



## Research Article

### CT ENTEROGRAPHY CROHNS ACTIVITY INDICES

Dr. Vikas Kumar Yadav<sup>1</sup>, Dr. Sachin Banthia<sup>2</sup>, Dr. Ridhima Gupta<sup>3</sup>

<sup>1</sup>Resident, Radiodiagnosis, Sardar Patel Medical College, Bikaner, Email ID- vikas775054@gmail.com

<sup>2</sup>Professor, Sardar Patel Medical College, Bikaner. Email ID- Sachinbanthia007@gmail.com.

<sup>3</sup>Professor, Sardar Patel Medical College, Bikaner. Email ID- doc.riids@gmail.com.

#### \*Corresponding Author

Dr. Vikas Kumar Yadav,  
Resident, Radiodiagnosis,  
Sardar Patel Medical College,  
Bikaner, Email ID-  
vikas775054@gmail.com

DOI:10.61336/JSR/26-3-10

#### Article History

**Received:** 15.02.2026

**Revised:** 22.02.2026

**Accepted:** 27.03.2026

**Published:** 05.04.2026

#### Citations:

Yadav, V. K., Banthia, S., & Gupta, R.  
(n.d.). CT enterography Crohn's activity  
indices. *J Surg Radiol*, V5(3) 66-70

**Abstract:** **Introduction:** Assessment of disease activity in Crohn's disease (CD) plays a central role in guiding patient management, evaluating therapeutic response, and predicting long-term outcomes. **AIM:** The aim of this study is to evaluate the accuracy of CT enterography in assessing the degree of inflammatory activity in patients with Crohn's disease. **METHODOLOGY:** This was a hospital-based prospective observational study conducted in the Department of Radiodiagnosis, SP medical college Bikaner. **RESULT:** CT enterography demonstrated a high prevalence of mural and extra-intestinal inflammatory changes in patients with Crohn's disease, with bowel wall thickening and mural hyperenhancement being the most common findings. A strong positive correlation was observed between CT enterography features and CDAI as well as histopathological severity, with imaging abnormalities increasing with disease activity. **CONCLUSION:** CT enterography is a reliable and non-invasive modality for assessing disease activity, extent, and transmural involvement in Crohn's disease. Its strong correlation with clinical and histopathological severity supports its role in guiding management and monitoring therapeutic response.

**Keywords:** Crohns, Enterography, CT

## INTRODUCTION

Assessment of disease activity in Crohn's disease (CD) plays a central role in guiding patient management, evaluating therapeutic response, and predicting long-term outcomes<sup>1</sup>. Accurate determination of inflammatory activity is essential for selecting appropriate medical therapy, deciding on surgical intervention, and monitoring disease progression or remission<sup>2</sup>. Traditionally, disease activity in CD has been evaluated using a combination of clinical assessment, endoscopic findings, and laboratory inflammatory markers such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP).<sup>3</sup> While these tools are widely used in routine practice, each has important limitations that reduce their ability to comprehensively assess the true extent and severity of the disease. Clinical indices are often subjective and may not correlate well with underlying inflammation, whereas serum biomarkers lack specificity and are not fully reliable indicators of disease activity in all patients<sup>4</sup>. Endoscopy remains the gold standard for assessing mucosal involvement in Crohn's disease; however, it is limited to evaluation of the superficial mucosa and fails to assess the transmural nature of inflammation that characterizes CD. Moreover, endoscopy provides limited information about extra-intestinal manifestations and may not adequately evaluate proximal small bowel involvement<sup>5</sup>.

