# EXTRACOLONIC FINDINGS AT COMPUTED TOMOGRAPHIC COLONOGRAPHY IN SYMPTOMATIC PATIENTS: RETROSPECTIVE STUDY

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## INTRODUCTION:

As a result of the advances in CT scanner technology and the development of specific software for data analysis, computed tomographic colonography (CTC) became a minimally invasive, patient-friendly, safe and robust radiological tool for evaluating colorectal lesions (1). The diagnostic performances of CTC for the detection of colorectal cancer and large polyps are similar to colonoscopy and surpassing the well-known barium enema (2) (3) (4). The role of CTC in screening settings is well established, but it could also be used in symptomatic patients as a colonoscopy alternative (5) (6).

The cross-sectional nature of CTC grants the opportunity of examining anatomical structures in the scanning range in a limited fashion with low-dose. In addition to the colorectum, abdominal parenchymal organs, vessels, bones, and soft tissue are also depicted. As a result unsuspected extracolonic findings are inevitably detected for which the potential burden vs. gain is still subject of debate (4). The benefits of identifying extracolonic findings were potentially life-saving in a small percentage of patients (0.5-1.3 percent) (3). On the other hand most of them are clinically insignificant but clarification often requires further investigations, including biopsy and even surgery, which may be worrisome, costly, and occasionally harmful, all for no ultimate benefit in most patients. By intravenous (IV) administration of contrast medium additional extracolonic lesions are detected, but the number of clinically significant lesions did not increased (7).

A system for categorization of extracolonic findings was established by the working group for virtual colonoscopy in 2005 as a component of the CTC reporting and data system (C-RADS) (8). Most of the extracolonic findings have been classified as clinically unimportant by prior research. The effect of the detection of the extracolonic findings at CTC remains controversial (4). The purpose of this study is to analyze the incidence and significance of extracolonic findings at CTC with IV contrast in symptomatic adults when colonoscopy is not an option.

Material and methods:

This is a retrospective review of all CTC studies performed at the University Clinic of Radiology in Skopje, Macedonia, from January, 2011 to December, 2015. A signed informed consent was waived for this study. At our institution, CTC is performed as an alternative to incomplete colonoscopies or it is done to patients who refuse to undergo colonoscopy. Each patient has been referred to CTC by gastroenterologist or by an abdominal surgeon as a result of change in bowel habit, abdominal pain, rectal bleeding, anemia or weight loss. Exclusion criteria included a history of malignancy, abdominal surgery or positive findings on previous abdominal CT examination. The study includes 83 consecutive symptomatic patients, 47 of them women and 36 men, with median age of 58.6 years, ranging from 15 to 85 years. The median age for women was 56.6 years (range, 18–83 years) and the median age for men was 61.2 years (range, 26–85 years). The CTC technique used in our institution is standardized. All of the patients undergo bowel preparation before CTC using a cathartic osmotic cleansing agent. On the day before examination patients also follow a clear liquid diet. Positive fecal tagging is not included in the procedure preparation. Intravenous spasmolytic is not being administrated. The distension of the colon is achieved by controlled insufflation of room air the by the radiologist using a standard handheld air bulb insufflator. The colonic distention is assessed by the radiologist after obtaining scout images in anteroposterior projection (9). Scanning is being performed on multidetector computed tomography scanner with 64 rows of detectors (Somaton Definition AS, Siemens) with the following parameters: 0.6-mm collimation, 0.7-mm reconstruction interval, tube-current modulation (range, 30–200mA) and 120 kVp. Both supine and prone acquisitions are being obtained for all patients. Additional prone acquisition is obtained 70 seconds after intravenous application of iodine contrast (3mL/s; 1ml per kg body weight) with the following parameters: 1.2-mm collimation, 5-mm reconstruction interval, tube-current modulation (range, 30–400mA) and 120 kVp. The CT colonography studies presented in this paper were interpreted by a radiologist with 10 years of experience in abdominal cross section imaging. In terms of colorectal evaluation, the study was considered positive if any polyps 6 mm or larger were detected. Extracolonic evaluation was done on supine images, pre and post contrast, including standard review with soft-tissue, lung, and bone windows. Extracolonic findings (ECFs) were defined as findings on CTC that

