



Original Research Article

Differentiation of Crohn's Disease and Intestinal Tuberculosis by Computed Tomography

Authors

R. Mithun Raj¹, Brahmadathan MN^{2*}, Paul V Puthussery³

¹Senior Resident, ²Professor, ³Associate Professor

Department of Radiodiagnosis, Government Medical College, Thrissur

Corresponding Author

Dr Brahmadathan MN

Professor of Radiodiagnosis, Government Medical College, Thrissur, India

Email: drmnbdathan@gmail.com

Abstract

Introduction and Background: *Intestinal tuberculosis and Crohn's disease are chronic granulomatous diseases that are commonly encountered in India. Crohn's disease seems to be increasing now a day. Intestinal Tuberculosis and Crohn's disease are difficult to differentiate because clinical, endoscopic and radiological manifestations of these diseases may be identical. This study aims to identify the CT features of Crohn's disease and Intestinal Tuberculosis and assess the significance of CT findings in differentiating between these two diseases.*

Materials and Methods: *Descriptive study was done in Department of Radiodiagnosis for a period of one and a half years with diagnosed 25 Crohn's disease patients (as per ECCO guidelines 2010) & 25 Intestinal Tuberculosis patients (as per modified Paustians criteria) who were referred for CT scan. Plain, oral and IV contrast CT abdomen were taken and the images were analyzed.*

Results: *CT features commoner in Crohn's disease were skip lesions ($p=0.01$), hypervascular mesentery (0.002), fibrofatty proliferation of mesentery (0.01) & wall thickening in distal ileum ($p=0.345$) was common in Crohn's disease than Intestinal Tuberculosis. CT features commoner in Intestinal Tuberculosis were mesenteric lymphadenopathy with central necrosis ($p=0.01$), high density ascites ($p=0.004$) & wall thickening in ileocecal junction was common in Intestinal Tuberculosis than Crohn's disease but did not show statistical significance (0.377).*

Conclusion: *CT is useful in differentiating the Crohn's disease and the Intestinal Tuberculosis.*

□ *Skip lesions, fibrofatty proliferation of mesentery, mesenteric hyper vascularity in Crohn's disease are useful in differentiating it from the Intestinal Tuberculosis.*

□ *Mesenteric lymph nodes with central necrosis, high density ascites in Intestinal Tuberculosis are useful in differentiating it from the Crohn's disease.*

Keywords: *Crohn's disease; Intestinal Tuberculosis; computed tomography.*

Introduction

Intestinal tuberculosis and Crohn's disease are chronic granulomatous diseases that are commonly

encountered in India and Crohn's disease seems to be increasing now days⁽¹⁻³⁾. Crohn's disease is a chronic granulomatous inflammatory disease of the gastrointestinal tract with a tendency toward

remission and relapse. Crohn's disease can affect any part of the gastrointestinal tract from the mouth to the anus, often involving multiple discontinuous sites⁽⁴⁾. Intestinal Tuberculosis is a diagnostic challenge as the nonspecific features of this disease may lead to diagnostic delays and development of complications⁽⁵⁾. Intestinal tuberculosis and Crohn's disease are difficult to differentiate because clinical, endoscopic and radiological manifestations of these diseases may be identical^(2,6). Computed tomography is useful in differentiating Crohn's disease and Intestinal Tuberculosis along with clinical, endoscopic and histological findings.

Any misdiagnosis will create potentially lethal problems to patients. Various studies have shown that computed tomography is useful in differentiating Crohn's disease from Intestinal Tuberculosis. There are some overlapping of CT findings between these two diseases, Hence identifying the most common CT findings in Crohn's disease patients like mural thickening with stratification, eccentric strictures, fibrofatty proliferation of mesentery, hypervascular mesentery (comb sign) and in intestinal tuberculosis patients like mural thickening without stratification, concentric strictures, hypodense lymph nodes with peripheral enhancement will help to differentiate Crohn's disease and Intestinal Tuberculosis⁽⁵⁾.

This study aims to evaluate differentiation of Crohn's disease and Intestinal Tuberculosis non-invasively by computed tomography.

Materials and Methods

Descriptive study was done in Department of Radiodiagnosis for a period of one and a half years with diagnosed 25 Crohn's disease patients (as per ECCO guidelines 2010⁽⁷⁾) & 25 Intestinal Tuberculosis patients (as per modified Paustians criteria⁽⁷⁾) who were referred for CT scan.

