Hospital
2) Department of Neurosurgery,
Hokkaido University Graduate School of Medicine

Introduction: In clipping surgery for complicated cerebral aneurysms, transient deflation of the cerebral aneurysm is helpful. There are several methods for flow control of the parent artery.

Aims: We describe our surgical strategies for aneurysm deflation.

Methods: We usually use temporary occlusion of the parent artery to reduce the pressure of the large aneurysm. However, parent artery occlusion might not be feasible in some case. For such cases, we use a bolus injection of adenosine to provoke a short period of cardiac arrest. We also used tachypacing for transient cardiac output reduction as an alternative way.

Results: 480 consecutive patients with cerebral aneurysms (ruptured: 236, unruptured: 244) were surgically treated between 2007 and 2019. In these, 56 patients underwent microsurgery with adenosine induced transient cardiac arrest. In two cases, tachypacing for transient cardiac output reduction was used.

Conclusions: Adenosine injection and tachypacing facilitated safe and quick dissection of the aneurysm and clip application. These methods are quite useful for aneurysm deflation.

Friday, October 25th, 2019

STROKE SYMPOSIA

Hall 1

FRONTLINE OF ACUTE STROKE INTERVENTION

Shinichi Yoshimura

Background: Efficacy of endovascular treatment (EVT) in patients with acute ischemic stroke and large vessel occlusion (LVO) was established. However, EVT coverage in Japan remains unclear.

Objective: To report EVT utilization and geographical coverage in Japan overall and to analyze regional differences in the number of EVT offered, in operators, and in EVT-capable hospitals.

Design, Setting, Participants: A national survey of members of the Japanese Society for NeuroEndovascular Therapy (JSNET). Study office send an e-mail twice for JSNET members and collected the number of EVT cases on 2017 and 2018.

Main Outcomes and Measures: Total number of EVT cases per year, total number of hospitals offering EVT per year, the number of specialists per hospital, the number of EVT cases per hospital were measured. The number of EVT cases in 2016 -2018 year per 100,000 population calculated using the Population Census data. Using geographic analyses, the distribution of treatment hospitals and neuroendovascular specialists was mapped, and in combination with the census data the population coverage rate determined.

Results: The total number of EVT cases overall in Japan increased from 2016 (7,702 cases) to 2018 (12482 cases). The number of EVT cases per 100,000 people was 6.06 in 2016 and 9.82 in 2018 respectively. There were 711 EVT-capable hospitals in Japan, with an average annual caseload of 17.6 EVT cases in 2018. The majority (97.7%) of the Japanese population live within 60-minute drive time of any EVT-capable hospital.

Conclusions and Relevance: Utilization of acute stroke intervention in Japan is increasing; however, the number of cases/hospital remained low. Centralization of EVT services may produce improved patient outcomes and benefit a health system like Japan that has a high number of EVT capable hospitals with low EVT volume, especially in urban areas.

THE ROLE OF A NEUROSURGEON IN STROKE MANAGEMENT

Matjaz Vorsic and Ninna Kozorog
University Hospital Maribor

Introduction: Stroke is a major cause of death and disability in the modern world. Rapid evaluation and treatment are critical to achieve a good outcome. Majorities of strokes are ischemic, approximately 10 % are hemorrhagic. The aim of the surgery is to restore adequate cerebral blood flow, to prevent secondary brain injury and to reduce recurrent stroke. A neurovascular team in an adequate center is needed for proper stroke management.

Surgical options in stroke treatment:
1. Emergent embolectomy There are 20-30% acute ischemic stroke patients who have large vessel occlusion or do not fit the strict time window for effective medical treatment with i.v. tissue plasminogen activator. In these case the endovascular techniques with cloth removal could be effective if applied in the right time frame. These surgical technique has larger time window then medical treatment alone.
2. Carotid endarterectomy (CEA) and carotid stanting (CAS) The CEA procedure significantly reduces the risk of future stroke in the patients with symptomatic occlusion greater then 70%. The CAS is a less invasive treatment for revascularization.
3. Intracerebral hematoma (ICH) evacuation In the case of hemorrhagic stroke, the ICH is to be removed. The time frame for surgery depends on clinical picture, stability of the patient and blood tests. It is safer to remove already organized hematoma.
4. Decompressive hemicraniectomy Up to 10% of strokes result in large infarction areas. Significant brain edema is reffered to malignant MCA infarction. Despite aggressive intensive medical care usually the decompression is needed with removal of extensive skull bone flap that helps improving the brain edema.
5. Extra – intracranial bypass EC-IC bypass surgery has not been shown to be beneficent for patients with atherosclerotic occlusion however is beneficent for the patients with Moyamoya disease to prevent the stroke.

Conclusions: The stroke management once traditionally reserved only for the neurologists is now a multimodality treatment where the role of neurosurgeon is more and more important. The critical factor for the stroke management is proper time window. Despite treatment many stroke patients end up with permanent neurologic deficit. Further advanced treatment is needed to improve those disabilities.

THE CLINICAL SIGNIFICANCE OF THE SCALE IN THE ASSESSMENT OF OUTCOME AFTER INTRACEREBRAL HAEMORRHAGE

Zeljko Zivanovic

Intracerebral hemorrhage (ICH) is the most fatal and disabling stroke subtype. Prognostic factors for predicting function outcome and mortality after intracerebral hemorrhage (ICH) play a major role in determining the treatment outcome. Examples of widely used clinical grading scales include the Glasgow Coma Score (GCS) for traumatic brain injury. Glasgow Coma Scale which assesses the level of consciousness was the first score for mortality prediction. ICH Score combining level of consciousness (GCS), age, hematoma volume at admission, presence of intraventricular hemorrhage, and hematoma location (infratentorial vs supratentorial). The ICH Score is a simple clinical grading scale that allows risk stratification on presentation with ICH. The use of a scale such as the ICH Score could improve standardization of clinical treatment protocols and clinical research studies in ICH. Intracranial hemorrhage can be deleterious if present with low GCS score and high ICH score.

Widely used tools for prediction of mortality are fundamentally limited in that they do not account for effects of withdrawal of care and are not designed to predict functional recovery. Functional outcome of patients was determined by modified Rankin's scale. The FUNC score was originally derived to predict 90-day functional outcome (GCS $\geq$ 4) in primary ICH patients and retained the GCS, hematoma volume, hematoma location, and age as predictors, but additionally included the presence of previous cognitive impairment and lobar hematoma location. This score is a valid clinical assessment tool that identifies patients with ICH who will attain functional independence and thus, can provide guidance in clinical decision-making and patient selection for clinical trials.

Te ICH score and FUNC score are the most extensively validated prognostic tools for non-traumatic ICH patients, with more data available for the ICH score than any of the other tools.

Friday, October 25th, 2019

HOW I DO IT SESSION

Hall 1

ANTERIOR CIRCULATION NUANCES IN TEMPORARY CLIPPING

Sajko T , Vrban F

Department of Neurosurgery, UHC Sestre milosrdnice,
Zagreb, Croatia

Objective. Temporary clipping is still the method of choice during cerebral aneurysm surgery for reducing intraaneurysmal pressure and preventing premature aneurysm rupture. The technique has been in neurosurgeons arsenal since early 1980. Despite the new treatment modalities developed over the years, cerebral aneurysm surgery and thus the part of it, temporary clipping, still opens a lot of discussions. Thromboembolic stroke, vessel injury in aterosclerotic vessels, cerebral ischemia are the main limitations when discussing temporary clipping with late beeing the most direct cause of mortality and morbidity in aneurysm surgery. Inapropriate proximal artery visualisation and prolonged time of proximal artery occlusion often needed to complete cerebral aneurysm clipping gave us neurosurgeons reason to find new ways to improve and modernize existing techniques and also experiment with new ideas.

Methods. Studies regarding temporary clipping disadvantages and new found treatment modalities were evaluated and disscused.

Results. Intraoperative neuromonitoring (SSEP, MEP, EEG, etc.) is a essential tool with witch we can predict postoperative outcomes regarding neurological deficit. Studies showed direct correlation of dissapearence of MEPs waves with application of temporary clip.

From an anesthesiologist point of view brain tissue oxigenation (PtiO2) has been used to detect changes in brain tissue oxygenation after temporary clip placement. In the last 10 years certain centers worked on adenosine-induced cardiac arrest as a method alternative to temporary clipping for cerebral aneurysm surgery. Multicentre studies showed that it can be a useful technique for cerebral aneurysm microsurgery.

Conclusions. Our presentation analyses studies made in the last decade, that show us the future of aneurysm microsurgery and allow us to reduce temporary clipping complications and limitations.

THE SURGICAL MANAGEMENT OF PREVIOUSLY ENDOVASCULAR TREATED ANEURYSMS

Carlos David

Lahey Clinic
Tufts University School of Medicine

As the number of endovascularly treated aneurysms has steadily increased over the past two decades, a small but significant number of recurrent or partially treated aneurysms have been identified. Incomplete occlusion and recanalization of the coil mass may lead to recurrence of the aneurysm and may carry an ongoing risk of rebleeding. If repeat EVT is not an option due to anatomical or technical considerations retreatment with surgical clipping may be considered.

The technical challenges in the microsurgical treatment are manifold; the coils may interfere with the application of a final clip in a multitude of ways: the aneurysm is less collapsible and less easy to manipulate, the placement of temporary clips may have less impact. The coils can interfere with the closure of the clip blades and may occlude parent artery or branches. Extrusion of coils in the subarachnoid space may make microsurgical dissection more complicated and intraluminal thrombus formation may require removal of both thrombus, coils or both before a clip can be successfully applied.

The technical difficulties and strategies for the surgical management of recurrent aneurysms will be discussed.

ENDOVASCULAR COIL EMBOLIZATION OF VERY SMALL INTRACRANIAL ANEURYSMS

Prof Dr Milan Mijailovic, Prof dr Snezana Lukic

Depatrment of Radilogy, Faculty of Medical Sciences,
University of Kragujevac

Introduction: Diagnose of small unruptured aneurysms is usually accidental finding on neuroimaging. In these cases there is treatment dilemma. Small ruptured aneurysms must be clipped or endovasculary treated.

Aim: We aimed to evaluate the results of endovascular coil embolization for very small aneurysms (≤ 4 mm).

Materials and Methods: Between 2007 and 2018, a total of 93 very small aneurysms in 93 patients were treated by coil embolization. Of the 93 aneurysms, 35 (38%) were ruptured, as opposed to 58 (62%) that were not. We assessed the procedural complications, immediate angiographic outcome after coiling, clinical outcome, and follow-up MR angiography (MRA).

Results: 5 thromboembolic complications occurred during the procedure, but did not lead to any persistent neurologic deficit. One procedural aneurysmal rupture was observed and procedure-related morbidity and mortality were both 0%. Occlusion was adequate in 86 aneurysms (92%) and incomplete in six aneurysms (8%). The clinical outcomes of five patients with ruptured aneurysms were good (Glasgow outcome scale ≥ 4), with no bleeding of the treated aneurysms during a mean follow-up period of 36 months. On 81 follow-up MRA, there was no recurrence, and the five incompletely occluded aneurysms showed a spontaneous amelioration resulting in an adequate occlusion.

Conclusion: Coil embolization of very small aneurysms is technically feasible with good results. The long-term efficacy and the potential as a standard treatment strategy remain to be determined by randomized large trials.

Keywords: small intracranial aneurysms, endovascular embolization,

Friday, October 25th, 2019

EXO VS . ENDO VS . HYBRID DISCUSSION - NEW FRONTIERS

Hall 1

TEMPORAL PATTERN OF INTRACRANIAL ANEURISM RUPTURE

Petar Vulekovic

Faculty of Medicine University of Novi Sad
Clinical Center of Vojvodina

Background. Numerous studies with conflicting results have tried to prove the influence of seasonal variations or different meteorological factors on the occurrence of aneurysmal subarachnoidal hemorrhage (SAH). The aim of this study was to establish a mathematical model of a series of aneurysmal rupture dates in different patients and verify a temporal pattern in the occurrence of SAH.

Methods. We analyzed a group of 563 patients with the exact aneurysm rupture dates, hospitalized at the Clinic of Neurosurgery, Clinical Center of Vojvodina, Novi Sad, Serbia, between January 1, 1998 and December 31, 2009. After the monthly distributions, we evaluated the period between two subsequent rupture dates.

Results. The absolute number of SAH per month varied between 0 and 10. The monthly seasonal indices show a fluctuation of the time series (with the peak in March and nadir in September), but the median values of the number of aneurysm ruptures in a particular month did not differ significantly. The time scale of the aneurysm rupture dates shows that the most frequent interval between subsequent ruptures was 1 day (in 75 cases or 13.34%). Following this period, the number of days between ruptures showed a gradually decreasing pattern that could be approximated by exponential distribution.

Conclusions. The results are a clear confirmation that SAH patients do indeed present in clusters in a restricted population area. This exact clustering in our series is not particularly connected to month or season, yet strongly supports the existence of a temporal pattern in SAH occurrence.

MANAGEMENT OF CEREBRAL VASOSPASM

Kostas N. Fountas, MD, PhD

Department of Neurosurgery
Faculty of Medicine, School of Health Sciences
University of Thessaly, Larisa, Greece

Cerebral vasospasm (CVS) constitutes one of the leading causes of mortality and morbidity among patients suffering aneurysmal subarachnoid hemorrhage (aSAH). Its incidence has been reported to vary from 6-11 per 100,000 persons per year. It is well known that although the angiographic incidence of CVS is approximately 70%, the clinically evident CVS is not higher than 30%. It is also uncertain if CVS is the only underlying pathophysiologic mechanism for delayed cerebral ischemia (DCI) associated with aSAH. Until recently, this was the prevailing general belief. However, a recent rapidly growing body of evidence, mainly based on experimental data, has demonstrated that other pathological conditions may be implicated in the development of DCI.

Thus, aSAH-induced microvascular spasm, disruption of cerebral autoregulation, microthrombosis, blood-brain barrier disruption, initiation of a compartmentalized inflammatory response, early brain injury along with cell death and apoptosis, as well as cortical depolarization spreading have been implicated in the development of DCI. The management of CVS aims at the prevention and/or the reversal of DCI, and thus at the mitigation of their clinical consequences. Several pharmacological agents have been tried in the management of CVS with significantly varying, and frequently contradicting, clinical results. There is a general consensus on the clinical value of the rapid clearance of blood products from the CSF. Also, the administration of nimodipine and its neuro-protective role are well established, in the management of patients suffering aSAH. Moreover, the intrathecal administration of thrombolytic agents has demonstrated decrease in the incidence of DCI.

The exact role of Fasudil, Cilostazol, endothelins (clazosentan), locally delivered nicardipine, low-molecular weight heparin, and the performance of prophylactic balloon angioplasty as well as the intra-arterial administration of vasodilators remains to be defined. The importance of further studying the pathophysiology of CVS and its relationship with DCI for developing targeted and efficient preventive and therapeutic strategies cannot be overemphasized.

Friday, October 25th, 2019

CAROTID SURGERY SYMPOSIA

Hall 1

INTERIM RESULTS: PREVENTION OF BRAIN INFARCTIONS DURING INTERNAL CAROTID ENDARTERECTOMY DETECTED USING MAGNETIC RESONANCE (SONOBIRDIE MR) TRIAL – A RANDOMIZED CONTROLLED TRIAL

David Netuka

Importance: Carotid endarterectomy remains a primary treatment modality in severe symptomatic carotid stenosis. The lower the incidence of any periprocedural ischemic lesion, the higher the benefit for the patient.

Objective: To determine whether sonolysis (continual TCD monitoring), using a 2MHz diagnostic probe with a maximal diagnostic energy leads to lower incidence of MRI proven ischemic lesions after carotid endarterectomy.

Design: Multicenter, randomized, doubleblind, sham controlled study using a 2MHz diagnostic probe with a maximal diagnostic energy during carotid endareterctomy. The study aimed to compare the risk of brain infarction detected using magnetic resonance imaging (MRI) between the sonolysis and the control group. Study period 8.3.16-1.3.18.

Setting: : Multicenter, randomized, doubleblind, sham controlled study

Participants: Patients with ≥70% carotid stenosis undergoing CEA using computer-generated 1:1 randomization to the sonolysis (SG) or control (sham procedure, CG) group. Inclusion criteria: patients with symptomatic or asymptomatic carotid stenosis ≥70% indicated for CEA, a sufficient temporal bone window for TCD, aged 40-85 years, functionally independent, signed informed consent. The primary endpoint was the incidence of new ischemic lesions on control brain MRI.

Intervention: TCD using a 2MHz diagnostic probe with a maximal diagnostic energy was randomly applied during the whole CEA procedure. Surgeon was blinded whether the TCD was on or off.

Main Outcome: The incidence of new ischemic lesions on brain DWI MRI performed 24 h after the CEA in the sonolysis and control groups, the number of new lesions and the occurrence of new lesions ≥0.5 mL and the incidence of ipsilateral new ischemic lesions.

Results: Totally 250 patients (180 males, mean age 67.4±7.6 years) were enrolled until December 31st 2017; 125 patients (87 males, mean age 67.5±7.4 years) were randomized to SG, 125 patients (93 males, 67.2±7.8 years) to CG. New ischemic lesions were detected in DWI-MR in 11 (9%) patients in SG and 25 (20%) patients in CG (P=0.012). No adverse event caused by sonolysis was recorded, 16 patients (6.4%) had stroke or TIA (5 in SG, 11 in CG, P>0.05), no patient died.

Conclusions and Relevance: The interim results show that sonolysis during CEA significantly reduces the incidence of new ischemic lesions on postprocedural DWI MRI. Final results need to awaited.

Trial Registration: NCT02398734.

INTRAOPERATIVE MONITORING IN EXTRACRANIAL CAROTID ARTERY SURGERY

Volodymyr Smolanka
Uzhhorod National University, Ukraine

The efficacy of carotid endarterectomy for stroke prevention has been established by randomized trials on symptomatic carotid artery stenosis. The success of this operation is determined by the rate of postoperative complications. Intraoperative cerebral ischemia remains a main concern during the procedure and main cause of postoperative complications. To avoid them we have been using different methods of intraoperative monitoring. Controversy persists as to the optimal method to assess cerebral perfusion when performing these operations under general anesthesia. The most accurate method of cerebral ischemia detection in the non awake patient is desirable to minimize unnecessary shunt placement.

We have analysed the results of 118 endarterectomies in patients with the history of previous brain ischemia. All procedures were performed under general anesthesia with different modern methods of intraoperative monitoring: transcranial Doppler (41 patients), electroencephalography (43 patients), somatosensory evoked potentials monitoring combined with EEG (34 patients). There were significant changes of blood flow in 5 patients (10.2%), EEG depletion in 6 patients (12.9%) and significant SSEP changes in 5 patients (13.2%) which required therapeutic intervention or shunt placement. Two of the patients from the first group had neurological deficit one of which was temporary.

Conclusion. All three methods of intraoperative neuromonitoring during carotid endarterectomy showed their sufficient efficacy. There is evidence that monitoring with electroencephalography and somatosensory evoked potentials increases the sensitivity of cerebral ischemia detection.

TREATMENTS OF CAROTID/INTRACRANIAL ARTERY STENOSIS

Shinichi Yoshimura
Department of Neurosurgery, Hyogo College of Medicine

Background: Carotid artery stenting (CAS) is getting to be more common in our country due to its less invasive nature and with support of recent positive 3 randomized controlled trials (RCTs). On the other hand, efficacy of stenting for intracranial artery stenosis (ICAS) was denied by 2 RCTs. Here we introduce our recent practices of these two therapies.

CAS: The number of CAS is increasing year by year, but recent trials showed higher incidence of distal embolism during and after CAS. To reduce this complication, we evaluate plaque characteristics by time-of-flight MRA or MRI preoperatively, and if large soft plaque or intraplaque hemorrhage is suspected on these examinations, CEA is recommended. However, if the patient prefers CAS, we use closed-cell stent under proximal and distal cerebral protection. Recently, micromesh stent is available, which seems useful to reduce distal embolism by avoiding plaque protrusion in case with soft plaque.

ICAS: In case of ICAS, we basically treat the patients medically. However, some of the patients are refractory to aggressive medical therapy. In those cases, we carefully check the stenotic lesion and surrounding anatomical features such as location of perforators, lesion length and diameter, calcification, and so on. We perform angioplasty and stenting to the patient only when the lesion is judged to be safely treatable. If not, bypass is recommended.

Conclusions: CAS is aggressively performed but ICAS is treated conservatively in our country. However, both endovascular therapies are getting safer and more effective with the help of vascular wall imaging which provides useful information to select the patient and treatment modality.

EXTRA AND INTRACEREBRAL DISSECTIONS

Laszlo Novak

Spontaneous dissections of the extracranial carotid or vertebral artery account about 2% of all ischemic strokes in adults and 10-25 % in young patients. The clinical symptoms depend on affected artery and on thromboembolism thus the clinical spectrum is wide. The imaging characteristics may include double lumen intramural hematoma, intimal flap, tapering stenosis, and pseudoaneurysm. Combination of examinations helps establish the diagnosis. The goal of the treatment is to prevent ischemia. Conservative medical management is often all that is required. If the patient is symptomatic and there are on-going ischemic events endovascular treatment may be of benefit.

The incidence of intracranial artery dissections is unknown but much less then on extracranial vessels. The ultrastructure of intra cerebral arteries differs from extracranial ones. The lack of external elastic lamina and very thin adventitia result in different pathological appearance and clinical symptoms. The two main manifestations of intracranial artery dissections are subarachnoid haemorrhage and cerebral ischemia. Subarachnoid bleeding represents in half of the intracranial dissections and more common in posterior circulation. The acutely ruptured dissections are unstable, 70 % of cases rebleed in the first day. The diagnosis of intracranial dissection means a challenge since the image can change over time. It is generally made by classic angiographic appearance.

The mortality can reach 50% in subarachnoid haemorrhage. In ischemic forms the prognosis is good with medical therapy. In serious cases when medical treatment is not sufficient endovascular techniques can be administered. In the treatment of bled dissections both deconstructive and reconstructive techniques are applied. The decision should be made case by case. The open surgery is less frequently used.

ENDOVASCULAR TREATMENT OF CAROTID ARTERY DISEASE – PRESENTATIONS OF DIFFERENT CASES FROM SERBIAN CLINICAL CENTRE

Vladimir Cvetic[1, 2,*], Borivoje Lukic[1, 2], and Momcilo Colic[1, 2]

1 Clinical Center of Serbia
2 Center for Radiology and MRI
* Presenting author

Carotid artery stenting (CAS) has become a standard alternative to surgical treatment of patients with hemodynamically significant carotid stenosis.

According to literature recommendations respecting the indications for CAS, starting from June 2006 to June 2019 at Clinical Center of Serbia more than 800 patients with carotid artery stenosis underwent CAS (31% had restenosis after carotid endarterectomy, 7% patients had surgically unapproachable lesions, 2% were treated after radiation therapy, and more than 50% of the patients were with severe coronary or pulmonary disease). There were more asymptomatic, than symptomatic patients. Because of anatomical reasons we didn't finish the procedure in 2.4% patients. The overall rate of in-hospital adverse events (transient ischemic attack, minor stroke, major stroke, myocardial infarction, and death) was arround 5%. Implanted carotid stents open and closed design, and dual layer stents depending on the type of the lesions, with mandatory use of cerebral protection devices.

CAS seemed feasible and relatively safe in our experience. CAS is the method of choice in the treatment of carotid disease in appropriately selected patients with a selection of the optimal material. Identifying complications during endovascular treatment of carotid stenosis, and the possibility of their solution is conditional upon the learning curve, experienced operator and the number of procedures performed in specialized centers

Friday, October 25th, 2019

EDUCATION AND TRAINING - YOUNG NEUROSURGEONS AWARD

Hall 2

FLOW DIVERTERS IN ENDOVASCULAR TREATMENT OF ANEURYSMS BEYOND THE CIRCLE OF WILLIS – OUR EXPERIENCE

Svetlana Milosevic Medenica[1] , Filip Vitosevic[1],* ,
Dragoslav Nestorovic[1] , Ivan Vukasinovic[1] , and Lukas Rasulic[1, 2]

1 Clinical Center of Serbia
2 University of Belgrade
*Presenting author

Introduction Flow diversion is an endovascular technique whereby instead of placing a device inside the aneurysm sac, such as with coiling, the device is placed in the parent blood vessel, like a stent, to divert blood flow away from the aneurysm itself. This technique is challenging when treating distal cerebral aneurysms, aneurysms beyond the circle of Willis due to a smaller caliber of the distal vessels.

Methods We analyzed the patients with distal cerebral aneurysms treated with flow diverting stents in our Institution in the period from January 2016 to September 2019. Results We have treated 14 patients, with two aneurysms located on A1/A2 segment of ACA, and 12 on M1/M2 segment of MCA. The patient group consisted of ten women and four men ranging in age from 39 to 71 years. There were one fusiform, two dissecting and 11 saccular aneurysms. All patients were treated only by flow diverting devices, without the use of coils. We have used “Silk” (Balt Extrusion Inc.) stents in 11 cases, “Derivo” (Acandis GmbH) in two cases, and “Pipeline” (Medtronic) in one case. All patients were premedicated with dual antiplatetet therapy before the procedure. On follow up DSA after six months we have observed the result of six totally occluded aneurysms, four partially occluded, and one aneurysm with minimal occlussion effect. Three recent cases have not had control DSA yet.

Conclusion The treatment of distal cerebral aneurysms with flow diverting stents is feasible with a low rate of complications. It seems to be appropriate for cases with the branch arising from the sac or neck of the aneurysm, because of slow thrombosis process. Usually the branch closes, but very slowly, enabling the development of collateral circulation. Since a six month follow up is not enough time in some cases for aneurysm to completely occlude, in order to obtain more reliable conclusions about the use of flow diverters in locations distal of the circle of Willis additional subsequent follow up is needed.

MULTIPLE INTRACRANIAL ANEURYSMS – 20 YEARS OF EXPERIENCE IN CLUJ-NAPOCA

Cristina Caterina Aldea[1, 2,*] , and Ioan Stefan Florian[1, 3]

[1] Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca
[2] CLuj County emergency Hospital
[3] CLuj County Emergency Hospital
*Presenting author

Introduction If a patient harbors multiple intracranial aneurysms none of them can be considered inoffensive (1). Many studies suggest that the risk of clipping all aneurysms simultaneously is less than the risk of a bleeding again from an untreated aneurysm (1,2,3). However, existing data on the outcome of treating bilateral MIAs using a unilateral approach is uncertain. The purpose of this study is to review our main author's experience with single stage single opening strategy in multiple cerebral aneurysms.

Material and Methods. This single center, single surgeon retrospective study is based on 101 patients with multiple aneurysms operated on by the main author at the Neurosurgical Clinic of Cluj-Napoca University Hospital between 01.01.1997-31.12.2017. The goal in all cases was single stage operation- unilateral fronto-pterional approach- with all aneurysms clipping. We analysed the complication rate, mortality, state at discharge between groups with unilateral and bilateral aneurysms of the anterior circulation.

Results. 101 patients had together 257 aneurysms. Most patients presented with 2 aneurysms (57, 6 %). The maximum number of aneurysms was 6 (1 patient) and 13 patients had mirror MCA aneurysms. The male to female ratio was 1:3.There were no statistically significant differences between the 2 groups regarding the rate of complications or the outcome ($p > 0,05$). When we compared patients with mirror middle cerebral aneurysms to the rest of the lot, no statistically significant difference could be observed, either ($p>0, 05$). 61% of patients were discharged with GOS of 4 and 5.

Conclusions. In experienced hands, unilateral fronto-pterional approach with clipping of all aneurysms in a single stage operation, is a feasible option for both unilateral and bilateral multiple cerebral aneurysms of the anterior circulation, with few exeptions.

Key words. multiple aneurysms, single stage operation, fronto-pterional approach, surgical clipping

1. Clatterbuck RE, Tamargo RJ. Contralateral approaches to multiple cerebral aneurysms. Neurosurgery. 2005;57(1 suppl):160-163
2. Wachter D et all: Early surgery of multiple versus single aneurysms after subarachnoid hemorrhage: an increased risk for cerebral vasospasm? J Neurosurg 114:935–941, 2014
3. Connolly ES Jr, et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a guideline for healthcare professionals from the American Heart Association/american Stroke Association. Stroke. Jun 2012;43(6):1711-37

RESULTS OF SURGICAL TREATMENT OF SPONTANEOUS INTRACEREBRAL HEMORRHAGE- PERSONAL EXPERIENCE

Andrija Savic

Clinical Center Serbia

Introduction Spontaneous non-traumatic intracerebral hemorrhage (ICH) remains a significant cause of mortality and morbidity throughout the world. Recent trials have not been able to demonstrate the overall beneficial effects of surgical intervention on mortality and functional outcomes however some patients with ICH may benefit from surgical management in specific clinical settings.

Method This prospective study included 26 patients operated by the single surgeon within the Emergency Department of the Clinic for Neurosurgery, Clinical Center of Serbia, from October 2018 to March 2019 due to spontaneous intracerebral hemorrhage. This study aimed to analyze the clinical and neurological condition of patients before surgery and three months after surgery. CT and CTangiography diagnostics were performed in all patients and patients with verified aneurysm, cavernoma or AV malformation were excluded from the study. Also patients in whom only conservative treatment was performed were excluded from the study.

Results Among 26 patients in this study 14 were females and 12 were males. 1 patient was aged 20-30 years, 3 patients were aged 30-40 years, 7 patients were aged 40-50 years, 10 patients were aged 50-60 years, 5 patients were aged 60-70 years. In the time of surgery 1 patient had GCS 6, 1 patients had GCS 7, 3 patients had GCS 8, 7 patients had GCS 9, 7 patients had GCS 10, 4 patients had GCS 11 and 3 patient had GCS 12. Volume of the clot varied from 30 ml to 80 ml. 1 hematoma was located in basal ganglia and the rest were lobar hematomas. Among this lobar hematomas 9 were located temporal, 4 were frontal, 5 were occipital, 3 were parietal and 4 were cerebellar. 23 patients underwent surgery within the first 24 h of bleeding, and the remaining 3 patients underwent surgery after this period. At the final testing 3 months after surgery the following results were registered: 1 patient died and 25 patients survived. Among this 25 patients 20 had GCS 15 and 4 GCS 14 and 1 had GCS13. 1 had severe pyramid deficit, 2 had moderate pyramid deficit, 4 had mild pyramid deficit, 5 patients had dysphasia, 7 had contralateral homonym hemianopsia and 3 had cerebellar ataxia.

Conclusion In specific cases, when it comes to young people with lobar hematoma whose size varies from 30 to 70 ml, or cerebellar hematoma whose size is greater than 30 ml, with GCS varies from 8 to 12 points and if there is a progressive deterioration of the neurological condition, surgery is an effective method of treatment.

VERTEBRAL ARTERY INJURY SECONDARY TO CERVICAL GUNSHOT

Duygu Dölen[1], Mustafa Selim Şahin[1,*], Tuğrul Cem Ünal[1], İlyas Dolaş[1], Pulat Akın Sabancı[1], Aydın Aydoseli[1], Yavuz Aras[1], and Ömer Faruk Ünal[1]

[1] Istanbul University School of Medicine
*Presenting author

Introduction: While spinal gunshot injuries used to be the third most common cause of spinal injuries, in the past current statistics shows it is becoming the most common cause. The ballistics of military and civilian guns are different, leading to different biomechanics of spinal injury in military and civilian populations. Low velocity handguns of the civilian populations cause much less tissue damage and spinal instability compared to the high velocity guns of the military. Penetrating injuries to the neck are prone to have adjacent vertebral artery (VA) injuries.

Method: Archives of Istanbul University School of Medicine Neurosurgery Department are retrospectively reviewed.
We report three cases of VA injury secondary to gunshot.

Results: One of our patients admitted to the ER with total neurologic deficit due to cervical gunshot injury. His CT scan showed fractures of right laminaes of C5-6-7 and processus spinosus of T1 vertebrae. His CT-Angio showed right VA injury without active bleeding. He was decided to be managed conservatively and discharged to physical therapy program two months following his admission.