were unsuspected and unrelated to the colon. This excludes findings such as anatomic anomalies or variations. Vascular calcifications, degenerative disease of the spine without significant spinal canal stenosis as well as enlarged prostate or punctiform parenchymal calcifications were omitted from both groups as a result of the expected high incidence and no clinical significance. ECFs were classified into two groups. The first group comprises of clinically important findings that require urgent medical or surgical management (e.g., extracolonic malignancy, lymph nodes >10mm, bile duct dilatation, hydronephrosis, etc.). The second group consists of findings with little immediate clinical relevance or no clinical importance and do not require additional workup (e.g., liver or kidneys cysts, hiatus hernia, non-obstructing calculi, fibroid, etc.). Statistical analysis was done using the chi square test and the *t* test for assessing the frequency of important extracolonic findings according to patient age, sex, and colorectal findings.

Results:

Out of total 83 patients who underwent CTC, extracolonic findings were identified in 15 patients, (15/83, 18%). The total number of extracolonic findings was 19 and only 2 patients had more than one finding. Extracolonic findings were presented in 6 males, (6/36, 16.6%) and 9 females, (9/47, 19.1%). There were no significant differences in the mean age and sex of patients. Two patients had significant extracolonic findings (2/83, 2.5%), abdominal aneurism and renal cell carcinoma. The rest of the findings were unimportant (17/19, 89.5%). The most common lesion was cortical renal cyst. Table 1 shows the abnormalities that were encountered and classified as clinically insignificant. The intravenous application of contrast helped in detecting and differentiating extracolonic findings in three patients, 3.6% (3/83), two hemangioma and renal cell carcinoma. Additional ultrasound examination was required in 4 patients, 4.8% (4/83). Two patients were sent for ultrasound examination of the gallbladder and the other two for ultrasound examination of the uterus. There was no need for patient follow up. There were no complications of the CTC or the workup. A total of 12/83 (14.4%) patients had colorectal lesion greater than 6 mm, of whom 5/83 (6%) had a colorectal malignancy. The incidence of extracolonic findings was identical in the subset of patients with or without positive CT colonographic study. Sixty eight patients (84.3%) were classified as not having extracolonic findings.

Discussion:

CTC has been valuable tool in the programs of colorectal cancer screening for more than 10 years. Besides its well-known drawbacks including ionization burden and inability for tissue sampling it is elaborately proved as a valid, less invasive, and better tolerable examination method compared to the optical colonoscopy (10). On the other side CTC is also an alternative method for symptomatic patients who had incomplete colonoscopy or who refuse to undergo colonoscopy as the best radiological test for the diagnosis of colorectal cancer (6).

The low-dose technique used at CTC capitalizes on the high contrast that exists between the air-filled colon lumen and the soft-tissue density wall. Low milliamps allow additional prone scanning while maintaining an acceptable radiation dose but this results in poor views of extracolonic lesions. Solid-organ contrast requires higher radiation doses for optimal lesion detection. In addition, lesion organ contrast differences can be improved with the use of IV iodinated contrast material. The use of IV contrast in symptomatic patients combines CT colonography with a routine contrast-enhanced abdominal CT scan, resulting in a one stop diagnostic investigation instead of a need of additional imaging (11). However, the cost of administering IV contrast medium as well as the added risks like the risk of contrast media–induced renal failure and hypersensitivity can't be neglected. The IV contrast material is generally not indicated, in part because its use would probably not significantly increase polyp detection, particularly when oral contrast tagging is used (12). ESGE/ESGAR suggest CT colonography (CTC) with intravenous contrast medium injection only in two settings: 1. surveillance after curative intent resection of colorectal cancer only in patients in whom colonoscopy is unfeasible or colonoscopy has been incomplete and 2. in the case of obstructing colorectal cancer (6).

