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EVALUATION OF PAIN FOLLOWING THE USE OF SCALPEL VERSUS ELECTROSURGERY FOR SKIN INCISIONS IN THE FACIAL REGIONS

Margarita Peneva[1], Andrijana Gjorgjeska[1], Smilja Tudzarova Gjorgova[1], Boro Dzonov[1], Lazo Noveski[1], Vladimir Ginoski[1], Roza Dzoleva Tolevska[2], Hristina Breshkovska[1]

[1] University Clinic for Plastic and Reconstructive Surgery, Medical Faculty, Ss. Cyril and Methodius University, Skopje, Republic of Macedonia

[2] University Clinic for Orthopedic surgery, Medical Faculty, Ss. Cyril and Methodius University, Skopje, Republic of Macedonia

Corresponding author: Margarita Peneva, University Clinic for Plastic and Reconstructive Surgery, Medical Faculty, Ss. Cyril and Methodius University, Skopje, Republic of Macedonia, e-mail: mapeneva@yahoo.com

ABSTRACT

Introduction: Postoperative pain presents a significant medical problem. It can create a considerable discomfort in the immediate postoperative period and thus increase patient's morbidity. Multiple mechanisms are involved in its' etiology, one of them being the method of tissue incision. The aim of this study is to compare the early postoperative pain following incision with two different methods, scalpel and electrosurgery in the facial regions.

Material and methods: Eighty patients with both benign and malignant skin lesions in the facial regions undergoing surgery were enrolled in this study. Patients were randomized in two groups. In group A, comprising 40 patients, cold steel surgical scalpel №15 was used for the surgical procedure. Electrosurgical microneedle with 0.06mm tip radius and generator unit KLS Martin Electrosurgical Unit ME MB 2 set on cutting mode, power 12 W was used for performing the surgery in group B including the same number of patients. After the surgery patients were given analgesics on their demand. The total number of on demand analgesics requirements was calculated. The patients were also asked to note the oral analgesics they were taking after being released from the hospital.

Results: Results of this study showed a statistically significant difference between the groups in the analgesics demand on the day of the operation ($p=0.041$). On the day of the operation 52.5% patients in the scalpel group and only 30% of the patents of the electrosurgery group received analgesics on demand. In all other analysed time points, the patients in the scalpel group received analgesics more often than the patients in the microneedle group, but with no statistically confirmed difference between the groups ($p>0.05$). Even more significant is the fact that patients treated with electrosurgery that needed analgesics, had significantly bigger excision area median 471 (rank 283-589) compared to the patients treated with the conventional method 289 (rank 177-432) ($p=0.016$).

Conclusion: In accordance with previous studies our results suggested a significantly reduced postoperative pain in the electrosurgery group.

Keywords: postoperative pain, scalpel, electrosurgery, analgesia, facial region

INTRODUCTION

Postoperative pain presents a significant medical problem. It may create a considerable discomfort in the immediate postoperative period and thus increase patient's morbidity. Multiple mechanisms are involved in its' etiology including nociceptive transduction, activation and sensitization of peripheral nociceptors and central neurons, and loss of descending inhibition of neurons in the brainstem and spinal cord [1].

Then again the severity of postoperative pain is influenced by factors such as anesthesia, analgesia and techniques of surgery including the method of incision of tissues [2].

Conventionally the most common method of cutting in surgery is by using the scalpel. The incisions made with the scalpel are sharp and very precise causing only mechanical injury to the tissue together with profound bleeding, which can sometimes obscure the operating field, resulting in wastage of operating time [3, 4].

In recent time alternative methods for performing incisions are gaining popularity with electrosurgery being one of the most popular.

Electrosurgery can be described as application of a high-frequency alternating electrical current to biological tissue as a means to cut, coagulate, desiccate, or fulgurate tissue. The effect is based upon transformation of electrical energy into heat [5, 6].