Second patient was intubated in the state hospital due to excessive bleeding from his mouth following gunshot and referred to our institution. Craniocervical CT and CT-Angio revealed multiple fractures of C1 and C2 and distal vertebral artery on the right side could not be visualised above C1 vertebrae. Emergent Cerebral Angiography showed rupture of the right VA from V2 segment. Embolization of the right VA was planned however, due to technical disabilities patient underwent surgery. C1 and C2 partial laminectomy combined with right sided facetectomy was made and VA was clipped. He was discharged home tracheostomised 1 month after initial admission without further neurologic deficit. Last patient was 2 out of 5 paraparetic and anesthetic below L3 level on admission. His CT scan showed C1 anterior arcus and left lateral mass fracture

as well as the bullet itself. C1-2 fusion was performed emergently. Two years following the injury, while on physical therapy session, he suddenly became 1 out of 5 quadriparetic with severe head ache. Emergent Spinal Angiography showed an arteriorvenous fistula draining from suboccipital plexus and inferior petrosal sinus to internal jugulary vein. Neuroinventional team embolised the fistula. He was discharged home with 2 out of 5 quadriparesis.

Conclusion: VA is mostly vulnerable to trauma especially while coursing through foramina transversarum from C6 to C1 due to being fixed to spine. Penetrating VA injuries are more common than nonpenetrating ones. Not only transections but also pseudoaneurysms may result. When suspected, CT Angiography of the cervical region should be added to initial neuroradiologic assessment of the patient. Previously, VA injury was managed via surgical ligation of the artery; nevertheless endovascular treatment options nowadays have increased.

A DAY IN THE LIFE WITH BRAIN CAVERNOUS MALFORMATION

Enrico Gambatesa[1],*, Vincenzo Fontana[1], Giuseppe Maria Valerio Polizzi[1], Mario Giarletta[1], Marco Cancedda[1] , Barbara Masotto[2], and Giampietro Pinna[2]

1 University of Verona
2 AOUI Verona
*Presenting author

Background Cavernous malformations are anomalies of the blood vessels of the brain and spinal cord, which in dilated capillary lined caverns. These caverns carry a dysfunction of the endothelial tight junctions resulting in increased risk of leak or bleed, with typical clinical presentations of seizures, focal neurological deficit and haemorrhage. At present days many studies concerning the natural history of disease have been carried; still, very a little is known about lifestyle and modifiable risk factors for bleeding and recurrence.

Methods We present our experience regarding surgical, radiosurgical and conservative treatment of patient with brain cavernous malformation, confronted with available literature data. A special focus was given to quality-of-life assessment and lifestyle considerations using ad-hoc questionnaires.

Results We retrieved data of 290 patients admitted to our department and our outpatient clinic from 2008 to 2018 with a diagnosis of brain cavernoma, both with infratentorial and supratentorial localization. Among them 132 underwent surgery, 90 were treated with stereotactic-radiosurgery (Gamma-Knife), and 68 underwent conservative treatment (wait-and-scan approach). During the follow-up, some of our patients still present neurological impairment after surgery (mostly due to infratentorial location). Nevertheless, the majority of patients is able to conduct a normal life.

Conclusions As most of the literature works state, surgery for cavernous malformation may be the definitive solution to cure the disease and control the symptoms (e.g. epilepsy and impairment due to haemorrhage). Remarkably, in our series pregnancy and physical activity does not relate with recurrence of disease or worsened disease course.

GIANT CAVERNOUS MALFORMATION WITH UNUSUALLY AGGRESSIVE CLINICAL COURSE: CASE REPORT

Jovan Grujic

Faculty of Medicine, University of Belgrade, Belgrade, Serbia
Clinic for Neurosurgery, Clinical Center of Serbia, Belgrade, Serbia

Giant cavernomas (GC) are rare lesions, with less than 50 cases reported so far. Clinical presentation usually involves epileptic seizures and less typically the focal neurological deficit, due to the repeated hemorrhages and GCs mass effect and conseqental increased ICP

Although individual cases were reported, due to the rarity and variable imaging appearance, GCs are usually not considered in the differential diagnosis of large hemorrhagic lesions, especially when significant mass effect is present

A 17-years-old boy reported due to severe headache, right-sided weakness, and slurred speech. Symptoms started three days before with occasional headache, which intensified gradually. The emergency computerized tomography (CT), revealed a left frontal massive heterogenic lesion. Soon after, right-sided hemiparesis, and speech impairment progressed, and the patient became somnolent with the slightly dilated left pupil. Emergency surgery was performed, and the lobed greyish lesion was entirely removed. Based on the macroscopic appearance, the surgeon assumed it was the metastasis of melanoma. Histopathological analysis result was - cavernoma.

GCs should be considered as an option in hemorrhagic lesions, especially in the young age population. Emergency surgery for mass lesions is not uncommon in neurosurgery, however bleeding cavernomas are usually planned for elective surgery due to the specific approach and complications.

Key words: Giant cavernoma, haemorrhage, expansive lesion

THE ROLE OF TNF-A-BASED MODELS IN PROGNOSTICATION OF THE OUTCOMES AFTER ICH: A PILOT STUDY

Vladimir Rendevski[1], Boris Aleksovski[2], Aleksandar Caparoski[1], Venko Filipce[1], Blagoj Shuntov[1], Dragan Stojanov[3], Ana Mihajlovska Rendevska[4], Vasko Aleksovski[5], and Icko Gjorgoski[2]

[1] University Clinics of Neurosurgery, Medical Faculty, "Ss. Cyril and Methodius'' University, Skopje
[2] Faculty of Natural Sciences and Mathematics, "Ss. Cyril and Methodius'' University, Skopje
[3] Faculty of Medicine, University of Nis
[4] University Clinic of Radiology, Medical Faculty, "Ss. Cyril and Methodius'' University, Skopje
[5] University Clinics of Neurology, Medical Faculty, "Ss. Cyril and Methodius'' University, Skopje

Introduction: Recently, we have developed TNF-α-based models for prognostication of the 3-month neurological outcome in patients after Intracerebral hemorrhage, ICH (Rendevski et al., 2018). In this pilot study, we aimed to test their utility in the clinical practice for the purposes of identification of the patients who will most likely end up with a poor outcome, as well as to test their utility for clinical decision making between conservative and surgical intervention.

Methods: 20 patients with ICH were included initially in this pilot longitudinal study. Their peripheral blood TNF-α levels were screened, and the risk for poor outcome was assessed by using our previously determined cutoff value of > 110.35 pg/mL. The neurological outcome was determined 3 months after the initial hemorrhagic cerebrovascular insult. Another series of 20 threatened patients with TNF-α levels higher than 200 pg/mL were tested for the possibility of lowering the risk of the poor outcome by implementing early craniotomy with hematoma evacuation.

Results: The value of > 110.35 pg/mL had fairly identified the patients who later fell into the group with poor outcome, 3 months after ICH (8 out of 9 identified patients with risk for poor outcome have resulted in a poor outcome). In the second series of 20 threatened patients with TNF-α levels higher than 200 pg/mL, early craniotomy and evacuation of the hematoma were shown beneficial; 7 out of 20 patients resulted in a good outcome.

Conclusions: TNF-α screening at admission was shown as a useful method for identifying the ICH patients with the highest risk for ending with poor neurological outcome; early craniotomy with hematoma evacuation in the threatened group of patients with the highest TNF-α levels has also shown benefit in lowering the risk for poor outcome and improving patient's neurological state 3 months after ICH.

Rendevski V, Aleksovski B, Stojanov D, et al. Modeling prognostic factors for poor neurological outcome in conservatively treated patients with intracerebral hemorrhage: A focus on TNF-α. Clinical Neurology and Neurosurgery September 2018, 172: 51-58
Abstract No.

THE INFLUENCE OF EARLY CRANIECTOMY AND MICROSURGICAL TREATMENT OF RUPTURED MCA ANEURYSM ON NEUROLOGICAL RECOVERY ACCOMPAINED WITH EXTRACRANIAL COMPLICATION

Fahrudin Alic[1,*], Eldin Burazerovic[2], Salko Zahirovic[2], and Almir Dzurlic[2]

[1] Cantonal Hospital Zenica
[2] Clinical Center University of Sarajevo
*Presenting author

Aim To emphasize the importance of early recognition, diagnostic processing and emergent surgical treatment of spontaneous rupture of intracranial aneurysms (aSAH)

Methods A 41-year-old female presented with sudden impaired state of consciousness up to coma. "A golden hour" native computed tomography (CT) scan showed signs of voluminous subarachnoidal hemorrhage (SAH) into basal cisterns filled with hemorrhagic content (Fisher grade III) and patient was sent to referral neurovascular centre due suspicious right MCA aneurysmatic rupture.

Results Repeted native CT scan showed signs of subarachnoidal hemorrhage (SAH) into basal cisterns, intracerebral hematoma into right temporal lobe accompanied with a cloak of right subdural haemathoma (Fisher grade IV). CT angiography scans (CTA) confirmed aneurysmatic rupture at bifurcation of right MCA. The patient underwent emergent decompressive craniectomy and clipping of ruptured aneurysm within 6 hours of symptoms onset.

Conclusion Aneurysmal subarachnoid haemorrhage (aSAH) is a devastating condition that we should to think about in patients presenting with sudden impaired state of consciousness up to coma like it was in our case. Computed tomography (CT) and CT angiography (CTA) present a gold standard and should be routinely performed in order to exlude or confirm the presence of ruptured intracranial aneurysm. Prompt surgical decompression and occlusion of ruptured aneurysm is an absolute surgical indication.

Key words: neurological impairment, computed tomography (CT) and CT angiography (CTA), decompressive craniectomy and clipping

COMPUTED TOMOGRAPHY VOLUMETRIC ANALYSIS OF ANEURYSMAL SUBARACHNOID HAEMORRHAGE IN MODIFIED FISHER SCALE GRADED PATIENTS: A STRONG DELAYED CEREBRAL ISCHEMIA PREDICTOR?

Jagos Golubovic[1,*] , Djula Djilvesi[1], Tomislav Cigic[1], Vladimir Papic[1], Nenad Krajcinovic[1], Igor Horvat[1], Mladen Karen[1], Bojan Jelaca[1], Filip Pajicic[1], Nebojsa Lasica[1], Marko Despotovic[2], and Petar Vulekovic[1]

[1]Clinical Centre of Vojvodina, Clinic of Neurosurgery, Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia
[2]Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia
*Presenting author

Background: The exact amount of subarachnoid blood after aneurysmal rupture (SAH) is usually assessed with semiquantitative method of (modified) Fisher scale in order to predict delayed cerebral ischemia. It is considered that modified Fisher scale has moderate prediction success due to rough and observer-dependent blood volume estimation. This study compared total SAH volume and SAH distribution on initial computed tomography scan (CT) to development of DCI via automatic CT volumetric analysis.

Materials and methods: We analysed clinical and radiologic data of 100 consecutive patients with aneurysmal SAH (modified Fisher scale grading) admitted to tertiary level neurosurgical centre. An analysis was performed between automatically quantified total blood volume and localisation on CT and DCI (clinical, radiologic, and both).

Results: Analysed volumetric CT characteristic have strong prediction power. Total blood volume of more than 30cc millilitre was strong predictor for delayed cerebral ischemia. Specific localisation ratios have significant role in predicting DCI patterns.

Conclusions: High total blood volume and specific localisation measured with automated quantification method is strong predictor of DCI. These results shift the traditional SAH scaling methods towards automated pipeline segmentation to strongly predict DCI and therefore administer appropriate counter measures.

ANGIOGRAPHIC VASOSPASM AND ITS PROGNOSTIC SIGNIFICANCE WITHIN OPERATIVE TREATED PATIENTS AFTER THE RUPTURE OF INTRACRANIAL ANEURYSMS

Luka Berilazic[1,*], Nebojsa Stojanovic[1], and Radisav Mitic[1]

[1] Klinical centre Nis
*Presenting author

Cerebrovascular spasm is significant cause of morbidity and mortality within patients who had subarachnoid hemorrhage caused by aneurysm rupture. It starts rarely before the third day of insult and the highest frequency is between sixth and eight day. Vasospasm is registered in 30-70% within 7 days of hemorrhage with 20-30% clinically manifested signs depending on localization of aneurysm and reduction of blood perfusion in certain regions. Post operative morbidity and mortality is closely related to presented angiographic vasospasm. Timing for surgery of ruptured intracranial aneurysms should correlate with clinical status of the patient and signs of angio vasospasm. Presence of angiographic vasospasm after the rupture of intracranial aneurysms could be an important prognostic factor and looking into these factors could influence the decision of timing of the surgery.

MAXILLARY AND MIDDLE MENINGEAL ARTERY INSONATION IN BY-PASS EVALUATION

Milan Lepic[1,*], Toplica Lepic[1], and Stefan Mandic-Rajcevic[2]

[1] Military Medical Academy, Belgrade, Serbia
[2] University of Belgrade, Belgrade, Serbia
*Presenting author

Background. Ultrasonographic visualization of the maxillary artery and it's branch middle meningeal artery in infratemporal fossa may allow for ultrasonographic assessment of the cerebral by-pass preoperative features as well as to evaluate the procedure.

Aim. We imply the possibility of pre- and postoperative evaluation in cerebrovascular by-pass surgical procedures through the infrazygomatic accoustic window, enlarged by patients medium opened mouth.

Results. The proposed acoustic window allows for the visualization of the two arteries which may be used as the donor vessels in common extracranial-intracranial by-pass as well as in the flow augmentation surgery. The increased flow in the two vessels may be observed in these patients, especially in augmentation.

Conclusions. The possibility of evaluating the blood flow in MXA has numerous implications in neurology and neurosurgery, but the use in by-pass evaluation is the most attractive for the neurosurgical audience, being a low-cost reproducible, and reliable tool which may be used for this previously unavailable assesment

Keywords: color doppler ultrasonography; infratemporal fossa; maxillary artery; meningeal arteries; cerebral by-pass surgery

Wang L, Cai L, Lu S, Qian H, Lawton MT, Shi X. The History and Evolution of Internal Maxillary Artery Bypass. World Neurosurg. 2018;113:320-332.

Yu J, Guo Y, Xu B, Xu K. Clinical importance of the middle meningeal artery: A review of the literature. Int J Med Sci. 2016 Oct 17;13(10):790-799. doi: 10.7150/ijms.16489

Niknejad HR, van der Zwan A, Heye S, Van Calenbergh F, Van Loon J. Value of the Middle Meningeal Artery in Cerebrovascular Bypass Surgery: An Anatomic Feasibility Study. 2018. Oper Neurosurg. 15(1)89–96.doi: 10.1093/ons/opx200

Friday, October 25th, 2019

RAPID CROSSFIRE SESSION 1
CASE PRESENTATION AND EXPERT DISCUSSION

Hall 2

SURGICAL TREATMENT OF THE CAVERNOUS ANGIOMA- CASE REPORT

Andrija Savic

Clinical Center Serbia

Introduction Cavernous malformation represent 5% to 16% of all CNS vascular lesions. It could be present in a sporadic and familiar form. Usually it consist of clusters of anomalous cavernous vessels embedded in a dense collagenous matrix. These lesions do not contain brain parenchyma. Hemosiderin deposits and gliotic reaction are found in the adjacent brain parenchyma.

Case report A 23-year-old man was admitted to the ward for frequent epi seizures and neuroradiologically (MRI and CT) verified cavernous malformation localized frontal left, 1,5 cm in diametar. DSA was not performed. According to neuroradiological popcorn appearance it was classified as Zabramski gr. II. Seizures were repeated several times in the ward and could not be prevented with medication. Surgery was indicated, left frontal craniotomy was performed, lesion and perilesional gliosis were removed. The patient woke up slowly after surgery and therefore a control CT was performed that indicated the large intracerebral hematoma and a revision surgery was made. The patient was discharged from the ward two months later as conscious, communicative, without lateralization but with signs of motor dysphasia.

Discussion Approximately 15-20% of these lesions are discovered incidentally. Lesion location is the most important factor in predicting the risk of hemorrhage. This annual risk is estimated 0,4% for superficial lesions compared with 4,1% among patients with deep lesions. Previous hemorrhage increases the risk of subsequent bleeding. The most frequent symptom is seizure, most often with lesions located in temporal or frontal lobes. This lesions may present with mon-hemorrhagic slowly progressive neurological deficits. Indication for surgical menagement are medically intractable epilepsy, recurrent overt hemorrhage and severe focal or progressive neurological deficits. For asymptomatic patients observation is indicated with MRI follow-up yearly. Patient with infrequent seizures, with single hemorrhage or with minimal neurological deficit represent main controversial situations in respect of surgical indications. The surgical strategy is usually circumferential en-bloc dissection and also resection of

the gliotic discoloured rim which is especially important for patients who are presented with epilepsy. For lesions located in eloquent area piece-meal, inside-outside removal is recommended.

Conclusion One has to take into the consideration that, from time to time, venous angioma, in the form of a dilated vein, could be found in the proximity of the cavernous malformation. If associated venous malformation is suspected conventional angiography is mandatory with special attention for late venous phase. During the surgery this venous malformation must be preserved. Otherwise it is likely to result in oedema or hemorrhage due to venous stagnation in the surrounding normal brain.

TREATMENT FOR INTRACRANIAL ANEURYSMAL HEMORRHAGE IN ELDERLY PATIENTS

Bojan Jelaca MD PhD

Clinical Center of Vojvodina, Clinic of Neurosurgery,
University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

Advances in medical science have led to an increase in life expectancy and treatment modalities. There are many studies that show that both microsurgical clipping and coiling yielded excellent results in elderly patients with unruptured aneurysms, but there are still controversies about their treatment with aneurysmal intracranial hemorrhage.

Therefore, we present the case of 78-year-old man with acute onset of symptoms and subarachnoid hemorrhage due to left side middle cerebral artery aneurysm rupture. In early phase of hospitalization there was major neurological deterioration and signs of rebleeding. At the first time, the what is best to do, dilemma was there, and should we do something different after rebleeding? With this case we want to emphasize in which ways the decision making process can be possibly changed in different occasions.

CASE PRESENTATION: PATIENT WITH SACCULAR RIGHT ICA AND TWO FUSIFORM ANEURYSMS OF THE LEFT VERTEBRAL AND BASILAR ARTERY

Nebojsa Lasica

Clinical Center of Vojvodina, Clinic for Neurosurgery

A 69 years old male patient with a history of hypertension presented with blurred vision, incomplete hearing loss on his right ear, and dizziness, lasting for 6 months prior to admission and Glasgow Coma Score 15.

After clinical and neurological exam, head CT angiography was performed that showed one saccular aneurysm of the right internal carotid artery, and two fusiform aneurysms of the left vertebral artery and the initial segment of the basilar artery. Here we discuss potential treatment options of the aforementioned aneurysms.

Friday, October 25th, 2019

ORAL PRESENTATION 1

Hall 2

COMPLICATIONS, COMORBIDITY, AND QUALITY OF LIFE IN PATIENTS WITH ANGIOGRAM NEGATIVE SPONTANEOUS SUBARACHNOID HEMORRHAGE

Aleksandar Kostic[1,*], Dragan Stojanov[2], Vesna Nikolov[1], Misa Radisavljevic[1], Radisav Mitic[1], and Emina Kostic[3]

[1] Clinic for Neurosurgery, Clinical center Nis
[2] Clinic for Radiology, Clinical center Nis
[3] Clinic for Nefrology, Clinical center Nis
*Presenting author

Introduction: Angiogram negative spontaneous subarachnoid hemorrhages are the less usual form of intracranial bleeding and not so well understood. Mild clinical presentation, a favorable outcome, and low complication rate are typical for subarachnoid hemorrhages (SAH) of unknown etiology. The aim of this study was to analyze the complications, comorbidity and quality of life in two forms of angiogram-negative spontaneous SAH: pretruncal (PNSAH) and nonpretruncal (NPNSAH).

Methods: The study group involved 28 patients with PNSAH and 19 patients with NPNSAH. CT scan was done within 72 hours from bleeding. All patients underwent four-vessel cerebral angiography. Repeat angiography was performed in five PNSAH and all NPNSAH patients.

Results: Forty patients were in grade I or II of the Hunt-Hess Scale (26 PNSAH and 14 NPNSAH). There was one case of rebleeding (NPNSAH patient), 11 cases of transient acute hydrocephalus (4 PNSAH and 7 NPNSAH). Cerebral vasospasm visualized by angiographies in two NPNSAH patients was local and mild but was not found in PNSAH patients. Acute electrocardiography changes were found in 25 patients (significantly more frequently in NPNSAH than in PNSAH, 14 and 11 patients, respectively; p=0.020). There were no significant differences in quality in life between two groups (working ability, depression and anxiety, together with comorbidity as hypertension, obesity, diabetes mellitus). There was a borderline significant difference in the frequency of smokers between the two groups (0.053).

Conclusion: Cardiac problems following these types of SAH are more frequent than expected, and therefore cardiac monitoring is necessary. Life quality in these patients, presented as socioeconomic abilities of the patients and comorbidity, is the meter of constant further dealing, both for clinicians and families.

Keywords: angiogram-negative subarachnoid hemorrhage; complications; life quality

EYEBROW KEYHOLE VERSUS PTERIONAL CRANIOTOMY FOR CLIPPING OF ANTERIOR CIRCULATION CEREBRAL ANEURYSMS

Dario Muzevic[1] , Splavski Bruno[2],* , Irina Bagic[1] , Mateo Grigic[1] , Vjenceslav Vrtaric[1] , and Marko Kovacevic[1]

1 Osijek Clinical Hospital Center, Osijek, Croatia
2 Sisters of Charity Clinical Hospital Center, Zagreb, Croatia
*Presenting author

Objective: To compare functional outcome, efficacy and safety between eyebrow keyhole and pterional craniotomy in surgical management of anterior circulation cerebral aneurysms.

Methods: A consecutive case series of 116 patients who underwent surgical clipping for anterior circulation cerebral aneurysms by means of eyebrow keyhole or pterional craniotomy was retrospectively analyzed. The investigated features were: baseline demographics, WFNS, Hunt and Hess and Fisher score upon admission, procedural or postoperative care complications and surgical outcome at hospital discharge assessed by the Extended Glasgow Outcome Scale.

Results: The median patient age was 56 years with female predominance. Overall, out of 116 patients included in the study, 83 patients underwent pterional craniotomy while 33 patients were treated by supraorbital keyhole approach. No statistically significant difference was observed between the two approaches in correlation to the surgical outcome or procedural or postoperative care complications.

Conclusion: Patient outcomes between pterional and supraorbital keyhole approach appear to be comparable and equally efficient in the anterior circulation cerebral aneurysm treatment. The keyhole approach may be valid alternative for pterional approach with careful patient selection and sufficient experience in the technique. Selection of appropriate and most effective approach is highly dependent on surgeon's individual preferences.

CHALLENGES IN ENDOVASCULAR TREATMENT OF WIDE NECK ANEURYSMS

Menka Lazareska[1,*], Petar Janevski[1], Milenko Kostov[2], Aleksandar Caparovski[2], Vladimir Mircevski[2], Jasna Bushinovska[3], Vladimir Rendevski[2], Ace Dodevski[4], Blagoja Shuntov[2], Elmedina Asani[2]

[1] University Institute of Radiology
[2] University Clinic of Neurosurgery
[3] Anesthesiology ,reanimation and intensive care
[4] Institute of Anatomy
*Presenting author

Background: An aneurysm is an abnormal focal dilatation of an artery. Most of the unruptured aneurysms are asymptomatic and discovered incidentally or some of them symptomatic with mass effect or nerve palsy, but rupture of aneurysm results in a potentially life-threatening subarachnoid haemorrhage. Aneurysms with wide necks are defined by neck diameters greater than 4 mm or dome-to-neck ratios less than 2 and are the most difficult to treat with the endovascular method.

Aim: This study aimed to analyse the decision and type of endovascular treatment of intracranial aneurysms with a wide neck.

Methods: The study population included 56 patients with 67 aneurysms referred to the University Clinic of Radiology in Skopje, the Republic of Macedonia for endovascular treatment during the period from 2017 to 2019. This study included 29 females and 18 males, ranging in age from 25 to 74 years.

Results: From total 56 treated aneurysms 19 were ruptured and 37 unruptured. Six patients were with multiple aneurysms. In these study complex aneurysms were treated with combined technique, 9 with balloon-assisted coiling, 28 with stent-assisted coiling, 6 stents, 3 with flow diverter assisted coiling, 13 FD and 3 with partial coil filling, 5 with coiling and neck remodeling without assistance device.

Conclusion: Aneurysms with wide neck remain a challenge for endovascular treatment. But the development of new techniques and materials in the treatment of aneurysms makes endovascular treatment of intracranial aneurysms safe and feasible.

THROMBECTOMY IN CHILDREN WHY NOT?

Ivan Vukasinovic, Filip Vitosevic

Clinic for Neurosurgery,
Department of Interventional Neuroradiology,
Clinical center of Serbia

In children, 50% of all stroke are ischemic. Incidence is 1.3-13 per 100 000. Mortality is approximately 3%-6%. 70% of survivors are with significant deficits. The need for acute treatment in this scenario is obvious. Although children were not represented in RCTs, technical advancement has enabled mechanical thrombectomy to be performed in this population. We present a case of 12 year old boy with acute occlusion of mid- basilar artery, with stenotic/dissection lesion that was underline this occlusion.

SURGICAL MANAGEMENT OF PARACLINOID ANEURYSMS IN SOLO NEUROSURGICAL PRACTICE

Hotetsu Shimamoto[1,*]

[1] Shimamoto Neurosurgical Institute
*Presenting author

Objective: To analyze the results of surgical intervention for paraclinoid aneurysm of the past 15 years.

Methods: Between 2004 Jan. and 2019 May. We have treated 74 patients (8 males, mean age at surgery: 55.6 years, range: 30 ~ 83 years) who underwent surgical interventions for unruptured paraclinoid aneurysm. Their location numbers are as follows: dorsal wall 23, medial wall 35, lateral wall 2 and ventral wall 14. Aneurysm location, size and postoperative results were investigated. Outcomes were assessed on the basis of a modified Rankin Scale (mRS).

Results: The overall rate of mRS 0 was 68 cases (91.9%), mRS 1 was 3 cases (4.1%) with partial visual disturbance, mRS 2 was 2 cases (2.7%) with one blindness, one with rt. hemiweakness due to thromboembolism and mRS 4 was one (1.4%) with lt. hemiparesis due to medical comorbidity.

Conclusion: The direct clipping method utilizing advanced techniques is the preferred approach and continues to be a good option for the treatment of paraclinoid aneurysms. Careful surgical consideration is necessary for elderly and medical risk patients.

UNRUPTURED MCA BIFURCATION ANEURYSM-CASE REPORT

Andrija Savic

Clinical Center Serbia

Introduction Unruptured intracranial aneurysms occurring in about 2% of the population. Most of them do not rupture and patients harboring these lesions often remain asymptomatic. On the other side aneurysm rupture is connected with significant morbidity and mortality. There are effective surgical and endovascular interventions to prevent rupture, but these procedures carry a risk of adverse complications.

Case report A 62-year-old woman, with known history of AIDS, has been admitted to Clinic for Neurosurgery Clinical Center of Serbia due to occasional headaches and dizziness she had had for months and which has had increased in frequency over the last two weeks. Head CT indicated a physiologic finding but angio CT indicated an aneurysm on the bifurcation of the right MCA, dome size 9mm and neck size 5mm, directed laterally, downward and backward. It was PHASES aneurysm risk score 7, so the surgery was indicated. We had performed standard pterional craniotomy, Sylvian fissure dissection and clip ligation of the aneurysm. Patient was discharged after seven days in excellent clinical and neurological condition.

Discussion Wide opening of the Sylvian fissure is necessary for safe clip ligation of MCA aneurysm. It is recommended to perform Sylvian fissure dissection with "from distal to proximal, and from inside to outside" technique because it is the least traumatic for brain tissue. Dissection should be started a little bit distal to Sylvian point, confluence of ascending, horizontal, and posterior rami, because this is the widest transfissure corridor between frontal and temporal lobes. It is important to conduct arachnoid opening above Sylvian vein, on the frontal side of the vein, since the vein travels approximately 4 mm below the fissure in the majority of cases. Also, on that way, the vein will not cross the fissure when the frontal lobe needs to be elevated. Arachnoid dissection should be performed in blunt fashion ,with tips of bipolar forceps ,which is preferred by western experts, or in sharp fashion ,with micro scissors, which is preferred by eastern experts. Usually there is the need to use combination of this two technique. Surgeon

must avoid large superficial opening od Sylvian fissure. First one should go deep and display the insula. Preservation of the veins and avoidance of pial injury is mandatory. Then dissection should be continued from distal to proximal and from deep to superficial layers. This technique simplifies identification of arachnoid planes between frontal and temporal lobes and allows early identification of the M2 MCA branches which leads surgeon to the MCA bifurcation, main arterial M1 trunk and aneurysm. One must always be aware that lenticulostriate perforators are localized at the level of the super-posterior aspect of M1 segment of MCA.

Conclusion Surgical treatment of non-ruptured aneurysms on MCA bifurcation using the described technique is the least traumatic method for intracranial structures, which in most cases does not require the use of fixed retractors and is associated with the fewest complications. On the other hand it allows early establishment of proximal control and effective permanent exclusion of aneurysm from the circulation.

MEDICAL IMAGE SEGMENTATION USING DEFORMABLE MODELS AND LOCAL FITTING BINARY

Emmanuel Gadzama Hamatu[1,*]

[1] Disotos Global Services Limited
*Presenting author

This paper presents a customized deformable model for the segmentation of abdominal and thoracic aortic aneurysms in CTA datasets. An important challenge in reliably detecting aortic aneurysm is the need to overcome problems associated with intensity inhomogeneities and image noise. Level sets are part of an important class of methods that utilize partial differential equations (PDEs) and have been extensively applied in image segmentation. A Gaussian kernel function in the level set formulation, which extracts the local intensity information, aids the suppression of noise in the extracted regions of interest and then guides the motion of the evolving contour for the detection of weak boundaries. The speed of curve evolution has been significantly improved with a resulting decrease in segmentation time compared with previous implementations of level sets. The results indicate the method is more effective than other approaches in coping with intensity inhomogeneities.

Keywords: Abdominal and thoracic aortic aneurysms, intensity in homogeneity, level sets, local fitting binary.

J.A.Abiola. Level Set Methods and Fast Marching methods. Lagos State University Press, 1999.

ENDOVASCULAR TREATMENT OF BRAIN AVMS: PEARLS AND PITFALLS

Ivan Vukasinovic[1], and Zarko Nedeljkovic[1]

[1] Clinical Center of Serbia

Current treatment modalities for cerebral AVMs include microsurgical resection, endovascular embolization, and stereotactic radiosurgery. These modalities may be used alone, or in to effect the best treatment result. The main goal is to prevent hemorrhage. The treatment to control seizures or other neurological complications is dubious and unsupported in scientific data. If treatment is initiated the goal should be complete cure of AVM, as partial treatment can elevate bleeding risk. Exception is targeted treatment of the part of ruptured AVM containing aneurysm. While treatment of previously hemorrhagic AVM is indicated, for the unruptured AVM decision to treat is more difficult. Ultimately, a risk-benefit analysis should be conducted wherein the natural history of the AVM is considered against the risks associated with the proposed interventions. From the endovascular treatment point of view, treatment strategies are nidus reduction before surgery or radiosurgery, curative embolization, and targeted embolization of the weak point as aneurysm, which is equally unsupported in clinical trials data. We present our experience in the endovascular treatment of brain AVM.

Mohr JP, Parides MK, Stapf C, et al;international ARUBA investigators. Medical management with or without interventional therapy for unruptured brain arteriovenous malformations (ARUBA): a multicentre, non-blinded, randomised trial. Lancet 2014;383:614–21

Stapf C, Mast H, Sciacca RR, et al. Predictors of hemorrhage in patients with untreated brain arteriovenous malformation. Neurology 2006;66:1350–55

Karlsson B, Jokura H, Yang HC, The NASSAU Analysis: Are the Results From The ARUBA Trial Also Applicable to Unruptured Arteriovenous Malformations Deemed Suitable for Gamma Knife Surgery? Neurosurgery. 2019 Jul 1;85(1):E118-E124.

Mosimann PJ, Chapot R. Contemporary endovascular techniques for the curative treatment of cerebral arteriovenous malformations and review of neurointerventional outcomes. J Neurosurg Sci. 2018 Aug;62(4):505-513.

