

Visceral Fat Area to Subcutaneous Fat Area >0.63 and Long Segment ≥ 3 cm as a Non-Invasive Method to Identify Crohn's Disease

Abhraneel Parames Guha¹, Jyoti Ranjan Mohapatra¹, Sayan Das¹, Sugat Sanyal¹, Saheli Mandal¹, Saikat Kumar Dalui¹

Peerless Hospital and B.K. Roy Research Centre, Kolkata, India

Cite this article as: Guha AP, Mohapatra JR, Das S, Sanyal S, Mandal S, Dalui SK. Visceral Fat Area to Subcutaneous Fat Area >0.63 and Long Segment ≥ 3 cm as a Non-Invasive Method to Identify Crohn's Disease. *J Enterocolitis*. 2025;4(1):15-18.

Corresponding author: Abhraneel Guha, e-mail: a.guha17@gmail.com

Received: March 16, 2025 **Accepted:** March 16, 2025

DOI: 10.14744/Jenterocolitis.2025.48533



Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Abstract

Objective: Crohn's disease is often difficult to diagnose. The combined score of visceral fat area/subcutaneous fat area (VFA/SCFA) >0.63 and a long segment (LS) ≥ 3 cm has previously been used to differentiate between Crohn's disease and tuberculosis. We investigated whether this score identifies only Crohn's disease and differentiates it not only from tuberculosis but also from other etiologies.

Methods: This was a retrospective analysis of prospectively maintained data at Peerless Hospital and B.K. Roy Research Centre, Kolkata, from June 2023 to January 2024. A total of 31 patients were included (15 diagnosed with Crohn's disease, 16 diagnosed with other etiologies). Contrast-enhanced computed tomography (CECT) abdomen was performed in all clinically suspected patients, and VFA/SCFA was calculated at the level of the L4–L5 vertebrae. LS was also measured. Each patient was followed up for one year. The chi-square test was used to determine statistical significance, using MedCalc version 15.8 software. We compared the results with other radiologically applicable scores.

Results: The combined score of 2, using VFA/SCFA >0.63 and LS ≥ 3 cm, showed a p-value of 0.0001 and was significantly associated with the diagnosis of Crohn's disease in our study.

Conclusion: The combined score of VFA/SCFA >0.63 and LS ≥ 3 cm is a useful tool for identifying Crohn's disease and may serve as an additional marker for the condition.

Keywords: Crohn's disease, long segment, visceral fat

INTRODUCTION

Crohn's disease is often difficult to diagnose. The combined score of visceral fat area/subcutaneous fat area (VFA/SCFA) >0.63 and long segment (LS) ≥ 3 cm has previously been used to differentiate between Crohn's disease and tuberculosis. In this study, we aimed to determine whether the score can specifically identify Crohn's disease and differentiate it not only from tuberculosis but also from other etiologies. Our goal was to evaluate the usefulness of the combined score—VFA/SCFA >0.63 and LS ≥ 3 cm, yielding a total score of 2—as an additional diagnostic tool for identifying or excluding Crohn's disease. The objective was to assess whether there is an association between this combined score and the diagnosis of Crohn's disease.

MATERIALS AND METHODS

This study was a retrospective analysis of prospectively maintained data conducted at Peerless Hospital and B.K. Roy Research Centre, Kolkata, from June 2023 to January 2024. A total of 31 patients were included in the study. Of these, 15 patients were diagnosed with Crohn's disease, while the remaining 16 patients were diagnosed with other etiologies.

All patients underwent contrast-enhanced computed tomography (CECT) of the abdomen based on clinical suspicion of Crohn's disease. Visceral fat area to subcutaneous fat area (VFA/SCFA) and LS involvement were calculated at the level of the L4–L5 vertebrae. Fat areas were measured using a freehand ruler within a density range of -50 Hounsfield units (HU) to -150 HU.

