Evaluation of Bowel Involvement in Crohn’s Disease by Using 64 Multislice CT Enteroclysis

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Abstract

Introduction: Crohn’s disease is a granulomatous inflammatory disease characterized by transmural and segmental involvement of the intestinal wall.

Purpose: To determine the utility of computed tomographic (CT) enteroclysis in the evaluation of patients with Crohn’s disease proper delineation of the bowel wall either as meticulous follow-up or in doubtful or difficult endoscopic cases.

Material and Methods: Twenty one patients well known of having crohn's disease were referred to assess either disease development or new complications with the utility of CT enteroclysis.

Results: CT enteroclysis was successfully performed in all 21 patients having crohn’s disease. Bowel wall thickening and increased enhancement of the thickened mucosa were diagnosed in all patients. Stenotic bowel segments and Skip lesions were depicted in 9 patients (43%). Fistulas were found in 5 patients (24%). Enlarged mesenteric lymph nodes were detected in 6 patients (29%). Conglomeration of bowel loops was found in two patients and abscesses and Ascites were detected in one patient.

Conclusion: CT enteroclysis should be considered as the primary method of choice in assessment of crohn’s disease. It yields objective and relatively specific morphologic criteria in the evaluation of chron’s disease as it combines benefits of traditional enteroclysis along with benefits of extra-intestinal CT imaging.

Key Words: Bowel involvement – Crohn’s disease – Multislice CT enteroclysis.

Introduction

DISTENTION of the small bowel lumen with barium suspension or other contrast agent facilitates the radiologic demonstration of morphologic changes caused by the disease process and allows identification of even subtle mucosal abnormalities [1].

However, conventional enteroclysis suffers from two major disadvantages: The limited information regarding extramural extension of Crohn’s disease and its complications as well as the radiation dose administered to patients, mostly at a young age [2]. Computed tomographic (CT) enteroclysis is an imaging technique that is dedicated to the study of the small bowel with the combination of the advantages of combine enteroclysis and helical CT [3]. It has the capability to show mural changes and extra-luminal complications as well. This study was designed to show the role of CT enteroclysis in the evaluation of patients with Crohn’s disease.

Patients and Methods

This study included twenty one patients 12 males and 9 females well known of having chron’s disease refered to Al-Ameri Radiology Department in Kuwait from first of April 2009 till end of April 2011. Inclusion criteria, were patients during a symptomatic stage of their disease and found to need proper delineation of the bowel wall either as meticulous follow-up or in doubtful or difficult endoscopic cases. Exclusion criteria included pregnancy, well known hypersensitivity to contrast media and acute episode of intestinal obstruction.

The CT examinations were performed using 64 multidetector row CT scanner (highspeed QX/i; GE Medical Systems, Milwaukee, Wis) with a gantry rotation speed of 0.8 second per rotation. The scanning parameters were: Coverage area from diaphragm till symphysis pubis, scanned in craniocaudal direction, slice thickness 5mm, pitch of 1.5, table speed of 15mm per rotation, reconstruction interval of 2mm, tube voltage of 120kV, and tube current of 200mA.
CT enteroclysis was performed in a standardized fashion. After local anesthesia was established using a lidocaine hydrochloride 2% gel (Xylocaine, AstraZeneca), a nasogastric tube (Biblao catheter) was advanced beyond the duodenojejunal junction under fluoroscopic guidance. Then the patient is transferred to the CT unit and on table. One ampule of antiemetic (e.g., Primpran) is given 30 minutes before procedure. 20mg of hyoscine–N–butylbromide (Buscopan, Boehringer Ingelheim) was injected IV as a smooth muscle relaxant and thus allowing proper dilatation of the bowel. One ml of glucagon is injected through intravenous line on table to inhibit bowel motion and thus minimizing of potential artifacts by peristaltic bowel movement, wait for 5 minutes. Then 2 liters of manitol 2.5% are injected using 2 syringes 100ml each in a rate of one minute duration, thus total time was about 20 minutes (for injection of the total mannitol amount). Half to One liter of water is injected through the rectum in one patient with colonic involvement.

During examination, Some patients experienced nausea and so we raised their heads on a wedged pillow and this successfully prevented vomiting. For imaging technique, no procedure-related complications or any kind of discomfort during the instillation were observed.

CT scan of the abdomen and pelvis was performed before and after intravenous injection of nonionic contrast medium during one breath-hold, from the dome of the liver to the lower margin of the symphysis pubis. Plain study was designated to detect intraluminal, mural or adjacent extraluminal hyperdense or calcified shadows and to compare pre and post contrast enhancement of the bowel wall.