PURE DVA PATIENT PRESENTED WITH INTRACEREBRAL HEMATOMA: A RARE CASE

Utku Özgen[1,*], Halil Can[2], Aydın Aydoseli[1], and Altay Sencer[1]

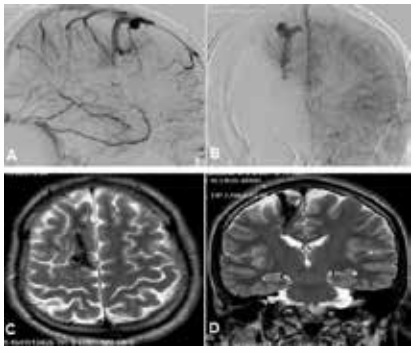
[1] Istanbul University Istanbul Medical Faculty
[2] Medicine Hospital
*Presenting author

DVA are cerebrovascular lesions which usually occur together with cavernomas. These patients usually present with intracerebral hematoma which mostly cavernoma was responsible.(1) Very few cases have been reported in the literature in which a pure DVA presented with intracerebral hematoma without an associated cavernoma or any other vascular anomaly. (2,3) In this case report, we describe a patient with having DVA and a right frontoparietal intracerebral hematoma without any associated cavernoma.

A 29-year-old man who had a sudden onset of left sided weakness was admitted to emergency department. He had 4/5 left-sided hemiparesis in his admission neurological examination. Glaskow coma scale was found 15. He had nothing special in his previous medical history. His admission Cranial computerized tomography revealed an intracerebral hematoma with 41x28x25 mm dimensions which is located in superior frontal gyrus, anterior to supplementary motor area and extending to centrum semiovale. No serious mass effects have been observed. In his 3rd month control MRI showed most of the hematoma was resolved and the DVA was clearly seen on DSA with its large collecting vein and its drainage to the superior sagittal sinus. Also in his 3rd month outpatient clinic control, his left sided hemiparesis was not existing anymore.

Surgical intervention can be performed for a DVA in the presence of deterioration of neurological examination, presence of midline shift, aquaduct compression causing hydrocephalus and seizure. In spite of the fact that our patient's clinical condition was stable, we decided to choose the conservative approach.

Although DVAs rarely lead to bleeding, care should be taken in terms of bleeding in patients who are candidates for using anticoagulant or antiaggregan medication.



1. Rammos SK1, Maina R, Lanzino G. Developmental venous anomalies: current consepts and implications for management: Neurosurgery J65(1):20-9, 2009
2. McLaughlin MR1, Kondziolka D, Flickinger JC, Lunsford S, Lunsford LD. The prospective natural history of cerebral venous malformations: Neurosurgery. 43(2):195-200, 1988
3. Garner TB1, Del Curling O Jr, Kelly DL Jr, Laster DW. The natural history of intracranial venous angiomas: J Neurosurg. 75(5):715-22, 1991

CASE REPORT: SURGICAL TREATMENT OF DEEP-SEATED OCCIPITAL PARAMEDIAN RUPTURED AVMS

Adina Mihaela Popa[1,*]

[1] Clinic of Neurosurgery Emergency Hospital Cluj
*Presenting author

Introduction: AVM`s surgical treatment is based on a careful evaluation of the patient`s clinical presentation, treatment risk based on the natural history of an untreated AVM and a comparison of the effectiveness of alternative treatments, such as embolization and radiosurgery. The surgical outcome has been linked to the size of the nidus, the relationship with the eloquent areas and the deep venous drainage, all of which conclude the Spetzler-Martin grading score of AVMs.

Material and methods: We present 3 cases of young patients with surgically treated deep-seated paramedian occipital ruptured AVMs, analysing the differences between the mode of presentation and the treatment outcome. Two of the cases presented with sudden onset of neurological symptoms after the AVM rupture, of which one was during pregnancy, and the last case was known with ruptured AVM 5 years prior surgery, initially conservatory treated.

Results: The surgical treatment outcome was favourable in most of the cases. Two of the patients had postoperative visual disturbances, homonymous hemianopia and one had no neurological deficits.

Conclusion: Deep-seated paramedian occipital AVMs represent a surgical challenge through their relationship with the optic radiation, multiple deep feeders from Posterior Cerebral Artery, Posterior Choroidal Artery, deep venous drainage toward Pineal Region Venous Complex and deep and tight operating field. Despite all this obstacles, surgery represent a valid option with excellent results, with an appropriate surgical strategy and technique.

Keywords: occipital lobe, ruptured AVM, pregnancy, AVM

FAMILIAL CEREBELLAR CAVERNOMA IN 13-YEAR-OLD CHILD: CASE REPORT

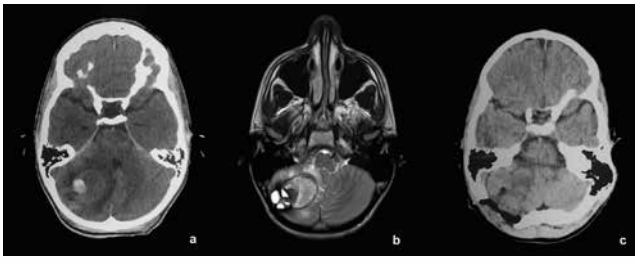
Bojana Zivkovic, Sinisa Matic, Toplica Milojevic, Vladimir Bascarevic, Radovan Mijalcic, Mirko Micovic, Andrija Savic and Lukas Rasulic

Clinic of Neurosurgery, Clinical Center of Serbia

Introduction Cavernomas are rare vascular hamartomatous lesions with prevalence of about 0.6% in pediatric population. Only one tenth of these cases are autosomal dominantly inherited (familial cerebral cavernous malformations).

Case report We present a case of 13-year-old boy treated in Clinic of Neurosurgery, Clinical Center of Serbia (CCS). Previously healthy child was suddenly complaining of severe headache, nausea and vomiting. He was examined in Emergency center, the CT was performed showing circular lesion in right cerebellar hemisphere, with different degrees of hiperdensity, approximately 20mm in diameter. The child was admitted in Clinic of Neurosurgery CCS and MRI was performed. It confirmed that the lesion was in fact an intracerebellar hematoma originating from a cavernoma. Furthermore, family history showed that the father of the child was diagnosed with multiple intracranial cavernomas several years ago and also, the child's grandmother was previously operated because of intracranial cavernoma. Thus, confirming this case to be a familial cerebellar cavernoma. The child was operated, the lesion was completely removed, the postoperative course was uneventful and the child recovered completely.

Conclusion This paper presents a very rare case of familial intracerebellar cavernoma in a 13-year-old boy. These lesions in children are quite rare, and they are usually supratentorial. Surgery remains the treatment of choice since the cases with positive family history observed so far appear to have somewhat greater risk of bleeding. Future research will be necessary to identify exact genetic pathophysiology and risk of rupture.



BASILAR ARTERY OCCLUSION AND UNKNOWN-ONSET STROKE, A TIED HANDS SITUATION OR NOT? CASE REPORT

Dmitar Vlahovic[1, 2,*], Zeljko Zivanovic[1, 2], Nikola Boban[3], and Dragan Andjelic[3]

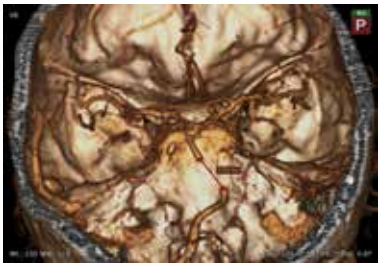
[1] Neurology Clinic, Clinical Center of Vojvodina
[2] Faculty of Medicine, University of Novi Sad
[3] Center for Radiology, Clinical Center of Vojvodina
*Presenting author

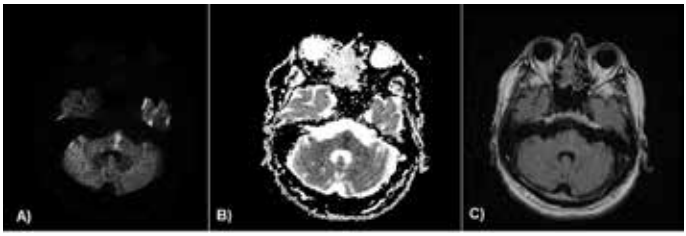
Introduction: Acute ischemic stroke (*AIS*) can be treated with a thrombolytic agent or endovascular procedure, or both, according to the current guidelines. Those with unknown-onset stroke (*UOS*) or stroke-onset time > 6 hours can be assessed for endovascular treatment using perfusion imaging either by CT or MRI, but it has only been proven effective for anterior circulation strokes. Also, perfusion imaging requires automated software for calculating the ischaemic volume and infarct core volume, which are not widely available. Posterior circulation strokes due to basilar artery occlusion (*BAO*) have a worse prognosis and high mortality rate if left untreated. Research has shown that patients with DWI-FLAIR mismatch and UOS of anterior circulation can be good candidates for the endovascular procedure.

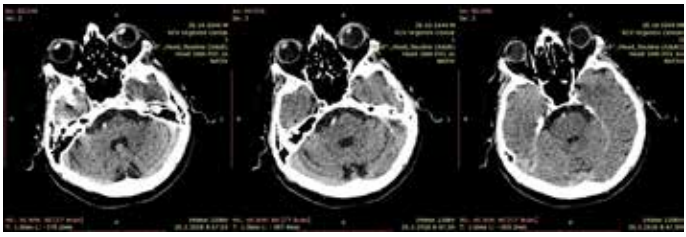
Aim: DWI-FLAIR mismatch can be used for assessing patients' eligibility for endovascular treatment in those with UOS (or stroke-onset time > 6h) and BAO.

Case report: The male patient with atrial fibrillation presented at our emergency room with symptoms of AIS, NIHSS 14. CT angiography confirmed BAO. The last time he was seen well was 11 hours before he was admitted. Brain MRI was performed next, with clear DWI-FLAIR mismatch in the pontine region. The patient was treated with mechanical thrombectomy, achieving mTICI score 3. NIHSS after the procedure was 9, and after 24 hours was 2. Patient was discharged with NIHSS 0 and mRS 0.

Conclusion: DWI-FLAIR mismatch could be a good assessment tool in those with unknown-onset AIS due to BAO, but further research is needed.







Alonso de Leciñana M, et al. J NeuroIntervent Surg 2016;0:1–6. doi:10.1136/neurintsurg-2016-012797
Nogueira, R. G. et al.(2018). Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct. New England Journal of Medicine, 378(1), 11–21.
Albers, G. W. Et al. (2018). Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging. New England Journal of Medicine, 378(8), 708–718.
Escalard, S. Et al. (2018), Unknown-onset strokes with anterior circulation occlusion treated by thrombectomy after DWI-FLAIR mismatch selection. Eur J Neurol, 25: 732-738.

INTRA-ARTERIAL TIROFIBAN THROMBOLYSIS AFTER FLOW-DIVERTER STENT THROMBOSIS: CASE REPORT

Slavko Djuraskovic[1,*], Novak Lakicevic[1], Boris Djurovic[1], Enes Kolasinac[1], Vuk Pesic[1], and Svetlana Milosevic-Medenica[2]

[1] Clinical Center of Montenegro
[2] Clinical Center of Serbia
*Presenting author

Tirofiban, which is antagonist of the platelet glycoprotein IIb/IIIa receptor, inhibits platelet aggregation. Several studies showed that Tirofiban can be effective to resolve thrombus during the embolization of cerebral aneurysms.

We present a case of male, 67 year old, who underwent endovascular treatment for 6,8x3,5mm unruptured right middle cerebral artery(MCA) aneurysm. During the embolization a 2,5mmx20mm Silk flow-diverter stent was deployed across the aneurysm neck. One hour after the procedure the patient worsened and developed severe weakness in his left hand and left leg. He couldn't speak and had deviation of eyes and head to the right side. We performed emergency control cerebral angiography which revealed thrombus inside flow-diverter stent, without filling in the majority of MCA branches. We performed intra-arterial (IA) thrombolytic therapy and administrated 2 ml of Tirofiban (12,5 mg/50ml) in 10 ml of saline during 10 minutes, through the microcatether, just proximal to the thrombus. After 10 minutes control angiography revealed thrombus recanalization and patency of the majority MCA branches. During the same day the patient rapidly improved and recovered left hemiparesis. On discharge, after seven days, the patient could walk independently and had only discrete left hemiparesis.

When procedural thromboembolic complication occurs, an IA Tirofiban thrombolysis can prevent serious neurological deficit. Further investigation is needed to set dosage limitations of the IA Tirofiban injection.

CHALLENGES OF ANESTHESIA IN ENDOVASCULAR MECHANICAL THROMBECTOMY

Inga Mladic Batinica[1],* , Vladimir Kalousek[1] , and Branimir Culo[1]
1 University Hospital Center Sestre milosrdnice, Zagreb, Croatia
*Presenting author

Background: Endovascular mechanical thrombectomy in acute ischemic stroke (AIS) is one of the most expanding, advancing and challenging clinical field during the past few decades. Which form of anesthesia, general anesthesia vs. conscious sedation, is more convenient for the patient during this procedure is still interesting topic for discussion and choice is always controversial.

Clinical case-series: We present a single "mothership" center experience that has a high volume neurointerventional level. Last several years half of all procedures were thrombectomies - in average 60 cases per year. We preferred general endotracheal anesthesia, with target controlled infusion (TCI) technique using propofol and remifentanil, and rocuronium for intubation. Short acting drugs allow rapid neurological examination after procedure. Using this strategy we avoid excessive BP variability, patient's movements are decreased, airway is secured and optimal carbon dioxide control levels are achieved.

Discussion: AIS outcome is dependent on rapid diagnosis and early treatment, namely, the time factor. The effect of anesthetic technique on the success of reperfusion is still inquiring topic. Therefore, understanding of the current and the future developments in that field should be subject of specific interest and challenge for anesthesiologist. Anesthetic management for this patients is much more than anesthetic plan of sedation or GA. Strategies include an individualized approach to hemodynamic and respiratory parameters, intravascular fluids and neuroprotection that can be essential for a favorable outcome. "Time is brain" and dedicated team members are time saving. Taking into account our clinical experience, as well as technical factors, we found GA the most suitable anesthetic technique for that kind patients.

Learning points: Endovascular treatment dramatically improves the outcome of eligible patients. The impact of the type of anesthesia used during mechanical thrombectomy on patient outcomes remains controversial. Experience of the team may yield a greater effect on the outcome than an anesthesia technique. In stroke "mothership" center establishing, one of the milestones is creation of a competent neuroanesthesiologist who is able to provide care for that kind patients. Drugs fine titration, accurate BP and respiratory function monitoring, good plan in dealing with possible complication and close cooperation with neuroradiologist are essential for favourable outcome.

SEIZURES IN EPILEPSY IN PEOPLE WITH CEREBRAL CAVERNOMAS

Lazar Stankovic, Igor Nikolic, Nikola Repac
Aleksandar Janicijevic, Jelena Kostic, Zead Abousabie
Mohamed Almzeogi, Vladimir Jovanovic, Goran Tasic

Clinic of Neurosurgery Clinical Center of Serbia
Belgrade, Serbia

Epileptic seizures are the most common first presentation of a cavernous angioma. The cavernoma is often, but not always, the cause of the seizures. The risk of seizures and the manifestation of seizures depend on the location of the cavernoma in the brain. The first line treatment are seizure medications (Lamotrigine, Carbamazepine, Levetiracetam, and others). Epilepsy surgery should be considered in people with cavernoma who do not become seizure free on seizure medications.

Established risk factors for seizures in people with cavernoma are number of cavernomas, size of cavernoma and presence or absence of hemosiderin rim around the cavernoma.

Prognosis for epileptic seizures in people with cavernomas and no history of seizures is 4% over 5 years. Prophylactic treatment is therefore not necessery. In people with cavernoma related seizures the risk of further seizures without treatment is 94% over 5 years. Treatment is recommended after first seizure. 50-60% of people with cavernoma – related epilepsy become seizure free on medications. 60%-80% of people with cavernoma become seizure free after epilepsy surgery for cavernoma over 2-5 years.

This retrospective study included 5 years experience and 24 operated patients.

EPILEPSY AS AN INITIAL FACTOR OF THE CLINICAL PRESENTATION OF ARTERIOVENOUS MALFORMATIONS OF THE BRAIN – NATURAL HISTORY AND RISK FACTORS

Abousabie Z, Nikolic I, Repac N, Janicijevic A,
Zivanović J, , Stankovic L, Almzeogi M, Jovanovic V, Tasic G.

Introduction We present the results of treatment of 15 patients with brain arteriovenous malformation initially presented by epilepsy in Neurosurgery, Clinical Center of Serbia in Belgrade, in the period 2012-2018 year.

Results: Most of the patients had a Tonic-clonic type of epilepsy, 14 of them, while one was presented Absence Seizures type of epilepsy. The attacks are manifested individually in 14, and in 1 case series. Response to treatment was good in 11 and 4 patients with refractory. In 26.7% of cases, seizures alternated with bleeding. Anatomical features of malformations have not show a significant difference in the predisposition to epilepsy treatment response.

Conclusion: Good quality management of epilepsy by medication supports the view that there is no need for urgent surgical intervention of brain AVM so we can generally conclude that brain AVM in relation to a wide range of neurosurgical patients are in benign lesions, which requires patience and good work man ship and strategic therapeutic approach.

Key words: AVM of the brain, epilepsy, the natural course

THE NATURAL COURSE OF SPONTANEOUS INTRACEREBRAL BRAIN HEMORRHAGE LOCALIZED IN THE BASAL GANGLIA OF THE BRAIN - THE ANALYSIS OF A SERIES OF 39 PATIENTS

Almzeogi M , Nikolic I, Repac N, Janicijevic A,
Zivanovic J, , Stankovic L, Abousabie Z, Jovanovic V, Tasic G.

Introduction The study included 39 patients treated in Neurosurgery Clinical Center of Serbia in Belgrade in the period from October 2016 to January 2018. The criteria for inclusion in the study is the moment of diagnosis of spontaneous intracerebral hemorrhage (ICH) in the basal ganglia of the brain (BG).

The results: we analyzed 25 male patients and 14 female patients, aged 54 years to 95 years. In deceased group - 22 (56.4%), 20 (90.9%) were the age group 60 to 80 years. GCS: 3-5 -12 patients (54.5%) died, GCS 6 -8 -10 patients (45.5%), 20 patients (90.9%) also had intracerebral and intraventricular hemorrhage complicated by acute hydrocephalus.

Conclusion: predisposing factors for mortality within one year in patients with spontaneous intracerebral hemorrhage in the basal ganglia of the brain are: males age more than 60 years, unregulated hypertension and leaking of blood in the ventricular system.

Key words: spontaneous intracerebral hemorrhage, basal ganglia of the brain, the natural course.

PREDICTOR MORPHOLOGICAL FACTORS FOR RUPTURE OF ARTERIOVENOUS BRAIN MALFORMATIONS

Zivanovic J, Nikolic I, Repac N, Janicijevic A, Stankovic L,
Almzeogi M, Abousabie Z, Jovanovic V, Tasic G

The study included a series of 39 patients with brain AVM who had not undergone any treatment except symptomatic therapy, who had been hospitalized and diagnosed with AVM at the Institute of Neurosurgery Clinical center of Serbia in period , 2008-2018.

Results: Male gender was prevalent in the structure of the examined patients. The median age of all subjects was 27.4 ± 7.6 years. At an average follow-up of 4.8 years, new hemorrhages occurred in 24 patients (58 episodes). Predictor ($p < 0.01$) factors for hemorrhage are: arterial supply from the VB and ACA supply and multiple arterial supply. Conclusion: The analysis of our series may suggest the following model of the natural course of AVM: After initially presented bleeding, the annual risk of recurrent bleeding of 3.33%. Bleeding is much more common from medium-sized AVMs (2.5-5cm), localized in the eloquent zone of the brain, with a combined type of venous drainage, arterial supply from the vertebrobasilar supply, anterior cerebral artery drainage, or a combined arterial supply.

Key words:Brain AVM, haemorrhage , natural course

Friday, October 25th, 2019

NEUROVASCULAR SUPERSESSION 1

Hall 2

AVOIDING INTRACAVERNOUS ICA INJURY IN ENDONASAL ENDOSCOPIC MICROSURGERY OF PARASELLAR MACROADENOMA

Bosnjak Roman, Jeglic Arne

Dept. of Neurosurgery, University Hospital Center Ljubljana, Medical faculty, Ljubljana, Slovenia

Objective. Extended endoscopic endonasal approaches in combination with the use of dedicated instruments and neuronavigation enabled exposure of different cavernous sinus (CS) compartments and direct transfer of bimanual microsurgical techniques to the endonasal skull base surgery. Extremely narrow corridor, large distance and oblique approach toward intracavernous ICA sifon (C4, C5 and C6 segments) demand excellent knowledge of applied endoscopic microanatomy, carefull trajectory planning and bony obstacles recognition along it, absolute orientation, sufficient exposure of posterior and lateral sphenoidal wall and proper technique of drilling which comes with time and gradual progress in endonasal endoscopic surgical work. Loops of ICA may have more vertical or more horizontal orientation, additional contours, double twist or otherways bizzare form. Neuronavigation, doppler or ICA fluorescence etc. will not replace your anatomical knowledge and subjective 3D presentation, but will confirm it.

We describe our surgical technique and results with extended endonasal approach for pituitary adenomas invading CS, especially the lateral cavernosus sinus compartment by mobilising the anterior loop of intracavernous ICA.

Methods and materials
SURGICAL TECHNIQUE
After maximal anterior sphenoidectomy and complete lateral sphenoidal wall exposure, OCRs maior and minor, anterior ICA loop protuberances, optic canals and carotid columns are identified, the bone over them is carefully drilled to paper-thin bone layer, which is then gently removed by punch. Drill bit must be abundantly irrigated to prevent thermic lesion to optic nerve in the bony canal. The drilling follows principle of gradual taking off the bony layer-by-layer using painting like drill movement of mild and changing pressure until protective paper-thin shell remains, transparent to see structures underneath (same as blue lining in ENT drilling of semicircular canals). The bone drilling is extended to

the lateral wall toward SOF, where only maxillary strut remains. If OCR maior is not pneumatized, it should be drilled off extremely carefully and as deep as possible. The bone at middle clinoid process is thicker and borders with optic canal, anterior loop of ICA and sellar floor. To expose sphenoidal recessus, which might obstruct approach to basis of carotid column and lateral wall of sphenoid, the posterior wall of pterygoid fossa is drilled in inside-out fashion. Dural incision goes medial and inferior to ICA's dural protuberance. Rectangular tip dissector is pushed behind dura lateral and below the ICA loop to identify the carotid collar and proximal dural ring. With rectangular scissors dura under ICA is cut horizontaly as close as possible to ICA. The next cut is lateral to ICA loop along the optic strut sleeve. Lateral compartment can now be entered by gentle medialisation of the anterior loop and controlled aspiration with keyhole aspiration opening (Fig.1.).

CASE 1

In young acromegalic patient, the left vertical paraclival ICA was successfully exposed by drilling the ICA column. A transversal movement of aspirator to clean the blood coming from nasal cavity produced apparently small superficial cut of ICA adventitia 3 mm with small, hair-tiny yet bleeding in the centre of the cut, which was easily coagulated and surgery continued (Fig.1.). Postoperative CTA was normal. On the 8th and 12th day, the patient had self limited rhinorrhea of dark blood up 30-40 mL. ENT exploration of the field on the 8th day was negative and pressurized nasal tamponades were reinserted. CTA on the 12th day was repeated and showed pseudoaneurysm 6 mm, which was urgently coiled with stent assistance. The postoperative period since then was uneventfull. The tip of the aspirator was unnoticeably sharply drilled as a knife during the same or previous surgeries. We now regularly check tip of the aspirators and use never interchangebly 2 aspirators: for nasal phase only where collision between aspirator and drill is likely, and for dural phase only.

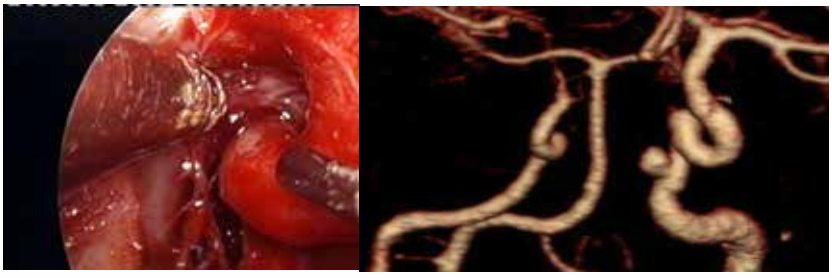


Fig.1. Left: The arrow shows the location of superficial cut into left paraclival ICA by unnoticely sharpened aspirator tip from collisional diamond drilling,

resulting in hair-thin stream of blood, which was easily coagulated and endonasal endoscopic removal of parasellar adenoma was completed. Right: However, pseudoaneurysm was identified on 12th postoperative day after a second bleeding from the nose.

CASE 2

17 x 15mm STH+ PRL adenoma was located behind anterior loop of right ICA. A tortuous ICA was clearly observed from MRI. Horizontal segment of ICA was turned medially into sella. During dural openning, tumor was noted in the right half of sella. Anterior loop of ICA was secured with microdissector and biopsy forceps entered paracentrally. During slow and gentle pull to obtain biopsy sample, elastic resistancy was felt which was explained by fibrous consistency of the adenoma (probably to carbagoline (Dostinex) therapy). An arterial bleeding appeared that was indentified as avulsion of one ICA branch (neither ILT nor MHT), emerging from superomedial aspect of horizontal segment of CS-ICA. 4 attempts with 2 Yasargil clips, using Yasargil clip applicator through left nostril were performed to close the hole with partial occlusion of the ICA. CTA immediately postoperatively revealed stenotic but patent ICA. Blood loos was 5 liters. There were no neurological deficits. CTA was repeated on 12th day and patient released home intact in 14 days after surgery.

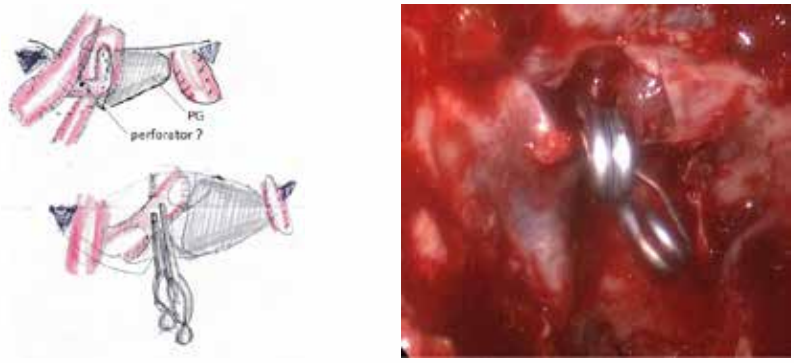


Fig 2. Left: Surgeon's sketch of ICA's curvature and superomedial position of aberrant perforator, which was avulsed during forceps biopsy and a pair of clips in final position. Right: Clips in final position, as applied through the nostril with standard Yasargil clip applicator, resulting in only partial occlusion of intracavernous ICA.

Conclusion. Although both bleedings were formaly punctiform, the case 1 shows that linear cut in the adventitia with central punctiform bleeding may develop into posttraumatic pseudoaneurysm in few days and true punctiform not. ICA laceration with sharp instrument or accidental pulling or abrasion with drill are catastrophic type of injuries that should not happen. If so, the ICA patiency is sacrified. Detailed individual ICA –CS anatomy must be studied preoperatively. Endonasal bayonet shaft applicator for clipping shall be included in standard set of instruments. Usage of standard pincete-like Yasargil clip throught the nostril may be hazardous or impossible as clip can't be released in desired position and should be rotated to vertical axis of the nostril to gain more space for wing release. All dissection around ICA shall be blunt, only dura is cut with rectangular shaft microscissors. We did not have any ICA bleeding during cutting the proximal ring and ICA medialisation to enter into lateral parasellar compartment.

The choice of extended endonasal approach to parasellar adenomas introduces the possibility of complete tumour resection and surgical cure with minimal surgical morbidity in a significant subset of patients with soft and aspirable adenoma at first surgery.

ACM:
TO CLIP OR COIL?

Antonino Raco

Nowadays, surgical options for MCA aneurysms include open clipping and endovascular coiling, each of which provide significant advantages and disadvantages. For decades microsurgical clipping was the gold standard treatment. In the last 20 years, endovascular techniques continue to advance and improve making optimal management of unruptured MCA aneurysms. In case of ruptured aneurysms the decision making is more determined by patient's charateristics. However, endovascular coiling results in lower occlusion rates and higher reintervention rates with comparable neurological outcomes.

There are two decisions to make in unruptured aneurysms:
1. To wait or to treat
2. Clip or Coil

The goal of treatment have two final endpoints: first, the treatment method must achieve radiographic complete obliteration and secondly, the risk of intervention must be lower than the natural history of the risk of rupture.

The decision making using clipping, coiling or hybrid techniques depends on aneurysm characteristics (site, neck, unruptured or ruptured) and surgeon experience, as well as patient's choice, neurological status and co-morbidities.

SURGICAL STRATEGY FOR BILATERAL LARGE VERTEBRAL ARTERY DISSECTING ANEURYSMS. LESSONS FORM A CASE

Yasuhiro Sanada

Kindai University

Surgical strategy for unilateral vertebral dissecting aneurysm is trapping or proximal ligation. In case of perforator involvement, bypass procedure will be added. However, this strategy cannot be easily selected in bilateral vertebral dissection, because bilateral vertebral occlusion produces brain stem ischemia. Therefore, some vascular reconstruction should be done to avoid brain stem ischemia. I would introduce a case with bilateral large vertebral dissecting aneurysms. This patient presented vertigo and swallowing difficulty. MRI revealed bilateral large vertebral dissecting aneurysms compressing medulla oblongata bilaterally. First, we performed trapping of one side dissecting aneurysm, but this caused rupture of the contralateral dissecting aneurysm. Finally, we performed trapping of the ruptured dissecting aneurysm with basilar revascularization. Surgical strategy for bilateral large vertebral artery dissecting aneurysms will be introduced in light of lessons from this case.

NATURAL HISTORY OF BRAIN AVMS

Aki Laakso, MD, PhD

Department of Neurosurgery,
Helsinki University Hospital

Brain arteriovenous malformations (AVMs) are developmental lesions and can be found at any age. The most common age of manifestation is between third and fifth decades of life, and they are the most common etiology of non-traumatic intracerebral haemorrhage in children and young adults. The prevalence remains unknown, but incidence of newly diagnosed brain AVMs is 1/100,000 person years. The most common type of presentation is still haemorrhagic stroke, but the proportion of unruptured presentation and even incidental AVMs is continuously increasing due to lowering threshold of imaging because of mild neurological symptoms. Other common types of symptomatic presentation are epilepsy, headache, and progressive neurological deficits.

The most feared complication of harboring an AVM is haemorrhagic stroke. Its risk has been the subject of several natural history studies. Prerequisites of reliable rupture risk analysis include unbiased (population-based) subject selection, long-term treatment-free follow-up, and appropriate statistical analysis of the data. Based on existing data, the natural history of AVMs is nowadays rather well known. Overall, the average annual risk of rupture from an untreated AVM is 2-3%, but varies greatly (from <1% to >10%) depending on various recognized risk factors. Characteristics that increase the future haemorrhage risk include previous rupture, deep and infratentorial locations, associated aneurysms, deep venous drainage and probably large size. Untreated AVMs are also associated with two-fold long-term mortality compared to general population.

IMPACT OF FLOW MODIFICATION ON PERI-ANEURYSMAL FLOW: MECHANICAL PROPERTIES AND FLOW EFFECTS BY MEASUREMENTS AND SIMULATION

Istvan Szikora*, Gabor Zavodszky**, Benjamin Csippa**, Ágnes Vadász*, Eszter Bognár**, Péter Nagy**, Gyorgy Paal**

*National Institute of Clinical Neurosciences & Semmelweis University
** University of Technology and Economics
Budapest, Hungary

This presentation aims to demonstrate the capacity of mechanical and computational studies in predicting the behavior and effects of Flow Diverters (FD) and Flow Disruptors (FDR) used to treat intracranial aneurysms.
Early experience demonstrated that while aneurysm packing is effective in preventing from rupture/rerupture, it may not permanently inhibit aneurysm growth/recanalization. With better understanding of perianeurysmal flow dynamics, flow modifying technologies were introduced to treat the causes rather than the results of the pathology. FD are primarily used to treat side wall aneurysms, while FDR-s are designed for bifurcation ones. While FD-s are highly efficacious even on the long term, aneurysm occlusion may remain incomplete in some cases and their application is hampered by thromboembolic complications mostly related to imperfect wall apposition of the device. FDR-s on the other hand are extremely safe, but less effective in complete and durable aneurysm occlusion.

To overcome these shortcomings, we have developed a flow simulation technology that is capable of (a) quickly and reliably simulating perianeurysmal flow on patient specific 3D models derived from Digital Subtraction Angiography data, (b) virtually implanting any FD considering both the mechanical properties of the device as well as the deployment technique used by the operator and (c) computing the effect on perianeurysmal flow using the hydrodynamic resistance of the device as determined by measurements using our proprietary experimental setup.

