

Virtual Colonoscopy as a Helpful Adjunct in Clinical Decision-Making Following Incomplete Endoscopic Evaluation for Stenotic Colonic Processes

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Abstract

Background: Bowel stenosis is a common finding in the clinic. The underlying pathology might be benign or malignant. Endoscopic examination via colonoscopy represents the gold standard of investigation. However, complete colonoscopy might not always be possible. Virtual computed tomography-based colonoscopy might be a helpful adjunct in such cases. We analyzed the findings from virtual colonoscopy in patients with incomplete endoscopy.

Materials and Methods: The charts of patients undergoing virtual colonoscopy due to incomplete endoscopic examination were retrospectively abstracted. The additive diagnostic value of virtual colonoscopy was analyzed by comparing the finding on virtual colonoscopy with the final diagnoses in patients undergoing surgery.

Results: Fifty patients including 17 males and 33 females with a mean age of 69.2 ± 12.2 years were included for analysis. The indication for virtual colonoscopy was stenosis of the left colon in 32 cases (64%), stenosis of the right colon in five cases (10%) and incomplete colonoscopy due to colon elongatum in 13 cases (26%). Virtual colonoscopy revealed pathologic findings with the need of surgical management in 19 cases (38%) including 15 cases with colorectal cancer (30%).

Conclusion: Virtual colonoscopy is a useful adjunct to endoscopy in patients with incomplete colonoscopy. Routine preoperative virtual colonoscopy might be helpful in evaluating surgical options in patients with incomplete endoscopic examination.

Keywords: Virtual Colonoscopy; Clinical Decision; Endoscopic Evaluation

Background

Colonic stenosis constitutes a well-defined clinical scenario. The underlying pathology of colonic obstruction might either be benign or malignant [1-3]. Benign bowel stenosis following diverticular disease or inflammatory bowel disease is a well-recognized clinical entity [4,5]. Colonic obstruction might equally be secondary to malignant processes like colorectal cancer [6,7]. The management of bowel stenosis depends on the underlying pathology [8] and surgery constitutes the most common treatment option [9]. However, complete bowel investigation via an imaging modality is recommended prior to treatment.

Endoscopic examination via colonoscopy has the highest sensitivity and specificity in revealing the cause of colonic stenosis [10-12]. Colorectal cancer, polyps or inflammatory stenosis can easily be diagnosed on colonoscopy. Besides direct visualization of the bowel

stenosis, biopsies taken during endoscopic investigation via colonoscopy enable a histopathologic diagnosis. More so, the cause of colonic obstruction might be managed during colonoscopy. Thus, endoscopic investigation via colonoscopy has been established as the gold standard for investigating bowel stenosis [13,14].

Despite the above advantages, colonoscopy might not always be possible. Bowel stenosis might not permit visualization of the bowel segment proximal to the stenosis. Besides, bowel kinking and adhesions might render scope passage difficult. Furthermore, the scope might be too short in patients with colon elongatum. In such cases computed tomographic (ct) colonoscopy also known as virtual colonoscopy might be a helpful adjunct [15,16]. Herein we report our experience with virtual colonoscopy in patients following incomplete endoscopic investigation with an emphasis on the clinical decision-making with regard to surgical management.

Methods

This is a retrospective analysis of the charts of patients investigated via virtual colonoscopy due to incomplete endoscopic examination in the department of diagnostic and interventional radiology at a university hospital in Germany.

A retrospective search of the electronic database of the department of diagnostic and interventional radiology of the Helios University Hospital Wuppertal for patients undergoing virtual colonoscopy within a five - year period from 2010 to 2015 was performed.

All patients included in this series were referred for virtual colonoscopy due to incomplete endoscopic examination. A written consent was obtained from all patients prior to examination. Baseline data including age and sex at the time of investigation were recorded for each patient. Relevant clinical data including the reason for incomplete endoscopic examination, previous abdominal surgeries and previous radiologic examination were reviewed all cases.

Bowel preparation was performed using either polyethylenglykol or sodium - magnesium sulphate 24 hours prior to examination. Virtual colonoscopy was performed on a 128 multi-detector row ct scanner (Somatom Sensation 128, Siemens, Germany). A spasmolytic agent e.g. Buscopan® (Buthylscopolamin) was used in all cases. The examination began with the insertion of a small flexible catheter into the rectum. Room air was insufflated to distend the bowel. Colonic distension was confirmed via an initial topographic scan. Once colonic distension was adequate, virtual colonoscopy was performed with two sets of images; first with the patient in the prone position without contrast and then with the patient in supine position after injecting an iodinated contrast agent (gastrographin) at a flow rate of 3ml /sec with a scanning delay of 65 seconds. Ct scanning was performed during a breath pause in a cranio-caudal direction using the following ct parameters: 120 kV, ≤ 50 mAs in the prone position and ≥ 100 mAs in the supine position. Axial ct images were reconstructed as 1.25 mm slices with a 0.7 mm reconstruction interval.

Image interpretation was performed at a remote computer workstation using the commercially available software “syngo-colonography” (Siemens Medical Solutions, Siemens, Germany). The processed images included multiplanar reformed images, volume rendering and three-dimensional virtual colonoscopy images (Figures 1-3).



Figure 1: Topographic imaging during ct-colonoscopy.



Figure 2: Endo-luminal image during ct-colonoscopy.



Figure 3: Ct – colonoscopy with the identification of diverticles in the sigmoid colon.

The images were analyzed by two attending radiologists (UK and PK) with expertise in virtual colonoscopy. Pathological findings were discussed in an interdisciplinary board with surgeons and gastroenterologists. The indication for surgical exploration was made based on patient’s complaints and the findings from virtual colonoscopy.