Several studies have compared the use of electrosurgery to traditional scalpel in skin incisions. The benefits of electrosurgery include reduced blood loss, dry and rapid separation of the tissue, and a possible decrease in the risk of accidental injury caused by the scalpel to operative personnel. Also electrosurgically sealed vessels demonstrated clinically equivalent bursting pressures when compared with vascular staples, titanium clips, and sutures, and significantly higher pressures when compared with the scalpel in vessels in the 4to7mm diameter range [7-11].

Most of the studies proved the superiority of electrosurgery over scalpel regarding the pain levels [6,7] [12-17]. Still, there are not many studies evaluating the postoperative pain regarding the use of electrosurgery in the facial regions.

A good pain control will not only alleviate patient's distress but lead to reduced stress response important to patients to preserve their quality of life. Pain relief is imperative as it lightens patient's anxiety and helps in rapid uncomplicated recovery.

MATERIAL AND METHODS

After the approval of the Ethic committee of the Medical Faculty Ss. Cyril and Methodius University in Skopje, eighty patients with both benign and malignant skin lesions in the facial regions undergoing surgery were enrolled in this study. All the patients were operated at the University Clinic for Plastic and Reconstructive Surgery in Skopje, Macedonia.

Patients were randomized in two groups using the envelope randomization method. Each group comprised 40 patients. A cold steel surgical scalpel № 15 was used for the surgical procedure in group A whereas electrosurgical microneedle with 0.06 mm tip radius and generator unit KLS Martin Electrosurgical Unit ME MB 2 set on cutting mode, power 12 W was used for performing the surgery in group B. The haemostasis was controlled only with electrosurgery through surgical forceps in both groups using the same generator unit set on coagulation mode power 20 W.

Surgical procedures were performed under local infiltrative anesthesia (lidocaine 1% with adrenalin) as to standard practice.

In each surgical procedure the proposed skin excision was marked and its' area was calculated accordingly. In all the cases only skin and superficial part of the subdermal tissue were excised.

Antibiotic prophylaxis was not provided according to the recommendations of Centres for Disease Control and Prevention in USA [18].

After the surgery patients were given oral or parenteral (intramuscular or intravenous) analgesics on their demand. The total number of on demand analgesics requirements was calculated. The patients were also asked to note the oral analgesics they were taking after being released from the hospital.

All the patients were informed about the nature of the skin incision and written informed consent was signed.

The study was conducted as prospective randomized study.

RESULTS

Data analysis was achieved using the statistical program Statistics for Windows 7.0. A value of $p<0.05$ was considered statistically significant.

Both groups of patients were homogenous according to the sex structure (p=0.64). The mean age of the patients in group A was 61.45 ± 19.8, and the mean age of the patients in group B was 69.03 ± 11.9.

The indication for surgery in terms of underlying diagnosis did not differ significantly between the groups and malignancy was diagnosed in majority of patients in each group.

Results of this study showed that on the day of the operation, the patients in the scalpel group received analgesics significantly more often compared to the patients of the electrosurgery group (p=0.041). Namely, on the day of the operation analgesics on demand received 52.5% of the patients in the scalpel group where as only 30% of the patents of the electrosurgery group (Table 1).

In all the other analysed time points, the patients in the scalpel group received analgesics more often than the patients in the microneedle group, but with no statistically confirmed difference between the groups (p>0.05) (Table 1).

During the total period of the follow up (4 postoperative days), analgesics demanded 55% of the patients operated with scalpel, and 37.5%

Table 1. *Postoperative analgesia – comparative by days*

Postoperative analgesia	Method			p value
	n	Scalpel	Microneedle	
Postoperative analgesia- Day of operation				
No	47	19 (47.5%)	28 (70%)	[a]0.041 sig
Yes	33	21 (52.5%)	12 (30%)	
Postoperative analgesia - First postoperative day				
No	62	28 (70%)	34 (85%)	[a]0.11 ns
Yes	18	12 (30%)	6 (15%)	
Postoperative analgesia- Second postoperative day				
No	70	34 (85%)	36 (90%)	[a]0.49 ns
Yes	10	6 (15%)	4 (10%)	
Postoperative analgesia - Third postoperative day				
No	74	35 (87.5%)	39 (97.5%)	[b]0.2 ns
Yes	6	5 (12.5%)	1 (2.5%)	
Postoperative analgesia - Fourth postoperative day				
No	77	38 (95%)	39 (97.5%)	[b]1.0 ns
Yes	3	2 (5%)	1 (2.5%)	

