

## CT VIRTUAL COLONOSCOPY

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### ABSTRACT

*CT Virtual Colonoscopy is a medical imaging procedure which uses x-rays and computers to produce two and three-dimensional images of the colon (large intestine) from the rectum, all the way to the lower end of the small intestine using only air as contrast medium and display them on a screen. The procedure is used to diagnose colon and bowel disease like polyps, diverticulosis and tumour. It also provides 3D reconstructed endoluminal views of the bowel. It holds significant promise for effective large-scale colorectal cancer screening. Although many radiologists continue to use the 2D images for polyp detection, more emphasis on the 3D images for primary detection of polyps has yielded the best results for screening. The primary target lesion for colorectal screening is the adenomatous polyp, since detection and removal of all larger or advanced lesions could potentially prevent approximately 95% or more of all colon cancers. A total of 13 cases were evaluated in our study. The patients presented with varying complaints ranging from abdominal pain to bloody diarrhoea. The age range was from 30-70 years. Eight cases turned out to be normal. One case showed synchronous carcinoma colon which was confirmed peroperatively and on histopathology. Two cases were of diverticulosis while one case showed inflammatory mass at the ilio cecal region while the other was of para rectal abscess. It is thus concluded that C. T. virtual colonoscopy is an excellent diagnostic modality for most of the colonic lesions.*

### INTRODUCTION

Computed tomographic (CT) colonography is rapidly becoming a viable option in the imaging armamentarium in the screening of the colon.<sup>1</sup> It is a minimally invasive, total colonic examination for colorectal cancer detection. Use of both two-dimensional (2D) and three-dimensional (3D) displays is vital for a complete evaluation. Although either the 2D or 3D displays may be used for initial polyp detection, the best results for screening have emphasized the 3D images for the primary evaluation. In fact, state-of-the-art 3D CT colonography has compared favorably with optical or conventional colonoscopy for the detection of clinically relevant lesions.<sup>2</sup> The intended target for colorectal cancer screening is the neoplastic polyp, including both benign and malignant lesions. Ideally, only lesions with malignant potential need to be detected and removed. As regards image interpretation, a primary two-dimensional (2D) image review with multiplanar reformation (MPR) and endoluminal (three-dimensional [3D]) imaging for problem solving is the preferred method for data interpretation, allowing evaluation to be performed in a time-efficient manner.<sup>3,4,5</sup> However, with thin-section multidetector row CT and enhanced computer processing workstations, it is certainly possible to perform image interpretation with a primary 3D display technique. This study was performed at Ganga Ram Hospital, Lahore and inclu-

ded a total of 13 cases in whom this technique was used to detect colonic lesions.

### CT Colonoscopy Technique

In the department of Radiology at Sir Ganga Ram Hospital, we have four slice CT scanner (Aquilion Super 4 by Toshiba). CT parameter used are shown in table 1. Optimal CT colonography technique relies on careful cleansing and distention of the colon, as well as acquisition with thin-section multidetector row CT. On the day prior to the examination, bowel preparations is administered. A flexible rubber catheter is inserted into the rectum and the colon is insufflated with room air to patient tolerance by an experienced technologist or nurse. The catheter is left in the rectum and a supine scout CT image is obtained to verify adequate bowel distention. If adequate bowel distention is present, the CT examination is performed. The patient is then placed in the prone position. Several additional puffs of air are administered, and the rectal catheter is removed. After acquisition of a second scout localizing image, the process is repeated over the same z-axis range. The Data volume acquired is sent to work station for analysis and interpretation of results. 3D endoluminal views and MPR images are acquired and analysed.

### RESULTS

A total of 13 cases were evaluated in our study The

patients presented with varying complaints ranging from abdominal pain to bloody diarrhoea. The patients' age range was from 30-70 years. Eight cases turned out to be normal. One case showed synchronous CA colon which was confirmed per-operatively and histopathology. Two cases were of diverticulosis. One case of pararectal abscess while the last case showed widened pre sacral space (Table 2).

**Table 1:**

	Finding	Cases
1	Normal	8
2	Synchronous CA colon	1
3	Diverticulosis	2
4	Para rectal abscess	1
5	Widened Pre sacral space (fat pad)	1
	Total	13

