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Original Research Article

Computed Tomography Chest Increases the Diagnosis Rate in Patients with Suspected Intestinal Tuberculosis

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Abstract:

Introduction: Intestinal tuberculosis (ITB) is a rare but serious extrapulmonary form of TB with symptoms that overlap with other gastrointestinal conditions, making diagnosis challenging. Traditional diagnostic methods are time-consuming and lack sensitivity. CT chest imaging has proven useful in detecting associated pulmonary TB, aiding in the early diagnosis of ITB and helping distinguish it from other gastrointestinal diseases, ensuring timely and appropriate treatment.

Aim and Objective: To evaluate the CT chest features in patients with intestinal tuberculosis.

Method: This retrospective study included 60 patients with suspected intestinal tuberculosis (ITB), of which 30 underwent chest CT before starting anti-tubercular therapy (ATT) and had at least one year of follow-up. Patients were assessed with laboratory tests, radiology, endoscopy, biopsy, and microbiological confirmation. ITB was diagnosed based on granulomas, positive AFB, or necrotic lymph nodes. A standardized ATT regimen was followed, with evaluations for symptom resolution and mucosal healing at regular intervals post-treatment.

Result: In this study of 60 patients with intestinal tuberculosis (ITB), the terminal ileum (50%) and caecum (39.6%) were the most commonly affected sites. Endoscopic findings included transverse ulcers (64.2%), strictures (32.7%), and aphthous ulcers (20%). Histopathological analysis revealed granulomas in 40% of cases, with 10.9% showing caseation necrosis. Radiologically, long-segment involvement (38.3%) and strictures (43.3%) were common, while active tuberculosis was observed in 38.3% of chest CT scans, with no significant difference between patients with and without a definitive TB diagnosis.

Conclusion: The study has concluded that the terminal ileum and caecum were the most commonly affected sites, with symptoms such as abdominal pain, weight loss, and anaemia being prevalent.

Keywords: Badminton, Strength Endurance, Upper Extremity, Training Protocol, Sports Performance

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Introduction

Tuberculosis is an important global health issue, especially in the developing world, where the problem is high [1]. Intestinal tuberculosis is a rare but serious type of extrapulmonary TB that affects the gastrointestinal tract mainly, with diagnostic difficulties arising from its non-specific presentation [2]. Those suspected of ITB usually present with abdominal pain, weight loss, fever, and changes in bowel habits, which may be confusing with other gastrointestinal illnesses, like Crohn's disease, malignancies, or infectious colitis [3]. Due to the communal clinical and radiologic presentation, timely and correct diagnosis is indispensable to begin proper treatment and improve patient outcomes [4].