Conventional imaging techniques such as small bowel follow-through can help define the extent and severity of luminal narrowing but offer little insight into whether such narrowing is caused by active inflammation or fixed fibrotic stricture. Additionally, small bowel follow-through does not allow adequate assessment of extra-enteric complications or mesenteric involvement. Computed tomography (CT) has emerged as an important imaging modality in the evaluation of Crohn's disease, particularly for detecting complications such as fistulas, abscesses, strictures, and bowel obstruction. Beyond complication detection, CT also shows promise in the assessment of inflammatory activity<sup>6</sup>. From the patient's perspective, CT offers several advantages over traditional fluoroscopic studies, including shorter examination time, minimal patient repositioning, and improved comfort. The development of multi-detector CT technology has further enhanced its diagnostic value, leading to the evolution of CT enterography (CTE) as a specialized technique for small bowel evaluation. CT enterography differs from conventional abdominal CT by combining high-resolution multi-detector imaging with large volumes of neutral oral contrast and intravenous contrast administration. This technique allows optimal distension and visualization of the small bowel lumen while providing detailed cross-sectional images of the bowel wall and surrounding structures. The ability to generate

thin-slice images and perform multiplanar reconstructions enables accurate assessment of both intra-luminal and extra-luminal disease manifestations.<sup>7</sup> Several CTE features, including bowel wall thickening, abnormal mural enhancement, increased attenuation of mesenteric fat, engorgement of the vasa recta known as the “comb sign,” and enlarged mesenteric lymph nodes, have been shown to correlate strongly with active inflammatory disease. Given these advantages, CT enterography has become a valuable non-invasive tool for evaluating disease activity in Crohn's disease.<sup>8</sup>

**AIM**

The aim of this study is to evaluate the accuracy of CT enterography in assessing the degree of inflammatory activity in patients with Crohn's disease .

**METHODOLOGY**

This was a hospital-based prospective observational study conducted in the Department of Radiodiagnosis, SP medical college, Bikaner. The study was carried out over a period of 6months, from July 2025 to dec 2025.

Patients with a clinical suspicion or previously diagnosed cases of Crohn's disease who were referred for CT enterography as part of their routine evaluation were included in the study. All patients underwent CT enterography using a standardized protocol, and the imaging findings suggestive of disease activity were documented. Histopathological examination of endoscopic or surgical biopsy specimens was taken as the reference standard for assessment of inflammatory activity, and CT enterography findings were correlated with histopathological results.

Inclusion criteria comprised patients of either sex aged above 12 years with clinically suspected or histologically proven Crohn's disease, patients who underwent CT enterography and had available histopathological correlation, and patients who provided informed consent to participate in the study. Exclusion criteria included patients with contraindications to iodinated contrast media, such as known contrast allergy or significant renal impairment, pregnant patients, patients with incomplete imaging or histopathological data, and those who were hemodynamically unstable or unwilling to participate.

**RESULTS**

**Table 1: Demographic Profile of Patients with Crohn's Disease (n = 39)**

Age (years)	Number (n)	Percentage (%)
<20	7	17.9%
21–30	8	20.5%
31–40	8	20.5%
41–50	9	23.1%
>50	7	17.9%

The age of patients in the present study ranged widely, with the highest number of cases seen in the 21–30 years and 31–40 groups (20.5% each ). This was followed by patients in the 41–50 years age groups (23.1% ), while patients below 20 years and above 50 years constituted 17.9% each of the study population.

**Table 2: Gender Distribution of the Study Population**

Gender	Number (n)	Percentage (%)
Male	23	59%
Female	16	41%

Male patients constituted the majority of the study population (59%), while females accounted for 41% of cases. This indicates a mild male predominance in the occurrence of Crohn's disease in the present study.

**Table 3: Duration of Disease in the Study Population**

Duration of disease	Number (n)	Percentage (%)
<1 year	14	35.9%
1–5 years	17	43.6%
>5 years	8	20.5%

The majority of patients had a disease duration of 1–5 years (43.6%), followed by those with a duration of less than one year (35.9%). Patients with a disease duration of more than five years constituted 20.5% of the study population.

**Table 4: Distribution of Patients Based on CDAI Score (n = 39)**

CDAI Category	CDAI Score Range	Number (n)	Percentage (%)
Mild	150-219	15	38.5%
Moderate	220-450	18	46.1%
Severe	>450	6	15.4%

Most patients in the study had moderate disease activity with a CDAI score of 220–450 (46.1%), followed by those with mild disease activity (38.5%). Severe disease activity (CDAI >450) was observed in 15.4% of the patients.