For FDR-s we developed an experimental method to analyze the effect of FDR oversizing that is recommended by the vendor to guarantee complete occlusion and prevent from recanalization.
Application of the above methods may reduce the failure and complication rate of flow modifying technologies in the endovascular treatment of intracranial aneurysms.

MICROVASCULAR DECOMPRESSION OF DOLYCHOVERTEBROBASILAR ARTERY IN PATIENTS WITH TRIGEMINAL NEURALGIA

Dzhamil Rzaev

Federal Neurosurgical Center
Novosibirsk, Russia

Background: the dolychovertebrobasilar artery often causes facial pain due to neurovascular conflict. The microvascular decompressions (MVD) in these cases are variable and more challenging.

Material and methods: MVD was performed in 328 patients. The dolychovertebrobasilar artery as an offending vessel was identified in 10 cases (3.04%) with trigeminal neuralgia (6 - males, 4 - females). The mean age is 59.5 (45-75). The dominant lateral side was left (9 cases).

Results: MVD with interposition of Teflon pledget between artery and brainstem and trigeminal root entry zone was done in all cases. The mean follow-up is 19.4 months (1 – 61 months). Only one patient (10%) did not have pain relief after MVD and he underwent radiofrequency ablation rhizotomy with favorable outcome. Complications observed in 2 cases: 1 case of transient diplopia and 1 case of facial numbness with partial regression.

Conclusions: MVD is an effective and safe surgical treatment of TN caused by the dolychovertebrobasilar artery. Interposition of dolychovertebrobasilar artery can be sufficient for comprehensive decompression and consecutive pain relief.

THE OVERALL OUTCOME INFLUENCE OF REBLEEDING, VASOSPASM, AND HYDROCEPHALUS IN PATIENTS WITH SPONTANEOUS SUBARACHNOID HEMORRHAGE, AND THE FACTORS DETERMINING THEIR ONSET

Goran Pavlicevic

Military Medical Academy
Belgrade, Serbia

Introduction. Spontaneous subarachnoid hemorrhage (sSAH) occurs in the setting of 1. cerebral aneurysm rupture (85%) 2. a so-called non-aneurysmal perimesencephalic hemorrhage (10%) 3. other reason (including arterial dissection, malformations, cavernomas…). The fatality after aneurysmal SAH is roughly 50%, and 10% of patients die before even reaching the hospital. The three most significant complications affecting the overall outcome are 1. rebleeding (the most imminent factor); 2. delayed cerebral ischemia due to the vasospasm 3. hydrocephalus; These also present the target points in the sSAH specific treatment.

Aim. This study aimed to evaluate the factors influencing complications onset, as well as their impact on the overall outcome in patients with sSAH.

Methods. The retrospective study included a total of 120 patients, treated in the Clinic for Neurosurgery of the Military Medical Academy in Belgrade Serbia due to the spontaneous SAH in a period from 2011.-2016. The diagnostic assessment included computerized tomography and digital subtraction angiography (DSA) of the cerebral blood vessels.

Results. Ninety-nine patients suffered to the sSAH due to the cerebral aneurysm rupture, 21 patients had SAH without the confirmed cause of bleeding, and five patients bled from a ruptured malformation (AVM or cavernoma). Rebleeding and vasospasm were noted only in patients with aneurysmal sSAH, in about a third of these patients. Acute hydrocephalus is expected in about 1/5 of patients.

Rebleeding
The whole group of patients was followed with repeated CTs due to the deterioration, and the complication was noted in 32.3%. A statistically significant

correlation with vasospasm was found, as more than a third of patients developed both complications (38.7%), while only 18.9% of patients rebled without signs of vasospasm. Factors associated with the rebleeding were: aneurysm rupture (especially the internal carotid artery (ICA)), poor initial clinical status, elderly, severe hypertension, and vasospasm. The complication is expected to occur in the first 36 hours, and between the 8th and 11th day after initial bleeding.

Vasospasm
One-hundred five patients with sSAH were included in vasospasm assessment (86 with a ruptured aneurysm). The complication was diagnosed when there was >40% diameter narrowing on DSA. 32.6% of patients developed vasospasm, of which 57.% were patients with anterior communicating artery (ACoA) ruptured aneurysm. Factors associated with the vasospasm onset were: aneurysm rupture (especially ACoA), the poor initial clinical status, and the nimodipine use. The complication is expected to occur between the 5th and 13th day after initial bleeding.

Hydrocephalus
The complication occurred in 21.6% of patients within the first 3 days after sSAH and an additional 3 patients during the first week. All cases were related to the higher Fischer grades.

Conclusion
Rebleeding increases the mortality rate (62.5%) and is closely associated with the initial status and the rebleeding extent. Vasospasm prolongs the preoperative period, as well as postoperative recovery, and is also related to the more frequent rebleeding, leading to the worse outcomes. Hydrocephalus worsens the neurological state, but its surgical treatment was not shown to improve the overall outcome.

Saturday, October 26th, 2019

EXO VS . ENDO VS . HYBRID DISCUSSION - MCA ANEURYSMS

Hall 1

MIDDLE CEREBRAL ARTERY ANEURYSMS: ENDOVASCULAR VS SURGICAL TREATMENT

Velinov N., Petrov M., Alioski N., Gabrovsky N.

Dept. of Neurosurgery
University Hospital Pirogov, Sofia, Bulgaria

Background and objective: There is much controversy surrounding the best treatment modality for brain aneurysms. Middle cerebral artery (MCA) aneurysms are a specific group of intracranial aneurysms, which can be treated by either surgical or endovascular approach. Our objective is to compare the two present modalities: surgical and endovascular used in the treatment of MCA aneurysms.

Methods: In order to analyse the relevant literature data, a review of the MEDLINE bibliographic database was performed. 29 studies concerning MCA aneurysms treatment using a decision-making algorithm were found. The preferred treatment modality in most studies was based on several variables, including aneurysm size and shape, presence of aneurysm rupture, treatment risk, patient age and other risk factors for rupture.

Results: Subarachnoid Aneurysm Trial (ISAT), an international randomised, prospective control trial, was initiated because of growing concerns, about which of the two treatment modalities (endovascular vs. microsurgical) is safer and more beneficial for patients with ruptured intracranial aneurysms. Following the ISAT study, most centres across Europe and the USA established a "coil first" policy. Analysing prospective literature data, it is clear that endovascular treatment of MCA aneurysms may lead to a high number of complications and is inferior in terms of occlusion rate. Microsurgery seemed superior to endovascular management regarding both clinical and radiological outcomes, although reported data from some studies might appear controversial.

Conclusion: Surgical clipping should be considered as a primary treatment modality in patients with MCA aneurysms. Endovascular treatment can be undertaken as a second line therapy for elderly patients with co-morbidities, special conditions, contraindications for surgery or those with a strong desire to avoid an open craniotomy.

Keywords: MCA, aneurysm, endovascular, surgical treatment

REDEFINING THE GUIDELINES IN RUPTURED MCA ANEURYSMS TREATMENT

Djilvesi Dj[1,2], Vulekovic P[1,2], Cigic T[1,2], Papic V1,2, Jelaca B1,2, Golubovic J1,2, Pajicic F[1]

[1]Clinical Centre of Vojvodina, Clinic for Neurosurgery, Novi Sad, Serbia
[2]University of Novi Sad, Medical Faculty, Novi Sad, Serbia

Introduction: Broad neck based middle cerebral artery (MCA) aneurysms and/or ruptured MCA aneurysms with haematomas are referred to as the typical cases for microsurgical clip obliteration with craniotomy. Many publications report on superior results of endovascular treatment based on large groups of cases and therefore being viable replacement for clip obliteration techniques. Recent literature even suggests that endovascular coil embolization followed by hematoma evacuation can be an acceptable alternative.

Design: This review will provide an overview with current literature standpoints on ruptured MCA treatment with specific focus on presentation with haematomas. The current evidence-based medicine will be compared with the results presented from case group from uniform tertiary care neurosurgical centre of the author's origin.

Objectives: The first objective of this paper will be to clarify current scientific guidelines on ruptured MCA aneurysms, define treatment steps and validate them based on external patient cohort. The second objective of this paper will be to determine the efficacy of endovascular treatment in comparison with standardised microsurgical clipping. The third and fourth objectives will be to discuss possible surgical approaches in clip reconstruction and to define training routine for future neurosurgeons in the era where clip reconstruction is decreasing.

Keywords: Middle cerebral artery; Aneurysm; Endovascular; Surgery

INDICATIONS FOR PROPER TREATMENT SELECTION OF MIDDLE CEREBRAL ARTERY ANEURYSMS: INSTITUTIONAL EXPERIENCE

Bruno Splavski[1],* , Kresimir Rotim[1], Filip Vrban[1], Ante Rotim[2]

1 Sestre milosrdnice University Hospital Center, Zagreb, Croatia
2 Dubrava University Hospital, Zagreb, Croatia
*Presenting author

Introduction. The indications for the proper treatment of middle cerebral artery (MCA) aneurysms are not fully established, yet. Hereby, we present our institutional experience concerned with microsurgical vs endovascular treatment selection.

Methods. A single-institution series of patients with MCA aneurysms who underwent different treatment modalities was analyzed. The investigated variables were: exact aneurysm location (M1 segment, bifurcation, M2 segments) and its dimensions (neck/fundus ratio); presence/absence of subarachnoid hemorrhage/ intracerebral hematoma indicating aneurysmal rupture; and initial clinical status assessed by Glasgow Coma Scale and Hunt-Hess Scale. The method of treatment was divided between surgical and non-surgical. The microsurgical patients were included in the case group, while those treated by endovascular procedures comprised the control group. Statistical analysis was used to explore the correlation between investigated variables and the selected method of treatment.

Results. Aneurysms were mainly located at MCA bifurcation, while some were situated in the proximal (M1) and/or the distal (M2) segments. Initial clinical status, as well as the presence of intracranial hemorrhage were unrelated to the selected treatment. Aneurysm location and dimensions were strongly correlated to the treatment modality.

Conclusion. Our results justify the aneurysm location and its dimensions as the main indicators of treatment selection regardless of aneurysm rupture or clinical status. Aneurysms located at MCA bifurcation and/or its proximal segment (M1) are considered for microsurgery, while those located beyond the bifurcation are more amenable for endovascular treatment. Both treatments are equally successful modalities having low morbidity in cautiously selected patients.

Saturday, October 26th, 2019

HOW I DO IT SESSION

Hall 1

INTRAMEDULLARY CAVERNOUS MALFORMATIONS. MICRONEUROSURGICAL TREATMENT. HOW I DO IT

Marcel Ivanov[1, 2],*, and Alexandru Budu[1]

1 Royal Hallamshire Hospital
2 Sheffield University
*Presenting author

Spinal cord cavernous malformations (scCM) are rare vascular malformation representing approximately 5-12% of all intramedullary lesions.

Although intramedullary spinal cord cavernous malformations have been considered as a relatively rare entity, this pathology recently surfaced in an increasing number of case series and natural history reports in the literature.

Surgery for spinal cord cavernous malformations can be particularly challenging, however with advances of micro neurosurgical techniques, intraoperative neurophysiology and intraoperative localization techniques good results after such surgery should be expected.

The authors present surgical steps of surgery for spinal cord cavernous malformations with detailed intraoperative video describing calculation of the optimal approach, intraoperative localization using intraoperative ultrasound, role of indocyanine green (ICG) and surgical goals.

We consider that an individualized surgical approach should be performed based on the anatomical and functional criteria.

In symptomatic patients surgery remains the primary treatment option in intramedullary cavernomas.

ENDOVASCULAR MANAGEMENT OF VEIN OF GALEN ANEURYSM MALFORMATION- CASE REPORT AND FOLLOW UP PERIOD OF 7 YEARS

Prof. Dr Snezana Lukic

Faculty of Medical Sciences, University of Kragujevac,
Depatrment of Radiology

Introduction: Vein of Galen aneurysmal malformations (VGAMs) are rare congenital abnormalities that can cause severe morbidity and mortality, particularly in neonates but also in infants and older children. The presentation differs and depending on the size and age at presentation. In the newborn with a large shunt, severe cardiac failure and cranial bruit are the typical signs.
Aim: Case report of a girl aged 6 days at the moment of diagnosing aneurysm of Galen Vein by brain ultrasound.
Case presentation: When the girl was 3 years and six months old she developed symptoms of increased intracranial pressure. MRI has shown Bilobar and enormously dilated vein of Galen mesauring 32mmx29mm and 22mmx17mm associated with hydrocephalus. Endovascular embolization of aneurysm which had main artery supply from right posterior communicating artery (PComA) was done. There were no procedural or postprocedural complications. After 7 years of follow up the child develops completely normal, without neurological deficits headache as well as heart failure. Periodic MRI for each year does not indicate aneurysm recanalization.
Conclusion: Endovascular embolization is a method of choice in management of innate VGAMs.
Key words: vein of Galen, aneurysm, endovascular embolization.

Learning Objectives:
Clinical presentation of Vein of Galen aneurysmal malformations (VGAMs)
Treatment options for (VGAMs)

IN-SITU OCCLUSION OF ARTERIOVENOUS MALFORMATIONS IN HIGHLY ELOQUENT LOCATIONS

Ahilan Kailaya-Vasan[1] , and Daniel C Walsh[1, 2],*

1 King's College Hospital, London
2 Institute of Psychiatry, King's College London
*Presenting author

Complete removal or Extirpation of the nidus is usually the microsurgical strategy employed to abolish arteriovenous shunting through vascular malformations of the brain and spinal cord. Where the malformation is located in a highly eloquent location or in cases of a diffuse nidus intimately related to functional cortex extirpation may be excessively morbid and alternatives to microsurgical treatment may need to be considered. In-situ disconnection of the arteriovenous malformation leaving the nidus in place has been reported as an alternative in such circumstances.

Spetzler et al. described the "Pial Resection Technique" (1) for spinal vascular malformations which effectively achieves the goal of abolishing arteriovenous shunt through partial resection of a nidus. Han et al. have reported "Occlusion-in-situ" (2) for selected brainstem arteriovenous malformations. All published surgical series of such highly eloquent AVMs have been small and includes still smaller numbers suitable for such a surgical strategy. In most practices the opportunity and indication for this approach are limited given that radiosurgery provides an excellent alternative for unruptured lesions of appropriate volume and trans-arterial and trans-venous endovascular techniques may be applied to malformation with an appropriate architecture. We present three cases where this technique has been applied in our practice and combined with intraoperative neurophysiological monitoring during temporary occlusion of irrigating arteries and draining veins to enhance safety.

The criteria applied to select these cases we suggest are:
1. Small volume arteriovenous malformations in highly eloquent locations and/or with a diffuse nidus 2. All irrigating arteries must be accessible on the pial surface
3. All draining veins must be accessible on the pial surface.
4. Pre-operative microcatheter exploration is advisable to demonstrate distal en-passant arterial supply as well as to assess alternative endovascular therapeutic options

We conclude that this is a little used but very valuable microsurgical technique for appropriately selected arteriovenous malformations.

EXOSCOPICAL ANEURYSM SURGERY: THE FUTURE?

Daniel Hänggi

Today, there is a first moderate shift regarding microscopical surgery towards exoscopical surgery. Goal of the present technical report is to analyze the value of exoscopical aneurysm surgery with regards to traditional techniques.

The present analysis is based on a single surgeon experience focusing on feasibility, safety, visibility and ergonomic parameters of exoscopical aneurysm surgery.

Non-ruptured and ruptured aneurysms were operated starting from July 2017 exoscopically using the hybrid system ZEISS Kinevo 900. Feasibility, safety, visibility and ergonomic parameters showed sufficient results, better in non-ruptured aneurysms than in the ruptured aneurysm group.

The present single surgeon experience demonstrated, that exoscopical aneurysm surgery is feasible and safe especially for non-ruptured aneurysms.

MANAGEMENT OF GIANT AND LARGE CAROTID-OPTHALMIC ANEURYSMS

Sames M., Bartos R., Hejcl A., Vachata P., Radovnicky T., Cihlar F.

Department of Neurosurgery, Masaryk Hospital, University J.E.Purkyne, Usti nad Labem, Czech Republic

Introduction: A high risk of rupture of large and giganticcarotid-opthalmic aneurysms is a reason for an active therapeutic approach. The aim is to present preoperative preparation, video of surgery, complicated postoperative course and analysis with clear conclusions.

Material and methodology: 53-year-old teacher with a non-ruptured gigantic C2 aneurysm on the left. According to CTA, it was realistic to achieve proximal edge of 6 mm neck after drilling of processus clinoideus anterior. Distal to the neck, ICA and outgoing branches PCOM and AChoA were recognizable. The patient tolerated ACI occlusion at BOT with sufficient collateral flow through ACOM. The A1 on the left was elevated by a gigantic sack directed medially, the fundus compressed the chiasm and both optic nerves. Compression of the visual pathway and hemianopsy on the right eye was the reason for choosing a surgical approach over the flow-diverter. Within the clipping we used Dallas technique with sack decompression by sucking blood off the carotid artery on the neck.

After application 4 clips on the aneurysm neck, insufficient flow through the carotid and collateral circulation through ACOM - A1 on the left was detected. Acute postoperative angiography showed the removal of the sac without a residue, carotid flow was reduced by torsion of the carotid artery after clipping, and collateral circulation was reduced by pulling the adhered left A1 by collapsed clipped gigantic fundus. During the postoperative period, the patient was dependent on higher systemic pressure (140/90 and more) supported by mimetics, and suffered from temporary hemiparesis and fatal disorder when the pressure dropped.

Results: After 7 days the spontaneous collateral circulation was opened, the condition was compensated, the neurological picture ceased to be dependent on systemic pressure.

Conclusion: In order to minimize complications in the treatment of gigantic carotid-opthalmic aneurysms, we consider the following points important: 1) Before clipping the aneurysm, it is necessary to release the adhering arteries (perforating or magistral) from the gigantic sack as long as possible to prevent them from kinking 2) Use of prophylactic ECIC bypass when applying Dallas technique for giant C2 aneurysm

TREATMENT OPTIONS FOR RUPTURED AND UNRUPTURED ANEURYSMS IN UHC SESTRE MILOSRDNICE

Vladimir Kalousek

Standard and proven method through clinical experiences in treating patient across the word: coiling / baloon assisted coiling. Most simple and most effective method in ruptured aneurysms. No need for double antiagregation therapy, no metal inside the parent vessel.Evolution of the material used, also made the evolution of the treatment, to be more ” easy “ and done by many.

Negative sides of simple coiling or baloon assited coiling is the patency of the treatment regarding the neck. Improvement of the material also changed our strategy, and in difficult aneurysms we can stage the treatment.

First we secure the aneurysm from the rerupture with baloon and coils and after 14-20 days we perform the second stage which consist (most of the time) of placing the flow diverter across the neck of the aneurysm.

Relatively new device which has been proven in unruptured aneurysms, and has potential to be excellent in ruptured – WEB.

Intrasacular device / no need for double AA.
Very quick and effective procedure
Maybe some trials in comparing different material is needed?

Coil vs Clip vs Web????

FLOW DIVERTING STENTS IN ENDOVASCULAR TREATMENT OF LARGE, GIANT AND FUSIFORM ANEURYSMS: BREAKING LIMITATIONS OF ENDOVASCULAR REPAIR

Svetlana Milosevic-Medenica

Department of Neuroradiology, Center of Radiology and MR,
Clinical Center of Serbia, Belgrade

Within the past 20 years there has been a veritable shift in the treatment of cerebral aneurysms. During this time our better understanding of pathophysiology of these lesions, as well as technological progress led to development of more reliable neurointerventional armamentarium in order to minimize the risk and mortality of aneurysmal rupture.

Despite all this progress, wide necked, giant and fusiform aneurysms remain challenging lesions, difficult to treat and carrying a very high risk for the patient.

The invention of flow diverting stents represents a revolution in treatment of these complicated lesions. These stents are of low porosity, specially designed to reduce flow velocity in the aneurysm sac and promote thrombosis in the aneurysm sac while maintaining flow in the parent artery and branch vessels. Many controversies still exists about need for dual antiplatelet therapy, risk of occluding side branches, as well as greater risks in the posterior circulation.

We will show our own results with flow diverting stents, as well as the results of recent large studies concerning this subject.

SURGERY OF THE VASCULAR LESIONS SURROUNDING FOURTH VENTRICLE

Ibrahim Omerhodzic

Clinical Center University of Sarajevo

Vascular lesions surrounding fourth ventricle are rare and difficult to treat. These lesions are sometime too small to be detected. Before resection AVM should be confirmed by DSA, despite they are visualized more frequently by computed tomography, while magnetic resonance imaging can differentiate these lesions from neoplasms or granulomatous lesions.

Aneurysms in this region are usually peripheral PICA aneurysm, which often lying in or near the fourth ventricle. Exophytic brainstem cavernoma of the fourth ventricle occurred most frequently in the floor comparing with other periventricular zones. Microsurgery remains the gold standard treatment for fourth-ventricular lesions. Approach is considered a challenge for neurosurgeons because of location and their intimate association with critical areas of the brainstem. Herein we report a case series of successful microsurgical resection of vascular lesions in or close to the fourth cerebral ventricle.

Saturday, October 26th, 2019

MULTIMODAL EXPERT FORUM 2

Hall 1

FENESTRATION OF LAMINA TERMINALIS AND MEMBRANE OF LILIEQUIST IN MICROSURGERY FOR ANTERIOR CIRCULATION ANEURYSMS: DOES IT REDUCE SHUNT DEPENDENT HYDROCEPHALUS AFTER SAH?

Francesco Tomasello

Estimates from the most recently published studies indicate that an incidence of chronic post-subarachnoid hemorrhage hydrocephalus (requiring shunt surgery) of 15 up to 20% is representative for an average contemporary population of patients with aneurysmal subarachnoid hemorrhage.

The comparative evaluation of hydrocephalus rate in patients with ruptured aneurysms treated by endovascular coiling and microsurgical clipping remains controversial. However, if poor-grade ruptured aneurysms are considered, multicenter studies and meta-analysis showed a significantly higher risk for hydrocephalus after coiling than clipping.

In my experience, in a series of 412 patients early microsurgical clipping was performed combining Fenestration of Lamina Terminalis (FLT), evacuation of blood clots from the basal cisterns and Fenestration of the Liliequist Membrane (FLM). This resulted in a incidence of shunt-dependent hydrocephalus of 3.9% compared to values of up to 20% reported in the literature. The hypothesis is that an anterior ventriculocisternostomy through FLT, FLM and cisternal blood clots clearance would facilitate cerebrospinal fluid dynamics and decrease the risk of subsequent hydrocephalus.

The procedure has been demonstrated to be safe and Fenestration resulted patent in a long-term follow-up.

PROGRESSIVE FOIX-ALAJOUANINE SYNDROME IN CASE OF TETHERED CORD PATIENT WITH COMPLEX SPINAL DEVELOPMENTAL DISEASE

Péter Banczerowski[1, 2,*] ,Tamás Mezei[1, 2] , Gábor Czigléczki[1, 2] ,
Péter Várallyay[1] and István Szikora[1, 2]

1 National Institute of Clinical Neurosciences
2 Semmelweis University
*Presenting author

Introduction: Subacute necrotic myelopathy or Foix-Alajouanine syndrome is a rare condition, however it may lead to progressive neurological dysfunction caused by a spinal dural arteriovenous fistula. Gaining diagnosis is usually complicated because it could mimic a spinal cord tumor or myelitis. The aim of this presentation is to pay attention of this rare disease and discuss the differential diagnostic and treatment possibilities.

Case presentation: Medical history of our patient includes tethered-cord, filum terminale lipoma and spina bifida. The onset of symptomatic deterioration was 1.5 years ago, including paraspastic gait disturbance, progressive weakness and sensory deficit, later urinary sphincter dysfunction is also occurred. Firstly, these symptoms were attributed to cervical degenerative disc disease thus cervical discectomy and ventrofixation were made, but no significant improvement was evident. Tethered cord is stretch-induced dysfunction of the caudal spinal cord and conus, caused by attachment of the filum terminale to inelastic structures caudally. The cause of the deterioration is the tethering of the spinal cord, that was the assumption. The surgical plan was the detethering the spinal cord. Preoperative dorsal and lumbal spine MR control images showed, the tethered-cord, filum terminale lipoma, complex spinal developmental disease and appeared signal intensity changes intramedullary and possibility of tortuous vessels around the cauda nerves and spinal cord with suppose of dural arterio-venous fistula. She underwent a CT Angiography and catheter-angiographic examination which confirmed the presence of the fistula (with left-sided lateral sacral artery depletion and cranial venous discharge). Endovascular embolization was performed without complications or postoperative novel neurological symptoms. Then she received active rehabilitation therapy and symptoms slightly improved.

Conclusion: In the case of complex spinal developmental anomalies, tethering of the spinal cord with intramedullary signal intensity changes, the possibility of subacute necrotic myelopathy (Foix-Alajouanine syndrome caused by dural arteriovenous fistula) should be in mind for differential diagnosis, especially progressive spastic (then flaccid) paresis, ascending sensory deficit or vegetative dysfunction occur.

MICROSURGERY OF UNRUPTURED ANEURYSMS - STILL A VALID OPTION

Ioan Stefan FLORIAN, MD, PhD, Cristian KAKUCS, MD,
Phd Std, Cristina Caterina ALDEA MD

Introduction: In the presence of an asymptomatic patient with an unruptured aneurysm (UIA), it is difficult to decide whether to leave the patient on observation, or to conduct the decision toward an invasive treatment, knowing that there is no therapeutical method without consequent risk of morbidity or even mortality. On the other hand, the notion of living with an "undetonated bomb" inside the head might be daunting for the patient. Nevertheless, the issue of unruptured aneurysms in a patient harboring multiple aneurysms (MAs) out of which one has bleed is equally controversial. Should we treat, how to treat, when to treat, in how many sessions, and how long can we can postpone the next session are questions as of yet lacking a standardized answer.

Method: We retrospectively analyzed our experience based on 1113 operated aneurysms in 944 patients, in a period of 21 years. 109 patients were operated for solitary UIAs (SUIAs), whereas 169 other UIAs were operated in 112 patients with MAs, amounting to a total of 281 operated UIAs. In SUIAs the indication of surgery was based on symptomatology (symptomatic UIA), aspect on imaging studies, location, and especially the informed patient's desire. In MAs with a ruptured aneurysm, our strategy, in majority of the cases, was "single stage-single opening" when appropriate, or single-stage multiple openings in selected cases.

Results: In cases operated for SUIAs, 97,8 % were discharged with GOS 4 and 5, only a single case being GOS 3. In MAs, results were far so favorable, only 58% being discharged with GOS 4 and 5, mainly due to the previously altered neurological status caused by the ruptured aneurysm.

Conclusion: With an appropriate selection of cases, based on informed consent of patient, surgery offers definitive good surgical results in SUIAs handled by an experienced team. In our opinion, "single-stage surgery" is recommendable for multiple aneurysms, since it reduces the risk of bleeding from unclipped aneurysm/s.

Keywords: unruptured aneurysms, multiple aneurysms, surgery

EFFICACY OF PREOPERATIVE EMBOLIZATION WITH ONYX FOR INTRACRANIAL AVM SURGERY ~ FROM A DIRECT SURGEON'S POINT OF VIEW

Tsuyoshi Izumo

Background: Surgical treatment of intracranial arteriovenous malformations (AVMs) is still challenging. Preoperative embolization with Onyx has been becoming an established treatment. However, the marginal usefulness of the modality for surgical removal of AVMs were reported. The purpose of this study is to elucidate the safety and efficacy of combined preoperative embolization using Onyx and microsurgical removal of AVMs.

Materials and Methods: We introduced the Onyx embolization at our institution on May 2014. Patients who underwent combined preoperative embolization and microsurgical removal of AVMs were included in this study. The patients were divided into two groups; pre-Onyx era (n=16) and Onyx era (n=12), and retrospectively analyzed. The variables analyzed included age, sex, location, Spetzler-Martin (SM) grade, clinical symptoms, operation time, intraoperative bleeding during surgical removal, complications, and obliteration rate.

Results: There was no statistically significant difference in patient characteristics including sex, age, location, clinical presentation, and SM grade between two groups. Mean embolization rate was 61.8% in pre-Onyx era group and 42.3% in Onyx era group (p=0.037). There was no difference in operation time between two groups (7 hours 37 minutes in pre-Onyx era group and 7 hours 33 minutes in Onyx era group, p=0.96) On the other hand, intraoperative bleeding in Onyx era group (178.1ml) was significantly less than that in pre-Onyx era group (421.5ml) (p=0.018). Total surgical obliteration was achieved in all cases except for one case of residual nidus in pre-Onyx group. There was no statistically significant difference in postoperative complication rate and surgical outcome between two groups.

Conclusions: Less intraoperative blood loss was achieved in the Onyx era group as compared with the pre-Onyx era group. Resection times, complications were equivalent between the 2 treatment groups. The preoperative embolization using Onyx may provide a blood-less operative field leading to safe surgery for brain AVMs.

Surgical Management of Complex Aneurysms using Skull Base Techniques.
Skull base techniques have developed over the past decade. The surgical techniques enable us to treat not only skull base tumors but also complex intracranial aneurysm. I will introduce 3 aneurysm cases treated with skull base approaches; 1. Clipping via trans-superior orbital fissure extradural total anterior clinoidectomy for a recurrent C2 large aneurysm after initial endovascular coil embolization, 2. Clipping via anterior transpetrosal approach for a ruptured basilar trunk fusiform aneurysm case and ruptured BA-AICA aneurysm case. 3.Clipping via transcodylar fossa approach for PICA involved VA dissecting aneurysm.

TREATMENT OF A GIANT VERTEBRAL ANEURYSM WITH ANTEGRADE VASCULAR RECONSTRUCTION

Yasuhiro Sanada

Kindai University
Presenting author

Trapping or proximal occlusion of vertebral artery can be selected to treat dissecting aneurysms or giant aneurysms. However, this strategy cannot be selected in case of hypoplasia or occlusion of the contralateral vertebral artery. For these cases, vascular reconstruction should be done together with vertebral artery occlusion to avoid basilar artery ischemia. Augmentation of superior cerebellar artery or anterior inferior cerebellar artery is usually performed for basilar artery ischemia, but perforators in the distal part of vertebral artery may be occluded because of hypoperfusion. Therefore, direct reconstruction of the sacrificed vertebral artery is an ideal option to maintain the antegrade blood flow in the vertebral artery and to avoid ischemic complications of the perforators in the distal part of the vertebral artery. I will introduce a case with a giant vertebral artery aneurysm presenting aspiration pneumonia because of dysphagia. This aneurysm was trapped with antegrade vascular reconstruction of the vertebral artery. Actual surgical procedure will be introduced.

Saturday, October 26th, 2019

QUO VADIS ? - BYPASS SUPERSESSION

Hall 1

PARENT ARTERY OCCLUSION UNDER BYPASS PROTECTION FOR THE MANAGEMENT OF COMPLEX INTRACRANIAL ANEURYSMS

Andreas Gruber

Johannes Kepler University Linz

Many complex intracranial aneurysms are difficult to treat using reconstructive techniques [i.e. surgical clipping or endovascular treatment (coiling, stent protected coiling, flow diversion)] and are better managed using deconstructive procedures [i.e. parent artery occlusion (PAO) with or without protective bypass surgery]. PAO in conjunction with bypass surgery can be used for the management of both anterior and posterior circulation aneurysms. In addition to the conventional technique of flow replacment bypass surgery and surgical PAO during the same procedure, hybrid techniques as demonstrated in this presentation [e.g. low flow bypass surgery followed by balloon test occlusion and subsequent PAO in the awake patient 48 hours after bypass surgery] are feasible concepts for the management of these challenging cerebrovascular lesions.

BYPASS SURGERY FOR BLOOD BLISTER-LIKE ANEURYSMS

Yoshimasa Niiya, M.D.1), Sumire Echizenya, M.D.1), Kouji Furukawa, M.D.1), Motoyuki Iwasaki, M.D.1), Kiyohiro Houkin, M.D.2), Shoji Mabuchi, M.D.1)

1) Department of Neurosurgery, Otaru General Hospital
2) Department of Neurosurgery, Hokkaido University Graduate School of Medicine

Introduction: Sometimes it is difficult to preserve the parent artery in surgery for Blood Blister-like aneurysms, because of large defect of the parent artery.

