

CLINICAL STUDY

Virtual colonoscopy: a new promising technique

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Abstract

Objectives: Virtual colonoscopy is less invasive than conventional colonoscopy and does not require a conscious sedation.

Background: Virtual colonoscopy using the abdominal spiral computed tomography scanning allows a total colonic evaluation with minimal invasiveness.

Methods: We studied 48 patients with a virtual colonoscopy using oral iodinated contrast. Colonic lavage was achieved with an oral polyethylene glycols preparation. We examined patients who had refused a colonoscopic examinations, or patients with a stenotic processes, in which it was not possible to examine the proximal colon using standard methods.

Results: Our indications for CT virtual colonoscopy were following: firstly, when colonic examination by other methods (colonoscopy, barium enema) failed or was not possible, and secondly, to exclude tumour duplicity in cases with an already verified colon tumour. 26 patients underwent a virtual colonoscopy examination based on the first indication, and 22 patients based on the second indication.

Conclusion: In summary, our results show that virtual colonoscopy is a promising method in detecting individuals with significant colorectal lesions. The aim of the present study was to assess the ability of virtual colonoscopy using oral contrast to detect patients with colorectal lesions who need a colonoscopy (Tab. 2, Fig. 3, Ref. 4). Full Text (Free, PDF) www.bmjj.sk.

Key words: colorectal cancer, virtual colonoscopy.

In clinical practice, colorectal surgeons are often faced with the situation where malignancy is diagnosed in the rectum or distal colon but the proximal colon can't be properly evaluated due to severe intraluminal stenosis. In recent years, with the development of laparoscopic approach for colorectal surgery, a proper examination of the entire colon is necessary preoperatively for an accurate operative planning and reducing the potential risk of missing a synchronous proximal tumor. In this study, we present our experience in using virtual colonoscopy for assessment of the whole colon preoperatively.

Material and methods

From January 2005 to December 2006, 48 patients were examined using a virtual colonoscopy in the Radiology department, University Hospital, Ostrava. Patients included in our study, where those who had refused colonoscopic examinations, or those with severe malignant strictures precluding proximal colon examination. Using a multidetector device (Siemens Sensation, 16-

detector, 5 mm slice, 2003, Germany), patient preparation was similar to that for a conventional colonoscopy. Two hours before the procedure, 5 mg of oral bisulphite hydrochloride was given. Just before the examination, butylscopolamin 20 mg i.v. was administered to all patients to reduce the digestive tract motility. In butylscopolamin sensitivity, glucagon 0.5–1 mg i.m. was used instead. A rectal tube was introduced and we insufflate approx. 1.5–2 litres of air into the colon – the amount depends on the patient's tolerance. Topograms were taken to be oriented in air-

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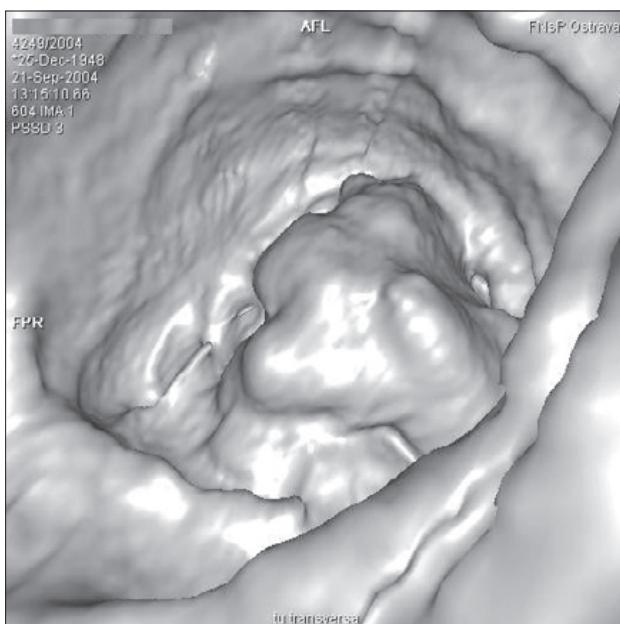


Fig. 1. Virtual colonoscopy of a patient with a colon carcinoma.