[a]p (Chi-squaretest)[b]p (Fisher exact two-tailed)

Table 2. P*ostoperative analgesia – summation*

Postoperative analgesia	Method			p value
	n	Scalpel	Microneedle	
No	43	18 (45%)	25 (62.5%)	0.12 ns
Yes	37	22 (55%)	15 (37.5%)	

p (Chi-squaretest)

Table 3. *Comparison between the excision surface area and received analgesia*

Groups	Area excision for receiving analgesia (mm²)			p value
	n	mean ± SD	median (IQR)	
Scalpel	22	367.64 ± 302.9	289 (177- 432)	0.016sig
Microneedle	15	516.53 ± 252.9	471 (283 - 589)	

p (Mann-Whitney test)

of the patients operated with electrosurgery. The results showed that post-operative analgesia was more often indicated when surgical scalpel was used as a method of work, but with no statistical significance (p=0.12) (Table 2).

Especially significant is the fact that patients treated with electrosurgery that needed analgesics had significantly bigger excision area, median 471 (rank 283-589) compared to the patients treated with the conventional method-median 289 (rank 177-432) (p=0.016) (Table 3).

As a conclusion, patients treated with electrosurgery not only asked for less analgesic, even more, they needed analgesics when having bigger excision areas.

DISCUSSION

A systemic review and meta-analysis found that post-operative pain appeared to be reduced in most of the studies [14].

In his study comparing diathermy versus scalpel incisions in elective midline laparotomy, Kerns et al. found that electrosurgery produced significantly less postoperative pain on the first and second postoperative day when compared to scalpel incisions. Morphine requirements were significantly lower over the first 5 postoperative days in the electrosurgical incision group, in their study [12].

Chrysos et al. in their prospective study comparing electrosurgery and scalpel incisions in tension free inguinal hernioplasty with regard to parenteral analgesic requirements noted reduced postoperative pain in the electrosurgery group as compared to scalpel group in the initial two postoperative days [17].

Mirza et al. found strong difference in the mean postoperative pain score comparing scalpel versus electrosurgery incision in head and neck surgeries (thyroidectomy, neck dissection, excision of neck mass) on the first postoperative day [7].

In the same context, the study of Diva Shrestha highlights the advantage of skin incision with electrosurgery as compared to scalpel skin incision in terms of less postoperative pain in ENT head and neck surgery patients [2].

In accordance with previous studies our results suggest a significantly reduced postoperative pain in the electrosurgery group on the day of the operation and continuing the trend in the following days although with no statistical significance. Another important statistical significance was noticed when excision areas were compared. Namely, patients treated with electrosurgery that required analgesics had significantly bigger excision area compared to the patients treated with scalpel and demanding analgesics (p=0.016).

Most studies suggest that the lower post-operative pain with cutting mode electrosurgery is due to the thermal effect on the sensory nerve fibers. Using current to cut the sensory cutaneous nerves fibers and to subsequently disrupt the pain transmission, causes on histological level cell vaporization and immediate nerve tissue necrosis without significantly affecting adjoining structures, thus leaving the rest of the tissue's architectonics intact. Therefore, the application of a pure sinusoidal current produces total or partial injury to the sensitive nerves fibers in the excised wound area, securing less bleeding and distortion of the surrounding connective tissue, and reducing postoperative pain in patients who had electrosurgical skin facial incision or excision [17, 19].