Aims: We describe our surgical strategies for Blood Blister-like aneurysms in internal carotid artery.

Methods: We usually perform EC-RA-MC high flow bypass with trapping of the aneurysm, when direct clipping of the aneurysm is not feasible.

Results: In 480 consecutive patients with cerebral aneurysms (ruptured: 236, unruptured: 244), 5 patient had Blood Blister-like aneurysms in internal carotid artery. In these, 3 patients underwent EC-RA-MC high flow bypass with trapping of the aneurysm. In one case, direct clipping under adnosine induced transient cardiac arrest was successfully performed. In another case, wrapping with clipping was performed.

Conclusions: Trapping with parent artery reconstruction is a safe treatment for Blood Blister-like aneurysm. But small branch involvement may be problematic in some cases.

Saturday, October 26th, 2019

EXO VS . ENDO VS . HYBRID DISCUSSION - POSTERIOR CIRCULATION ANEURYSMS

Hall 1

COMBINED NEUROVASCULAR APPROACH ("HYBRID REPAIR") FOR COMPLEX LARGE/GIANT BASILAR APEX ANEURYSMS

Hiroki Kurita, MD, PhD

Professor and Chairman, Department of Neurosrgery,
Director, Department of Cerebrovascular Surgery and Stroke Center,
International Medical Center, Saitama Medical University

Large/giant or wide neck basilar artery apex aneurysms are unsuitable for either primary microsurgical clipping and intravascular coiling, and continue to generate technical challenges. We present our initial experience with hybrid surgery of clipping and coiling so as to present the role of hybrid treatment as a viable management option for these complex aneurysms. Our experience introduces hybrid surgery as a safe and more durable treatment option for the management of complex basilar apex aneurysms that tend to have a higher rate of failure with endovascular therapy and of morbidity with microsurgery.

THE ROLE OF BYPASS IN SURGERY OF COMPLEX ANEURYSMS (ANTERIOR AND POSTERIOR CIRCULATION)

Andrey Dubovoy, MD

FSBI "Federal Neurosurgical Center", Novosibirsk, Russia

The first surgeon, who is in vivo diagnosed a giant intracranial aneurysm the size of "chicken egg" was J. Hutchinson in 1875 year. He listened the systolic noise at the female patient with paralysis of oculomotor muscles. To treat this patient he made the ligation of the internal carotid artery. After his surgery female was lived during 11 years. After the death of the patient the diagnosis was confirmed by the autopsy.

The occurrence of giant aneurysms varies according to different authors, from 2.03% to 13.5%. From 5% to 10% of all giant aneurysms are found in children and teenagers, and ranges from 10% to 44% of all aneurysms in children.

What is a typical giant aneurysm morphologically? Most often a giant aneurysm looks like a sack of irregular shape; partially it is filled with thrombotic masses of varying age and density. Inside these thrombotic masses are located channels of serpentine form, with blood flows in distal direction and to the perforating arteries. The frequency of giant aneurysms thrombosis varies from 36% to 92%.

Most often the giant aneurysms are found at the internal carotid artery (54% of all giant aneurysms). From them 21% - in cavernous segment, 18% - paraclinoidal localization. Giant aneurysm of vertebrobasilar region meet in 23% cases, anterior communicating artery – in 10%, middle cerebral artery – in 9%, distal segments of all cerebral arteries – in 4% cases.

The majority of giant aneurysms behave as tumor lesions of the brain, causing compression of its structures. According to various reports the occurrence of this kind of disease from 65% to 85% of all cases. Hemorrhagic type of the disease meets in 13%-76%. Ischemic type of the disease meets in 2%-5%. In 4% of giant aneurysms is an incidental finding and the disease is asymptomatic.

For effective and radical surgery of giant aneurysm without complications, it is necessary to know about it everything.

When performing computed tomography, it is possible to see not only the giant aneurysm, but also to determine the presence of subarachnoid hemorrhage. Using computer tomography, it is possible to see calcification of the aneurysm walls and neck. MSCT angiography allows us to see the filled part of the giant aneurysm, and to study the anatomy adjacent to the aneurysm blood vessels. MRI allows us to see entirely the aneurysm, its true dimensions, because often the main part of the cavity is thrombosed. When performing MSCT perfusion can be seen the reduction of perfusion in the distal vessels of the aneurysm region, most often a Mean Transit Time. Angiography allows us to study the dynamics of the blood flow in the aneurysm cavity, to study the anatomy of perforating arteries, and to determine suitable for revascularization donor and recipient arteries. During angiography it is possible to perform a temporary occlusion of the vessel proximal to the aneurysm, to assess a collateral blood flow.

Surgical treatment of giant aneurysms is associated with a higher risk of complications than conventional surgical treatment of simple aneurysms. What problems await the surgeon?

- Incomplete closure of clip jaws
- Clip dislocation on the neck of aneurysm
- Thrombosis of the cerebral arteries and branches
- Distal thromboembolism
- Occlusion of the perforating arteries
- Cranial nerves injury
- Brain tissue injury
-

In cases when aneurysm cannot be closed by simple clipping, we use the methods of revascularization and trapping. Revascularization methods are listed below, allows improving the results of surgical treatment:

- Low-flow bypass
- High-flow bypass
- Intra-intracranial bypass
- Combination of different bypasses

In our hospital, to achieve the best results, we use all available revascularization techniques. The technique of cerebral revascularization in the surgical treatment of aneurysms allows expanding possibilities of surgical treatment without losing radicalism.

In the presentation, we will show you several cases of using various bypasses in the treatment of complex aneurysms.

BYPASS SURGERY FOR ANEURYSMS IN POSTERIOR CIRCULATION

Akitsugu Kawashima MD.PhD.

Department of Neurosurgery, Tokyo Women's Medical University
Yachiyo medical center, Chiba, Japan

There are some cases of complicated aneurysms in the posterior circulation. Extracranial-intracranial (EC-IC) bypass is one of the useful options to treat them, however still challenging in the posterior circulation territory. In this study, variations of the EC-IC bypass technique and outcome in cases adapted for the posterior circulation aneurysms are demonstrated based on our experience of 1200 bypass surgeries.

The indication of EC-IC bypass for complex aneurysms includes need of permanent interruption of the parent artery or the cortical branch and strategy using surgical flow alternation. Variations of EC-IC bypass were superficial temporal artery (STA)-superior cerebellar artery/posterior cerebral artery via subtemporal approach, and occipital artery-posterior inferior cerebellar artery/anterior inferior cerebellar artery via lateral suboccipital approach. Many variations of the EC-IC bypass can expand the options to treat the complex aneurysms in the posterior circulation. Many kinds of EC-IC bypasses adapted to the posterior circulation aneurysms with surgical videos are demonstrated.

MANAGEMENT OF DISSECTING AND FUSIFORM VERTEBRAL ARTERY ANEURYSMS INVOLVING THE PICA ORIGIN

Andreas Gruber

Johannes Kepler University Linz

In contrast to fusiform aneurysms of the vertebral artery arising proximal or distal to the origin of PICA, management of vertebral artery aneurysms involving the PICA origin is more challenging. Whereas endovascular procedures using stenting or flow diversion of the vertebral artery - thereby relying on remodelling and subsequent healing of this vascular segment - have been reported and are often recommended for this indication, such techniques are usually not feasible for recently ruptured and/or dissecting intradural aneurysms. Management of the latter pathologies requires definitive treatment of the [potential] bleeding source, which is usually achieved by parent artery occlusion under bypass protection only. Posterior circulation bypass surgery is technically more challenging and bypass malfunction is often followed by severe neurologic compromise. The most reliable revascularisation technique for this indication is usually the occipital artery to PICA bypass. The limitations and inherent technical problems of this procedure will be discussed in this presentation. Large and partially thrombosed aneurysms, often exerting relevant brain stem compression, may be trapped and decompressed surgically after successful revascularisation and trapping.

ENDOVASCULAR TREATMENT OF INTRACRANIAL BIFURCATION ANEURYSMS

Kubilay Aydin

Koc University Hospital
and Istanbul University Medical School

Endovascular treatment of wide-necked bifurcation aneurysms still remains challenging. The risk of coil prolapse is the main restrictive and complicating factor of successful endovascular treatment of wide-necked bifurcation aneurysms. The development of balloon remodeling and stent-assisted coiling techniques made it possible to treat some of the wide-necked bifurcation aneurysms that were not previously amenable to endovascular surgery. However, endovascular treatment of wide-necked and complex bifurcation aneurysms incorporating both side-branches of the bifurcation is still a challenge for endovascular neurosurgeons.

The coiling of these complex bifurcation aneurysms necessitates the protection of all parent vessels. The double balloon remodeling method has been described to treat complex bifurcation aneurysms. The arrest of blood flow during balloon inflation intervals, risk of coil prolapses after balloon deflation, and relatively high recanalization rates are the main disadvantages of double balloon remodeling. Stent-assisted coiling is increasingly used to treat wide-neck intracranial aneurysms. During the endovascular treatment of a wide-necked aneurysm, stents provide a mechanical scaffold to prevent coil prolapse into the parent artery.

However, a single stent may not suffice for the endovascular treatment of wide-necked and geometrically complex bifurcation aneurysms involving both side branches of bifurcation. Therefore, endovascular treatment of wide-necked and complex bifurcation aneurysms often necessitates the implantation of double stents in various configurations, such as X-, Y-, T-, and parallel-stenting.

Saturday, October 26th, 2019

EXO VS . ENDO VS . HYBRID DISCUSSION - OUTCOME

Hall 1

ANEURYSMS BY THE NUMBERS: MATHEMATICAL MODELING TO PREDICT RUPTURE STATUS

Charles Prestigiacomo

University of Cincinnati College of Medicine

Background: Subarachnoid hemorrhage affects patients at their most productive part of their lives and thus incurs a tremendous cost to patients, family and society. Predicting the rupture of an incidental aneurysm is critical in exposing only those patients with a high risk of rupture to the risks of surgical or endovascular complications. Certain criteria have been correlated to the risk of rupture. However, single variate analysis has been the most common approach to assessing these characteristics. Recent studies have incorporated the use of biophysical parameters as well as computational fluid dynamics to help clinicians better understand and perhaps predict aneurysm behavior.

Methods: A careful analysis of the published literature provides the foundational elements discussing the mathematical relationships associated with aneurysm rupture. These foundational elements also help to describe novel approaches to the aneurysm's angle relative to flow vectors. Novel biophysical parameters recently discovered will be presented and related to specific patient characteristics and comorbidities, such as hypertension.

Results: Specific parameters such as aneurysm angle, initiation impingement forc and relative residence time are correlated with aneurysm formation and rupture. CONCLUSION: Observational data provides an excellent foundation for understanding relationships in aneurysm formation and rupture. Such elements provide a fertile basis for advanced and complex analyses that can help shed light on the factors that may best predict aneurysm rupture.

OUR APPROACH AND EXPERIENCE WITH ADULT BRAINSTEM CAVERNOUS MALFORMATIONS

M. İmre Usseli1,* , Mustafa Güdük1 , M. Şakir Ekşi1 , Abuzer Güngör1 , and M. Necmettin Pamir1

1 Acıbadem Mehmet Ali Aydınlar University, School of Medicine, İstanbul, Turkey
*Presenting author

Background: Cavernous malformations (CMs) are vascular malformations with an incidence of 0.5% in general population, comprimising 5-10% of all intracranial vascular malformations. Brainstem cavernomas (BSCs) have a prevelance of 4-35% among all other intracranial CMs. BSCs have distinct place among other intracranial CMs due to peculiar location and potential devastating events. Treatment approaches could not have been standardized due to these unrelenting situations. Our aim was to analyze our surgical series operated by the same senior surgeon (MNP) with a full-filled experince of microsurgical techniques at this eloquent region of the brain.

Methods: This is a retrospective review of prospectively collected database. Patient charts, cranial MRIs, pathology reports, and outpatient notes were collected.

Results: There were 45 patients with BSCs. Of 45 patients, 20 (45%) were women and 25 (55%) were men. Mean age was 30.8 years (range: 18-67 years). Specfic tumor locations were pineal region (4.5%), thalamus (13.5%), mesencephalon (7%), pons (64%), and medulla oblongata (11%). Mortality rate was 0%. There were cranial nerve deficit in 24%, motor deficit in 18%, sensorial deficit in 9% and ataxia/other cerebellar signs in 13% of the patients in the early postoperative period. Better or the same clinical/neurological status could be achieved in 82% of the patients. Literature review denoted a 75-100% total resection rate, 0-69% immediate post-op neurological deficit, 0-4% mortality rate and 44-100% same or better outcome.

Conclusion: Despite demanding surgical skills for surgical approch to BSCs, surgery could be accomplished safely and effectively in selected cases with appropriate indications.

SURGICAL OUTCOME IN POOR GRADING SAH PATIENTS

Anastasia Tasiou

It is well known that rupture of an intracranial aneurysm constitutes the most common cause of spontaneous subarachnoid hemorrhage (sSAH). Even though aneurysmal subarachnoid hemorrhage (aSAH) is a common clinico-pathological entity, it remains a devastating disease because of its unpredictable behavior and its dismal prognosis. It has been estimated that 20-40% of all aSAH cases are classified as clinically severe (Hunt and Hess grades IV and V). Despite the lack of solid management guidelines, it is generally accepted that conservative management is the indicated initial treatment, while delayed surgery is reserved only for those surviving the initial acute phase. Almost half of these cases suffer from a poor functional outcome, while the mortality rate has been reported to be as high as 75-100%. The most efficacious treatment, and the optimal timing of surgical intervention are of paramount importance to the overall outcome of these patients.

A recently increasing body of evidence suggests that aggressive surgical treatment in patients with severe aSAH, including aneurysm clipping, is associated with an improved functional outcome. Similarly, ultra-early surgery could lead to an improved overall survival. Although early surgery is increasingly performed among poor aSAH patients, its efficacy remains highly controversial. The clinical dilemma that needs to be addressed every time is whether aggressive treatment is worthwhile or not.

ASSOCIATION BETWEEN CIRCLE OF WILLIS CONFIGURATION AND RUPTURE OF CEREBRAL ANEURYSMS

Nebojsa Stojanovic, Aleksandar Kostic, Radisav Mitic, Luka Berilazic

Clinic of Neurosurgery, Clinical Center Nis, [2]University of Nis, Faculty of Medicine

Background: In the general population, intracranial hemorrhage caused by the rupture of brain aneurysms occurs in almost 10 per 100000 people whereas the incidence of such aneurysms is significantly higher, accounting for 4 -9%. Determining the influence of the appropriate configurations of the circle of Willis on the rupture of cerebral aneurysms can be of great importance for making decisions about their further treatment.

Methods: A group of 114 patients treated operatively for aruptured cerebral aneurysm and a group of 56 autopsied subjects were involved in the study. Four basic types of the circle of Willis configurations were formed–two symmetric types A and C, and two asymmetric types B and D.

Results: A statistically significantly higher presence of asymmetry of the circle of Willis was determined in the group of surgically treated subjects ($p=0.001$),witha significant presence of asymmetric Type B in this group ($p<0.001$). The changeson the A1 segment in the group of surgically treated subjects showed a statistically significant presence compared to the group of autopsied subjects ($p=0.001$)Analyzing the presence of symmetry of the circle of Willis between the two groups, that is, the total presence of symmetric types A and C indicated their statistically significant presence in the group of autopsied patients ($p<0.001$).

Conclusion: Changes such as hypoplasia or aplasia of A1 and the resulting asymmetry of the circle of Willis directly affect the possibility of the rupture of cerebral aneurysms. Detection of the corresponding types of the circle of Willis after diagnostic examination can be the basis for the development of a protocol for monitoring such patients.

THE VASCULAR, ENDOVASCULAR AND COGNITIVE APPROACH TO CEREBRAL ANEURYSM SURGERY

Milan Spaic
KBC Zemun

The treatment of the cerebral aneurysm might have resulted in the more or less obvious cognitive decline of the patient mental status. The postoperative cognitive i.e. neuropsychological status might have an important role in the longterm outcome. The obliteration of the aneurysm is being the primary treatment goal.

However, the risk of the postoperative cognitive decline arises the dilemma - weather the direct clipping is more or less convenient and/or safe compared to the endovascular treatment. The clipping of the aneurisym requires the direct acess to the aneurysm neck through the pathway microsurgically but artefitially created by the surgeon. The endovascular approach employes the already existeing natural path – the lumen of the blood vessel, thus the risk of the procedure has been related primarily to the morphology of the aneurysm but not the acess to it.

The modality of the treatment and the approach to the aneurysm neck and the risk of the cognitive impairment are discussed.

Key words: aneurysm surgery, neuropsichylogical deficit

LONG TERM COGNITIVE OUTCOME AFTER RUPTURED ANEURYSM CLIPPING

Papic V[1], Jelaca B[1], Golubovic J[1], Pajicic F[1], Lasica N[1], Bugarski Ignjatovic V[2], Batic Ocovalj S[3]

[1]University of Novi Sad, Clinic for neurosrugery
[2]University of Novi Sad, Clinic for neurology
[3]University of Novi Sad, Philological faculty

Introduction: Aneurysmal subarachnoid hemorrhage is sudden and often catastrophic event with a mortality rate of about 50%. A significant number of patients, whose recovery were assessed by generally accepted scales considered good outcome, suffers from subtle cognitive impairment.

Objective: The aim of this study was to assess cognitive function in surgicaly treated patients after subarachnoid hemorrhage caused by rupture of intracranial aneurysms.

Materials and Methods: The study was conducted on 40 patients who underwent surgery for aneurysmal subarachnoid hemorrhage. On regular follow up patients were clinically evaluated and the outcome of treatment was evaluated based on The modified Rankin scale. and adequate neuropsychological test battery. Neuropsychological tests assessed different aspects of cognitive function: attention and concentration, mnestic function, executive function, verbal function, and visuospatial and visuoconstructional abilities.

Results: The study demonstrated poorer performance of the study group in the areas of executive functions and divergent thinking. Elderly patients achieve poorer performance in the domains of verbal memory, executive functions, attention, concentration and visual memory. People with a high level of education have better achievement in the areas of attention and concentration, and verbal memory. Localization of the aneurysm is not correlated with achievement on tests of cognitive domains tested. Poorer performance in the domain of verbal memory, visual memory, and attention and concentration was observed in patients who underwent surgery in delayed term. Patients with an aneurysm accessed on the dominant side, and those who had hidrocephalus achieve poorer performance in the field executive function. Conclusion: Detailed and adequate

battery of neuropsychological tests used in this study was able to diagnose significant cognitive deficits in the domains of executive functions and divergent thinking in patients of good neurological outcome after surgery for ruptured intracranial aneurysm. So far, overlooked of cognitive disorders in patients with aneurysmal subarachnoid hemorrhage should point to the need for rehabilitation of specific cognitive domains and indicates the need for long-term follow-up and implementation of specific rehabilitation needs.

THE INFLUENCE OF INTRAOPERATIVE RUPTURE OF CEREBRAL ANEURISMS ON THE OUTCOME OF MICROSURGICAL INTERVENTION

Novak Lakicevic, Slavko Djuraskovic, Boris Djurovic

Clinical centre of Montenegro, Clinic of neurosurgery,
Podgorica, Montenegro

The treatment of intracranial aneurysms still remains to be a big neurosurgical challenge, weather it is microsurgical or endovascular treatment.

The study is about intraoperative ruptures of aneurysms during microsurgical intervention and the influence on the outcome of the treatment.

The study analysed 536 patients in which has been occurred rupture of aneurysm during the intervention. The frequency of intraoperative rupture (IOR) with in the total number of treated patients was 14,7% (79 patients), based on the localisation of the aneurism 11,9% ACM, 6% of posterior cerebral circulation, ACoA 17%, ACI 17,3%.

The influence of different factors, which could be predictors of intraoperative rupture was analysed, as well as the influence of intraoperative rupture on the final outcome of the treatment. It is established that IOR is detected more often in a group of patients who are operated in the early stadium, but also that IOR does not significantly influence the outcome of the treatment in all groups, depending on the timing of the operation.

Saturday, October 26th, 2019

STROKE SYMPOSIA

Hall 2

OUTCOME PREDICTION BY VOLUME OF ISCHEMIC BRAIN IN MALIGNANT MIDDLE CEREBRAL ARTERY INFARCTION TREATED BY DECOMPRESSIVE HEMICRANIECTOMY

Freyschlag C.F., Boehme C., Bauer M., Kerschbaumer J., Unterhofer C. and Thomé C.

Aim: Malignant middle cerebral artery (MCA) infarction represents a life-threatening condition due to its space-occupying character. The surgical treatment outcome was assessed in multiple well-designed trials and showed strong evidence in favor of decompressive hemicraniectomy. However, the timeframe for decompressive surgery remains debatable and no objective criteria are found to facilitate the decision. We aimed to analyze imaging characteristics of patients with MCA-infarction to detect objective criteria.

Methods: A retrospective analysis of 34 consecutive patients undergoing decompressive craniectomy was carried out. We used volumetric analysis through segmentation to determine the volume of the initial infarction and subsequently volumes on the first an 3rd postoperative day (pod1 and 3). The size of craniectomy was assessed and the time between onset and surgery. Outcome was measured as modified Rankin Scale (mRS), whereas favorable outcome was set for mRS ≤3.

Results: Median age of our patients was 53.5 years (25 – 72), the median time from the onset of first symptoms to surgical intervention was 38 hours (1 – 150) and the male: female ration was 2:1. The median ischemic volume was 250 cc (106 – 418) preoperatively, 315 cc (141 – 505) on pod1 and 349 cc (177 – 617) on pod3, respectively. A mRS ≤3 after 6 months could only be reached in 7 (20%) patients. Within the first 24 hours, the volume of infarction rose significantly ($p=0.0003$) and was associated with a worse outcome ($p<0.0001$) upon univariate analysis. In multivariate analysis, the volume on pod 3 showed a significant ($p=0.014$) correlation with outcome, so was the age upon onset ($p=0.018$).

Conclusion: Volumetric analysis of the infarction predicts the outcome of patients undergoing decompressive hemicraniectomy for malignant MCA-infarction.

MALIGNANT MIDDLE CEREBRAL ARTERY (MCA) INFARCTION AND DECOMPRESSIVE HEMICRANIECTOMY- TO DO OR NOT TO DO?

Natasa Milivojevic

Neurocritical Care Unit, Neurology Clinic,
University Medical Centre Ljubljana

Background and aims: Decompressive craniectomy (DC) has been shown to reduce mortality in some life-threatening conditions. However, little is known about long term functional outcome for post-surgery survivors. Since significant functional impairment after DC is a common consequence worldwide, clinicians experience decision-making difficulty when confronted with making life or death choices related to surgical intervention for these conditions. The aim of this study was to acquire follow-up data on short term and long term mortality and functional outcome in patients treated at our neurocritical care unit who were admitted because of massive middle cerebral artery infarction (MCA) and were treated with DC.

Methods: We retrospectively analysed 22 patients with malignant MCA infarction and DC, treated between January 2010 and June 2016. DC was done within 48 h after stroke onset in patients without important co-morbidities and after all other possible causative interventions. Size of the DC was at least 12cm long. Modified Rankin-Scale was used to evaluate functional outcome at discharge from our unit and after intensive neurorehabilitation 7 to 18 months after the DC.

Results: The follow up period ranged between 7 to 18 months (mean: 10,4 ± 3,6). From surviving patients 66,7% reached favourable long term outcome (mRS≤3) . In total, long term outcome was favourable (mRS≤3) in 10 patients (45,5%) with MCA infarction, while 12 patients (54,5%) with MCA infarction reached unfavourable outcome (mRS≥4). 7 patients (31,8%) with MCA infarction died during intensive care treatment or within the first six months after the procedure. Short and long term outcomes were not associated with sex. Age was, was significantly associated with long term outcome in MCA infarct survivors (p=0,01).

Conclusion: We estimate that decompresive craniectomy can potentially have good long term outcome in well selected patients with severe MCA infarction or intracerebral haemorrhage, especially in young. Larger studies on long term outcome with more selective approach are needed to clarify which patients would benefit the most from decompressive craniectomy.

INDICATION FOR SURGERY AND SURGICAL STRATEGIES FOR SPONTANEOUS INTRACEREBRAL HEMORRHAGE

Vojin Kovacevic

Department for surgery, Faculty of Medical Sciences,
University of Kragujevac
Center for neurosurgery, Clinical Center Kragujevac, Serbia

Introduction: Spontaneous, nontraumatic intracerebral hemorrhage (ICH) is still significant cause of morbidity and mortality. ICH as pathological entity isn't in the focus of neurosurgeons unlike aneurismal hemorrhage and arterio-venous malformations (AVMs).

Aimof study: Aim of our study was to assess the benefits of surgical evacuation of spontaneous ICH and other factors affecting the outcome.

Patients and methods: Retrospective study included patients who were surgically treated because of spontaneous hypertensive ICH in Clinical Center Kragujevac, Serbia during three-year period. We examined the influence of different factors on treatment outcome: Glasgow coma scale (GCS) score at admission, neurological status, the time of onset of symptoms, ICH volume and location.

Results Preoperative GCS score is significantly correlated with postoperative outcome. There is a statistically highly significant relationship between volume of hematoma and outcome and residual hematoma hasn' t had influence on final outcome. The best surgical results were obtained in patients who were operated early regarding the time of onset symptoms and with a hematoma size of 30–60 ml.

Conclusion Intracerebral hemorrhage remains a serious condition for which early aggressive treatment and postoperative intensive care is necessary.

Saturday, October 26th, 2019

RAPID CROSSFIRE SESSION 2
CASE PRESENTATION AND EXPERT DISCUSSION

Hall 2

GIANT BASILAR ARTERY ANEURYSM

Nemanja Jovanovic[2] *, Vojin Kovacevic[1,2]

[1] University of Kragujevac, Serbia,
Faculty of medical Sciences, Department for Surgery
[2] Clinical Centre Kragujevac, Center for neurosurgery
* presenting author

Female patient, 37 years old, sought medical attention due to months of dizziness and headache in the occipital region. Divergent strabismus and positive Romberg sign were observed by the neurologist during the outpatient examination. No other neurological deficit was noted.

Head CT revealed roundshaped lesion in posterior fossa, diameter of 31mm, with postcontrast enhancement of signal. There was also dilateted ventricular system without signs of hemorrhage. MRA showed right-sided vertebral artery aneurysm with signs of brainstem compression. It was planed to refer patient to referral center for neurovascular pathology.

Three days after MR examination patient get worsed, she complained on more intensive headache and started vomiting. Head CT didn't show any changes.

What to do?

DIFFUSE SPINAL AVM

Milan Lepic
Military Medical Academy, Belgrade, Serbia

The patient in 52-years-old female with progressive weakness developing for many years already. She underwent several endovascular embolizations of the malformation in Zurich, by Prof. Valavanis, but the malformation reoccured with the short periods of partial symptoms relief, which have reoccured shortly after every time, and worsened in the following period. Since her symptoms have evolved and she became wheelchair dependent outside her home. A juvenile or metameric spinal AVM involving the upper thoracic region is confirmed with MRI and DSA. The AVM is located in the spinal cord and also extends beyond to involve the spine and adjacent tissues. The intramedullary component is diffuse, lacking distinct margins that would allow easy separation from normal spinal cord. Prof. Robert Spetzler suggested microsurgery... What to do?

POSTERIOR FOSSA VASCULAR LESION PRESENTING WITH SEVERE CEREBELLAR SYMPTOMS

Filip Pajicic
Clinical Center of Vojvodina

Patient presented to ED with cerebellar ataxic symptoms when a CT showed hypodense lesion of left cerebellar hemisphere. Further imaging was made to diagnose dural arteriovenous fistula with significant compressing/ischemic effect. In the following days patient deteriorated from GCS 15 to GCS 13 while follow up imaging showed edema progression.

Treatment options (decompression, clip ligation, endovascular treatment) will be discussed.

Saturday, October 26th, 2019

NEUROVASCULAR SUPERSESSION 2

Hall 2

ORIGIN OF SYLVIAN HEMATOMA

Hidetoshi Kasuya

Sylvian hematoma in subarachnoid hemorrhage (SAH) is known as to correlate to poor prognosis. While active bleeding can be observed by multiphase dynamic enhanced CT, alternate bleeding from vessels in Sylvian fissure has also been found in Sylvian hematoma.

The purpose of this investigation was to discuss the origin of Sylvian hematoma based on new image findings of multiphase enhanced CT. We investigated a series of SAH patients with or without Sylvian hematoma. The existence of active bleeding in Sylvian hematoma was evaluated using multiphase dynamic enhancement CT perfusion scan. The location of the aneurysm and regional cerebral blood volume and cerebral blood flow were also recorded. In 71 SAH patients, we found 8 patients with Sylvian hematoma (11.3%), three of which indicated multiple extravasations from small vessels apart from ruptured aneurysms. No extravasations were found in the remaining patients in other regions of the cerebral artery, even those associated with Sylvian hematoma. No severe perfusion disturbance was observed in patients with extravasation in Sylvian hematoma. Sylvian hematomas may be caused secondarily by multiple bleeding from small vessels together with aneurysm rupture.

SURGICAL MANAGEMENT OF COMPLEX ANEURYSMS USING SKULL BASE TECHNIQUES

Tsuyoshi Izumo

Skull base techniques have developed over the past decade. The surgical techniques enable us to treat not only skull base tumors but also complex intracranial aneurysm.

I will introduce 3 aneurysm cases treated with skull base approaches;

1. Clipping via trans-superior orbital fissure extradural total anterior clinoidectomy for a recurrent C2 large aneurysm after initial endovascular coil embolization,

2. Clipping via anterior transpetrosal approach for a ruptured basilar trunk fusiform aneurysm case and ruptured BA-AICA aneurysm case.

3.Clipping via transcodylar fossa approach for PICA involved VA dissecting aneurysm

MANAGEMENT AND EVALUATION OF CLINICAL OUTCOME IN PATIENTS WITH MIDDLE CEREBRAL ARTERY ANEURYSMS TREATED WITH SURGICAL CLIPPING VERSUS ENDOVASCULAR COILING

Aleksandar Chaparoski[1],*Venko Filipce[1],
Vladimir Rendevski[1], Menka Lazareska[2], Blagoj Shuntov[1]

1 University Clinic of Neurosurgery Skopje
2 University Clinic of Radiology Skopje
*Presenting author

Background. There is an ongoing debate on the preferred choice of treatment for middle cerebral artery (MCA) aneurysms. The purpose of this study was to assess the management, clinical outcome and to express our multidisciplinary single center experience in treatment of unruptured and ruptured MCA aneurysms using endovascular coiling or clipping method.

Methods. This is a retrospective cohort study that include a period ranging between 2010 and 2018 including a total of 85 patients. All the cases were retrospectively reviewed measuring the initial Hunt and Hess grade on admission, CT scan findings, location of the aneurysm, method of treatment, complications of spontaneous SAH, peri-procedural complications and clinical outcome measuring the modified Rankin Scale - mRS. The patients were divided in two groups, unruptured aneurysm group (29 patients) and ruptured aneurysm group (56 patients).

Results. A total of 85 patients were included in this study for the period between 2010-2018. Out of all patients with MCA aneurysms, 22 patients (25.8%) harbored multiple aneurysms. Forty-six patients (55%) were females and 39 patients (45%) were male. Fifty-six aneurysms (65.8%) were ruptured, 29 aneurysms (34.1%) were unruptured. A total of 27 cases were associated with intracerebral hematoma. In the ruptured aneurysm group 7 patients (12.5%) were admitted with H&H grade I, 32 patients (57.1%) were admitted in H&H grade II-III, 11 patients (19.6%) were admitted in H&H grade IV and 6 patients (10.7%) were in H&H grade V. Fourteen aneurysms (16,4%) involved M1 segment, 69 aneurysms (81.1%) involved M1 bifurcation and 2 aneurysms (2.3%) distal MCA. Twelve aneurysms (14.1%) were larger then 1cm or giant and 4 aneurysms (4.7%) were

fusiform. All unruptured MCA aneurysms were treated with endovascular method using coiling, Y stenting, stentassisted coiling and one patient received WEB flow disruption device (Woven EndoBridge). In the ruptured aneurysm group of 56 patients a total of 14 patients (25%) were treated with endovascular method and 42 patients (75%) were approached with clipping method via a pterional transsylvian route. Direct clipping was the treatment of choice for 41 aneurysms, one case was completed only using wrapping. Hydrocephalus occurred in 19 patients (22.3%) of the ruptured aneurysm group that required ventriculoperitoneal shunting. Two cases of the ruptured aneurysm group treated with endovascular method were readmitted due to recanalization of the aneurysm. A modified Rankin Scale (mRS) of 0-1 was achieved in 95% of patients in the unruptured aneurysm group, and in 87% of the ruptured aneurysm group. Six percent had an mRS of 2-3 and 2% of patients had an mRS of 4-5. Overall mortality was of 5% in the ruptured aneurysm group.