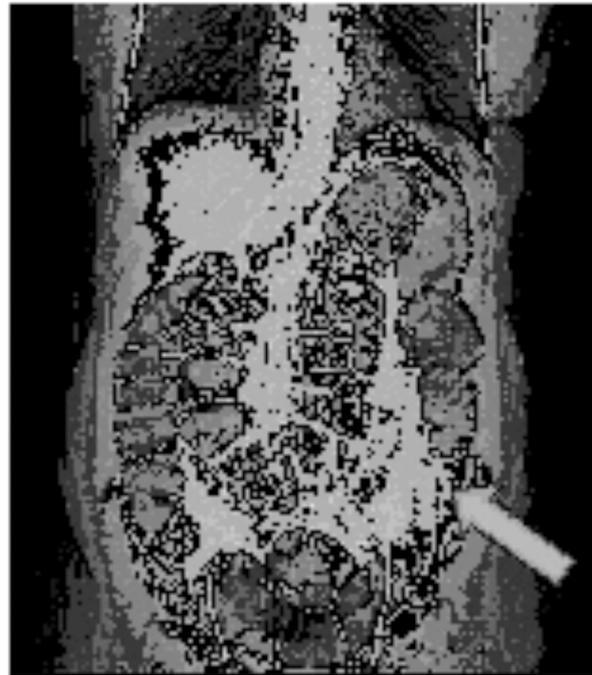
## DISCUSSION

**Synchronous CA colon:** Patient presented with history of pain in the left iliac fossa with palpable mass and constipation. Barium enema was carried out which showed two filling defects at the level of splenic flexure and junction of descending and sigmoid colon. This was followed by conventional colonoscopy. However the colonoscope was unable to pass beyond the sigmoid colon due to severe luminal narrowing because of the mass. Virtual colonoscopy was performed for confirmation of the finding of barium enema. Two distinct masses one at the level of splenic flexure showing fungating appearance with intraluminal extension and the other at the junction of sigmoid showed appearance identical to apple core in barium enema. Patient then underwent 'extended left hemicolectomy with Colorectal anastomosis'.

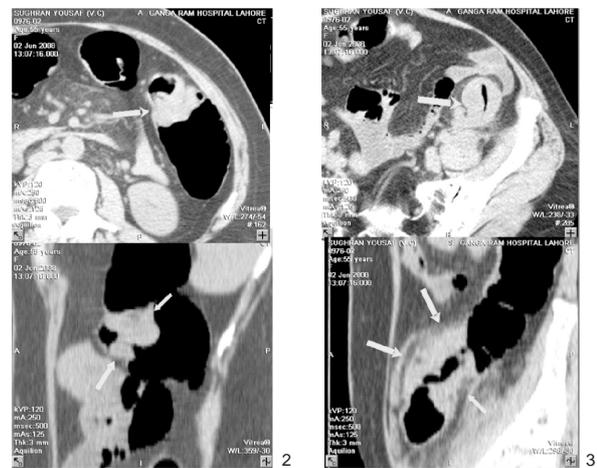
On histopathology both tumours were low grade adenocarcinoma and invaded subserosal fat. This case was a good example of synchronous CA colon. In up to 5% of cases, a synchronous carcinoma is present and the endoscopist may be unable to perform endoscopy proximal to the lesion.<sup>6</sup> Prospective identification of a significant synchronous lesion may alter the surgical approach to colorectal resection.

**Diverticula:** Two cases in our study were diagnosed with diverticulosis. In addition to axial images, 3D and multiplanar reformatted views (MPR) were very helpful in making diagnosis. On endoluminal view there is an incomplete border around a polyp, whereas a diverticulum has a complete ring around the orifice (7). If there is uncertainty at

endoluminal imaging, axial images are helpful in differentiating these entities.



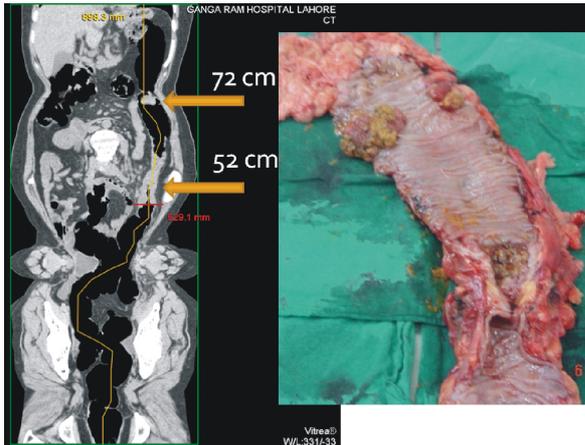
**Fig 1:** CT Scanogram demonstrating mass at junction of sigmoid and descending colon.



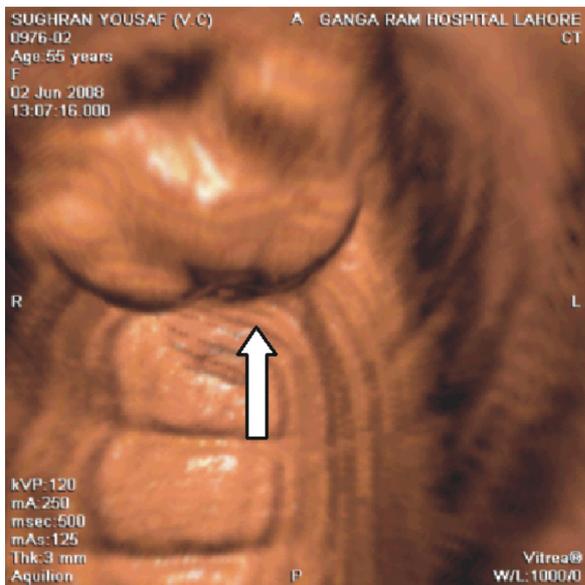
**Fig. 2:** Mass 1 at the splenic flexure as seen in axial and sagittal reformatted image.

**Fig. 3:** Mass 2 with circumferential involvement and surrounding area of fat stranding as seen in axial and sagittal reformatted images.

