CT ENTEROGRAPHY AS A TOOL FOR DIAGNOSIS AND EVALUATION OF SMALL BOWEL INFLAMMATORY AND INFECTIVE DISEASES

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Abstract: Background & objectives: The small intestine is a difficult organ to examine by clinical or radiographic means. There is a vast array of pathologic processes that occurs in the small bowel and mesenteric vasculature. With advent of CT especially with MDCT the small bowel imaging has grown by leaps and bounds with radiologists playing a key role nowadays in determination of the disease process and its degree of severity. Material & Methods: A total of 50 cases between the age group 18-70 years presenting with pain abdomen or other features of small bowel disease, referred for CT examination from various wards, Intensive care units and OPDs were included. CT enterography in all patients was carried out on Somaton definition AS+ with 128 slice CT machine by Siemens Germany Std with a gantry rotation speed of 0.5 second, tube current of 100-350 mA, reconstruction increment of 1.0 mm and slice thickness of 5.0 mm. Results: Out of the 50 cases referred for CT enterography, majority were males (54%) and belonged to the age group 21-30 years (24%). Chronic pain abdomen was the most common clinical presentation. On CT enterography, 27 (54%) and 15 (30%) of the cases were diagnosed with Crohn’s disease and intestinal tuberculosis respectively. Nonspecific findings were seen in 8 (16%) of the patients. Mural thickening (80%) and mucosal hyperenhancement (60%), multiple segment involvement (75%) were the most common findings on CT enterography, with ileum being the most common site involved in diagnosed cases of Crohn’s disease, whereas in diagnosed cases of intestinal tuberculosis, mural thickening (70%), mucosal hyperenhancement (50%) and free fluid (50%), single segment involvement were the most common findings on CT enterography, with ileum (70%) and ileo-caecal junction (40%) being the common sites involved. Interpretation & Conclusion: CT enterography is an excellent diagnostic tool for the study of small bowel disorders. It offers the additional benefit of assessing abdominal and pelvic structures other than the small intestine. Multi-slice CT enterography is a valuable and complementary addition to endoscopy/pathology in the diagnosis of small bowel disorders.

Keywords: CT enterography, inflammatory bowel disease, Crohn’s disease, ulcerative colitis, intestinal tuberculosis

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INTRODUCTION

The small intestine is a difficult organ to examine by clinical or radiographic means. The upper gastrointestinal (GI) tract - comprising the esophagus, stomach and duodenum - is accessible by direct endoscopy, as is the lower gastrointestinal tract. The small intestine, however, is beyond the reach of most flexible endoscopes. There is a vast array of pathologic processes that occurs in the small bowel and mesenteric vasculature. Conventional barium examination has been the problem solving tool but on most of the occasions the findings were non specific and did not contribute much to the management. With advent of CT especially with MDCT the small bowel imaging has grown by leaps and bounds with radiologists playing a key role nowadays in determination of the disease process and its degree of severity. CT enterography using neutral contrast media has become the preferred modality for assessment of small bowel disease. The added advantage of CT enterography is besides giving information regarding the intestinal changes it gives the information of perienteric changes as well as extraintestinal manifestations and associations of particular disease which can be an aid to the diagnosis. The determination of extraintestinal complications of certain diseases like Crohn’s disease can be helpful in prognostication of the disease process.

MATERIAL & METHODS

The prospective study was conducted on 50 patients in the Department of Radiodiagnosis and Imaging at Dayanand Medical College and Hospital, Ludhiana. A total of 50 cases between the age group of 18-70 years presenting with pain abdomen or other features of small bowel disease, high suspicion of Crohn’s disease and its flare up, positive small bowel findings on endoscopy, barium and sonography referred for CT examination from various wards, Intensive care units and OPDs were included. CT enterography in all patients was carried out on Somaton definition AS+ with 128 slice CT machine by Siemens Germany Std with a gantry rotation speed of 0.5 second, tube current of 100-350 mA, reconstruction increment of 1.0 mm and slice thickness of 5.0 mm. Characteristic CT enterography imaging findings included: anatomical site, mural thickening, bowel dilatation, narrowing, mucosal hyper enhancement, strictures, lymphadenopathy, perienteric stranding and comb’s sign.

RESULTS

Out of the 50 cases, majority belonged to the age group 21-30 years (24%) and majority were males (54%). The mean age was 44.94 with standard deviation of 14.63. Chronic pain abdomen was the most common clinical presentation. On CT enterography, it was observed that most intestinal lesions were seen involving the ileum (88%). Out of 50 cases, the ileum was affected in 44 cases (88%), while the jejunum was affected in 12 cases (24%), IC junction in 10 cases (20%) and the duodenum in 4 cases (8%). Multiple segments of bowel were involved in 24
(48%), while single segment was involved in 15 (30%) of the patients. Mucosal hyperenhancement was detected in 29 (58%) cases. Thickening of bowel wall was seen in 41 (82%) of the cases. Stranding was seen in 15 (30%) cases as follows. Lymph nodes were seen in 29 (58%) cases and 18 (36%) of them had sub centimetre lymph nodes. Peritoneal thickening was present in 7 (14%) and free fluid was detected in 12 (24%) of the cases. (Image I-VII)

On the basis of findings on CT enterography, 27 (54%) and 15 (30%) of the cases were diagnosed with Crohn’s disease and intestinal tuberculosis respectively. (Figure I)

Majority patients diagnosed with Crohn’s disease belonged to the age group 61-70 years (30%), followed by 51-60 years (25%). Mean age of the patients with Crohn’s disease was 49.7 ± 15.31 years. Mural thickening (80%) and mucosal hyperenhancement (60%) were the most common findings on CT enterography and ileum was the most common site involved in diagnosed cases of Crohn’s disease. Multiple segments were involved in 75% of the cases.