Patients with co-existing gastrointestinal malignancy, operated cases of Crohn's disease and Intestinal Tuberculosis, uncooperative patients, patients not willing to participate in this study were excluded from the study. The study was conducted with informed consent from the patients

after getting permission from Ethical committee. CT examination was done in fasting state with good bowel preparation. Patients were subjected to Computed Tomography using Siemen SOMATOM 16 Slice CT. Contrast was given by bolus injection at the rate of 2-3ml/sec typically of 100 ml of Iopromide (15gI/50ml, with each ml containing 0.623gm Iopromide i.e. equivalent to 300 mg iodine) who were not contraindicated by altered renal function or had previous history of hypersensitivity to iodinated contrast medium and positive oral contrast was given (500ml diluted diatrizoate meglumine and diatrizoate sodium approximately 30min prior to examination and an additional 250ml at the time of exam and rectal contrast was given on table). CT sections were taken from the level of diaphragm to pubic symphysis with 5mm thick sections, 6-15mm/sec table speed, and reconstruction of data at 3mm intervals. Multi-phase contrast study was done with image acquired at 30-35 sec for late arterial phase, 70 - 75 sec for portal venous phase after contrast administration.

Images were analysed for these findings - Wall thickening (small bowel - > 3mm, colon - >3mm and Rectum - >5mm)⁽⁸⁾, Skip lesions (Segmental areas of disease with intervening disease with intervening normal bowel), Fibrofatty proliferation of mesentery, Hypervascular mesentery (comb sign), Mesenteric lymphadenopathy with central necrosis (1 or more nodes with central necrosis), Fistula (Enterointeritic / Enteromesenteric / Enterocutaneous fistulas), Abscess, High density ascites (20-45HU)⁽⁹⁾ in both Intestinal Tuberculosis and Crohn's disease patients. Data was collected and tabulated with Microsoft excel and analysed using SPSS 16 software for obtaining the frequency, percentage and chi square values.

Results

Out of 25 Crohn's disease patients included in the study 19 (76%) were males and 6 (24%) were females. Most of them were in 20-40 years age group, Mean age is - 37 years and

Minimum age studied - 14 years, Maximum age studied - 68 years. Out of 25 Intestinal Tuberculosis

patients included in the study 17 (68%) were males and 8 (32%) were females. Most of them were in 40-60 years age group, Mean age is – 48.5 years, Minimum age studied– 21 years and Maximum age studied - 78 years.

Wall thickening in ileocecal junction: 28% (7 out of 25 patients) of Crohn's disease patients showed wall thickening in ileocecal junction region and 44% (11 out of 25 patients) of Intestinal Tuberculosis patients showed wall thickening in ileocecal region and when assessed for statistical significance using chi square test there was no significant association with $p = 0.377$.

Wall thickening in distal ileum region: 80% (20 out of 25 patients) of Crohn's disease patients showed wall thickening in distal ileum region and 64% (16 out of 25 patients) of Intestinal Tuberculosis patients showed wall thickening in distal ileum region and when assessed for statistical significance using chi square test there was no significant association with $p = 0.345$.



Figure 1: CECT Axial sections – wall thickening involving in distal ileum in a Crohn's disease patient.



Figure 2: Axial CECT shows wall thickening involving in ileocecal junction region in an Intestinal Tuberculosis patient.

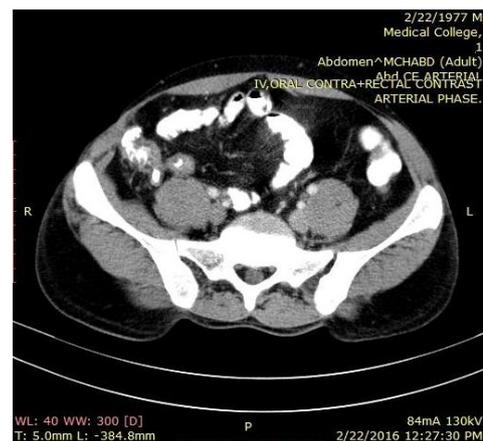
Wall thickening in jejunal loops: 8% (2 out of 25 patients) of Crohn's disease patients showed wall thickening in jejunal loops and 4% (1 out of 25 patients) of Intestinal Tuberculosis patients and when assessed for statistical significance using chi square test there was no significant association with $p = 1.0$.

Wall thickening in colon: 44% (11 out of 25 patients) of Crohn's disease patients showed wall thickening in colon and 36% (9 out of 25 patients) of Intestinal Tuberculosis patients and when assessed for statistical significance using chi square test, there was no significant association with $p = 0.773$.