Conclusions. Both coiling and clipping are procedures with low mortality and morbidity rates and we would like to express the need for multidisciplinary approach in every case. We observed that surgical clipping is the best option for complete occlusion of the dome of the aneurysm. A standardized prospective clinical trials are needed for stronger conclusions on what is the best treatment for MCA aneurysms.

INCIDENCE OF HYPOPITUITARISM AFTER SPONTANEOUS SUBARACHNOID HEMORRHAGE OF ANEURYSMAL ORIGIN

Jovanović Vladimir, Milic Ivan, Nikolic Igor, Repac Nikola, Janicijevic Aleksandar, Paunović Aleksandra, Tasić Goran

Recent studies showedincreased incidence of hypopituitarism in patients with spontaneous subarachnoid hemorrhage (SAH) of aneurysmal origin, tested several months or years after aneurysmal rupture.

OBJECTIVE
The aim of this study was to evaluate the incidence ofpituitary gland secretion dysfunction in patients with spontaneous subarachnoid hemorrhage of aneurysmal origin, as well as the most prevalent hormonal deficiency. Possible predictive factors for the onset of hypopituitarism were also examined.

METHODS:
We included 91 patients (61 women and 30 men) with spontaneous subarachnoid hemorrhage of aneurysmal origin, aged 48.0±1.1 years surgicaly treated at Neurosurgery Clinic, Clinical Center of Serbia. Early and late complication of SAH (vasospasm, hydrocephalus and epilepsy), major risk factors including diabetes mellitus,smoking and arterial hypertension, also with GOCS in patients with SAH were evaluated.Endocrinologic evaluation of these patientsincluded basic hormonal status obtained after fasting during night, at 8:00 am in the position of restingwas performed. The level of IGF1, T4, TSH, FSH, LH, Testosterone in men, Estradiol in women, Cortisol and Prolactin were analyzed.The results were compared to standard ranges of hormone levels in blood according to age,sex and BMI,as the control group.Statistical evaluation was performed with standard SPSS 10.0 program.

RESULTS
Women had higher incidence of SAH than man. More than 60% of women were in postmenopausal period.Time from SAH onset and endocrinologic evaluation varied from one to 10 years with the mean period of 1,8 years. Vasospasm occurred in 18 patients (19,8%). Hydrocepalus occurred in 9 patients (9,9%), while epilepsy was found in 4 patients (4,4%). Mean GOCS was 4,6±0,6 without statistical significance in men and women. Arterial hypertension was

diagnosed in 53,8% of patients, diabetes mellitus in 5,5%, while 62,6% patients were smokers. In all 91 patient hormonal analyses was performed one year after hemorrhage onset.Endocrinological disorder was significantly correlated with the presence vasospasm in acutephase of SAH..In 25 patients (27.5%) IGF 1 level was decreased, in 15 patients as an isolated pituitary hormone deficiency, while in 10 patiens as multiple pituitary hormone deficiency.In18 patients (19,8%) low cortisol level was found, in 12 of them (13.2%) as an isolated pituitary hormone deficiency. Decreased level of T4 and TSH was found in 2 patients (2.2%)as an isolated pituitary hormone deficiency.

CONCLUSIONS:
More than half of patients (53.8%) surgically treated for aneurysmal SAH have some degree of hypopituitarism after one year, with isolated hormone deficiency most common being growth hormone and cortisol deficits.Hormonal screening is suggested to be done after 3-6 months in clinically clear patients and after a year in all other patients, regardless of the presence of symptoms and signs of the illness.

Key words: Spontaneous subarachnoid hemorrhage, aneurysm, hypopituitarism

Saturday, October 26th, 2019

ORAL PRESENTATIONS 2

Hall 2

INTRAVENTRICULAR CEREBRAL CAVERNOMAS: NATURAL HISTORY AND SURGICAL OUTCOME

Vincenzo Fontana[1],* , Barbara Masotto[1], and Giampietro Pinna[1]

1 AOUI Verona
*Presenting author

Cavernous hemangiomas, or cavernomas, are rare benign vascular hamartoma occurring potentially everywhere in CNS and along spinal chord and accounting the 5-13% of CNS vascular malformations. Intraventricular cavernomas are a group of rare angiographically occult vascular anomalies amounting to 2.5 - 10.8 % of cerebral cavernomas. Their precise localization makes them unique in terms of clinical presentation, natural history and surgical strategies.

Compared with intraparenchimal ones, they have shown higher tendency to rebleeding, although they are almost never correlated to a devastating hemorrhage, and a more rapid rate of growing, referable to the absence of surrounding parenchymal brain tissue. We report five cases of Patients (2M; 3F) admitted consecutively to our department from 2009 to 2018 with diagnosis of intraventricular cavernoma, four of them undergoing surgery.

According to Kivelev classification, we recorded 4 type B and 1 type A cavernoma; 2 were located at foramen of Monro, 2 in lateral ventricles. Mean age was 51; three Patients underwent first surgery: as clinical presentation, 2 of them had severe to mild headache, 1 had memory disturbances. One Patient was a re-do and presented with hemiparesis and diplopia, improved at discharge. A transcortical tranventricular approach was employed and it was achieved gross total resection in all cases. No permanent neurological deficits were recorded. IVC are peculiar subgroup of intracranial cavernomas, presenting themselves with obstructive hydrocephalus more often than massive hemorrhage. Their natural history remains undefinied. In our experience, surgery is faesible with low complications, but only indicated in symptomatic frequent rebleeding or in case of neurological deterioration due to mass effect and obstructive hydrocephalus.

DUAL-TRAINED VASCULAR NEUROSURGEON – A PARADIGM SHIFT

Moranjkic M, Mehmedovic G,
Cickusic A, Sejdinovic A, Ercegovic Z

University Clinical Center Tuzla, Tuzla,
Bosnia and Herzegovina

By the dawn of the 21st century, endovascular techniques have assumed a significant role in the treatment of cerebrovascular disorders. Supported by the results of recent randomized controlled trials and novel technological solutions, endovascular techniques are striving to assume a dominant role in intracranial aneurysm management. In many regions of the world (particularly North America and Japan), the bulk of endovascular procedures are performed by neurosurgeons, trained in both endovascular and neurosurgical techniques.

Dualism and multidisciplinary integration of both microsurgical and endovascular strategies have become a hallmark of mature cerebrovascular programs. The reluctance of European neurosurgeons to embrace this new paradigm shift might lead to deleterious consequences, with interventional radiologists gaining a dominant role in aneurysm treatment in Europe. We present a single-center experience with a dual-trained neurosurgeon paradigm and we suggest that this is not only preferred, but also a necessary path to follow.

THE UNUSUAL TIMING OF THE CEREBRAL VASOSPASM AND ISCHEMIC NEUROLOGICAL DEFICIT IN A PATIENT WITH ANEURISMAL SUBARACHNOID HEMORRHAGE

Slavko Zivkovic , and Aleksandar Kostic
Clinical center Nis

Introduction: The period of time from 4th to 12th day from the initial hemorrhage is considered as the most frequent period for vasospasm. Initial radiological presentation, of cerebral vasospasm within few hours from the onset of bleeding, is rare.

Case presentation: Sudden severe headache and vomiting had occurred in a 40 years old female patient. Computer tomography angiography (CTA) was performed one hour after the onset of the symptoms and massive subarachnoid hemorrhage (Fisher grade 4) was presented, middle-sized aneurism of arteriae communicants anterior and small one of arteria pericallosa. Also, the radiologist has described focal vasospasm of both arteria cerebri anterior (ACA). As the patient was GCS 14, a day after the onset digital subtraction angiography was performed and the presence of both aneurysms and vasospasm of bilateral A1 segments of ACA. The patient was treated conservatively, among all, with spasmolytic therapy. Thirteen days after, control CT had shown bifrontal ischemia, apparently irrelevant to good clinical status. Nineteen days after onset, operation was performed and clipping of the bleeding ACoA aneurism. Postoperativly, for 10 more days patient was GCS 15, and without any neurological deficit. Postoperative CT has shown similar finding as preoperative. Twentynine days after the hemorrhage started, the clinical presentation of the vasospasm and delayed ischemic deficit occurred with the deterioration of the patient. Signs of incipit diabetes occurred. Subcomatose patient was conservatively treated in intensive care unit for 30 more days but finally she died.

Conclusion: In this paper, we presented unusually early radiologic signs of cerebral vasospasm and also its extremely late clinical presentation as delayed ischemic neurological deficit and tried to review all factors that influenced the course of illness. This could be essential in choosing the most adequate treatment options.

Keywords: cerebral aneurysm, subarachnoid hemorrhage, cerebral vasospasm

SKULL-BASE OSSEOUS ARTERIOVENOUS MALFORMATION – A RARE CLINICAL ENTITY IN PEDIATRIC PATIENTS

Mirjana Raicevic[1], Milan Mrdak[1], Jelena Sopta[2, 3], Slobodan Culafic[4], and Srdjan Nikolovski[5,*]

[1] University Children's Hospital, Belgrade, Serbia
[2] Institute of Pathology, University of Belgrade School of medicine, Belgrade, Serbia
[3] University of Belgrade School of medicine, Belgrade, Serbia
[4] Special Hospital for Cerebrovascular Disorders "Sveti Sava", Belgrade, Serbia
[5] University of Belgrade School of Medicine, Belgrade, Serbia
*Presenting author

Introduction: Focal skeletal vascular abnormalities are rare, mostly benign condition, usually occuring in the axial skeleton. There are only few reported cases of those abnormalities, described mainly in adults, and usually presented as cystic lesions with bone destruction. However, non-cystic angiomatosis and vascular malformations of calvarial bones have not yet been described in pediatric population.

Case Report: Our case of ten-year-old girl was initially presented with occasional facial spasms, without other neurological disturbances or loss of conciousness. Anticonvulsive treatment has been started and skull magnetic resonance imaging showed presence of small tumorous bone mass invading clivus, left temporooccipital suture, and left temporal bone base. Sampling of the altered bone tissue, followed by its microscopic examination, revealed the presence of compressive atrophy of trabeculae caused by vascularized fibroblastic proliferation. Additional mild-to-moderate bone destruction has been also detected as a consequence of severe proliferation of pathologically altered blood vessels. Angiographic examination confirmed the branches of the left external carotid artery, especially the left ascending pharyngeal artery, as the main supply of this malformation, without pathologic alterations of right carotid arterial system. Selective angiography of the left side revealed the zone of „tumor blush“ with 3.3 x 4.0 cm in size. First attempt of endovascular embolization with ethylene vinyl alcohol copolimer was unsuccessful due to the subsequent opening of several anastomoses with left vertebral artery. Repeated embolization, however, was successful, and the "blush" was excluded from blood circulation by supraselective instilation of ethylene

vinyl alcohol copolimer through the microcatheter placed in the left ascending pharyngeal artery as the main supplying blood vessel. Control magnetic resonance angiography, year and a half after the endovascular embolization procedure, revealed sclerotic and thickened petrous part of left temporal bone, as well as the left half of the clivus, without visible signs of pathologic vascularization. Neurologic exams and electroencephalography showed no abnormalities.

Discussion: In addition to their rarity, skull vascular lesions, as challenging topic in pediatric neurosurgery, require special attention. Our case correlates in great extent to the complexity of making the correct diagnosis, which is not the case with symptomatology. The majority of patients with skull base lesions often present with significant functional deterioration of cranial nerves. In our case, it was absent, with exception of facial nerve excitation. This kind of pathology also requires several neuroimaging modalities, as it was the case in our patient. However, differential diagnosis, even after performed radiographic analyses, may include several other conditions, such as hemangioma, metastatic bone lesions, or histiocytosis. Therefore, careful bone biopsy would be necessary for accurate diagnosis, followed by angiography in order to identify the nourishing blood vessels and to make precise treatment plan, which is in significant percent of cases also very complex. Angiographic diagnosis is very delicate, as it was in our case. However, it also has a paramount importance in treatment planning. At the very end, prompt treatment of vascular craniofacial malformations is necessary in order to prevent further angiogenesis, enlargement of present formations, and further, possible fatal complications.

Di Rocco C, Tamburrini G, Rollo M. Cerebral arteriovenous malformations in children. Acta Neurochir (Wien). 2000;142(2):145-56.

Aviv RI, McHugh K, Hunt J. Angiomatosis of bone and soft tissue: a spectrum of disease from diffuse lymphangiomatosis to vanishing bone disease in young patients. Clin Radiol. 2001;56(3):184-90.

Park ES, Jung YJ, Yun JH, et al. Intraosseous arteriovenous malformation of the sphenoid bone presenting with orbital symptoms mimicking cavernous sinus dural arteriovenous fistula: a case report. J Cerebrovasc Endovasc Neurosurg. 2013;15(3):251-4.

Chauhan DS, Guruprasad Y. Massive juvenile angiomatosis of maxilla and mandible. Chron Young Sci. 2014;5(1):75-8.

Mohimen A, Kumar Kannath S, Jayadevan ER. Skull Base Osseous Arteriovenous Fistula-A Rare Clinical Entity: Case Report and Literature Review. World Neurosurg. 2017 Jan;97:760.e9-760.e12.

Gramiak R, Ruiz G, Campeti FL. Cystic angiomatosis of bone. Radiology. 1957;69(3):347-53. Morshed S, Mohit P. Cystic angiomatosis of the skull presenting with extradural pneumocephalus. J Neurosurg. 1990;72(6):968-70.

DIAGNOSTIC AND THERAPEUTIC FLOW-CHART FOR TREATMENT OF CEREBRAL CAVERNOUS MALFORMATIONS

Pier Paolo Berti,* , Giampietro Pinna , Giuseppe Kenneth Ricciardi, Pietro Meneghelli, Alberto Pasqualin, Antonio Nicolato, and Barbara Masotto

1 Azienda Ospedaliera Universitaria Integrata in Verona
*Presenting author

Objective. Cerebral Cavernous Malformations (CCMs) are a rare disease where aberrant vascular conglomerates are prone to bleeding, with clinical presentation according to cortico-subcortical localization. To date, shared guidelines for the treatment of CCMs is lacking. We present a novel flow-chart for the management of CCMs in our medical Centre in Verona.

Methods. We reviewed previous published series (Pubmed, Cochrane Library) comparing this to our personal series.

Results. Head-MRI emerged as the goal standard for CCMs diagnosis (in particular Gradient-Echo and SWI/SWAN sequences). The precondition for the treatment of CCMs is bleeding. The modality of treatment (microsurgery vs. stereotactic radiosurgrey) vs. "wait and see" are defined dependig on: lesion charachteristics (localization, number of bleeding), patient charachteristics (age, comorbidities), severity of clinical condition and patient willness. If a gross total resection is performed, the patient is considered free from disease. Stereotactic Radiosurgery is a valid option in case of bleeding CCMs with no accessible surgical localization and/or in patient with high surgical risk.

Conclusion. We present this flow-chart as a possible option for perioperative and postoperative management of CCM. As the pathology is uncommon, treatment in specialised centres with a multidisciplinary team is crucial.

ENDOVASCULAR TREATMENT OD AVM- CASE REPORT

Andrija Savic[1,*], and Lukas Rasulic[1, 2]

[1] Clinical Center SerbiaClinic for neurosurgery
[2] School of Medecine, University of Belgrade
*Presenting author

Introduction. Brain arteriovenous malformations (AVMs) are abnormal connections between arteries and veins leading to arteriovenous shunting with an intervening network of vessels—the so-called nidus. Brain AVM prevalence varies between 15 and 18 per 100 000 adults. Roughly half of patients with brain AVMs present with intracranial hemorrhage, resulting in a first-ever hemorrhage rate of 0.55 per 100 000 person-years. Outcomes following treatment of brain arteriovenous malformations (AVMs) with microsurgery, embolization, stereotactic radiosurgery (SRS), or combinations vary greatly between studies. Although case fatality after treatment has decreased over time, treatment of brain AVM remains associated with considerable risks and incomplete efficacy.

Case report. A cerebral AVM was discovered incidentally in 41-year-old man who underwent CT performed for minor head trauma. Patient was completely asymptomatic and neurologically intact. MRI and DSA showed AVM centered in the corpus callosum, 4,5cm in diameter, supplied bilaterally by anterior cerebral arteries . High flow arteriovenous shunting was associated with deep venous drainage into the straight sinus. AVM was graded Spetzler-Martin 3 and Lawton-Young 5. Endovascular treatment with Onix was conducted. After the intervention patient was comatose and control CT revealed huge intracerebral hematoma. Revision surgery was performed, but patient died three days after.

Discussion. The rates of complete obliteration of AVM's with embolization vary between 0% to 20%. In the same time rates of hemorrhage can be up to 10% if less than 30% of the AVM's is embolized due to alerted flow dinamics within the AVM. This is unacceptable when compare to annual risk of 2-4% based on natural history. Embolisation as an invasive procedure has overall risk of morbidity and mortality of 11.8%. Stereotactic radiosurgery for AVM's less than 3cm has obliteration rates between 60% and 100%. It is especially suitable for small, deep seated lesions. Procedural risk of morbidity and

mortality is about 2-5,3%. Its main disadvantage is latency period between treatment and complete obliteration which may last 2 to 5 years. The risk of hemorrhage during this period is slightly higher when compared with natural history. Failure od radiosurgery is thought to be secondary to incomplete or incorrect targeting of AVM nidus or inappropriate dosing. The surgical tretment for AVMs Spetyler-Martin gr. I to III has rate of complete resection up to 97% with overall mortality estimated at 0-12,5% and morbidity from 8% to 30%.

Conclusion. Embolisation can't be used as primary treatment modality for AVMs. But it has got very important role as adjunt procedure prior to radiosurgery or microsurgical resection. The goal of this intervention is reducing AVM nidus size which can make improvement in cure rates up to 25%. In terms of microsurical resection there is added benefit of superselective exclusion of deep arterial feeders and reduction of intraoperative blood loss. Also embolization has got its palliative role in certain patients for the control of headaches and seizures.

CAN EEG TEST HELPS IN IDENTIFYING BRAIN TUMOR?

Emmanuel Gadzama Hamatu[1,*]

[1] Disotos Global Services Limited
*Presenting author

Brain tumor is inherently serious and life-threatening disease. Brain tumor builds the intracranial pressure in the brain, by shifting the brain or pushing against the skull, and also damaging nerves and healthy brain tissues. This intracranial pressure affects and interferes with normal brain functionality, which results in generation of abnormal electrical activities from brain. With recent development in the medical engineering and instruments, EEG instruments are able to record the brain electric activities with high accuracy, which establishes EEG as a primary tool for diagnosing the brain abnormalities. Research scholars and general physicians, often face difficulty in understanding EEG patterns. This paper presents the EEG patterns associated with brain tumor by combing medicine theory and neurologist experience. Paper also explains the pros-cons of the EEG based brain tumor identification.

Keywords: Brain tumor, Electroencephalogram (EEG)

Lagos, Nigerian Cancer Society: Cancer Facts and Figures 2018, Nigerian Cancer Society, 2017

ENDOVASCULAR TREATMENT OF LARGE AND GIANT ANEURYSMS: USE OF INTRAOPERATIVE MONITORING AND POST-SURGERY RESCUE TECHNIQUES

Ivan Vukasinovic[1], and Zarko Nedeljkovic[1]

[1] Clinical Center of Serbia

Large and giant aneurysms often present considerable treatment challenge. Sometimes the vessel harboring aneurysm must be sacrificed in order to achieve the durable treatment. Balloon occlusion test in the awake patient and angiographic confirmation of sufficient collateral flow in the patient under general anesthesia, are classical techniques use to assess safety of parent vessel occlusion. Nonetheless, these tests do not completely eliminate stroke risk, especially for the delayed ischemic deficit. Recently proposed transcranial evoked potential (TCEP) monitoring is proofing to be safe and useful for detecting blood flow insufficiency in the territory of the vessel during aneurysm embolization. Decreases in TCEP amplitude during endovascular treatment are likely to reflect dysfunction due to a subtle blood flow insufficiency, not detectable by DSA. We present our case series of the patients treated with the use of TCEP. In the other part of the lecture, we will show our case series of endovascular treatment as the post-surgery rescue strategy.

Hiraishi T, Fukuda M, Oishi M, et al. Usefulness of motor-evoked potential monitoring during coil embolization of anterior choroidal artery aneurysms: technical reports. Neurol Res. 2011 May;33(4):360-2.

Pavesi G, Dimitriadis S, Baroni S, et al. Intraoperative Functional and Perfusion Monitoring During Surgery for Giant Serpentine Middle Cerebral Artery Aneurysms. World Neurosurg. 2015 Aug;84(2):592.e15-21.

Thomas B, Guo D. The Diagnostic Accuracy of Evoked Potential Monitoring Techniques During Intracranial Aneurysm Surgery for Predicting Postoperative Ischemic Damage: A Systematic Review and Meta-Analysis. World Neurosurg. 2017 Jul;103:829-840.e3.

Sorteberg A, Bakke SJ, Boysen M, et al. Angiographic balloon test occlusion and therapeutic sacrifice of major arteries to the brain. Neurosurgery. 2008 Oct;63(4):651-60; dicussion 660-1.

Abud DG, Spelle L, Piotin M, et al. Venous phase timing during balloon test occlusion as a criterion for permanent internal carotid artery sacrifice. AJNR Am J Neuroradiol. 2005 Nov-Dec;26(10):2602-9.

MECHANICAL THROMBECTOMY IN STROKE- OUR TEN MONTHS EXPERIENCE

Menka Lazareska[1,*], Venko Filipce[2], Vjolca Aliji[1], Petar Janevski[1], Dejan Daskalov[1], Jasna Bushinvoska[3], and Ida Temenugova[3]

[1] University Institute of Radiology
[2] University Clinic of Neurosurgery
[3] Anesthesiology ,reanimation and intensive care
*Presenting author

Mechanical thrombectomy for stroke patient started in November 2018 in our country. For ten months we have 21 patient with large vessel occlusion. Our center is for now single center that provide mechanical thrombectomy for population of two million people. All stroke patient were with large vessel occlusion on CT and CTA. First patient was directly evaluated and treated in angiography suite on the basis of native CT- hyperdense MCA sign and clinical symptoms. Next patient underwent CT and CTA and one with MR/MRA. Four patient were with T occlusion, two successful recanalization and two failure. Other 17 were M1/M2 occlusion from witch tree tandem lesions ICA and M1. Patients were on age of 25 to 73 years old. We used stent retriever in all patients (solitaire or embotrap) and aspiration together and in most of patient intermediate catheter (sofia/sofia plus) but we never used balloon guiding catheter. Time window in 18 patient was <6h and 3 of patients with wake up stroke. All patients were with NIHSS >5. TICI 2b was achieved in 8 patients, TICI 3 in 4 patients, TICI 2a in 3 patients, in one patient grade 1 and no reperfusion in 5 patients from witch one with worsening. No major hemorrhage appeared but only 4 patients previously received IV tPA. Till today no national strategy for stroke patient pathway.

SURGICAL OUTCOMES OF PONS CAVERNOMAS OPERATED WITH SUBOCIPITAL CRANIECTOMY

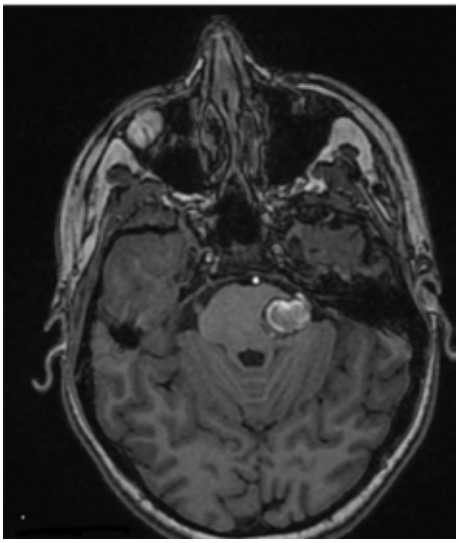
Utku Özgen[1,*], Halil Can[2], Aydın Aydoseli[1], and Altay Sencer[1]

[1] Istanbul University Istanbul Medical Faculty
[2] Medicine Hospital
*Presenting author

Brainstem cavernomas are rare lesions and account for 20% of cavernous malformations.(1) The annual bleeding risk is between 2-6% and the annual risk of re-bleeding is 6-35%. (2) Although the most common symptom is seizures, they may also present with progressive neurological deficient (50%), bleeding (20%) and hydrocephalus.(3) In the presence of recurrent bleeding and worsening neurological examination, if there is progression in mass effect, control MRI imaging and if the lesion is close to the pial surface (<2mm), treatment is surgical. (4)

Surgical results of brain stem cavernoma patients operated by a single surgeon between 2014 and 2018 were examined retroscopectively. Three patients (60%) were female and 2 (40%) were male. The mean age of the patients was 33.6 years and they were followed for 11.6 months. Neuroradiological examinations revealed bleeding pons cavernoma in all patients and all patients were operated with subocipital craniectomy and retrosigmoid approaches. 1 patient underwent radiosurgery first and was operated upon re-bleeding in the follow-up. Total excision was performed in all patients. There was no feature in the preoperative neurological examination of 3 patients and there was no change in postop neurological examinations. 2 patients revealed 6th cranial nerve paresis in the preop neurological examination and the 6th cranial nerve paresis persisted also in the postop neurological examination and that there was no additional neurological deficient.

Brainstem cavernomes can be safely resected with the right surgical approach and microsurgical techniques. Treatment is surgical in lesions close to the pial or ependimal surface of the brain stem, causing symptomatic bleeding and causing compression effects. However, treatment for deeply located lesions is controversial for lesions that are far from the surface of the brain stem or where safe entry areas cannot be accessed. Other treatments such as radiosurgery and drug therapy may be an alternative to surgically high-risk lesions.



2. Ferroli P, Sinisi M, Franzini A, Giombini S, Solero CL, Broggi G: Brainstem cavernomas: Long-term results of microsurgical resection in 52 patients. Neurosurgery 56:1203–1214, 2005.
4. Li H, Ju Y, Cai BW, Chen J, You C, Hui XH. Experience of microsurgical treatment of brainstem cavernomas: report of 37 cases. Neurol India. 2009;57(3):269–273.
1. Garrett M, Spetzler RF: Surgical treatment of brainstem cavernous malformations. Surg Neurol 72 Suppl 2: S3-9, 2009
3. Kondziolka D, Lunsford LD, Kestle JR: The natural history of cerebral cavernous malformations. J Neurosurg 83:820–824, 1995.

TRANSORBITAL HYBRID APPROACH FOR ENDOVASCULAR OCCLUSION OF INDIRECT CAROTID-CAVERNOUS FISTULAS-CASE REPORT

Ivan Vukasinovic, Filip Vitosevic, Vladimir Bascarevic

Clinic for Neurosurgery, Department of Interventional Neuroradiology, Clinical center of Serbia

Carotid-cavernous fistulas (CCFs) consist of a group of vascular malformations characterized by an aberrant shunt between one or more sources of arterial inflow and the cavernous sinus (CS); they are subdivided into direct and indirect fistulas. Indirect CCFs involve fistulous connections between branches of the internal carotid artery (ICA) or the external carotid artery (ECA). In the case of isolated CS surgical exposure of the vein is often the only approach to the fistula. We present the case of a patient treated for right sided indirect CCF, without accessable endovascular route, treated with hybrid approach. The patient underwent a hybrid intervention involving preparation and cannulation of the right superior ophthalmic artery and embolization of the CS with liquid embolic agent Onyx 18. In the postprocedural period, the patient complained of diplopia that fully recovered after three months.

SHOULD WE RESTORE ORAL ANTICOAGULANT THERAPY AFTER INTRACEREBRAL HEMORRHAGE, WHEN AND HOW?

Goran Knezovic[1,*], Željko Živanovic[1,2], and Ivana Divjak[1,2]

[1] Clinical Center of Vojvodina
[2] Faculty of Medicine
*Presenting author

Introduction: Patients who are on oral anticoagulant therapy (OACT) have a significantly higher risk (up to 10 times) of intracerebral hemorrhage (ICH) compared to those who are not on this therapy. ICH is the most serious complication of OACT because of a high morbidity rate which exceed 50%. Years of life, unregulated hypertension, previous history of stroke, dosage of anticoagulant therapy, and fluctuation in values of international normalized ratio (INR) are positively correlated with the risk of ICH. In the first month of therapy (vitamin K antagonists), 8% of patients are diagnosed with ICH, which is explained by fluctuations in INR values at the beginning of therapy. Use of OACT after pre-existing ICH (especially lobar) increases the risk of recurrent ICH.

Aim: Restitution of oral anticoagulant therapy after hemorrhagic stroke trough case report and review of the literature.

Case report: The female patient 75 years old was hospitalized in the Clinic for Neurology, Clinical Center of Vojvodina for the first time, with clinical signs of ICH, which presented with nausea, instability and speech disability. Her past medical history was notable for atrial fibrillation and using of OACT. Initial brain CT scan confirmed a smaller hematoma in the left cerebellar hemisphere, which was comletely reabsorbed on control CT scan. Her hospital stay was without complications, and she had no contraindications for using direct OACT, therefore apixaban was introduced into the therapy 4 weeks after the onset of ICH after which she was discharged. A few months later the patient was hospitalized again, with similar clinical presentation. On initial brain CT scan left insular region hematoma was confirmed, and on the 12th day of hospitalization - neurological deterioration occurreds in the form of sensorimotor dysphasia. Brain CT scan was repeated which showed acute infarction of the precentral gyrus in the right cerebral hemisphere, with initial resorption of hematoma in the left insula. The patient was discharged with antiplatelet therapy, and recommendation for the placement of occluder in the left auricle.

Conclusion: The benefit of introducing OACT is to reduce the incidence of stroke and systemic embolism in patients with atrial fibrillation, with special caution and careful assessment because of the increased risk of ICH. When it comes to reintroducing of OACT after an ICH, there are still no clear guidelines and the right time for that step remains questionable. Definitely, individual therapeutic approach is necessary for each patient.

Incidence, Mortality, and Risk Factors for Oral Anticoagulant–associated Intracranial Hemorrhage in Patients with Atrial Fibrillation; Rebbeca Grysiewicz, Philip B. Gorelick, 2014.

Guidelines for the Management of Spontaneous Intracerebral Hemorrhage. A Guideline for Healthcare Professionals From the American Heart Association/ American Stroke Association, 2015.

Anticoagulation Resumption After Intracerebral Hemorrhage Yan-guang Li, Gregory Y. H. Lip, 2018.

Resumption of oral anticoagulation after spontaneous intracerebral hemorrhage Jochen A. Sembill, Joji B. Kuramatsu, Stefan Schwab & Hagen B. Huttner, 2019.

Management of therapeutic anticoagulation in patients with intracerebral haemorrhage and mechanical heart valves. Kuramatsu, J. B. et al. European Heart Journal. 2018

GOAL DIRECTED FLUID THERAPY DURING INTRACRANIAL ANEURYSM SURGERY- FASHION OR NEED?

Sanja Maričić Prijić[1, 2],* , Radmila Popović[1, 2] , and Snežana Stanisavljević[1, 2]

1 Clinical Centre of Vojvodina
2 Medical Faculty, Univeristy of Novi Sad
*Presenting author

Goal directed fluid therapy (GDFT) is one link in the chain called peronalized medicine whose cornerstone is an individual approach to the patient. GDFT is a technique which uses a minimallyinvasive cardiac output monitoring device to guide management of circulating blood volume. Intraoperative fluid management in patients with intracranial aneurysm surgery is critical to preserve systemic and cerebral perfusion pressure, oxygenation, and metabolism. Perioperative fluid administration has been shown to be a major determinant of postoperative outcome. The amount of fluid administered during the perioperative period depends on multiple factors such as preoperative hydration, intraoperative blood loss, hemodynamic stability, as well as habits and believes of anesthesiologists and surgeons. Intraoperative hypotension caused by anesthetic-induced vasodilation, and/or hypovolemia induced by blood loss or diuresis can reduce cerebral perfusion pressure and increase intracranial pressure (ICP). Furthermore, fluid volume overload may elevate ICP, an unfavorable influence on brain condition with detrimental effects on neurological outcomes, or increase susceptibility to pulmonary edema.