Each patient also underwent ileocolonoscopy with tissue biopsy or double-balloon enteroscopy with tissue biopsy, if required, as part of the routine diagnostic workup for such cases. The parameter VFA/SCFA >0.63 was assigned a score of 1, and LS ≥ 3 cm was also assigned a score of 1. The purpose of the study was to evaluate whether a combined score of 2 is associated with the diagnosis of Crohn's disease.

All patients were followed up for a period of one year, with evaluations conducted at 0, 3, 6, 9, and 12 months. Statistical significance was assessed using the chi-square test with MedCalc software, version 15.8.

Table 1.

Combined score	Biopsy impression				
	Intestinal tuberculosis	Crohn's disease	Non specific ileitis	Tubular adenoma with low grade dysplasia	
0	1	0	7	1	9 (29%)
1	0	0	7	0	7 (23%)
2	0	15	0	0	15 (48%)
	1 (3%)	15 (48%)	14 (46%)	1 (3%)	31

Table 2. The different spectrum of disease of ileal lesion and the chi square significance of combined score with it.

Chi square	32.727
DF	6
Significance level	P < 0.0001
Contingency level	0.722

Inclusion Criteria:

1. Patients presenting with clinical features including chronic diarrhea lasting more than 3 months, abdominal pain, fever, anemia, and weight loss.
2. Patients aged over 18 years who provided consent for the study.
3. Presence of small intestinal wall thickening or signs of small intestinal wall inflammation.
4. All patients underwent ileocolonoscopy or double-balloon enteroscopy when required, with biopsy taken from the small intestinal lesion.

Exclusion Criteria:

1. Patients receiving biological therapy for conditions such as rheumatoid arthritis or other diseases.
2. Patients already diagnosed with Crohn's disease and currently undergoing treatment for it.

Definition of Case and Control

Case: Patients diagnosed with Crohn's disease based on ECCO guidelines, incorporating clinical, endoscopic, and histological findings.

Control: Patients with etiologies other than Crohn's disease but exhibiting clinical features similar to those of Crohn's disease.

RESULTS

A total of 31 patients were included in the analysis. Among them, 15 patients (48%) had a combined score of 2, all of whom were diagnosed

MAIN POINTS

- A combined score of VFA/SCFA >0.63 and long segment involvement >3 cm is strongly associated with biopsy-proven Crohn's disease.
- The score demonstrated a statistically significant correlation with Crohn's disease diagnosis ($p < 0.0001$), with high sensitivity and specificity.
- In all cases where both parameters were present, Crohn's disease was confirmed; when one or both were absent, Crohn's disease was not diagnosed.
- The combined score may serve as a non-invasive, radiological screening tool to support the diagnosis or exclusion of Crohn's disease in clinically suspected cases.
- Further multicentric studies with larger sample sizes are needed to validate the diagnostic performance of this scoring method.

with Crohn's disease on biopsy. A combined score of 1 was observed in 7 patients (23%), all diagnosed with non-specific ileitis. A combined score of 0 was seen in 9 patients (29%), which included 1 case of intestinal tuberculosis, 7 cases of non-specific ileitis, and 1 case of tubular adenoma with low-grade dysplasia.

There was a statistically significant association between the combined score and the biopsy diagnosis, with a chi-square value of 32.727, degrees of freedom (DF) of 6, and a p-value of <0.0001. The contingency coefficient was 0.722, indicating a strong association (Table 1 and 2).

DISCUSSION

Crohn's disease (CD) is often quite challenging to diagnose, especially when biopsy findings do not provide definitive evidence of the condition. In such cases, it remains difficult to confidently diagnose Crohn's disease and initiate appropriate treatment. A few previous studies have utilized a combined score based on a visceral fat area to subcutaneous fat area (VFA/SCFA) ratio of >0.63 and LS involvement of >3 cm to suggest a diagnosis leaning more toward Crohn's disease rather than tuberculosis.¹