CONCLUSION

Taking into consideration the knowledge of especially abundant amount of nociceptors and rich sensitive innervation of the face, our study once again showed that using the electrosurgery for skin incisions reduced the need for post-operative use of analgesia, thus decreasing the pain in one of the most delicate parts of the body i.e. the facial region. Although we hope that our study will only encourage further analyses and bias improvements, we strongly recommend the utilization of electrosurgical skin incision in the facial region, altogether in order to improve the patients' well-being during and after surgery by reliving the post-operative pain.

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Резиме

АНАЛИЗА НА БОЛКАТА ПРИ ХИРУРШКИ РЕЗОВИ НАПРАВЕНИ СО СКАЛПЕЛ НАСПРОТИ ЕЛЕКТРОХИРУРШКИ КОЖНИ РЕЗОВИ ВО ПРЕДЕЛОТ НА ЛИЦЕВАТА РЕГИЈА

Маргарита Пенева[1], Андријана Ѓорѓеска[1], Смиља Туџарова Ѓоргова[1], Боро Џонов[1], Лазо Новески[1], Владимир Гиноски[1], Роза Џолева Толеска[2], Христина Брешковска[1]

[1] Универзитетска клиника за пластична и реконструктивна хирургија, Медицински факултет, Универзитет „Св. Кирил и Методиј“ – Скопје, Република Македонија

[2] Универзитетска клиника за ортопедија, Медицински факултет, Универзитет „Св. Кирил и Методиј“ – Скопје, Република Македонија

Вовед: Постоперативната болка претставува голем медицински проблем. Таа може да создава значаен дискомфор во непосредниот постоперативен период и со тоа да го зголеми морбидитетот на пациентот. Повеќе механизми се инволвирани во нејзината етиологија, а еден од нив е и методот на ткивна инцизија. Целта на оваа студија е да се спореди раната постоперативна болката кај хируршки резови направени со скалпел наспроти електрохируршки кожни резови во пределот на лицевата регија.

Материјали и методи: Студиската популација се состои од вкупно 80 пациенти, кај кои беа хируршки отстранети бенигни или малигни кожни промени во пределот на лицевата регија. Пациентите беа рандомизирани во две групи. Во групата А беа рандомизирани 40 пациенти кај кои хируршките резови во пределот на лицевата регија беа направени со употреба на конвенционален хируршки скалпел број 15, а другите 40 пациенти (група Б) беа оние кај кои хируршките резови во пределот на лицевата регија беа направени со електрохирургија со електрода во облик на микроигла и димензија на нејзиниот врв од 0,06 милиметри. Притоа, за сечењето користен беше модусот „pure cut“, со вредност 12W од електрохируршки генератор KLS Martin Electrosurgical Unit ME MB 2. Се нотираше постоперативната аналгезија во првите 24 часа и следствено 2-7 постоперативен ден, а која се даваше по барање на пациентите. Исто така, од пациентите се бараше да ги запишуваат постоперативните орални аналгетици што ги земаа по нивното излегување од болница

Резултати: Резултатите од ова испитување покажаа статистички значајна разлика меѓу двете групи во однос на потребата од аналгетици на денот на операцијата (p=0,041). На денот на операцијата 52,5% од пациентите оперирани со скапел и само 30% од пациентите оперирани со електрохирургија добиле аналгетик на нивно барање. И во сите други анализирани временски точки пациентите оперирани со скалпел почесто примале аналгетици споредно со пациентите оперирани со електрохирургија, но без статистички потврдена разлика меѓу двете групи (p>0,05). Уште позначаен е фактот дека пациентите третирани со електрохирургија, кои имале потреба од аналгетици, имале сигнификантно поголема површина на ексцизија [median 471 (rank 283-589)] споредено со пациентите третирани со конвенционална метода [289 (rank 177-432) (p=0,016)].

Заклучок: Во согласност со резултатите од претходните студии, и нашите резултати сугерираат сигнификантно помала постоперативна болка во групата пациенти третирани со електрохиругија.

Клучни зборови: постоперативна болка, скалпел, електрохирургија, аналгезија, лицева регија