Therefore, monitoring intravascular volume status and implementing a rational fluid therapy strategy are important considerations for anesthesiologists. Static indicators, such as central venous pressure (CVP), pulmonary capillary wedge pressure, mean arterial preasure (MAP), diuresis and heart rate have been shown to be poor predictors of fluid responsiveness. Functional hemodynamic monitoring using dynamic parameters such as stroke volume variation (SVV) is considered more accurate in predicting fluid responsiveness. Minimally invasive haemodinamic devices allow automatic and continuous monitoring of cardiac output (CO) based on pulse contour analysis and respiratory SVV. Fluid needs may be highly variable from one patient to the other and are hardly predictable from classical physiological parameters. Fluid titration based on the measurements of advanced hemodynamic parameters and dynamic predictors of fluid responsiveness, has been shown to be useful to improve the outcome of neurosurgical patients.

PREDICTABLE MORPHOMETRIC PARAMETERS FOR RUPTURE OF INTRACRANIAL ANEURYSMS

Nikolić I, Repac N, Janicijevic A, Zivanovic J,
Stanković L, Almzeogi M, Abousabie Z, Jovanovic V, Tasic G.

AIm: Intracranial aneurysm rupture is followed by high mortality and morbidity. In order to understand the aneurysm's natural course, it isnecessary to recognize the predisposing factors for the rupture.

MaterIal and Methods: Analysis included 142 operated aneurysms (94 hemorrhaging and 48 unruptured) in the period from 2008 to 2010.

Result s: The ratio between the width of the aneurysm neck and diameter of the carrying blood vessel – artery in ruptured aneurysms (OR) was 1.58±0.61, and in unruptured aneurysms 1.14±0.52 ($p<0.01$). Aspect ratio of ruptured aneurysm was 1.89 ± 0.59, and in unruptured 1:33 ± 0.17. The angle of inclination of ruptured aneurysms was 139.22 ± 21.53, while in unruptured aneurysms it was 101.73 ± 21.26.

Conclusion: Based on the results of our research, a predictive model of morphometric characteristics of the vessel bearing the aneurysm to rupture can be identified: an irregular shape of the aneurysm, AR> 1.6, OR> 1.5 and inclination angle >135 deg.

NATURAL FLOW OF ARTERIO-VENOUS MALFORMATIONS OF THE BRAIN

Repac N, Nikolic I, Janićijevic A, Zivanovic J,
Stankovic L, Almzeogi M, Abousabie Z, Jovanovic V, Tasic G.

Arterio-venous malformations of the brain are congenital malformations.
Due to the anatomical characteristics of brain angiomas and their localization, in many cases they require a combined therapeutic approach - surgery, embolization and radiotherapy.

Despite ongoing technological advances, 5% of all brain angiomas cannot be completely excluded from circulation. That is why there is a need to know their natural flow better.

Our results indicate that vascular malformations are of a significantly more benign clinical course than aneurysms.

The clinical model indicates that the annual risk of hemorrhage is 3.3% with a total mortality of 5.3%, especially if the size of the angioma is 2.5-5 cm, localized in the motor area of the brain, with a combined type of venous drainage and arterial supply from the vertebro-basilar basin.

Epilepsy caused by brain angioma is 26.7% refractory to drug therapy, and in 25% (every 4th) patient will experience hemorrhage at an annual risk of 0.14%.

CAVERNOUS MALFORMATIONS OF THE BRAIN STEM – THE CLINICAL FEATURES AND SURGICAL APPROACHES

Janićijevic A, Nikolic I, Repac N, Zivanovic J, Stankovic L, Almzeogi M, Abousabie Z, Jovanovic V, Tasic G

Introduction. Cavernous malformations localized in the brain stem are considered as a separate entity in re lation to other intracranial cavernoma. Clinical presentation is specific in terms of focal neuro logic deficit, they show aggressive biological behavior and unfavorable clinical course, whereas localization in the brain stem naturally represents the largest surgical problem and challenge and significantly higher operational risk.

Results. We report a series of 35 patients with brainstem cavernoma, operated at the Depart ment of Neurosurgery, Clinical Center of Serbia in the period of 2008-2018. In cavernous le sions of the dorsal pons and upper cerebellar peduncul we used the approach through the fourth ventricule, in the laterally localized pontine cavernoma we used the cerebellopontine angle approach, in the cavernoma localized in the central midbrain tegmental area was used supreacerebellar infratentorially approach.

Conclusion. Surgical removal of the brainstem cavernoma is absolutely expedient both from the stand point of preventing recurrent and dysabillitating hemorrhage and in terms of recov ery of neurologic deficit. In pa tients with disturbed vital functions, the evacuation of the hematoma and removal of the malformation eliminate com pression of effects on vital structures of the brain stem.

Key words: Cavernous, brainstem, surgical approach

Saturday, October 26th, 2019

NURSING SYMPOSIUM

Hall 3

DECISION MAKING IN THE NURSING PROFESSION

Cecilija Rotim, MSN

Croatia Chief Nurse Officer
Andrija Stampar Teaching Institute of Public Health, Head Nurse
Zagreb, Croatia

The World Health Organization and other leading associations in Europe in the field of health and nursing, at all levels of health care, point to the importance of nursing and cooperation with other professions.

In a daily work, the nurse is exposed to a variety of challenges, which requires a significant degree of motivation and creativity to work in the healthcare delivery process. Implementing sustainable and meaningful change requires the support of all members of the multidisciplinary team in which the nurse must be an equal member. Decision-making is a skill that is refined with time and experience, gained through day-to-day work with the patient, his family, and members of the multidisciplinary team. Each decision-making process consists of a series of steps and stages. Nursing decision making takes place in a variety of circumstances, which can be favorable and unfavorable, predictable or unpredictable. In the narrow sense, decision-making involves the process of choosing between two or more alternatives, and in the broader process of problem solving.

Decision-making, that is, the process of making decisions in modern nursing practice in the field of health care is best based on scientific evidence, although in everyday work and practice, certain situations require responsibility and experience-based decision-making. When making such decisions, competencies, completed education, legal regulation and patient needs should be taken into the account. In order for a decision to be put into practice, it must be made at the right time, must be precise, clear and realistic. The foundations of a properly made decision must include activities, timelines and goals.
In order for the nurse to respond to all the professional challenges of modern nursing practice, she must base her work and decision-making on the latest science and technology knowledge, but must also possess a high level of acquired knowledge, skills and expertise.

Key words: decision making, nursing, multidisciplinary team

SURGICAL TREATMENT OF CEREBRAL ANEURYSM- INTRAOPERATIVE NURSING CARE

Vesna Svircevic. MNS

Department of neurosurgery
UHC Sestre milosrdnice
Zagreb, Croatia

Cerebral aneurysms involve pathological expansions of the brain's blood vessels and in case of rupture they have a high rate of mortality and disability. It is a weakening and saccular outpouching of a cerebral artery. Participation in these surgical procedures is very complexed and from scrub nurse requires great skill, conscientiousness, knowledge and continuous education.

Psychological support for these patients is important because the diagnosis of cerebral aneurysm causes anxiety within themselves. Therefore, upon arriving at the operating block, it is important to monitor their emotional state, give them an opportunity to express their fears and concern, also it is a necessity to provide them with encouragement and support.

The success of the surgical procedure depends on good preparation of the scrub nurse, who needs to know the instruments she will handle, how they are used, what they are used for, how they are properly prepared for sterilization and how to do the sterilization itself. Furthermore, she needs to know the course of the operation and all of its phases, as well as the anatomical structures through which it is being performed to be ready for all possible complications that may occur. To understand the operation, one must also know the pathophysiology of this serious illness. It is also obligatory to know the equipment that will be used during the operation as well as the type and amount of consumable material it needs. In addition, the nurses duty is to supervise the work of all members of the operating team throughout the operation and that it is carried out under strictly aseptic conditions.

Mutual respect between all members in the team is a key factor in creating a successful ambience. Scrub nurses, in their daily work, mainly care about patients safety in the operating room environment,so that the surgery would be safe for the patient and without any possible complications. It is their primary goal to be as efficient and supportive as possible.

Keywords: intraoperative nursing care, scrub nurse, cerebral aneurysms.

NURSING CARE OF PATIENTS WITH AV MALFORMATION

Marija Knezovic, BSN

Department of neurosurgery
UHC Sestre milosrdnice
Zagreb, Croatia
E-mail: marijaknezovic95@gmail.com

Arteriovenous malformations around the spinal cord may cause the cord compression, ischemia, hemorrhage in the parenchyma, subarachnoid hemorrhage or a combination thereof. The symptoms may include neurological deficits segment which gradually deteriorate, excesses of ascending or disconnections that appear and disappear, and radicular pain; or sudden back pain with sudden-onset segmental neurological disturbances. Diagnosed by MRI. Treated surgically or stereotactic radiosurgery, and may include angiography with embolization. Arteriovenous malformations are most spinal vascular malformations. The largest number occurring thoracic lumbar region, and outside the posterior spinal cord. The remaining are most commonly found in the neck or upper thoracic region, and are often intramedullary. MAVM small and may be localized or may affect up to 1/2 cord. Compressible or even replace normal parenchyma of the spinal cord, can rupture, causing a focal or generalized hemorrhage. Cutaneous angioma is sometimes placed above the spinal AVM. AVM usually pressed nerve roots, causing pain radiating down the distribution of nerve root (radicular pain), or put pressure on the spinal cord, causing segmental neurological deficits or progress gradually appear and disappear. Frequent deficits were combined upper and lower motor neurons. AVM can rupture the parenchyma of the spinal cord, causing a sudden and severe back pain, and rapid onset of segmental neurological deficits. AVM high in the neck rarely rupture into the subarachnoid space, causing a sudden, severe headache, nuchal rigidity and impaired state of mind. AVM of the spinal cord can be detected by chance neuroradiological examinations. On the AVM is suspected clinically in patients with unexplained segmental neurologic deficits or subarachnoid hemorrhage, especially those who have sudden, severe back pain or cutaneous angioma in the median line. Diagnosed using MRI, magnetic angiography, selective
arteriography and sometimes by myelography plus CT. The surgery is indicated if the compromised function of the spinal cord, or it is necessary to command of

specialized professional microtechnology. Stereotactic radio-surgery is helpful if the AVM small and localized to surgically inaccessible place. Angiographic embolization closing heads of arteries and often precedes surgical removal or stereotaxia radio surgery. The aim of this paper is to emphasize the importance of care nurses in the preparation of patients for embolization and surgical intervention (mental and physical preparation), management of patients after surgery. Given that it's about the vitally compromised patients and the complexity of the tasks that a nurse performs is of great importance that the nurse has the appropriate experience and knowledge. A nurse with a patient spends most of the time, it is necessary that the patient create a professional empathic relationship in which they will show understanding for his feelings, to include patients in the planning and implementation of health care and create a sense of confidence and demonstrate expertise. The principles of the process of health care neurosurgical patients with AV malformation is the application of logical procedures and resolution of problems arising in connection with the disease. The task of nurses to improve the quality of life, social conditions and realize the rights of sick.

KEY WORDS: Arteriovenous malformation, health care, nursing

NURSING CARE FOR THE PATIENTS SUBJECTED TO ENDOVASCULAR INTERVENTION OF INTRACRANIAL ANEURISMS

Lorena Manovic[1] BSN,
Ivona Bakotin, BSN

[1,2] Department for Neurosurgery, , UHC Sestre milosrdnice Zagreb

The term intracranial aneurysm implies pathological local extension in the vessel wall that may be congenital or acquired. The frequency of intracranial aneurysms is about 5%. The most serious complication of an aneurysm is a rupture of the aneurysm, that is, bleeding in the brain, which is most commonly detected as SAH and requires immediate medical intervention. Aneurysm treatment involves surgical and endovascular treatment techniques. The choice of treatment technique is undertaken after stabilization of the patient's vital risk and because of the urgency of the surgery, preoperative preparation of the patient for classical neurosurgical or endovascular surgery is individualized. Endovascular treatment of intracranial aneurysms has evolved in the last twenty years intending to reduce invasive treatment of aneurysms and recovering patients as soon as possible after surgery.

This paper aims to show the importance of nursing care in preoperative and postoperative patient care for endovascular surgery of intracranial aneurysms. Because of the continued progress of medicine and innovations in patient care, the nurse, as an equal member of the healthcare team, must receive continuing education to provide the highest quality nursing care possible. From hospital admission to preoperative and postoperative care, it is important to have the knowledge and skills and apply them on time. Each patient should be approached individually and it is necessary to establish a trusted relationship that leads to better mental and physical preoperative preparation. Caring for a patient after endovascular surgery requires a competent nurse who can identify potential complications and respond to them on time as she is the one who spends the most time with the patient. Only through teamwork, continuous improvement, and individualized approach is it possible to achieve patient recovery, reduce the burden on the healthcare system and integrate the patient into everyday life as soon as possible.

Keywords: nursing care, endovascular surgery, intracranial aneurysms

COMMUNICATION OF A NEUROSURGICAL OPERATING ROOM NURSE WITH A BRAIN TUMOR PATIENT

Zrinka Gabrilo, BSN

Department of neurosurgery,
UHC Split, Split, Croatia

Communication is a dynamic and complex proces sin which people send and receive verbal and non-verbal information in order to understand and to be understood. Ability to communicate efficiently creates high level of contentment of both patients and nurses. Required nursing communication skills: active listening, empathy, assertiveness should be implemented in nursing practice. The scrub nurse is the first member of the surgical team to meet the patient in the operating room. The nurse explains following procedures to a patient in a way that the patient is able to understand her while giving him full attention. The certain nurse – patient contact is important because it is precondition for adequate communication which results with reduces patient's fear related with anaesthetic and surgical procedures, and it also results in patient's improved cooperation during the perioperative period.

Aim: the main aim of a scrub nurse is to create both professional and empathic relationship with a patient and enhance patient's feeling of safety. Operating room nurse strives to gain patient's trust and to show professional competence. Brain tumor is a diagnosis which may affect patient's everyday life and his self-care abilities. Therefore, fear of death and vegetation may be present which makes nursing communication skills even more important in reducing it.

Conclusion: along with improving and advancing science and technology, medical proffesion is continuosly changing. Medical proffesionals are often more concerned with treatment methods than the patient. In order to understand a patient and patient's needs, it is necessary to be empathic person and to have developed communication skills.

Key words: importance of communication, types of communication, brain tumor patient specifics, improved communication recommendations, emapthy as the key in nurse-patient relationship

NURSING CARE OF PATIENTS WITH CEREBRAL ANEURYSM

Marija Magdic, BSN, Mirjana Orsic, BNS

Department of neurosurgery,
UHC Sestre milosrdnice, Zagreb,
Croatia

Cerebral aneurysm is an abnormal enlargement of a blood vessel in the brain. The arterial bifurcations are the most common locations of aneurysms, most commonly occurring in adults aged 35 to 60 years, more commonly among women. Risk factors for aneurysms may be congenital or develop over time (age, smoking, alcoholism, hypertension, arteriosclerosis, injuries, infections, menopause). Aneurysms can be classified by size, shape and etiology. Most aneurysms are asymptomatic until rupture and hemorrhage into the subarachnoid space occurs. Few giant aneurysms can be manifested by the development of a neurological deficit, which results from a compressive effect. In diagnostics, the "gold standard" is angiography-DSA, CTA, MRA, MRI. When choosing the best treatment for the patient, Hunt-Hess classification, GCS, and neurologic deficit are the factors used in the decision making process.

There are several choice options; surgical (craniotomy and clipping, and rarely lining or ligatures) and endovascular (coiling). The timing of the procedure is of crucial importance.

Nursing interventions are complex and require a high level of knowledge of possible clinical manifestations and intensive neurological monitoring. They also include neurological evaluation, respiratory care, monitoring and regulation of blood pressure, intracranial pressure, normothermia, knowledge of laboratory parameters, exact application of prescribed therapy, maintenance of desired volume, nutrition, activity management, pain, sedation, antiemetic, thromboprophylaxis. Communication with the patient's family and psychosocial support are very important, as are instructions for rehabilitation, lifestyle, restrictions, possible disorders (headaches, memory loss), possible complications and recognition of emergency symptoms, and how to respond in these cases.

Surgery in neurosurgical nursing includes preoperative preparation with the purpose of providing support and working on patient's physical and psychological

readiness. The nurse should include the patient (and his family members) in the process of planning and health care, which will help him gain confidence and allow him to express his insecurity and fears. All of it will contribute to successful preparation for a neurosurgical intervention. Preoperative preparation also includes caring for the patients the day before, and on the day of the procedure. The preoperative period is the time when the patient and his family should be provided with emotional, psychological and religious support. Postoperative patient's care is aimed at monitoring patient's conditions, eliminating or reducing physical symptoms, and recognizing complications. The purpose is to achieve patient's self-sufficiency as soon as possible.

KEY WORDS: cerebral aneurysm, diagnostic-therapeutic protocols, nursing interventions, preoperative preparation, postoperative health care, education

TECHNICAL ORGANISATION OF A NEUROSURGICAL OPERATING ROOM

Sanja Lesnjak, BSN

Department of neurosurgery,
UHC Sestre milosrdnice,
Zagreb, Croatia

The concept of a modern operating room has evolved from the time when operations were performed in a patient's home, in a surgical clinic or in a tent near the battlefield, to the present day because special environments are designed to provide optimal conditions for performing the minimum risk surgery. Numerous elements of the operating room environment are important. An appropriately designed space is needed not only for the immediate treatment of patients but for providing suitable environments for the staff involved in treatment, also to accommodate all the equipment needed to perform operations.

Operating spaces must be designed, constructed and adapted to suit the operations performed in them. The risk of contamination, dust accumulation and other impurities must be minimized. Lighting, temperature, humidity and ventilation must meet the requirements of the operations and must not affect the operation and the quality of the equipment.

The neurosurgical surgery block is a unique unit for performing neurosurgical procedures. This is the place where hospitalized patients undergo regular surgery - elective surgery and, if necessary, emergency surgery. The operating room and its accompanying rooms form the operating block. Each operating block is designed to ensure the best performance of aseptic work and a smooth flow of operations. The organizational and architectural separation of operating rooms and the introduction of an aseptic mode and the development of increasingly sophisticated operating techniques have raised the need for educated instrumental nurses. Instrumentation of the operating nurse requires a great deal of skill, conscientiousness, expertise and, above all, a sincere desire to help the patient. The advances in medicine and technical innovation make further improvement indispensable for an instrumental nurse.

Keywords: neurosurgical operating room, technical characteristics, technological progress

THE ROLE OF SCRUB NURSE DURING STEREOTACTIC BRAIN BIOPSY PROCEDURE

Branislava Sirar

Clinical center of Vojvodina

Purpose: Frame-based stereotactic biopsy is a way for acquiring histopathological diagnosis as an important step in decision making process how to treat patients with different brain tumors. This study illustrates a stereotactic brain tumor biopsy procedure, as well as the nursing plan of care and implications for the neuroscrub nurse.

Methods: This prospective study included a total of 50 patients who were hospitalized because of the intracranial tumors at the Clinic of Neurosurgery, Clinical Center of Vojvodina, Novi Sad. All patients underwent CT guided stereotactic brain biopsy in the general anesthesia.

Results: In whole group we performed frozen section histological examination on the two groups of samples during the stereotactic procedure and we achieved almost 92% diagnostic value in histopathology analysis with average 9 sample bits per single biopsy. There were no problems related to sample quality or postoperative wound infections. Patients were discharged from our clinic usually on the 3rd or 4th postoperative day. Conclusion: Scrub nurses carry very important role in stereotactic procedures. We would like to emphasize the importance of handling a lot of instruments for stereotaxy as well as taking care of biopsy samples. Stereotactic biopsy is established as a safe and reliable procedure, with minimum or without any complications, in the diagnosis and further therapy management of brain lesions. Key words: stereotactic brain biopsy, scrub nurse, biopsy samples

TECHNOLOGICAL INNOVATION- CHALLENGES IN SCRUB NURSING PROFFESION

Ivana Galic

Department of neurosurgery, UHC Sestre milosrdnice,
Zagreb, Croatia

Neurosurgery is a very complex and specific branch of surgery and requires a high level of specific knowledge and skills of the scrub nurse. There are several factors that influence changes and trends in neurosurgical nursing. If we highlight some, such as the advancement of scientific knowledge and the development of highly sophisticated equipment, the scrub nurse must always keep up with the demands that these changes bring.

Developments in the field of microscopic imaging, endoscopy, the use of lasers, special tubular retractors and other minimally invasive instrumentation now allow most classic, "open" operations to be performed on the so-called the minimally invasive way.

Nowadays in the advancement of medicine and technology, the nurse is assigned tasks that she needs to master in order to be an equal member of the operating team. The mission of the nurse to participate in spinal surgery with minimally invasive methods is very complex, and technical innovations require constant education to keep up with new technological challenges

Keywords: technological advancement, education, scrub nurse.

THE CONNECTION BETWEEN DEPRESSION AND STROKES – THE CHALLENGES NURSES FACE IN THEIR WORK

Mateo Kosier, BSN

Department of neurosurgery
UHC Sestre milosrdnice
Zagreb, Croatia

Strokes are often accompanied by depression, which additionally affects the progress of the illness, the efficiency of the treatment and the patient's recovery. Depression is a psychological state characterized by immense sadness and anxiety as well as lack of interest, will, and energy. Other characteristics of depression include the feeling of guilt, self-blaming and sometimes suicidal thoughts. Depression is also an additional risk factor for strokes. A stroke is the sudden loss of brain functions, caused by the failure of cerebral circulation due to an artery blockage (ischemic) or bleeding caused by a ruptured vessel (blood spreading into the surrounding tissue – hemorrhagic). Strokes are the main cause for disabilities in developed countries, and the third most common cause of death, which implicates a medical and socio-economic aspect of strokes. A nurse needs to prevent the development of depression in patients who suffered a stroke by helping them in due time with everyday activities as well as communicating with them and establishing a mutual trust. Nurses need to reduce the patient's anxiety and feeling of worthlessness and help them build self-respect and acceptance of their own condition. Being hospitalized can also cause anxiety and discomfort, which can trigger depression, so it is necessary to reduce any negative feelings and satisfy basic human needs during the patient's hospital stay.

Key words: depression, stroke, nurse, communication, prevention

INTRATHECAL BACLOFEN THERAPY (ITB) WITH THE IMPLANTED PROGRAMMABLE PUMP - OUR EXPERIENCE

Martina Kolacko, MNS
Andreja Vadjunec, BSN.

Department of neurosurgery,
Varazdin General Hospital, Varazdin,
Croatia

Spasticity as an uncontrolled muscle reaction is a common symptom after brain and / or spinal cord injury; it reduces the ability to carry out daily activities - selfcare and contributes to poorer quality of life. Intrathecal Baclofen Therapy (ITB) is a contemporary approach to spasticity therapy, regardless of the cause.

This study presents the indications for ITB, drug testing and patient selection, patient preparation for surgery, surgical procedure of pump implantation, importance of further monitoring of patients with pump refilling procedure.

Informed and cooperative family, an educated patient with realistic and clearly defined goals of treatment, and the teamwork of all health professionals involved in his / her care will secure good results.

Key words: intrathecal baclofen therapy, patient, medical nurse.

Sunday, October 27h, 2019

EXO VS . ENDO VS . HYBRID DISCUSSION - AVM

Hall 1

ENDOVASCULAR TREATMENT OF SPINAL DURAL AVFS: POSSIBILITIES AND LIMITS

Ivan Vukasinovic, and Zarko Nedeljkovic
Clinical Center of Serbia

Spinal dural arteriovenous fistulas (SdAVFs) are the most commonly encountered vascular malformation of the spine with the frequency of approximately 70%. They represent a treatable cause for progressive para- or tetraplegia, but the diagnosis is often delayed with already developed symptomatology. Treatment modalities are endovascular embolization and direct surgical clipping. For durable treatment the principal aim is to exclude the proximal collector vein from the spinal circulation. This is often not easy to achieve with endovascular approach, even with superselective catheterization of the feeding radiculomeningeal artery.

Only a proximal arterial occlusion will lead to a transient improvement of symptoms; however, owing to the good collateralization of the dura, the fistula is prone to recur within the following months. Symptoms, as they return, are more severe and less reversible. On the other hand, the proximal vein is more accessible through direct approach, and open surgery can be less challenging. The success rates of endovascular therapy have been reported to vary between 25% and 75%, whereas meta-analysis suggested complete occlusion following surgery in about 98%. The current treatment strategy adopted by many centers includes a tentative embolization, and in the case of failure, early surgical intervention. We present our experience in endovascular treatment of SdAVFs.

DURAL AVF'S - A CASE STUDY

Sanja Tomasovic

In this study we present a case ofthe treatment ofa patient with a dural arteriovenous fistula (DAVF). The 22 year old male patient was admitted to emergency with the following symptoms: a frontal headache, nausea and vomiting, vision probiems, chills and sweating. He did not report a loss ofconsciousness or head injury.

On admission he presented with left homonymous hemianopsia. All other newological tests were within normal ranges. The MSCT scan showed intercerebral hemorrhaging in the right occipital lobe with bleeding into the ventricles. An MSCT angiography of the cerebral vessels was taken and the consultant neuroradiologist and neurosurgeon were of the opinion that it was a case of dural AVF. The patient was transferred to another hospital where digital subtraction angiography was performed on the patient, which showed a small intracranial pial arteriovenous fistula The patient was then treated with neuroendovascular glue and the pial fistula was occluded. The patient's condition upon being discharged was satisfactory, however, the left homonymous hemianopsia was still present. He was given anti-epileptic therapy (valproate).

Six months later he was admitted to hospital for a check-up where he was shown to have no neurological or psychological deficit. Digital subtraction aagiography was performed on the patient again which showed that the dural AVF occlusion was stable.

This is a good example of how cooperation and collegiality between experts at different hospitals and within different subspecialisations leads to favourable outcomes for patients.

THE IMPORTANCE OF TELESTROKE NETWORK IN SWIFT TREATMENT OF RUPTURED AVMS

Tomaz Velnar1, 2,* , Tilen Zele1, and Roman Bosnjak1

1 University medical centre Ljubljana
2 AMEU-ECM Maribor
*Presenting author

The number of invasive procedures in medicine is increasing, as is the employment of new technological achievements. One such achievement is the telemedicine network. Telemedicine is defined as the use of medical data, mostly in emergencies, by employing electronic communication with purpose to improve healthcare, health and educational services in outpatient and emergency situations. In Slovenia, this network is known as the Telekap (TeleStroke) network, which was primarily designed for fast and efficient management of stroke patients. The Telekap has been considered to provide any patient with symptoms and signs consistent with acute neurosurgical pathology a quick expert clinical evaluation, a review of diagnostic finings, a diagnosis, decision making, emergency treatment recommendations and postoperative advice.

In the neurosurgical community, the system is frequently used also for conveying vital information regarding intracerebral bleeding, especially form the arteriovenous malformations (AVMs). As swift management is necessary in this type of pathology, the Telekap is of utmost importance. It offers the neurosurgical team thorough information about the extent and location of the bleeding and facilitates the preoperative planning of the neurosurgical intervention. Numerous factors have all contributed to optimal conditions for Telekap implementation in Slovenia, including the opportunity to improve access and quality of care, narrow window of time frame and treatment efficacy, the resources required for ground and helicopter medical transportation and the expansions and improvements of the medical care dedicated information-communication technology. As a result, the Telekap is being used extensively in the national health care and it use is still rising. From our experience so far, the system should be expanded to other neuro-centres as well to all neurosurgery departments in order to facilitate patient management and acute care.

Sunday, October 27h, 2019

EXO VS . ENDO VS . HYBRID DISCUSSION CAVERNOMA

Hall 1

MR IMAGING OF CAVERNOMAS

Matej Vrabec, MD, PhD

Clinical Institute of Radiology
University Clinical Centre Ljubljana, Slovenia

Cavernous malformations are low-flow vascular malformations that are histologically characterized by the lack of mural elements of mature vascular structures and intervening parenchymal neural tissue. Natural history studies of cavernous malformations show that they are often clinically quiescent, they may grow, bleed, and regress, but can also manifest clinically as neurologic deficits or seizures, especially in the setting of an acute hemorrhage. In the case of seizures, a careful correlation of electro-encephalographic studies, clinical semiology of the attacks and imaging studies is warranted, to ascertain whether it is in fact the cavernous malformation that is the cause of the epileptic activity.

The low-flow nature of cavernous malformations renders them inherently occult on cerebral angiography. Magnetic resonance imaging has become the mainstay imaging modality in evaluating cavernous malformations, producing characteristic imaging features that usually provide a straightforward diagnosis. Features on magnetic resonance imaging include a reticulated pattern of mixed hyper- and hypointensity on T1- and T2-weighted imaging, with a characteristic hypointense rim best appreciated on T2-weighted imaging or gradient-echo sequences.

Contrast enhancement is useful for revealing coexisting developmental venous anomalies that are frequently associated with sporadic cavernous malformations, and may further support the diagnosis. Susceptibility-weighted imaging is highly sensitive for cavernous malformations and accompanying developmental venous anomalies, and is superior to gradient-echo sequences in screening for multifocal, familial cavernous malformations.

References:
Akers A, Al-Shahi Salman R, A Awad I et al. Synopsis of Guidelines for the Clinical Management of Cerebral Cavernous Malformations: Consensus Recommendations Based on Systematic Literature Review by the Angioma

Alliance Scientific Advisory Board Clinical Experts Panel. Neurosurgery. 2017;80:665-680.

Campbell PG, Jabbour P, Yadla S, Awad IA. Emerging clinical imaging techniques for cerebral cavernous malformations: a systematic review. Neurosurg Focus. 2010;29:E6.

Dammann P, Barth M, Zhu Y et al. Susceptibility weighted magnetic resonance imaging of cerebral cavernous malformations: prospects, drawbacks, and first experience at ultra-high field strength (7-Tesla) magnetic resonance imaging. Neurosurg Focus. 2010;29:E5.

Wang KY, Idowu OR, Lin DDM. Radiology and imaging for cavernous malformations. Handb Clin Neurol. 2017;143:249-266.

Zabramski JM, Wascher TM, Spetzler RF et al. The natural history of familial cavernous malformations: results of an ongoing study. J Neurosurg. 1994;80:422-432.

RADIOSURGERY FOR BRAINSTEM CAVERNOMAS

Prof Dr Selçuk Peker

Brainstem cavernomas are life threatening pathologies. The first line treatment for a hemorrhagic brainstem cavernoma should be surgical removal. However, some cavernomas may not be suitable for surgery. This could be due to the localization of the lesion or systemic problems of the patient.

For those cavernomas, radiosurgery can be a solution. Many studies in the literature demonstrate the effectiveness of radiosurgery on these pathologies.

For the patients with hemorrhagic brainstem cavernomas, which is not suitable for surgery, radiosurgery is a good treatment option.

Sunday, October 27h, 2019

MULTIMODAL EXPERT FORUM 3

Hall 1

SNSS Tribute "Professor Madjid Samii Lecture"

THE CURRENT STATUS AND FUTURE OF DIRECT AVM SURGERY

Hiroki Kurita, MD, PhD, FJNE

Vice President,
Professor and Chairman, Department of Neurosurgery,
Director, Department of Cerebrovascular Surgery and Stroke Center,
International Medical Center, Saitama Medical University, JAPAN

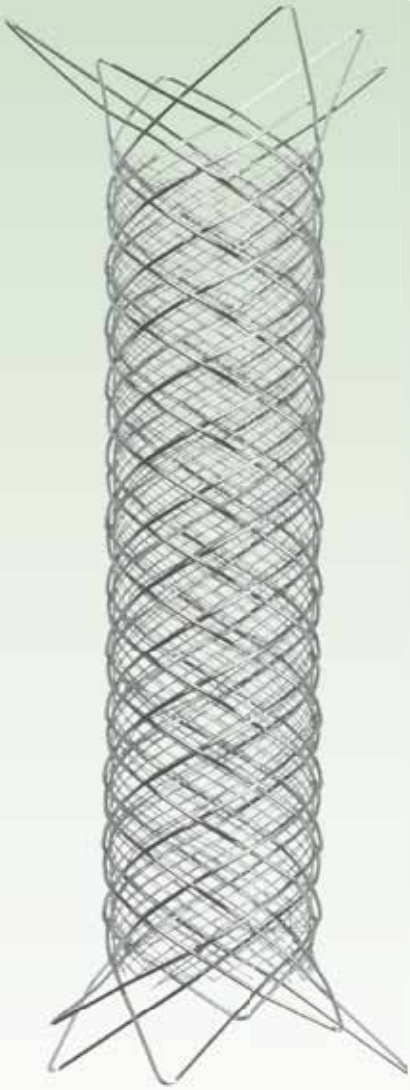
Background: Recently, the erosion of microsurgical case volume is significant due to the advances in endovascular and radiosurgical therapies for cerebral arteriovenous malformations (AVMs). Furthermore, controversy exists in the indication of invasive treatment in post ARUBA era.