**Table 5:CT Enterography Findings in the Study Population**

<b>CTEI Finding</b>	<b>Present</b>	<b>Percentage</b>
<b>Bowel wall thickening (&gt;3 mm)</b>	<b>32</b>	<b>82.1%</b>
Mural hyperenhancement	29	74.4%
Stratified mural enhancement	21	53.8%
Comb sign	24	61.5%
Mesenteric fat stranding	27	69.2%
Mesenteric lymphadenopathy	19	48.7%
Ulceration	17	43.6%

Bowel wall thickening was the most common CT enterography finding, seen in 82.1% of patients, followed by mural hyperenhancement (74.4%) and mesenteric fat stranding (69.2%). Other features such as stratified mural enhancement, comb sign, mesenteric lymphadenopathy, and ulceration were also frequently observed, reflecting active inflammatory disease.

**Table 6: Distribution of Disease According to CTE**

<b>Site of involvement</b>	<b>Number (n)</b>	<b>Percentage (%)</b>
Terminal ileum	14	35.9%
Ileum	8	20.5%
Ileo-colonic	10	25.6%
Colonic	4	10.3%
Multi-segment involvement	3	7.7%

The terminal ileum was the most commonly involved site, accounting for 35.9% of cases, followed by ileo-colonic involvement in 25.6% of patients. Isolated ileal, colonic, and multi-segment involvement were observed in 20.5%, 10.3%, and 7.7% of cases, respectively.

**Table 7: CT Enterography (CTEI) Positive Findings in Study Population**

<b>CTEI Finding</b>	<b>Histo pathology Result</b>			<b>Total</b>
	<b>Mild/negative</b>	<b>Moderate</b>	<b>Severe</b>	
<b>Bowel wall thickening (&gt;3 mm)</b>	<b>13</b>	<b>13</b>	<b>6</b>	<b>32</b>
<b>Mural hyperenhancement</b>	<b>11</b>	<b>12</b>	<b>6</b>	<b>29</b>
<b>Stratified mural enhancement</b>	<b>8</b>	<b>8</b>	<b>5</b>	<b>21</b>
<b>Comb sign</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>24</b>
<b>Mesenteric fat stranding</b>	<b>10</b>	<b>11</b>	<b>6</b>	<b>27</b>
<b>Mesenteric lymphadenopathy</b>	<b>8</b>	<b>7</b>	<b>4</b>	<b>19</b>
<b>Ulceration</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>17</b>

CT enterography findings showed a clear increase in frequency with rising histopathological severity, with most features being more common in moderate and severe disease. Findings such as bowel wall thickening, mural hyperenhancement, comb sign, and ulceration demonstrated a strong correlation with histopathologically proven active inflammation.

## DISCUSSION

In our study the population showed a wide age distribution, ranging from below 20 years to above 50 years. The age of patients in the present study ranged

widely, with the highest number of cases seen in the 21–30 and 31–40 years age groups (20.5% each). This was followed by patients in the 41–50 years age group (23.1%), Patients below 20 years and above 50 years constituted 17.9% each, indicating that Crohn's disease affected individuals across all age groups.

In the present study, a total of 39 patients were evaluated for Crohn's disease. Male patients constituted the majority of the study population, accounting for 23 cases (59%). Female patients comprised 16 cases (41%) of the total study group. The male-to-female ratio was approximately 1.4:1, indicating a slight male predominance. This gender distribution is comparable with previously reported studies on Crohn's disease. Ahmed Mostafa Mohamed et al<sup>9</sup> Twenty-six patients were included in the study. There were 18 males and 8 females. Median age was 43.4 years (range 19–69). In the present day the duration of disease among the study population showed considerable variation. The majority of patients had a disease duration of 1–5 years, accounting for 43.6% of cases. Patients with disease duration of less than one year constituted 35.9%, indicating a significant number of relatively recent diagnoses. Long-standing disease of more than five years was observed in 20.5% of patients. This distribution reflects a predominance of patients in the early to intermediate stages of Crohn's disease.