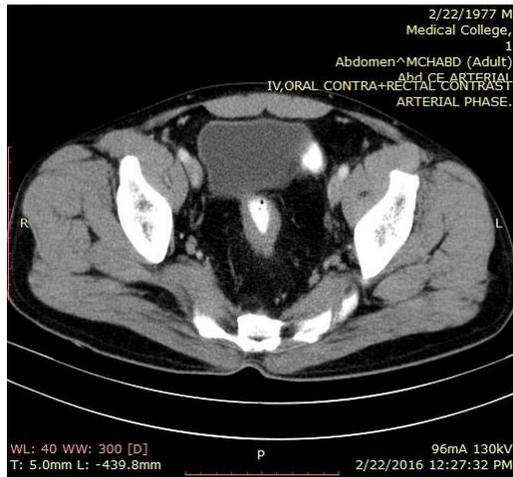
Wall thickening in rectum: 12% (3 out of 25 patients) of Crohn's disease patients showed wall thickening in rectum and none of the Intestinal Tuberculosis patients showed it. and when assessed for statistical significance using chi square test, there was no significant association with $p = 0.235$.

Skip lesions: 72% (18 out of 25 patients) of Crohn's disease patients showed skip lesions and none of the Intestinal Tuberculosis patients showed it and when assessed for statistical significance using chi square test, there was significant association with $p < 0.01$.

A



B



C

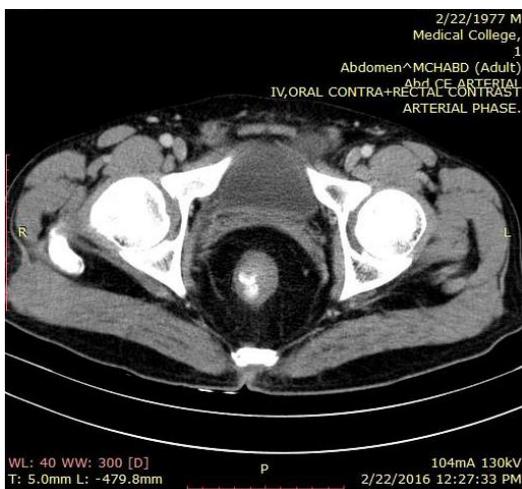


Figure 3: A, B & C axial CECT images show wall thickening involving in distal ileum, recto-sigmoid region and rectum (skip lesions) in a Crohn's disease patient.

Fibrofatty proliferation of mesentery: 64% (16 out of 25 patients) of Crohn's disease patients showed fibrofatty proliferation of mesentery and none of the Intestinal Tuberculosis patients showed it and when assessed for statistical significance using chi square test, there was significant association with $p = 0.002$.

Hyper vascular mesentery (comb sign): 56% (14 out of 25 patients) of Crohn's disease patients showed hyper vascular mesentery (comb sign) and none of the Intestinal Tuberculosis patients showed it and which was assessed for statistical significance using chi square test, there was significant association with $p < 0.01$.



Figure 4: Coronal CECT image shows hypervascular mesentery (comb sign) in a Crohn's disease patient.

Mesenteric lymph adenopathy with central necrosis: 44% (11 out of 25 patients) of Intestinal Tuberculosis patients showed mesenteric lymph adenopathy with central necrosis and none of the Crohn's disease patients showed it and when assessed for statistical significance using chi square test, there was significant association with $p < 0.01$.

Fistula: 1 out of 25 of patients of Crohn's disease and 3 out of 25 patients of Intestinal Tuberculosis showed fistula and when assessed for statistical significance using chi square test, there was no significant association with $p = 0.61$.

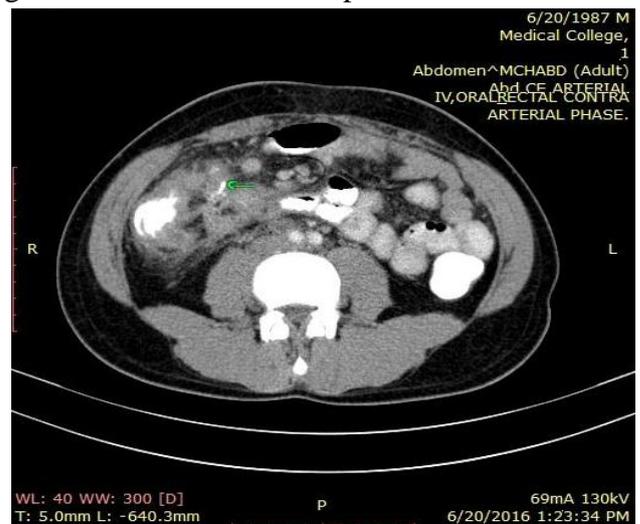


Figure 5: Axial CECT shows a fistulous track with ramification is seen extending from the terminal ileum to adjacent mesenteric soft tissue in an Intestinal Tuberculosis patient.