The exact reason why the VFA/SCFA ratio is typically greater than 0.63 in Crohn's disease and not in tuberculosis has yet to be clearly established. One possible explanation is that, in tuberculosis, the body focuses on fighting the infectious organism and therefore does not attempt to conserve fat. In contrast, Crohn's disease may lead to intestinal narrowing, strictures, and malabsorption syndrome, prompting the body to conserve fat—particularly visceral fat—although this theory is yet to be proven. In our study, we aimed to determine whether the combined score of VFA/SCFA >0.63 and LS >3 cm is associated with Crohn's disease confirmed by biopsy. We also evaluated whether the absence of both parameters, or the presence of only one that does not meet the specified threshold, could help in excluding a diagnosis of Crohn's disease. This approach may aid in screening for Crohn's disease through a non-invasive method and serve as an additional marker in cases where the diagnosis is uncertain or difficult to establish.

In our study, we found that using the combined score, we were able to both diagnose and exclude Crohn's disease. The p-value was <0.0001. Out of 30 patients, 15 were diagnosed with Crohn's disease, and 15 were not. Among the non-Crohn's cases, 11 were diagnosed with non-specific ileitis, 3 with chronic inflammation, and 1 with tubular adenoma with low-grade dysplasia. Although our results demonstrated very high sensitivity and specificity, approaching 100%, a larger sample size is necessary to make definitive conclusions. Nevertheless, the findings were encouraging (Figure 1-3).

In a study conducted by Kedia et al.,¹ it was concluded that the combination of long segment involvement and a VFA/SCFA ratio >0.63 was exclusive to Crohn's disease when compared with ileocecal tuberculosis. In other studies, only the VFA/SCFA ratio >0.63 was used as a

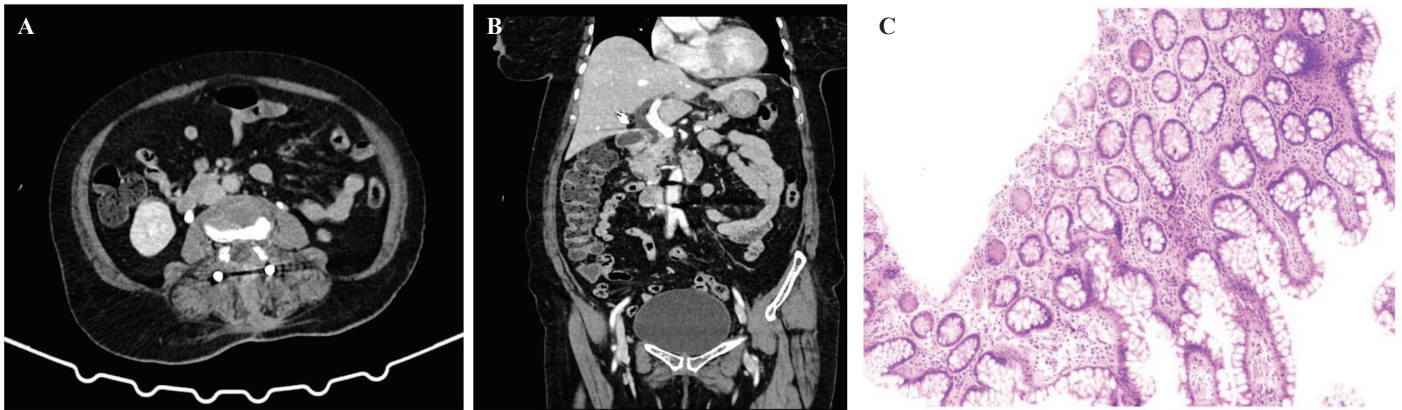


Figure 1. (A) A1: VFA/SCFA < 0.63, (B) A2: LS < 3 cm, (C) A3: Biopsy of the above patient showing no specific ileitis features.