In our study Assessment of disease activity using the Crohn's Disease Activity Index (CDAI) revealed that the majority of patients had moderate disease activity (46.1%). Patients with mild disease activity constituted 38.5% of the study population, indicating a substantial proportion with less severe symptoms. A smaller group of patients (15.4%) demonstrated severe disease activity, reflecting advanced clinical involvement. Overall, most patients fell within the mild to moderate CDAI categories. CDAI proved useful in stratifying patients according to clinical severity. Park E K et al<sup>10</sup> Mural hyperenhancement, mural thickness, comb sign, mesenteric fat density, and fibrofatty proliferation were significantly correlated with CDAI and CRP ( $P < 0.05$ ). The binary logistic regression model demonstrated that mesenteric fat density, mural stratification, and the presence of enhanced lymph nodes ( $P < 0.05$ ) had an influence on CDAI severity. The area under the receiver operating characteristic curve (AUROC) of the CTE index for predicting disease activity was 0.85. Using a cut-off value of 8, the sensitivity and negative predictive values were 95% and 94%, respectively.

In our study CT enterography revealed bowel wall thickening ( $>3$  mm) as the most common finding, seen in 82.1% of patients, indicating active intestinal inflammation. Mural hyperenhancement was observed in

74.4% of cases, reflecting increased vascularity and inflammatory activity of the bowel wall. Mesenteric fat stranding was present in 69.2% of patients, suggesting extension of inflammation into the surrounding mesentery. The comb sign, representing engorged vasa recta, was noted in 61.5% of cases and was more frequent in patients with active disease. Stratified mural enhancement was identified in 53.8% of patients, signifying layered mural inflammation. Mesenteric lymphadenopathy and ulceration were seen in 48.7% and 43.6% of patients, respectively, indicating moderate to severe disease involvement. Tong J A et al<sup>11</sup> total of 280 intestinal segments were evaluated. Independent predictors for CDEIS were mural thickness ( $p < 0.001$ ), mural stratification ( $p < 0.001$ ) and comb sign ( $p = 0.002$ ). In order to quantify disease activity based on CTE findings in each segment, a simplified CT enterography index of activity (CTEIA) was derived from logistic regression analysis. The formula was as follows:  $CTEIA(\text{segment}) = 2.1 \text{ mural thickness}(\text{mm}) + 9.7 \text{ mural stratification} + 5.2 \text{ comb sign}$ . There was a high and significant correlation coefficient between CDEIS and CTEIA ( $r = 0.779$ ,  $p < 0.001$ ) for per-segment analysis.

In our study The distribution of disease involvement on CT enterography showed that the terminal ileum was the most commonly affected site, accounting for 35.9% of cases. Isolated ileal involvement was observed in 20.5% of patients, while ileo-colonic involvement was seen in 25.6%, indicating frequent extension of disease beyond the small bowel. Colonic involvement alone was less common, occurring in 10.3% of cases. Multi-segment involvement, reflecting more extensive disease, was identified in 7.7% of patients. Tong J A et al<sup>11</sup> The model for the detection of ulcerative lesions in the colon and terminal ileum achieved an area under the receiver-operating curve of 0.901 using a cut-off point of 6.25.

In our study Correlation of CT enterography findings with histopathological severity showed a progressive increase in imaging abnormalities with increasing disease activity. Bowel wall thickening and mural hyperenhancement were the most frequently observed findings across all categories, including mild/negative, moderate, and severe disease. Features such as stratified mural enhancement, comb sign, and mesenteric fat stranding were more commonly seen in patients with moderate and severe histopathological activity. Severe disease showed a higher proportion of aggressive findings, particularly ulceration and stratified enhancement, indicating advanced transmural inflammation. Mesenteric lymphadenopathy was observed across all grades but was more frequent in moderate and severe cases. Ahmed Mostafa Mohamed et al<sup>9</sup> Moderate disease was diagnosed correctly in 50% of cases on the basis of the presence of mucosal hyperenhancement and bowel wall thickening  $>3$  mm, while 40% were over graded as severe and McNemar test revealed no significant agreement between CT findings

and histological results. So we found that if we recondition the presence of two criteria rather than only one to diagnose severe disease, the correlation with histological results would be of greater sensitivity in predicting moderate disease activity(80%)

## CONCLUSION

The present study demonstrates that CT enterography is a valuable and reliable imaging modality for the assessment of disease activity in patients with Crohn's disease. The study population showed a wide age distribution with a slight male predominance, and most patients presented in the early to intermediate stages of the disease, highlighting the chronic and progressive nature of Crohn's disease. Clinical assessment using the Crohn's Disease Activity Index revealed that the majority of patients had mild to moderate disease activity, emphasizing the need for accurate, non-invasive tools for disease stratification and monitoring.