Abscess formation: 3 out of 25 of patients of Crohn’s disease and 2 out of 25 patients of Intestinal Tuberculosis showed abscess formation and when assessed for statistical significance using chi square test, there was no significant association with $p = 1.0$.

A



B



Figure 6: A & B - Axial CECT shows abscess in the RIF region in a Crohn’s disease patient and same patient shows wall thickening in the sigmoid colon region.

High density ascites: 32% (8 out of 25 patients) of Intestinal Tuberculosis patients showed high density

ascites and none of the Crohn’s disease patients showed it and when assessed for statistical significance using chi square test, there was significant association with $p = 0.004$.

Table 2: Frequency of CT findings in Crohn’s disease and Intestinal Tuberculosis with “p” value

| Parameters | Crohn’s disease | Intestinal Tuberculosis | P value | Significance |
|--|-----------------|-------------------------|---------|-----------------|
| Skip lesions | 72% (18) | 0% | <0.001 | significant |
| Fibrofatty proliferation of mesentery | 64% (16) | 0% | 0.002 | significant |
| Hyper vascular mesentery | 54% (14) | 0% | <0.01 | significant |
| Mesenteric lymphadenopathy with central necrosis | 0% | 44% (11) | <0.01 | significant |
| High density ascites | 0% | 32% (8) | 0.004 | significant |
| Wall thickening in ileocecal junction | 28%(7) | 44%(11) | 0.377 | Non-significant |
| Wall thickening in distal ileum | 80%(20) | 64%(16) | 3.45 | Non-significant |
| Wall thickening in jejunal loops | 8%(2) | 4%(1) | 1 | Non-significant |
| Wall thickening in colon | 44%(11) | 36%(9) | 0.773 | Non-significant |
| Wall thickening in rectum | 12%(3) | 0% | 0.235 | Non-significant |
| Fistula | 4%(1) | 12%(3) | 0.61 | Non-significant |
| Abscess | 12%(3) | 8%(2) | 1 | Non-significant |

Discussion

Distal ileum is the most common site of wall thickening Crohn’s disease and ileocecal junction in Intestinal Tuberculosis patients. In our study in wall thickening was commonly seen in distal ileum (80%) followed by ascending /descending/ transverse colon (40%), ileo-cecal junction (28%) sigmoid colon (12%), and rectum (12%) in Crohn’s disease.

This was consistent with a study by Yun-Yan Liu et al⁽⁴⁾, in which distal ileal involvement (60%) was common followed by ileo-cecal junction, ascending / descending / transverse colon, sigmoid colon and rectal involvement.

In Intestinal Tuberculosis patients wall thickening was commonly seen in distal ileal (64%) followed by ileo-cecal junction (44%), ascending / descending / transverse colon (36%) and sigmoid colon (4%).

This was consistent with a study by Yun-Yan Liu et al (4), in which ileo-cecal junction involvement (63%) was common followed by ileal, ascending / descending / transverse colon, sigmoid colon involvement.

Skip lesions is a common finding in Crohn's disease patients.

In our study skip lesions was only seen in Crohn's disease patients and which was assessed for statistical significance using chi square test, there was significant association with $p < 0.01$ ($p < 0.05$). This was consistent with a study by Anna Benjamin Pulimood⁽⁵⁾ et al, in which skip lesions were more commonly seen in Crohn's disease.

Fibrofatty proliferation of mesentery is a common finding in Crohn's disease patients. In our study fibrofatty proliferation of mesentery was only seen in Crohn's disease patients with statistical significance. This was consistent with a study by Dorothy Makanjuola⁽¹⁰⁾, in which fibrofatty proliferation of mesentery was only seen in Crohn's disease patients.

Hyper vascular mesentery (comb sign) is a common finding in Crohn's disease. In our study hyper vascular mesentery (comb sign) was only seen in Crohn's disease patients statistical significance. This was consistent with a study by S. Kedia et al (11), in which presence of Comb's sign (40% vs 19.6%, $p = 0.02$) and a study by Dorothy Makanjuola⁽¹⁰⁾, in which comb sign was only seen in Crohn's disease patients.

Mesenteric lymphadenopathy with central necrosis is commonly seen in Intestinal Tuberculosis patients. In our study mesenteric lymph adenopathy with central necrosis was only seen in Intestinal Tuberculosis patients with statistical significance. This was consistent with a study by Dorothy Makanjuola⁽¹⁰⁾ in which mesenteric lymph node with central necrosis was only seen in Intestinal Tuberculosis patients.