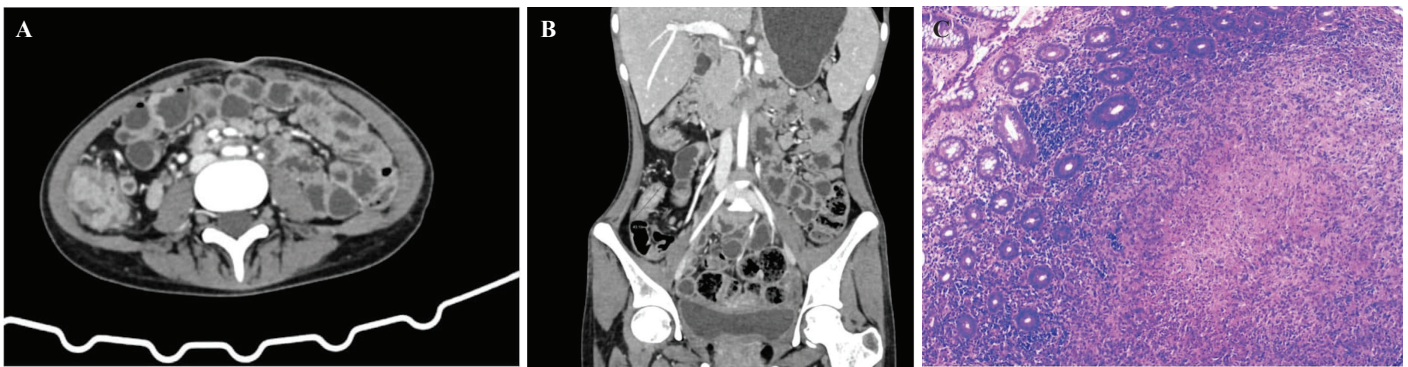


Figure 2. (A) B1: VFA/SCFA < 3 cm, (B) B2: LS < 3 cm, (C) B3: Biopsy of above patient showing caseating granuloma suggestive of intestinal tuberculosis.

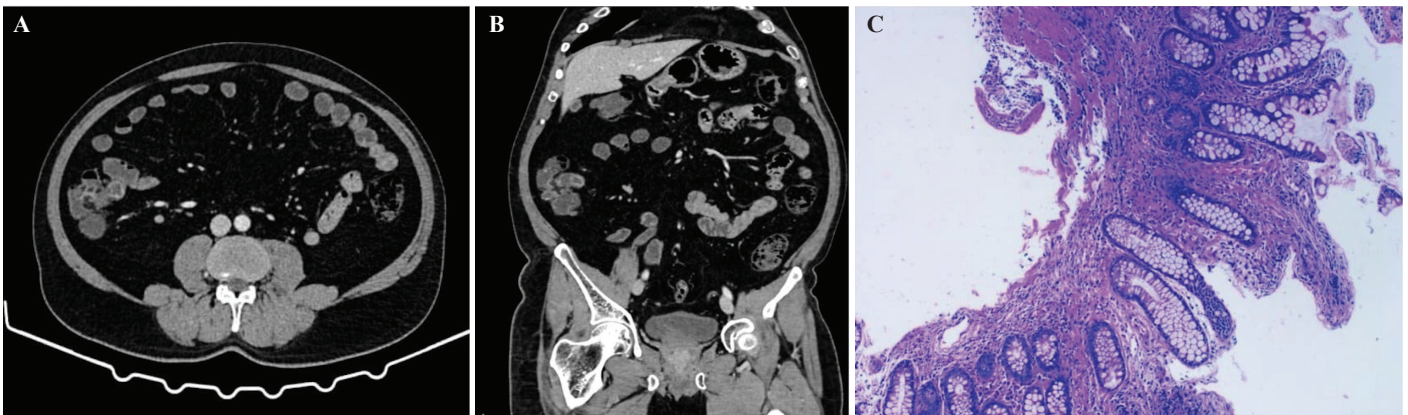


Figure 3. (A) C2: VFA/SCFA > 0.63, (B) C2: LS > 3 cm, (C) C3: Biopsy showing features of non-caseating granuloma, suggestive of Crohn's disease.

differentiating factor between Crohn's disease and intestinal tuberculosis.^{2,3} Additional research has also explored the relationship between sarcopenia, visceral fat, and the prognosis of Crohn's disease. Increased sarcopenia and visceral fat, despite ongoing treatment, have been associated with poor prognosis.⁴

Consistently, multiple studies have shown that visceral fat is increased in Crohn's disease, while subcutaneous fat and muscle mass tend to decrease over time if the disease remains untreated or symptoms persist despite treatment. However, there is limited research available that specifically evaluates the use of this combined score in both diagnosing and excluding Crohn's disease.