The triphasic technique was obtained by using 120ml of iohexol, Omnipaque 300 with a flow of 3mL/sec), these were administered via an antecubital vein and 18-gauge intravenous cannula by means of an automatic injector (Medrad; Stellant CT injector). The scan delay was determined by using automated bolus-triggering software (Smart Prep; GE Healthcare, Milwaukee, Wis) program. The region of interest cursor was positioned in the descending aorta 2cm above the diaphragm. Two scans are taken, first one after 45 seconds delay, second one after 70 seconds delay, if needed delayed scan after 7-10 minutes was performed.

Transferred transverse CT images were reviewed as digital images on a picture archiving and communication system workstation monitor (IMPAX, DS3000, AGFA). Coronal and sagittal multiplanar images (MPR) were reconstructed from the retroperitoneal border to the anterior abdominal wall at a 0.5-mm section width.

CT enteroclysis were specifically analyzed for the presence or absence of the following findings: Mucosal changes as bowel wall thickening and increased segmental contrast enhancement. Wall thickening was diagnosed when the bowel wall measured at least 3mm on an adequately distended bowel loop. Increased enhancement was assessed subjectively by comparing the suspected segment with unaffected small-bowel loops. Stenosis was characterized as a lack of bowel loop distention below a minimum diameter of 1.5cm. The criterion for the diagnosis of prestenotic dilatation was a diameter exceeding 2.5cm or the presence of segments wider than more proximal bowel loops. A fistula was defined as abnormal communication between two epithelial surfaces or from the bowel wall to the skin. Abscesses were diagnosed as a circumscribed, round, or oval fluid collection with a contrast-enhancing wall. Skip lesions were defined as additional segmental inflammatory small-bowel abnormalities in locations other than the terminal ileum. Additional abnormalities included mesenteric lymphadenopathy and conglomeration of bowel loops, defined as a clump of small-bowel loops, matted due to transmural inflammatory changes were also looked.

Results

CT enteroclysis was successfully performed in all 21 patients with well known history of having chron’s disease, 12 males and 9 females. Crohn’s disease-associated radiographic changes were found in all cases using CT enteroclysis. Table (1) showed different CT enteroclysis findings detected in the current study. The commonest sites of affection are the ilial loops (15) while the Transverse jejunum in 9. Only one case showed additional colonic involvement.

Table (1): Different detected CT enteroclysis findings.

<table>
<thead>
<tr>
<th>CT findings</th>
<th>Number of patients</th>
<th>%</th>
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<tbody>
<tr>
<td>Mucosal changes:</td>
<td></td>
<td></td>
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<tr>
<td>Bowel wall Thickening</td>
<td>21</td>
<td>100</td>
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<tr>
<td>Increased enhancement</td>
<td>21</td>
<td></td>
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<tr>
<td>Stenotic (narrowed) bowel segment</td>
<td>9</td>
<td>43</td>
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<tr>
<td>Skip lesions</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Enlarged mesenteric lymph nodes</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>Fistulæ</td>
<td>5</td>
<td>24</td>
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<tr>
<td>Conglomeration of small bowel loops</td>
<td>2</td>
<td></td>
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<tr>
<td>Abscess</td>
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<td>Ascites</td>
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Case (1): Fig. (A-C): A twenty-six-year-old man with active Crohn’s disease. Transverse and coronal CT enteroclysis image shows the mid part of the transverse colon (arrow) is a seat of an area of narrowing (6cm in length) with circumferential wall thickening and homogeneous enhancement (a) Uneven mild thickening of the wall of the ascending and descending colon also seen (white arrowhead). No obstruction.