Considering the high incidence as well as the significance of ECFs a couple of grading scales were introduced such as: a) clinically important vs unimportant (13), b) potentially important (C-RADS) (8), and c) of high, moderate, or low importance (14). Since the initial publication of the C-RADS consensus proposal, C-RADS has become a standard for reporting of both colorectal and extracolonic findings at CTC and a standard for classifying patients for the purposes of guiding management following screening (15). Additional workup of some sort is typically

mandatory for ECFs classified as clinically important, with high importance or E4 (and sometimes E3). Extracolonic evaluation at CTC represents a double-edged sword. The potential benefits are the ability to detect disease earlier in a more curable stage or even if an untreatable condition is identified, patients may appreciate the advanced warning to organize their lives. Potential disadvantages are of equal magnitude. At the worst extreme, patient mortality or morbidity could increase due to invasive diagnostic testing or nonessential surgery. Other disadvantages include unnecessary patient anxiety as well as higher costs and extra patient radiation exposure from superfluous additional tests. (14)

In this 5 years retrospective study, 14.4% (12/83) of the patients had a positive colonic finding. Similar results (13.6%) were reported by Netz et al. (4) in a series of over 3000 low-risk symptomatic patients. On the other hand Pooler et al. (15) reported almost the exact results (14.4%) in a similar series in asymptomatic adults.

On contrary to the ESGE/ESGAR guidelines and the widely accepted practice, we performed CTC with intravenous aplication of contrast, so we could significantly eliminate doubtable lesions and in the same time increase the sensitivity for isodense lesions in parenchymal organs. Extracolonic findings were detected in 18% (15/83) of the patients and furthermore they were divided in only two groups, clinically important and unimportant like Yee (13), despite the widely used C-RADS criteria (8). ECFs reported in the literature have a vast range as low as 41% by Hara et al. (14) to 98.6% by Kimberly et al. (16). Most of the studies report ECFs in up to 2/3 of the asymptomatic patients (17) (18) (19). Higher incidence of ECFs are reported in series that target seniors (74%) (19) or intravenous contrast is administered 89% (11). Despite of intravenous contrast administration our rate of ECFs was significantly below even to the lowest reported. The only explanation that could be offered is our decision to omit vascular calcifications, degenerative disease of the spine as well as enlarged prostate or punctiform parenchymal calcifications.

Only two patients had clinically important extracolonic findings (2/83, 2.5%), abdominal aneurism and renal cell carcinoma. Intravenous contrast was not necessary for detecting abdominal aneurism, but it helped in detecting and differentiating renal cell carcinoma. Most of the published studies report clinically important or E4 ECFs in range of 8.6% by Pickhardt et al., (20) to 17.5% by Kimberly (16), including 10% by Gluecker et al. (17), 10.4% by Netz et al. (4),

10.7% by Kim et al. (21), 11% by Hara et al. (14), 12% by Pedersen (18), and 15.4% by Kim et al. (22). Tolan et al. (1) reported high prevalence of clinically important extracolonic findings of 29% in symptomatic patients. Unusual large percent was report by Hellstrom et al. (23) in 59%, but part of them were noted in the medical history. Urgent medical or surgical management as a result of ECFs was required in up to 3%: 1.3% (17), 1.9% (14) and 3% (18). In our study no additional imaging was required by the radiologist and the prevalence of clinically important extracolonic findings was in the limits reported by previous studies.

Seventeen insignificant ECFs were detected in 13 patients. In two patients intravenous contrast aided in the detection and the differentiation of two liver hemangiomas, and no further examination was needed. Although four lesions were classified as insignificant, referring physicians asked for additional ultrasound examination. When it comes to the gallbladder and uterus, clinicians feel more comfortable with ultrasound examination.

Because of the lack of IV contrast material and the low dose of radiation, the sensitivity and the specificity of CTC for identifying extracolonic lesions is much lower than that for a regular CT scan. Additionally, one phase post contrast in CT scanning of the abdomen and pelvis could help to detect more ECFs and help further more in their differentiation. As mentioned before, administration of intravenous contrast means additional cost and greater risks. One of the possible solutions is a) a selective contrast administration coordinated by the online physician as suggested by Hara et al. (14) or b) to train radiographers to triage extracolonic findings despite the initial reported underperformance by Boellaard et al. (24).

A) the small number of patients in the group, b) the wide range of patient age, as well as c) the omit to follow up of the patients, were the main limitations of our study.