A study conducted by Desreumaux et al.⁵ concluded that peroxisome proliferator-activated receptor gamma and tumor necrosis factor-alpha (TNF- α) play a pivotal role in mesenteric fat hypertrophy in response to inflammation. This may help explain the increased visceral fat observed in Crohn's disease. Additionally, adipocytes are believed to behave like macrophages, as they are more than mere fat-storing cells; they also produce TNF- α .⁶

In our study, we found that only when both conditions—VFA/SCFA > 0.63 and long segment involvement > 3 cm—were present did the biopsy confirm a diagnosis of Crohn's disease. When only one of the two parameters was present, the diagnosis was not Crohn's disease.

Therefore, based on our findings, the absence of both parameters makes Crohn's disease less likely.

CONCLUSION

The combined score of VFA/SCFA ratio >0.63 and LS involvement >3 cm is a useful tool for diagnosing Crohn's disease and, even more so, for excluding it. The p-value was 0.0001, indicating statistical significance. However, multicentric studies are needed to further validate its sensitivity and specificity. Nevertheless, this combined score can serve as a screening tool and a non-invasive test for the diagnosis of newly detected Crohn's disease.

Ethics Committee Approval: Ethics committee approval was not required.

Informed Consent: Written informed consent was not required.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – A.P.G., J.R.M., S.D.; Design – A.G., J.R.M., S.D.; Supervision – J.R.M., S.D.; Data Collection and/or Processing – A.G.; Analysis and/or Interpretation – A.G.; Literature Review – A.G.; Writing – A.G.; Critical Review – A.G., S.M., S.D., S.D., J.R.M., S.S.

Use of AI for Writing Assistance: AI-assisted technologies were not used in this article.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study received no financial support.

REFERENCES

1. Kedia S, Madhusudhan KS, Sharma R, et al. Combination of increased visceral fat and long segment involvement: Development and validation of an updated imaging marker for differentiating Crohn's disease from intestinal tuberculosis. *J Gastroenterol Hepatol.* 2018;33(6):1234-1241. [\[CrossRef\]](#)
2. Yadav DP, Madhusudhan KS, Kedia S, et al. Development and validation of visceral fat quantification as a surrogate marker for differentiation of Crohn's disease and intestinal tuberculosis. *J Gastroenterol Hepatol.* 2017;32(2):420-426. [\[CrossRef\]](#)
3. Ko JK, Lee HL, Kim JO, et al. Visceral fat as a useful parameter in the differential diagnosis of Crohn's disease and intestinal tuberculosis. *Intest Res.* 2014;12(1):42-47. [\[CrossRef\]](#)
4. Boparai G, Kedia S, Kandasamy D, et al. Combination of sarcopenia and high visceral fat predict poor outcomes in patients with Crohn's disease. *Eur J Clin Nutr.* 2021;75(10):1491-1498. [\[CrossRef\]](#)
5. Desreumaux P, Ernst O, Geboes K, et al. Inflammatory alterations in mesenteric adipose tissue in Crohn's disease. *Gastroenterology.* 1999;117(1):73-81. [\[CrossRef\]](#)
6. Peyrin-Biroulet L, Chamailard M, Gonzalez F, et al. Mesenteric fat in Crohn's disease: a pathogenetic hallmark or an innocent bystander? *Gut.* 2007;56(4):577-583. [\[CrossRef\]](#)