One of these cases also showed a polyp measuring 6 mm. Homogenous attenuation and persistence in the same location on both supine and prone examination confirmed the lesion to be a polyp. It is emphasized that residual faecal material accounts for the vast majority of false-positive



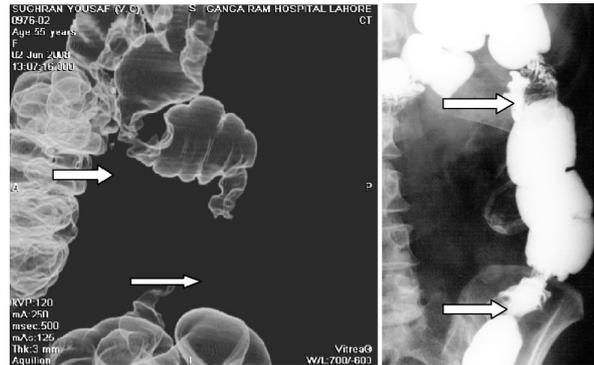
**Fig. 4:** Comparison of reformatted CT image and pathologic specimen showing mass (1) about 72cm and mass (2) 52cm away from anal verge.



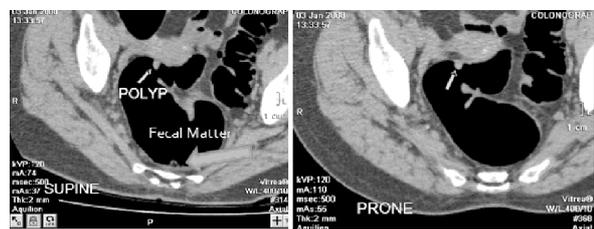
**Fig. 5:** Mass 1 seen in intraluminal view of virtual colonoscopy having solid fungating appearance.

findings at CT colonography (8). However, by using supine and prone thin-section multi-detector row CT colonography and a combination of 2D and 3D imaging, most residual faecal material can be distinguished from polyps (9). The three characteristics used to determine if a filling defect is residual faecal material include mobility, morphology, and internal attenuation characteristics.

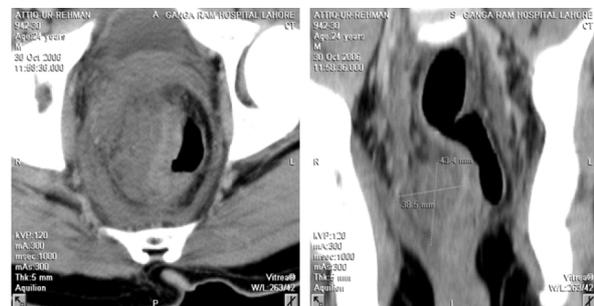
**Para rectal abscess:** This patient came to us with the history of lower abdominal pain and foul smelling discharge per rectum. Virtual colonoscopy was performed to rule out large bowel disease. Right



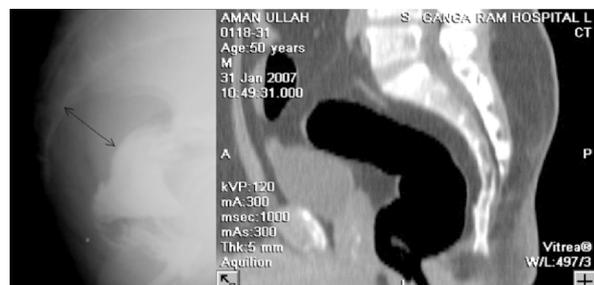
**Fig. 6:** Synchronous CA Colon on both 3D CT and Barium Enema.



**Fig. 7:** Polyp shows homogenous attenuation and does not change its position on both supine and prone examinations. Fecal matter on the other hand shows non homogenous attenuation because of trapped gas and debris and also changes its position when comparing supine and prone images.



**Fig. 8:** Axial and coronal reformatted images showing Right Para Rectal Abscess.



**Fig. 9:** Comparison between lateral view of barium enema film and saggital reformatted CT showing presacral fat pad to be the cause of widened presacral space.

para rectal mixed density collection was demonstrated with thickening of overlying mucosa. Ultrasound guided aspiration proved this to be para rectal abscess.

**Widened pre sacral space:** This patient underwent barium enema examination for altered bowel habits which showed widened pre sacral space on lateral view. Virtual colonoscopy proved to be of help and showed presacral fat pad fat to be the cause of this finding. No further investigation was needed.

With regard to extraluminal pathologies, when only endoluminal imaging is used, these filling defects cannot be distinguished from true polyps and neoplasms. Whether one relies on a primary 2D or 3D viewing technique, both must be available to facilitate adequate characterization of a filling defect. Therefore, extrinsic compressions, although potentially confusing at 3D imaging, are easily characterized with a combination of axial and MPR imaging<sup>7</sup>.

In **conclusion** the optimal situation for interpretation of CT colonographic data is present when the colon is clean, distended, and without filling defects. CT Virtual Colonoscopy is an effective modality as a screening tool for evaluation of colorectal cancer as well as diagnosis of diverticulosis and polyps.

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