Conclusion:

In conclusion, specifically, CTC with administration of IV contrast medium could help in detecting and differentiating more extracolonic findings and as a result extracolic diseases could be detected in earlier phase and furthermore unnecessary diagnostic testing could be reduced as well as nonessential surgery and certainly unnecessary patient anxiety.

Cost and the added risks of administering IV contrast medium should not be neglected. An effort should be made for introducing selective contrast administration.

As designed, our study, with objectively very limited number of participants, greatly affirms the findings of other reported studies, much larger by the number of the included patients. CTC ECFs, even under different circumstances are valuable in various manners and should not be ever neglected. In contrary, those findings should be used in their best way to help patients to get always more for the benefit of their health.

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*Table 1*. Extracolonic findings classified as clinically insignificant

| Extracolonic findings classified as clinically insignificant | Number |
|---|---|
| Hepatic hemangioma | 2 |
| Gall stones | 3 |
| Renal cyst | 6 |
| Renal calculi | 2 |
| Uterine fibroid | 2 |
| Osteolytic lesions, bone | 1 |

*Figure 1*. Unenhanced transverse CT image in 85-year-old woman shows cholelithiasis with multiple small gallstones

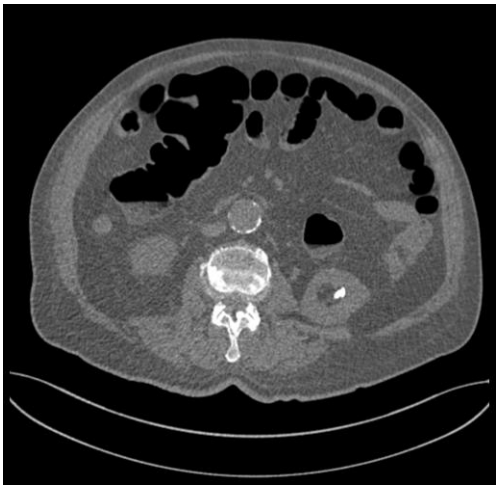

*Figure 2*. Unenhanced transverse CT image in 85-year-old man shows a renal calculus

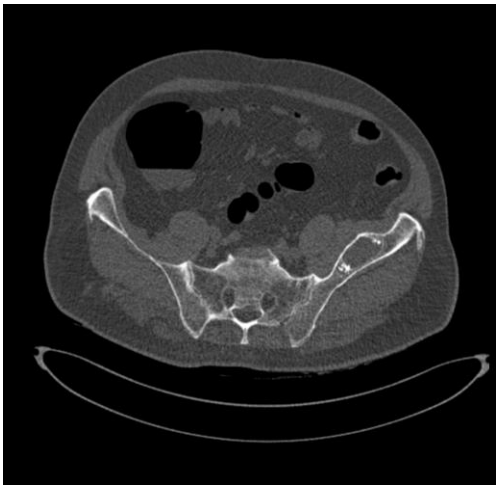

*Figure 3*. Unenhanced transverse CT image in 70-year-old woman shows expansile lytic lesion without any evidence of periosteal reaction or soft tissue enhancement

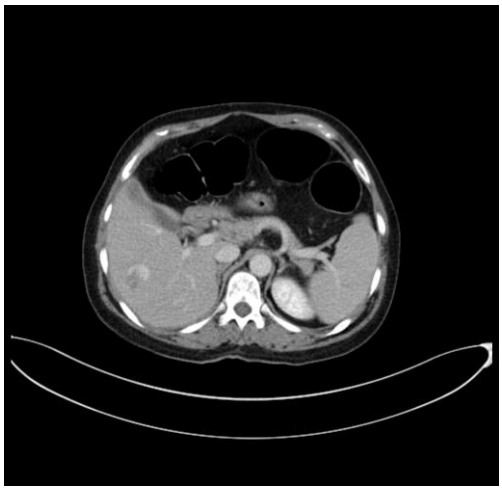

*Figure 4 and 5*. Unenhanced and contrast-enhance transverse CT images in 50-year-old woman show well defined lesion hypoattenuating relative to liver parenchyma with peripheral enhancement after contrast administration

*Figure 6*. Unenhanced transverse CT image in 69-year-old man shows cholelithiasis with multiple gallstones