Fistulas are common in Crohn's disease and abscess is common in Intestinal Tuberculosis patients but these findings can be seen in both diseases.

High density ascites is common in Intestinal Tuberculosis patients. In our study 32% (8 out of 25

patients) of Intestinal Tuberculosis patients show high density ascites and none of the Crohn's disease patients. This was consistent with a study by Raju Sharma et al⁽¹²⁾ and Dorothy Makanjuola⁽¹⁰⁾, in which ascites was a common finding in Intestinal Tuberculosis patients.

Conclusions

CT is useful in differentiating the Crohn's disease and the Intestinal Tuberculosis. The conclusions drawn from the study include

- Skip lesions, fibrofatty proliferation of mesentery, mesenteric hyper vascularity are useful in differentiating it from the Intestinal Tuberculosis.
- Mesenteric lymph nodes with central necrosis, high density ascites are useful in differentiating it from the Crohn's disease.
- Fistulas, abscess and site of wall thickening are not very useful in differentiating Crohn's disease and the Intestinal Tuberculosis.

Conflict of Interest: No conflict of interest

Acknowledgement

We thank our Institutional research committee, Ethical committee and Kerala University of Health Sciences for permitting us to conduct the study and guiding us.

References

1. Amarapurkar DN, Patel ND, Rane PS. Diagnosis of Crohn's disease in India where tuberculosis is widely prevalent. World journal of gastroenterology: WJG. 2008 Feb 7;14(5):741.
2. Makharia GK, Srivastava S, Das P, Goswami P, Singh U, Tripathi M, Deo V, Aggarwal A, Tiwari RP, Sreenivas V, Gupta SD. Clinical, endoscopic, and histological differentiations between Crohn's disease and intestinal tuberculosis. The American journal of gastroenterology. 2010 Mar 1;105(3):642-51.

3. Mukewar S, Mukewar S, Ravi R, Prasad A, Dua KS. Colon tuberculosis: endoscopic features and prospective endoscopic follow-up after anti-tuberculosis treatment. *Clinical and translational gastroenterology*. 2012 Oct 1;3(10):e24.
4. Liu YY, Chen MK, Cao Z, Liu SZ, Ding BJ. Differential diagnosis of intestinal tuberculosis from Crohn's disease and primary intestinal lymphoma in China. *Saudi journal of gastroenterology: official journal of the Saudi Gastroenterology Association*. 2014 Jul;20(4):241.
5. Pulimood AB, Amarpurkar DN, Ghoshal U, Phillip M, Pai CG, Reddy DN, Nagi B, Ramakrishna BS. Differentiation of Crohn's disease from intestinal tuberculosis in India in 2010. *World journal of gastroenterology: WJG*. 2011 Jan 28;17(4):433.
6. Li X, Liu X, Zou Y, Ouyang C, Wu X, Zhou M, Chen L, Ye L, Lu F. Predictors of clinical and endoscopic findings in differentiating Crohn's disease from intestinal tuberculosis. *Digestive diseases and sciences*. 2011 Jan 1;56(1):188-96. 10.1007/s10620-010-1231-4.Epub 2010 May 14. Erratum in: *Dig Dis Sci*. 2011 Mar;56(3):920.
7. Larsson G, Shenoy KT, Ramasubramanian R, Thayumanavan L, Balakumaran LK, Bjune GA, Moum BA. High faecalcalprotectin levels in intestinal tuberculosis are associated with granulomas in intestinal biopsies. *Infectious Diseases*. 2015 Mar 4;47(3):137-43.
8. Normal radiological reference values ,Dr Dan J Bell® and DrAyushGoel et al. 85
9. Burrill J, Williams CJ, Bain G, Conder G, Hine AL, Misra RR. Tuberculosis: a radiologic review. *Radiographics*. 2007 Sep;27(5):1255-73.
10. Mekanjuola D. Is it Crohn's disease or intestinal tuberculosis? CT analysis. *European journal of radiology*. 1998 Aug 31;28(1):55-61.
11. Kedia S, Sharma R, Nagi B, Mouli VP, Aananthakrishnan A, Dhingra R, Srivastava S, Kurrey L, Ahuja V. Computerized tomography-based predictive model for differentiation of Crohn's disease from intestinal tuberculosis. *Indian Journal of Gastroenterology*. 2015 Mar 1;34(2):135-43.
12. Sharma R, Madhusudhan KS, Ahuja V. Intestinal tuberculosis versus crohn's disease: Clinical and radiological recommendations. *The Indian journal of radiology & imaging*. 2016 Apr;26(2):161.