CT enterography effectively identified both mural and extra-intestinal manifestations of Crohn's disease, with bowel wall thickening, mural hyperenhancement, mesenteric fat stranding, and comb sign being the most frequent findings. The terminal ileum and ileo-colonic regions were the most commonly involved sites, consistent with known disease distribution patterns. Importantly, CT enterography findings showed a strong correlation with histopathological severity, with an increasing frequency and intensity of imaging abnormalities observed from mild to severe disease. Features such as stratified mural enhancement, ulceration, and comb sign were particularly associated with moderate to severe inflammatory activity, reflecting transmural disease involvement.

## REFERENCES

1. Solem CA, Loftus EV, Tremaine WJ, et al. Correlation of C-reactive protein with clinical, endoscopic, histologic, and radio-graphic activity in inflammatory bowel disease. *Inflamm Bowel Dis* 2005;11:707–12.
2. Del Campo L, Arribas I, Valbuena M, et al. Spiral CT findings inactive and remission phases in patients with Crohn's disease. *J Comput Assist Tomogr* 2001;25:792–7.
3. Best WR, Beckett JM, Singleton JW. Rederived values of eight coefficients of the Crohn's disease activity index (CDAI). *Gastroenterology* 1979;77:843–6.
4. Booya F, Fletcher JG, Huprich JE, et al. Active Crohn disease:CT findings and interobserver agreement for enteric phase CT enterography. *Radiology* 2006;241(3):787–95.
5. Johnson KT, Hara AK, Johnson CD. Evaluation of colitis:usefulness of CT enterography technique. *Emerg Radiol*2009;16:277–82.
6. Bruining DH, Siddiki HA, Fletcher JG, et al. Prevalence of penetrating disease and extraintestinal manifestations of Crohn's disease detected with CT enterography. *Inflamm Bowel Dis*2008;14(12):1701–16.
7. Gore RM, Balthazar EJ, Ghahremani GG, Miller FH. CT features of ulcerative colitis and Crohn's disease. *Am J Roentgenol* 1996;167:3–15.
8. Choi D, Jin Lee S, Ah Cho Y, et al. Bowel wall thickening in patients with Crohn's disease. CT patterns and correlation with inflammatory activity. *Clin Radiol* 2003;58:68–74.
9. Ahmed Mostafa Mohamed, Sherine Kadry Amin, Maha A. El-Shinnawy, Amr Elfouly, Aber Halim Baki, Role of CT enterography in assessment of Crohn's disease activity: Correlation with histopathologic diagnosis, *The Egyptian Journal of Radiology and Nuclear Medicine*, Volume 43, Issue 3, 2012, Pages 353-359, ISSN 0378-603X, <https://doi.org/10.1016/j.ejrn.2012.05.005>. (<https://www.sciencedirect.com/science/article/pii/S0378603X12000563>)
10. Tong J, Feng Q, Zhang C, Xu X, Ran Z. CT enterography for evaluation of disease activity in patients with ileocolonic Crohn's disease. *BMC Gastroenterol.* 2022 Jun 30;22(1):324. doi: 10.1186/s12876-022-02389-5. PMID: 35773629; PMCID: PMC9248101.
11. Park E K, Han N Y, Park B J, Sung D J, Cho S B, et al. Value of Computerized Tomography Enterography in Predicting Crohn's Disease Activity: Correlation with Crohn's Disease Activity Index and C-Reactive Protein. *I J Radiol*.2016;13(4):e59352. <https://doi.org/10.5812/ijranradiol.34301>.