Whereas in diagnosed cases of intestinal tuberculosis, majority belonged to the age group 21-30 years and 31-40 years (40% each), with average of 35 ± 9.38 years. Mural thickening (70%), mucosal hyperenhancement (50%) and free fluid (50%) were the most common findings on CT enterography. Ileum was the most common site involved in 70% of these patients, followed by ileocaecal junction (40%). Single segment involvement was more common in intestinal tuberculosis.

On CT enterography, mural thickening, narrowing, mucosal hyperenhancement and comb’s sign were more in diagnosed cases of Crohn’s disease as compared to intestinal tuberculosis, whereas obstruction and free fluid were more in diagnosed cases of intestinal tuberculosis. Ileum with ileocecal junction and isolated ileocecal junction was more common in patients with intestinal tuberculosis as compared to patients with Crohn’s disease.
FIGURE I: DISTRIBUTION OF CASES ON CT ENTEROGRAPHY (n=50)

- 54% Crohn's disease
- 30% Tuberculosis
- 16% Others

FIGURE II: CT ENTEROGRAPHY FINDINGS (n=50)

- Mural thickening: 82%
- Obstruction: 58%
- Stranding: 22%
- Comb's sign: 30%
- Lymph nodes: 34%
- Peritoneal thickening: 58%
- Free fluid: 14%
- Others: 24%
DISCUSSION

Rapid increase in the spatial resolution with the introduction of multidetector CT and better multiplanar reconstructions have modified the approach to bowel imaging.\(^2,3\)

A total of 50 patients referred for CT examination were enrolled in our study. Chronic pain abdomen was the most common clinical presentation present in all the patients. On CT enterography, 27 (54%) and 15 (30%) of the cases were diagnosed with Crohn’s disease and intestinal tuberculosis respectively. Mural thickening (80%) and mucosal hyperenhancement (60%), multiple segment involvement (75%) were the most common findings on CT enterography, with ileum being the most common site involved in diagnosed cases of Crohn’s disease. Similar findings were found by Ilangovan et al and Elsayes et al.\(^4,5\) Laghi et al, who stated that the ileum is the most common site affected in Crohn’s disease.\(^6\) Larsson et al observed involvement of three or more intestinal segments in patients of Crohn’s disease.\(^7\)

In our study, in the diagnosed cases of intestinal tuberculosis on CT enterography, mural thickening (70%), mucosal hyperenhancement (50%), free fluid (50%) and single segment involvement were the most common findings on CT enterography, with ileum (70%) and ileo-caecal junction (40%) being the common sites involved. Similar findings were reported by Kalra et al.\(^8\)

In our study, lymph node involvement was seen in 50% of the diagnosed cases of intestinal tuberculosis. Similar findings were reported by Sinan et al in his study, in which lymph node involvement was detected in 46.9% patients.\(^9\)

On CT enterography, mural thickening, narrowing, mucosal hyperenhancement and comb’s sign were more in diagnosed cases of Crohn’s disease as compared to intestinal tuberculosis, whereas obstruction and free fluid were more in diagnosed cases of intestinal tuberculosis. This was consistent with the study of Huang et al, in which comb’s sign was more common in Crohn’s disease patients.\(^10\) Multiple segment involvement was more commonly seen in patients diagnosed with Crohn’s disease, whereas single segment was more involved in patients diagnosed with intestinal tuberculosis. Ileum & ileocaecal junction and isolated ileocaecal junction involvement was more common in patients diagnosed with intestinal tuberculosis. Classicallly, the ileocecal area is the most common segment involved in patients with ITB, noted in up to 90 % of cases\(^11,12\), whereas isolated involvement of the ileocaecal region has been rarely associated with CD. In CD, usually there is involvement of the ileum with sparing of the ileocecal valve. In the present study, on CT, the ileocaecal area was involved in 40 % patients with ITB and was more common when compared to the patients with CD. CD has been reported to be a multifocal disease whereas ITB is usually a unifocal disease. In the present study, multiple segment involvement was more common in patients with CD.
Wide availability of multidetector row CT platforms and examination efficiency with good patient tolerance ensures a significant role for CT enterography. Integration of imaging endpoints and mucosal inspection and biopsy of the small bowel will yield the most accurate representation of small bowel disorders.

**IMAGE I:** Coronal CT enterography image showing circumferential wall thickening and mucosal hyperenhancement terminal ileum, ileocecal junction, caecum and proximal ascending colon.

**IMAGE II:** Coronal CT enterography image showing circumferential wall thickening of caecum, proximal part of ascending colon.

**IMAGE III:** Axial CT enterography image showing multiple enlarged lymph nodes (arrow) seen in mesentry.

**IMAGE IV:** Axial CT enterography image showing circumferential wall thickening and mucosal hyperenhancement involving terminal ileum, ileo-caecal junction & caecum.
IMAGE V: Axial CT enterography image showing multifocal short segment circumferential wall thickening involving distal ileal loops with focal intersegmental dilatation.

IMAGE VI: Axial CT enterography image showing few lymph nodes in the mesentry.

IMAGE VII: Axial CT enterography showing increased vascularity in the surrounding fat.
REFERENCES