Objectives: This presentation aimed to illustrate recent technologies and techniques to decrease treatment risks, and to discuss the efficacy and durability which make microsurgery a preferred option for AVMs.

Methods & Results: Between 2007-2018, 200 patients with cerebral AVMs underwent direct surgery in our institution. Spetzler-Martin grade was I-II in118, III in 51, and IV-V in 31. ARUBA-eligible AVM was found in 66. In current settings, preoperative embolization was used in 76% of the patients. Majority of scheduled surgery was performed in hybrid suit. Intraoperative selective 3D-angiography (and subsequent intraoperative embolization in selected cases) was very helpful for understanding of the microstructure of the complex lesions. After surgery, preoperative mRS was maintained in 91% of the patients. Reviews of ARUBA-eligible AVM patients also have demonstrated that microsurgery is still better than many new techniques and less invasive approaches.

Conclusions: Results of current surgical AVM management with our combined neurovascular team suggested that indication remains for surgical removal of AVMs. ARUBA shall not exterminate but centralize unruptured AVM surgical practice. The microvascular surgical practice for AVM of the future will require super-subspecialization, as well as other complex cerebrovascular diseases. Systemic training program for specialized vascular neurosurgeons remains to be elucidated.

TERUMO
INTERVENTIONAL
SYSTEMS



LIFE IS IN THE DETAIL

Terumo's ROADSAVER® Stent.
Sustained embolic protection. Featuring the unique double layer micromesh scaffold.

Roadsaver®
Carotid Artery Stent

IS521GB1115ITII

www.terumo-europe.com

INDUSTRY ENGAGEMENT HIGHLIGHTS

IPSL - ADOC
Complete neurovascular support for microcirculation and nerve function –Nuronorm
Dragana Lavrnic

IPSL - MEDTRONIC
Endovascular treatment aneurysms with wide neck on bifurcation with Web system
Slobodan Culafic

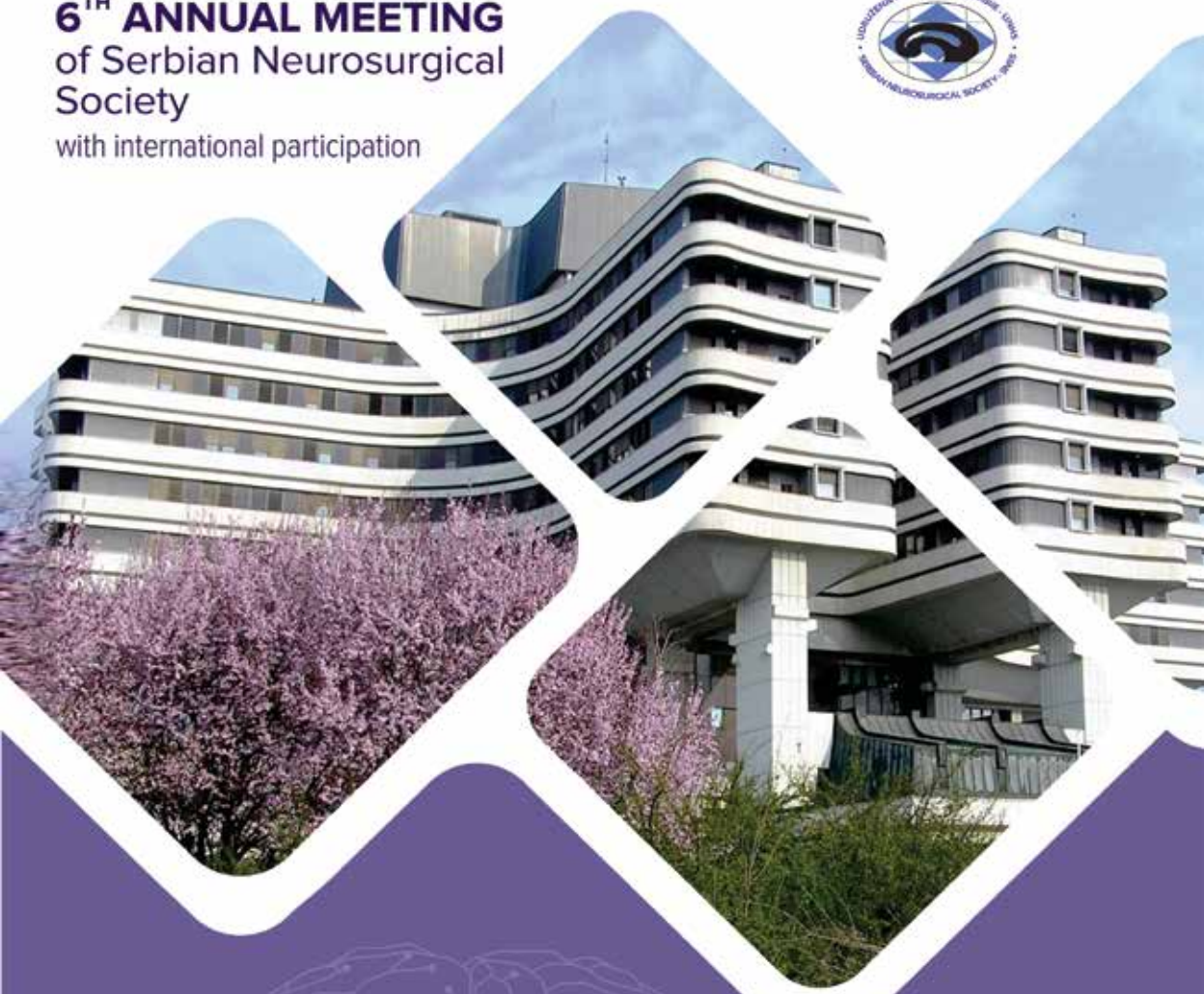
IPSL - VEMAX
Novel emerging therapeutical supplements in treatment of neurovascular disorders; augmentation biases in regeneration and sanation of the oxydative stress - myth or reality
Lukas Rasulic

IPSL BORMIA - VESALIO
New technologies in stroke treatment
Luka Novosel

IPSL - HEMOFARM
Hospital infections in the era of hybrid OR
Aleksandar Markovic

IPSL - GALENIKA
Contemporary and Practical Management of the enigmatic process: microcirculation and delayed nerve tissue ischemia
Vojin Kovacevic

6TH ANNUAL MEETING
of Serbian Neurosurgical Society
with international participation



CURRENT CONCEPT IN MILITARY NEUROSURGERY
THE STATE IN THE FIELD

November 27th-29th, 2020

Venue: Military Medical Academy
Crnotravska 17
BELGRADE, SERBIA

97th Anniversary
of Neurosurgery
in Serbia

82nd Anniversary
of Clinic for Neurosurgery,
Clinical center of Serbia

SNSS & SeENS

Technical support and organisation

ULTRA marine

Ultra Marine d.o.o.

tel. +381 11/334 81 58, fax. +381 11/334 82 55, +381 11/334 94 51

e-mail: office@ultramarine.rs




National Tourism
Organisation of Serbia

www.serbia.travel
@serbiatourism
#seeserbia







KOÇ HEALTHCARE

Vehbi Koç Foundation, a part of the Koç Group, Turkey's largest and Fortune 500 company, addresses the fundamental needs of life for a modern and developing Turkey through the promotion of education, health and culture. Koç Healthcare Institutions are non-profit world-class hospitals that prioritize research and education.

American Hospital, Koç University Hospital and MedAmerican Ambulatory Care Surgery Center operate under the roof of Koç Healthcare Institutions. Our greatest advantage is our human resources, with more than 4,700 employees, consisting of 666 physicians, 1,192 nurses, 2,507 administrative and supporting staff. In 2017, we treated approximately 400,000 patients in our healthcare institutions

Comprehensive Cancer Program
Our comprehensive cancer program is the first multidisciplinary service line consisting of specialized physicians, cancer nurses, psycho-oncologists and patient care coordinators who work together to provide the best available care to our cancer patients and their families in a caring environment. At our institutions, every cancer patient's treatment is planned during multidisciplinary cancer meetings in which specialists, each highly trained in their fields, share their knowledge and experience to offer a tailored treatment.

MD Anderson International Collaboration
Our partnership with the University of Texas MD Anderson Cancer Center in Radiation Oncology began in 2010 as the only satellite radiation treatment facility outside the United States. In 2016, we expanded this partnership by becoming an MD Anderson International Associate Member, granting us exclusivity rights over 22 countries. Today, besides Radiation Oncology, American Hospital provides healthcare services in every field involved in cancer treatment ensuring the identical quality and standards with MD Anderson Cancer Center

Gamma Knife Radiosurgery
Gamma Knife Radiosurgery Unit brings together a combination of extensive experience, up-to-date protocols from cutting-edge research and latest technology. Director of the Gamma Knife Radiosurgery Unit, Professor Selçuk Peker treated more than 7,000 patients and holds considerable number of internationally recognized publications to his name. With powerful human capital and the most precise radiosurgery system on the market, patients with cranial disorders will receive the finest care possible. We are proud to say Koç Healthcare Institutions are among the first healthcare providers in Turkey to implement the latest radiosurgery system, found in selected centers worldwide. Our Gamma Knife Radiosurgery Unit has the capacity to serve approximately 2,000 patients each year.

Bone Marrow Transplantation Unit
In accordance with our Comprehensive Cancer Program, bone marrow transplantation unit started admitting patients in the second half of 2016 at Koç University Hospital. The unit consists of 14 HEPA-filtered air-locked single rooms, a flow-cytometry laboratory, and a cell manipulation laboratory with a clean room. Under three internationally acknowledged academics in lead, the unit has already proven to become our newest excellence center with an annual capacity of 120 patients. Pediatric bone marrow transplantation unit will be in operation in 2018, which will be a great step forward for our pediatrics service line.

Living Heart Cardiovascular Service Line
Living Heart is a multidisciplinary cardiovascular program that congregates a high-qualified team from Cardiac Surgery, Cardiology and Vascular Surgery departments supported by advanced technology.
With a flow of 5000 minimally invasive operations yearly, numerous innovative approaches and techniques are introduced to the literature by our competent cardiac surgeons. Haldun Karagöz, M.D., director of the Living Heart Cardiovascular Service Line, is one of the leading cardiovascular surgeons of the world and developed various surgical techniques and he is the first surgeon in the world to perform a coronary bypass operation in an awake patient. Genco Yücel, M.D., a world-renowned interventional cardiologist, is the first physician to execute TAVI and Mitraclip operations in Turkey. The collaboration within the team combined with the accreditation from the "European Association of Echocardiography" allow us to continue being the most respected and leading cardiovascular center in the nation.

Spine Center
Spine Center is a multi-disciplinary clinical program that brings together physical therapy, rehabilitation, neurology, neurosurgery, rheumatology and orthopedics departments. The center, led by 6 reputable academicians from different disciplines, provides services for various degenerative spinal disorders to complex congenital scoliosis, each case being evaluated individually to offer a tailored treatment.

Robotic Surgery
Gynecology, General Surgery and Urology are the main surgical departments that utilize Robotic Surgery in our institutions. Most up-to-date technology combined with highly experienced surgeons, patients are receiving the best care possible.

Organ Transplantation Center
Organ Transplantation is a serious need in all over the world. Koç University Hospital offers organ transplantation in a high quality level based on an advanced global standard of care. The mentor and the chief of the Koç University Hospital Organ Transplantation Center is the worldly renowned transplant surgeon Professor Münci Kalayoğlu, M.D. Dr. Kalayoğlu served as the chief of the Wisconsin University Medical School Liver Transplant Center. He is also recognized as one of the most innovative 20 pediatric surgeons alive today in the world.

Koç University Hospital Organ Transplantation Center offers kidney, pancreas, liver transplant operations by an internationally experienced team under the leadership of Professor Burak Koçak, M.D. and Assistant Professor Turan Kanmaz, M.D. Koç University Hospital Pediatric Organ Transplantation Program offers kidney and liver transplant operations.

Don't trap and drag the clot
when you can ***Capture & Retain***

VESALIO™

VESALIO is pleased to introduce
FIRST PASS
CLOT REMOVAL TECHNOLOGY

NeVa™

CONTACT
vesalio.com
info@vesalio.com
615.206.7788

PN LV-MKT-002 REV B

ENGINEERED FOR **First Pass Success by Capturing & Retaining All Clot Types**

OPTIMIZED RADIAL FORCE – bi-directional radial force is optimized for clot capture

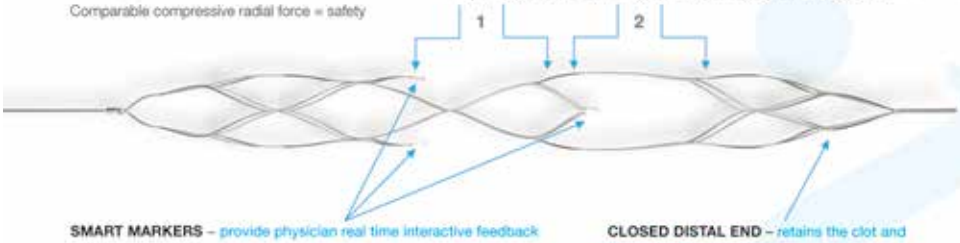
Proven higher expansive radial force = improved clot integration

Comparable compressive radial force = safety

DROP ZONE TECHNOLOGY – captures the clot inside the device

Specific areas that allow the clot to drop inside the device, all types of thrombi (soft, organized, hard)

Hybrid stent design with large offset openings optimize clot capture



SMART MARKERS – provide physician real time interactive feedback

Placed at the leading edge of the Drop Zones, the tandem markers are offset 90 degrees

Assists operator in considering type of clot, integration and timing & distance of pull

Binary code gives input as to location of clot relative to device

CLOSED DISTAL END – retains the clot and fragments for extraction

Creates an end cap to support the Drop Zones

Reduces downstream migration

PRODUCT FAMILY

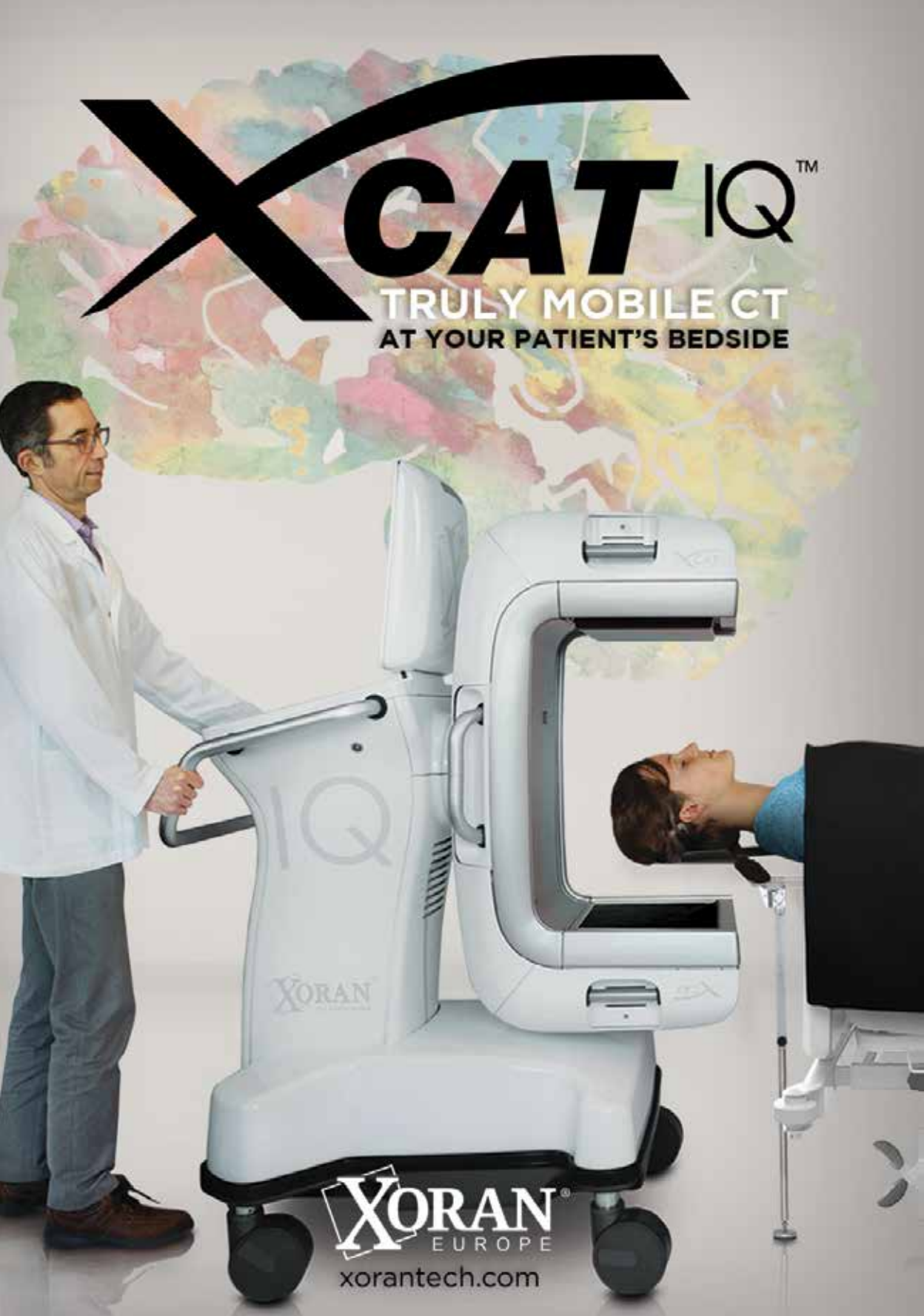
Product No.	Product Name	GTIN	Diameter	Device Total Length	Device Working Length	Recommended Vessel Diameter	Pusher Wire Length
30040V-T	NeVa T	00851279008002	4.5 mm	57 mm	37 mm	≤ 4.5 and ≥ 2.0 mm	180.0 cm
30041V-TL	NeVa Tx	00851279008040	4.5 mm	57 mm	37 mm	≤ 4.5 and ≥ 2.0 mm	300.0 cm
30010V-M1	NeVa M1	00851279008019	4.0 mm	48 mm	30 mm	≤ 3.5 and ≥ 2.0 mm	180.0 cm
30011V-M1L	NeVa M1x	00851279008057	4.0 mm	48 mm	30 mm	≤ 3.5 and ≥ 2.0 mm	300.0 cm
30020V-MS	NeVa M1-S	00851279008026	4.0 mm	39 mm	22 mm	≤ 3.5 and ≥ 2.0 mm	180.0 cm
30021V-MSL	NeVa M1-Sx	00851279008064	4.0 mm	39 mm	22 mm	≤ 3.5 and ≥ 2.0 mm	300.0 cm
30050V-VS	NeVa VS	00851279008033	4.0 mm	38 mm	22 mm	≤ 4.0 and ≥ 2.0 mm	180.0 cm
30051V-VSL	NeVa VSx	00851279008071	4.0 mm	38 mm	22 mm	≤ 4.0 and ≥ 2.0 mm	300.0 cm

CE 0297

S. BOULARDII BULACOL®

Saccharomyces boulardii kapsule 250/500 mg

Hemofarm
STADA GRUPA


XCAT IQ™
TRULY MOBILE CT
AT YOUR PATIENT'S BEDSIDE
XORAN
EUROPE
xorantech.com

Neuronal®

ZA BRZ OPORAVAK OŠTEĆENIH NERAVA

NEURONAL® SADRŽI NCFR-6 JEDINSTVENU KOMBINACIJU NUKLEOTIDA I VITAMINA.

Sastav	Tableta
Nukleotid (UMP)	50 mg
Niacin	20 mg
Vitamin B6	4,2 mg
Vitamin B1	3 mg
Folati	400 µg
Vitamin B12	9 µg

- ✓ PODRŠKA TRETMANU KOMPRESIVNIH NEUROPATIJA
- ✓ UBRZAVA PROCESE OBNOVE I REGENERACIJE OŠTEĆENIH NERAVA
- ✓ SMANJUJE POTREBU ZA KORIŠĆENJEM ANALGETIKA
- ✓ JEDNOSTAVNO DOZIRANJE - JEDNA KAPSULA DNEVNO

CombiNERV®

INOVATIVNA ČETVOROSTRUKA KOMBINACIJA ZA PODRŠKU TRETMANU PERIFERNIH NEUROPATIJA

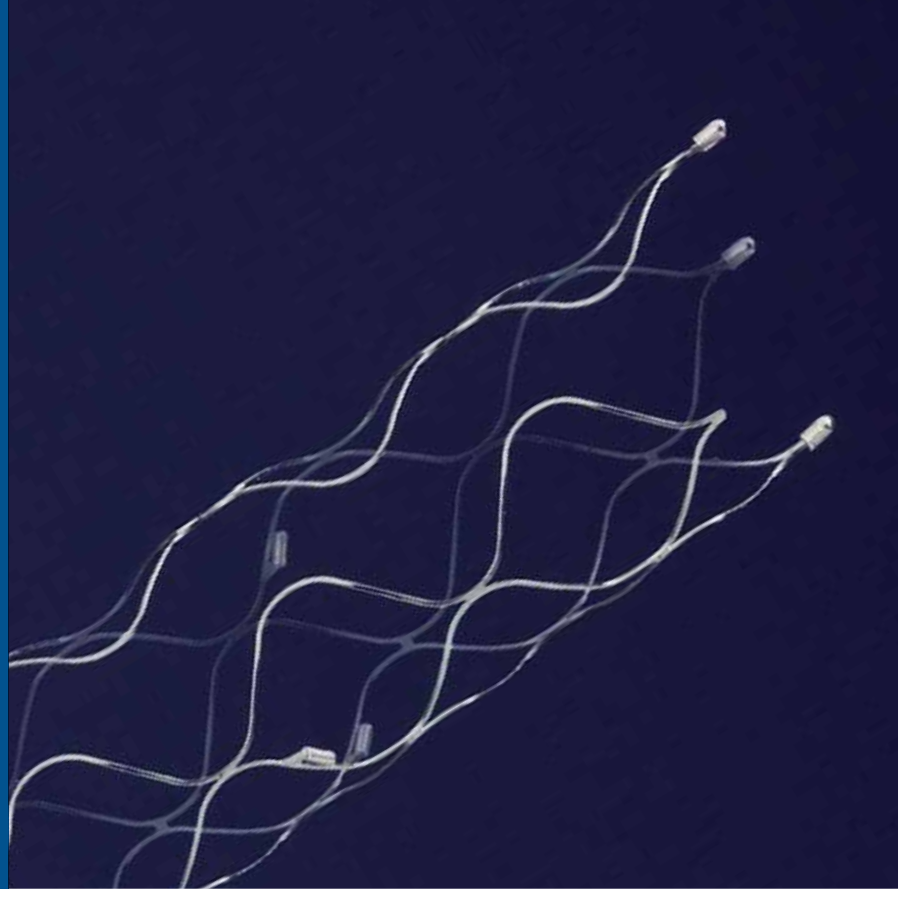
INOVATIVNA ČETVOROSTRUKA KOMBINACIJA		
Preporučena dnevna doza: 1 tableta		
Sastav	Tableta	% PDD
ALPHA LIPOIC ACID MATRIS® RETARD	570 mg	
ACETYL-L-CARNITINE	300 mg	
SOD GLISODIN®	10 mg	
VITAMIN B12	2,5 µg	100

VEMAX PHARMA

www.vemaxpharma.rs

medicinalis+ LIBYTEC

INTRODUCING THE NEW SOLITAIRE™ PLATINUM REVASCULARIZATION DEVICE



Medtronic

Further, Together

Icon.

At the forefront of intracranial care.

Leksell Gamma Knife® Icon™ provides clinically-proven, unmatched precision with 2x-4x better sparing of normal brain tissue.

elekta.com/icon

Please visit us at Elekta's booth during the WFNS 2019 International Meeting.

Focus where it matters.

45133711538 03.17

Galenika

Bedoxin®
piridoksin

Bensedin®
diazepam

Venlax®
venlafaksin

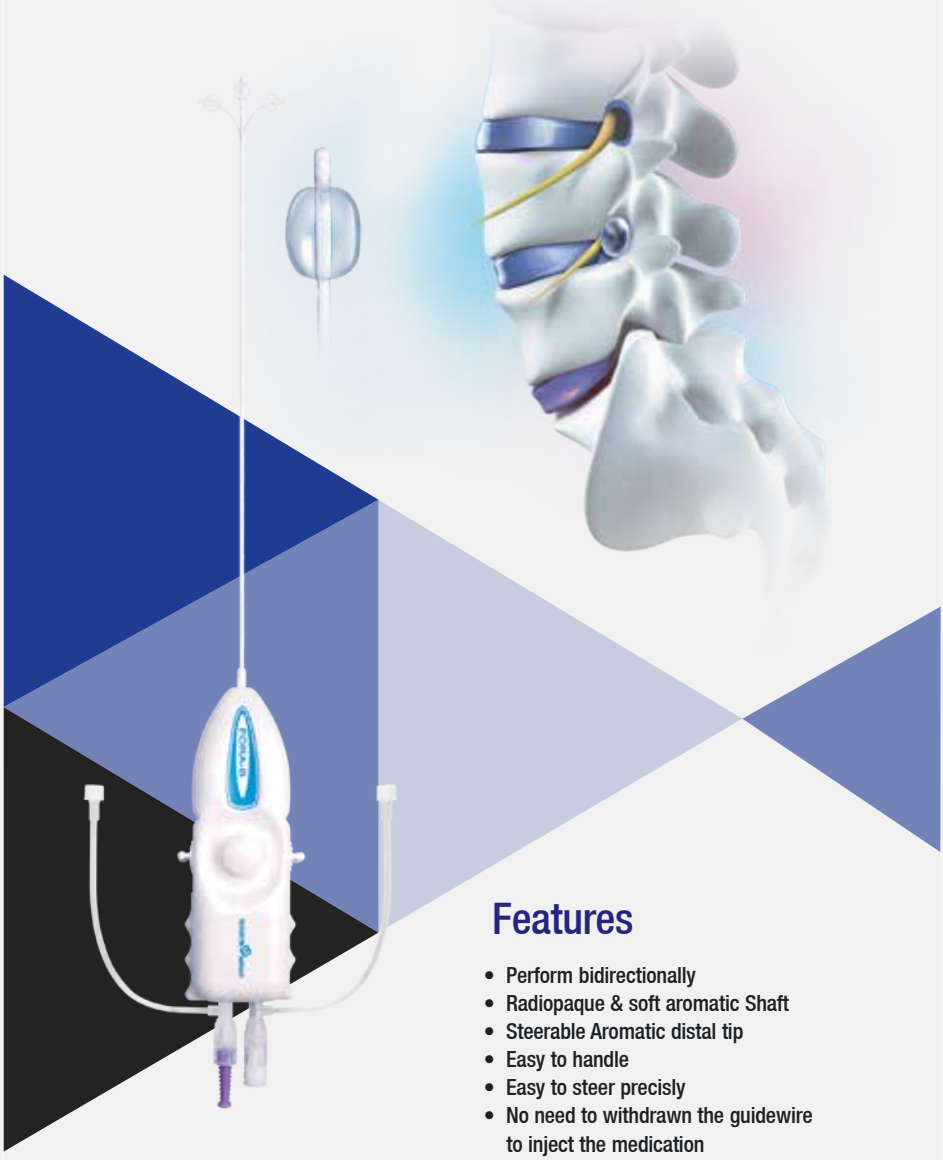
Damaton®
pentoksifilin

Clopigal®
klopidogrel

FORA-B

Steerable Epidural Balloon Catheter

Minimally invasive
Rapid recovery time



Features

- Perform bidirectionally
- Radiopaque & soft aromatic Shaft
- Steerable Aromatic distal tip
- Easy to handle
- Easy to steer precisly
- No need to withdrawn the guidewire to inject the medication

"Steerable Neurolysis Catheter Technique", this proven method has been used to decompress spinal nerves without open surgery and lastingly alleviate the pain associated with acute and chronic spine disorders. FORA-B which is a sort of steerable neurolysis catheter technique systems for the foresaid proven method has the control handle to steer and ideally target with precision through the spinal canal for precise treatment of pathology.

CORRIGENDUM:

Oral Presentations in Program and Abstract book

In the abstract
"Pure DVA patient presented with Intracerebral Hematoma: A rare case" by Utku Ozgen et al.,
the name Mustafa Selim Şahin has been added
and he will be a presenting author within the session
ORAL PRESENTATIONS 1 on Friday, October 25th, 2019.

In the abstract
"Surgical Outcomes of Pons Cavernomas Operated with Subocipital Craniectomy" by Utku Ozgen et al.,
the name Mustafa Selim Şahin has been added
and he will be a presenting author within the session
ORAL PRESENTATIONS 2 on Saturday, October 26th, 2019.

Abstract **"Embolisation of giant fusiform intracranial aneurysm of the left carotid artery using flow diverting stent"** by Svetlana Milosevic Medenica, Igor Pirkovic*, Dragoslav Nestorovic, Filip Vitosevic, Lukas Rasulic
has been added in the session ORAL PRESENTATIONS 1
on Friday, October 25th, 2019 and in the Abstract book.
Igor Pirkovic will be a presenting author.

EMBOLISATION OF GIANT FUSIFORM INTRACRANIAL ANEURYSM OF THE LEFT CAROTID ARTERY USING FLOW DIVERTING STENT

Svetlana Milosevic Medenica, Igor Pirkovic*, Dragoslav Nestorovic, Filip Vitosevic, Lukas Rasulic

Clinical Center of Serbia, Belgrade, Serbia
*presenting author

Introduction: Flow Diverter stents (FD) are relatively new endovascular devices for treatment of complex, fusiform and wide-neck intracranial aneurysms. Diversion of blood flow in the parent artery, with reduction of inflow in the aneurysm sac and subsequent thrombosis is the main mechanism of these stents.

Case report: A 40-year-old male who had constant headaches and lower face paresthesia on the left side underwent MDCT angiography which showed a giant fusiform aneurysm located on the left internal carotid artery (segments C4-C7), with visible part of aneurysm sac measuring 11,5 mm in diameter and maximum length of 26 mm. FD stent measuring 5,5 mm in radius, with length of 50 mm was successfully deployed across the aneurysm. The procedure and post-procedural course were uneventful.

Conclusion: After 3 months, MDCT angiography showed complete obliteration of the aneurysm with good patency of the branching vessels originating from the deployed segment.

Keywords: Flow diverter stent, Fusiform aneurysm, Carotid artery

PROGRAM & ABSTRACT BOOK
5TH ANNUAL MEETING OF SERBIAN NEUROSURGICAL SOCIETY

Urednik: Prof. Dr Lukas Rasulić

Kragujevac, 2019.

Izdavač:
Udruženje neurohirurga Srbije, Beograd

Za izdavača:
Prof. Dr Lukas Rasulić

Štampa:
Štamparija Grafostil d.o.o., Kragujevac

Tiraž: 300

ISBN 978-86-80922-01-0

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд
616.8-089:005.745(497.11)"2019"(083.97)
616.8-089(048)

UDRUŽENJE neurohirurga Srbije (Beograd). Godišnji sastanak sa međunarodnim učešćem (5 ; 2019 ; Kragujevac)
Neurovascular supersessions : exo? endo? hybrid? quo vadis? : [program & abstract book] / 5th Annual meeting of Serbian Neurosurgical Society, SNSS Annual Meeting 2019 with international participation, October 24th - 27th 2019, Kragujevac. - Beograd: Udruženje neurohirurga Srbije, 2019 (Kragujevac : Štamparija Grafostil). - 268 str. : ilustr. ; 24 cm
Tiraž 300.

ISBN 978-86-80922-01-0

a) Удружење неурохирурга Србије (Београд). Годишњи састанак са међународним учешћем (5 ; 2019 ; Крагујевац) -- Програми b) Неурохирургија -- Апстракти

COBISS.SR-ID 280758284

EANS2020 Belgrade

October 18 – 22

SEE YOU IN BELGRADE!

TRENDS. INSIGHTS. INNOVATIONS.

Neurosurgery beyond technology.

SAVE THE DATE

eans2020.com

Sign up to find out more and have a chance of winning a **free registration** to EANS2020 Belgrade: eans2020.com