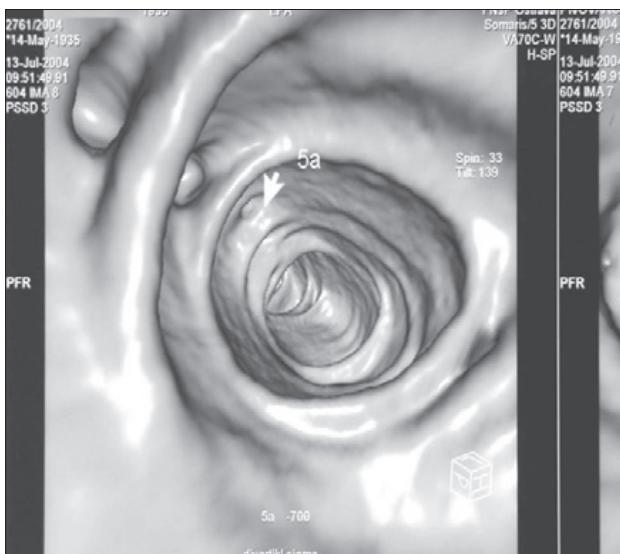


Fig. 2. Virtual colonoscopy shows a sigmoid diverticulum.

filling of the intestines; in case of an insufficient filling, air insufflation was increased.

A native examination can be performed only in screening purposes; if there is a serious suspicion of carcinoma, we apply non-ionic contrast substance i.v. by a pump. In our study, we applied 80–120 ml of non-ionic contrast (iohexol 300) substance, with a rate 3 ml/s. The machine parameters are set in a standard manner – 120 kV, 80–250 mAs, scan time 16 s, detector configuration 16x0.75, the examined area is from xiphoid to symphysis. The examination is performed upon inspiration in prone position to reduce artefacts and improve the gaseous filling distribution.

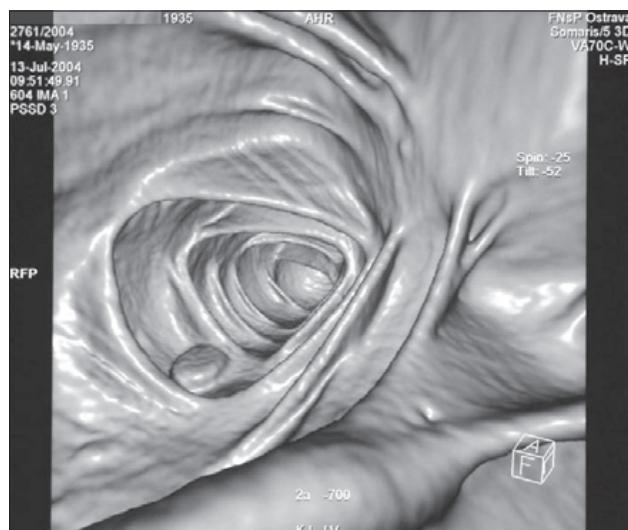


Fig. 3. Virtual colonoscopy demonstrates a benign polyp.

Results

Our indications for CT virtual colonoscopy were following: firstly, when colonic examination by other methods (colonoscopy, barium enema) failed or was not possible, and secondly, to exclude tumor duplicity in cases with an already verified colon tumour. 26 patients underwent a virtual colonoscopy examination based on the first indication, and 22 patients based on the second indication.

In our study, 22 patients have been diagnosed with a primary colorectal tumor prior to virtual colonoscopy (Tab. 1). Out of this group, 18 patients had their provisional diagnosis confirmed with no additional pathology in the rest of the colon, 2 patients had additional polyps and another 2 patients had diverticulae. 26 patients haven't been diagnosed prior to virtual colonoscopy. Out of this group, 6 patients were diagnosed as having polyps, 6 with diverticulae, 2 with colitis, 6 were negative, and 4 failed due to an inadequate colon preparation and high faecal colonic load. The remaining 2 patients from this group has been diagnosed as having primary colonic tumor detected only using the virtual colonoscopy, one was at the splenic flexure and the other was in the sigmoid colon (Tab. 2). However, when a tumour was detected, we didn't recommend a surgical intervention based on virtual CT colonoscopy only, but we insisted on a histological verification. Therefore, in this case, a conventional colonoscopy with tumour biopsy and histological examination was indicated.

Discussion

Pickhardt et al (1) evaluated the CT virtual colonoscopy processed in 3D-image in comparison with the gold standard – classical colonoscopy. In the sample of 1233 asymptomatic patients of the mean age 57.8 with a medium risk of colorectal neoplasia, they calculated that the sensitivity of virtual colonoscopy to adenomatous polyps bigger than 10 mm was 93.8 %, to polyps

Tab. 1. Findings detected in our study.