The surgical notes of all patients undergoing surgical exploration were reviewed and the diagnosis at the time of surgery was recorded. The final diagnosis was derived from the final histopathologic reports in all cases managed by surgical resection. The findings on virtual colonoscopy were compared with the surgical and pathological diagnosis.

Statistics

The data was evaluated using the Statistical Package for Social Sciences (SPSS®, IBM Corporation, Armonk, NY, USA). Continuous variables were reported using absolute values, percentages, means and standard deviations where necessary using a 95% confidence interval. Categorical variables were reported using absolute case numbers and percentages.

Results

The study population included 50 patients, 33 females and 17 males examined via virtual colonoscopy within a five year - period from 2010 to 2015. A one-sample Kolmogorov-Smirnov Test for age distribution revealed a p- values of 0.20, indicating that the age was normally distributed across the study population. The mean age was 69.2 ± 12.2 yrs.

Virtual colonoscopy was ordered due to incomplete endoscopy in all cases. Bowel obstruction was the most common indication for virtual colonoscopy in 37 cases (74.0%). The stenosis was most commonly found in the left colon compared to the right colon. Virtual colonoscopy was successfully completed in all cases, table 1. Pathologic findings were seen in in 80% of cases (40 cases), table 1.

Features	Number of cases
Indication for ct colonoscopy	
Left colonic stenosis	32 (64.0%)
Colon elongatum	13 (26.0%)
Right colonic stenosis	5 (10.0%)
Findings on virtual colonoscopy	
No pathologic findings	10 (20.0%)
Diverticular disease	13 (26.0%)
Cancer	15 (30.0%)
Polyps	9 (18.0%)
Others*	3 (6.0%)
Management	
No intervention	31 (62.0%)
Left colon / rectal resection	14 (28.0%)
Right colon resection	3 (6.0%)
Multiorgan resection	2 (4.0%)

Table 1: Clinical characteristics in this series.

*Pathologic process involving the ovaries, uterus and colon.

Surgical intervention was needed in 19 cases (38%) including four cases with diverticular disease (8%) and 15 cases with bowel cancer (30%). Segmental resection of the left colon and rectum was performed in 14 cases (28%). The right colon was resected in three cases (6%) while resection of multiple organs including the bowel, uterus and ovaries was performed in two cases following uterine cancer with bowel infiltration. Virtual colonoscopy enabled the diagnosis of bowel pathologies of the right colon in five cases (10%) including three cases following incomplete colonoscopy due to colon elongatum and two cases due to stenosis in the left colon.

Discussion

This series retrospectively examined the findings from virtual colonoscopy in 50 patients with incomplete conventional colonoscopy. Stenosis of the left colon with the inability to judge the pre-stenotic bowel was the most common indication for virtual colonoscopy in this series. Pathologic findings were seen in 80% of cases and surgical management was warranted in 36% mainly to manage diverticular stenosis or colorectal cancer.

Conventional colonoscopy represents the unequivocal gold standard for investigation luminal pathologies of the large bowel. However, conventional colonoscopy might not be possible for many reasons [17]. An elongated colon might not be completely visualized due to shortness of the scope. Equally, bowel narrowing secondary to both inflammatory and benign colonic processes might render conventional colonoscopy impossible [18].

The importance of complete bowel evaluation in patients with colon stenosis is the need to rule out a synchronous process which has been reported in up to 14 - 48% for adenomas [19] and 2 - 9% for carcinomas [20,21]. In such cases, complete bowel work-up could be achieved via virtual colonoscopy. In fact, many clinical guidelines recommend bowel investigation via virtual colonoscopy in patients following incomplete colonoscopy [15,22].

Although virtual colonoscopy does not represent the first line investigation for colonic pathologies, several advantages make this imaging modality a helpful adjunct to endoscopy. Besides its use in investigating colonic occlusion, elongation and kinking, it enables a topographic association of the bowel process to a specific abdominal location [16]. Another advantage of virtual colonoscopy is the possibility to screen other abdominal organs [18,23]. The procedure is not subjected to increased risk of bleeding for patients under coagulation treatment. More so, the risk of iatrogenic bowel injury is basically nonexistent and there is no need for sedation as opposed to conventional colonoscopy. These advantages have contributed to a high degree of acceptance for virtual colonoscopy amongst patients [24] and its recommendation as a tool for the screening of colorectal cancer [25,26].

Despite the above advantages some possibly adverse aspects about virtual colonoscopy need to be discussed. Radiation exposure (3 - 12 mSv) during virtual colonoscopy is an issue. Also, there is a risk of false positivity as feces might not be readily discriminated from bowel pathologies. Besides, virtual colonoscopy has a very low sensitivity in diagnosing small lesion < 6 mm [27]. Equally, laterally spreading flat cancers might be easily missed on virtual colonoscopy [28]. The inability of to directly visualize the mucosa and the impossibility to take biopsies or completely remove polyps constitute major limitations to this investigation modality in comparison to conventional colonoscopy [29].

Despite the above limitations, our experience confirms virtual colonoscopy as a helpful adjunct in patients with incomplete endoscopic examination. Routine virtual colonoscopy in patients with incomplete endoscopy might be a useful tool in clinical decision-making with respect to the need of surgical exploration for bowel stenosis.

Conclusion

Virtual colonoscopy is a useful adjunct to endoscopy in patients with incomplete colonoscopy. Routine preoperative virtual colonoscopy might be helpful in evaluating surgical options in patients with incomplete endoscopic examination.

Conflict of Interest

The authors have no conflicting interests.

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