Case (2): Fig. (A-B): A twenty-two-year-old female with prior history of ileocolic resection for Crohn disease: (A) Transverse CT enteroclysis image shows severe stenosis at anastomotic site, with marked thickening and mild enhancement of the terminal ileum and ileocecal junction show circumferential wall thickening and narrowing over a length of about 12cm (white arrows), (B) Coronal CT enteroclysis image shows normal postanastomotic colon (black arrow) with adjacent fat stranding and prominence of the mesenteric vasculature. No obstruction.
Case (3): Fig. (A-C): A twenty-two-year-old male known Crohn’s disease with right hemicolecctomy and recurrence at the neoterminal ileum To R/O stricture. Axial (A) and coronal (B-C) CT Enteroclysis: A segment of small bowel (arrow) is seen in the right lower abdomen and pelvis measuring about 7.8cm, in its maximum length showing wall thickening and narrowing as well as irregular contour. No evidence of obstruction.
Case (4): Fig. (A-D): A twenty five year old male, a known Crohn’s disease, came to check for any collections or strictures. Axial (A), coronal (B-C) and Sagittal (D) CT enteroclysis showed Air filled collection is seen contained between anterior abdominal wall and urinary bladder that contains air within (white arrow), suggesting fistulous communication. Wall thickening and irregularity of the sigmoid colon (black arrow) with Extensive stranding of the mesenteric fat is noted adjacent the above described collection with amalgamation of the bowel loops, yet no definite stricture with transition could be detected.

Case (5): Fig. (A-D): A twenty one year old male patient with fistulating Crohn’s disease to rectum and anterior abdominal wall. CT enteroclysis showed Amalgamated intestinal loops in the pelvis abutting the urinary bladder with thick circumferential homogenously enhancing walls and evident fistulous communication to the rectum posteriorly and anterior abdominal wall anteriorly (this seems closed at the skin and subcutaneous tissue by fibrosis). The right side of the wall of the urinary bladder shows indentation and localized thickening (white arrow).
Discussion

Crohn’s disease is a granulomatous inflammatory disease characterized by transmural and segmental involvement of the intestinal wall [4]. Complications of Crohn’s disease, such as mesenteric and adjacent organs extension, fistulas, abscesses, and stenoses, are found in approximately 40% of those patients [5,6]. Patients with inflammatory and sometimes even obstructive small-bowel disease require prompt and accurate treatment to relieve their symptoms and to minimize the risk of potential complications [7,8,9].

Conventional enteroclysis has been effective in the exclusion of small-bowel disease and in the work-up of patients suspected of having intestinal disease [10]. The principal advantage of conventional enteroclysis is that the jejunum and ileum can be optimally distended that provides functional information by defining distensibility or fixation of the small-bowel loops. On the other hand, conventional enteroclysis gives only indirect information on the state of the bowel wall and its surrounding structures, and its effectiveness may be hindered owing to overlapping bowel loops [11]. Several studies discussed other newly developed imaging techniques that could combine enteroclysis with cross-sectional imaging methods either computed tomography (CT) or magnetic resonance (MR) imaging that could have better role in early detection of complications of chron’s disease would be expected to take the diagnosis of small-bowel disease a step further.

The use of CT for the evaluation of patients with small-bowel disease has been one of the recent interests [12] as a successful alternative imaging method for a more detailed small-bowel evaluation and demonstration of the bowel wall and extraluminal structures [13]. CT enteroclysis provided important information about the extra-intestinal extension of the disease in particular, by depicting more fistulas and abscesses. In addition more accurate detection of skip lesions but lacks the ability to provide sufficient functional information [8,13]. CT enteroclysis initially used positive enteral contrast material without intravenous contrast material to show mucosal enhancement. Also we performed coronal and sagittal multiplanar reformat using high resolution images offered by 64 multislice machine which offered more anatomical details and were of great value in showing skip lesions as well as site and extent of fistulae. Multiplanar reformatted CT enteroclysis images also helped to determine the length of the affected portion of the small bowel.

In this study, we found increased enhancement and thickening of the mucosa in all patients (100%), this copes with Sailer et al., [15] who reported mucosal affection in 88% of cases. Stenotic bowel segments and skip lesions were depicted in 9 patients (43%). While Fistulas were found in 5 patients (24%). These figures are in agree with those reported by Sailer et al., [15] who detected fistulae and skip lesions in 36% & 34% of cases respectively. Also Boudiaf et al., [3] reported fistulae in 33% of cases. Sailer et al., [15] reported 13 case of conglomeration of bowel loops and 8 cases of abscesses in their study while in our study 2 cases have conglomeration of bowel loops, may be due to less number of cases included (21 case).

There are few limitations of this study. First, there is relatively small number of cases hindered findings of statistical significance, but this is attributed to restriction of this technique to complicated cases. Further studies are recommended in large number of doubtful or difficult endoscopic cases patients with Crohn’s.

Conclusion: CT enteroclysis is a promising technique in evaluations of chron’s disease as it combines benefits of traditional enteroclysis along with benefits of extra-intestinal imaging. It should be considered as the primary method of choice in assessment of chrons’s disease.

References