Virtual colonoscopy findings	Number of patients
Known colon tumour	18
New detected tumour	2
Known colon tumour + Polyp	2
Known colon tumour + diverticulum	2
Colitis	2
Polyp	6
Diverticulum	6
Negative	6
Failed	4

Tab. 2. Tumour localization as detected by virtual colonoscopy.

Tumour site	Number of patients
Splenic flexure	4
Sigmoid colon	8
Rectum	12

sized 8–10 mm was 93.9 %, and to polyps sized 6–8 mm was 88.7 %. Specificity of virtual colonoscopy was 96.0 %, 92.2 % and 79.6 % respectively. Two polyps were malignant, both were detected by virtual colonoscopy, one of them was missed by the classical colonoscopy.

Laghi in his work considers the CT colonography a suitable alternative method to traditional colonoscopy and ultrasound liver examination in monitoring patients after surgery for colorectal carcinoma (2). In 35 patient, an optimal presentation of the whole colon was performed in 97.7 % of patients with 100 % presentation of the anastomosis area; no tumor recurrence was detected, and 7 polyps were diagnosed in 5 patients. Metastatic affection of the liver was detected in 3 cases, further 2 metastases were found in basal pulmonary segments.

An interesting study was performed by Pineau et al (3). According to their statement, the CT virtual colonoscopy allows the evaluation of the whole colon with minimum invasiveness. 2D as well as 3D modality was used to detect colorectal lesions. The study evaluated the capability of virtual colonoscopy to determine patients with colorectal lesion, where classical colonoscopy had to be added. In the sample of 205 patients, the sensitivity and specificity of virtual colonoscopy in lesion detection was 61.8 %, or 70.7 % respectively.

For lesions bigger than 6 mm, the sensitivity was 84.4 % and specificity 83.1 %, for lesions bigger than 10 mm the sensitivity was 90 % and specificity 94.6 %. Negative predictive value for lesions bigger than 6 mm was 95 % and for lesions bigger than 10 mm was 98.9 %. Upon detection of lesions bigger than 10 mm, the virtual colonoscopy excluded further necessity of colonoscopy in 86 % of patients, and in 68 % for lesions bigger than 6 mm.

Pedersen et al (4) compared, in a sample of 148 patients, the results of CT colonoscopy and classical colonoscopy. With a

positivity of CT colonoscopy and a negative colonoscopy, the endoscopic method was repeated and served as a golden standard. CT virtual colonoscopy correctly detected all 11 carcinomas. For polypoid lesions bigger than 6 mm, its sensitivity was 81 % and specificity 97 %. However, only in 76 % of patients a technically sufficient colon distension was achieved. In conclusion, the authors specify that virtual colonoscopy and classical colonoscopy feature the same total sensitivity for the detection of polypoid lesions ≥6 mm.

We have used a virtual colonoscopy in two basic indications. First, for severe impassable colonic strictures, which prevent us from excluding a duplicate tumour, and further in patients with a negative experience from previous examinations, when the patients refused the barium enema or colonoscopy. In both indications, virtual colonoscopy has fully proved itself and with the development of technique in medicine we expect its further expansion, e.g. as a screening method to capture colorectal carcinoma.

Conclusion

Virtual colonoscopy is probably a method of the future. However, both financial intensity and the demands for skills of the examining staff do not allow, for the time being, the use of the virtual colonoscopy as a screening method for general population. So far, our experience with the performed examinations of the patients have been only positive, and we can say that with increasing number of examined patients also the examination results get better interpretable both to radiologists and operating surgeons.

References

1. Pickhardt PJ, Choi JR, Hwang I et al. Computed tomographic virtual colonoscopy to screen for colorectal neoplasia in asymptomatic adults. *New Engl J Med* 2003; 349 (23): 2191–2200.
2. Laghi A, Iannaccone R, Bria E et al. Contrast-enhanced computed tomographic colonography in the follow-up of colorectal cancer patients: a feasibility study. *Euro Radiol* 2003; 13 (4): 883–889.
3. Pineau BC, Paskett ED, Chen GJ et al. Virtual colonoscopy using oral contrast compared with colonoscopy for the detection of patients with colorectal polyps. *Gastroenterology* 2003; 125 (2): 304–310.
4. Pedersen GB, Christiansen TE, Bjerregaard NC, Ljungmann K, Laurberg S. Colonoscopy and multidetector-array computed-tomographic colonography: detection rates and feasibility. *Endoscopy* 2003; 35 (9): 736–742.

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