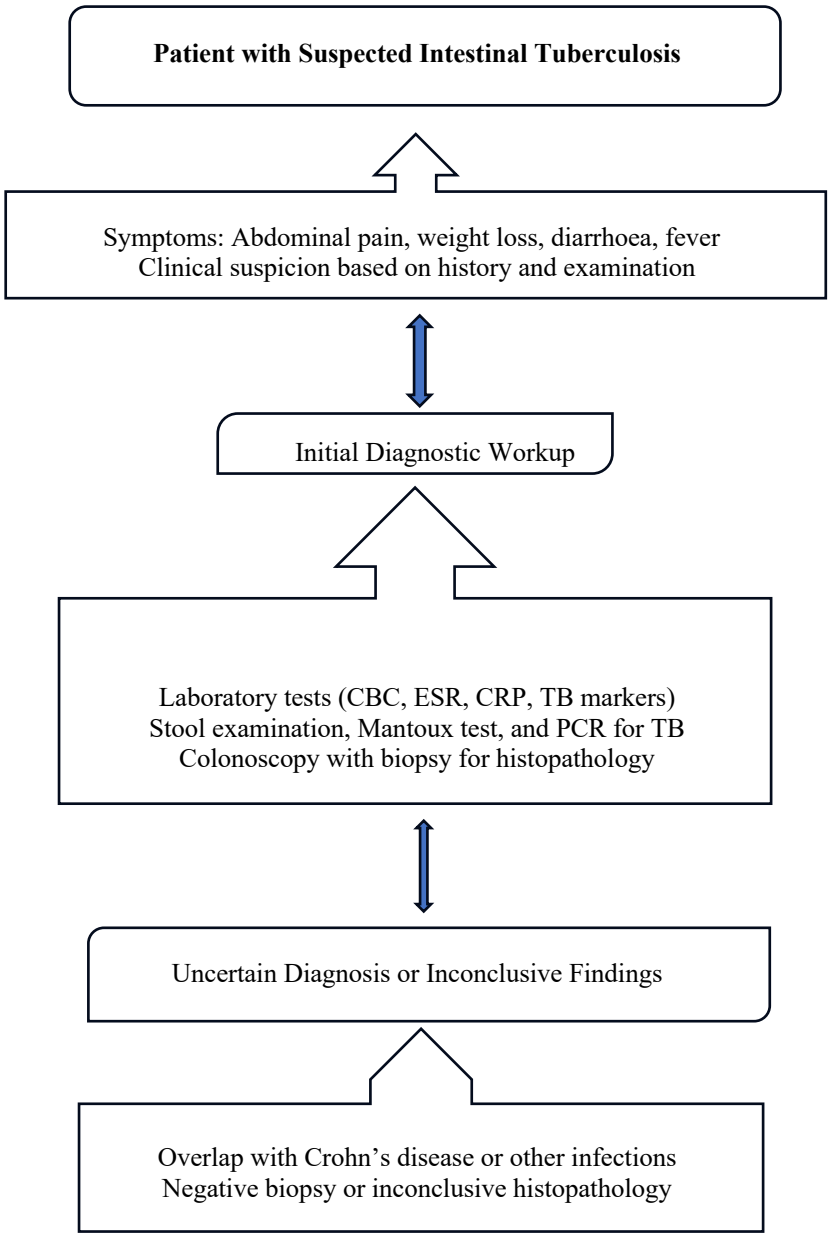

Figure 1: Flow chart of the role of CT Chest in Diagnosing Intestinal Tuberculosis

Traditional methods of diagnosing ITB involve clinical assessment, endoscopic biopsy, histopathology, acid-fast bacilli staining, and culture. While extremely unpredictable and time-consuming, they do not provide sensitivity or specificity [5]. To overcome this, computed tomography of the chest has been increasingly utilised as a helpful adjunct during the diagnostic workup of suspected cases of ITB. Pulmonary TB is often associated with extrapulmonary manifestations, and imaging evidence of active or healed TB lesions in the lungs can offer indirect evidence of an ITB diagnosis [6]. Accordingly, CT chest imaging can increase diagnostic sensitivity and raise the probability of early ITB detection.

CT chest scans encourage the detection of lung abnormalities like nodules, cavitations, tree-in-bud patterns, consolidation, mediastinal lymphadenopathy, and pleural effusion patterns that indicate coexisting pulmonary TB [7]. The fact that these radiological features are present in a patient with a suspected ITB raises the probability of TB being the cause of intestinal symptoms. In addition, synchronous correlation of CT chest results with clinical and lab parameters can validate the diagnostic workup, making an unnecessary invasive diagnosis and attracting the timely commencement of anti-tubercular drug treatment [8].

Various studies have emphasised the function of CT chests in pleasing the diagnostic rate of ITB, proving to be an adjunctive tool in facilities where microbiological confirmation is difficult [9]. CT chest supports the diagnostic process by presenting supplementary evidence of lung changes due to TB, and patients can receive suitable and timely

treatment. In addition, in areas of high prevalence of TB, CT chest screening in suspected cases of ITB can be very useful in the decision-making process [10].

In addition, CT chest imaging may help distinguish ITB from other inflammatory or infectious gastrointestinal diseases. By detecting associated pulmonary TB, physicians can regulate other differential diagnoses like Crohn's disease, which demands immunosuppressive treatment [11]. Different diseases and confirming proper treatment choices for such misdiagnosis may result in inappropriate treatment measures and deteriorating patient consequences. Thus, CT chest imaging is a noninvasive, supportive diagnostic method that helps identify ITB [12]. This effect on clinical consequences and the importance of integrating CT chests into standard diagnostic procedures for ITB suspects confer the importance of CT chests in raising the rate of ITB diagnosis and its importance in early detection [13].

Table 1: Comparison of Diagnostic Methods for Intestinal Tuberculosis [14]

Analytic Method	Sensitivity	Specificity	Compensations	Restrictions
Clinical Symptoms	Low	Low	Non-invasive; first-line method	Non-specific symptoms; overlaps with other diseases
Endoscopy and Biopsy	Moderate to High	High	Direct visualisation; tissue sampling	Invasive; sampling error; false negatives possible
AFB Staining and Culture	Low to Moderate	High	Ultimate diagnosis if positive	Time-consuming; low sensitivity in ITB
Interferon Gamma Release Assay	Moderate	High	Blood test; functional in concealed TB	Does not differentiate between active and latent TB
Polymerase Chain Reaction	High	High	Rapid; detects MTB DNA	Expensive; availability limited in some settings
Computed Tomography Chest	Moderate to High	Moderate	Identifies pulmonary TB features; non-invasive	May not confirm ITB directly; radiation exposure

CT chest imaging in an affected role with assumed ITB signifies an appreciated diagnostic method, supplementing methods and improving the overall detection rate. By recognising pulmonary TB manifestations, clinicians can make informed decisions and improve early diagnosis, leading to better patient consequences and reduced injury related to delayed or lost diagnoses [15].

Methods

Research Design: This retrospective analysis was conducted at the Department of Radiology in our medical college hospital, between April 2021 and March 2022. A sample of 60 patients with supposed ITB were separated, out of which 30 patients who experienced computed tomography of the chest before introducing anti-tubercular therapy and had a minimum of one-year follow-up after ATT completion were comprised. Ethical approval was found from the Institutional Ethics Committee of our hospital, and consent was considered.

All patients experienced a standardised diagnostic procedure, which comprised baseline laboratory tests, radiological assessment, endoscopic assessment with biopsy, and microbiological endorsement through acid-fast bacillus smear, culture, and polymerase chain reaction for Mycobacterium tuberculosis. The analysis of definite ITB was founded on the occurrence of necrotising granulomas on histopathology, positive AFB on smear or culture, or necrotic lymph nodes on CT enterorrhaphy. Designed for affected roles who did not meet these criteria, a beneficial trial with ATT was administered, and an established clinical and endoscopic/radiologic answer was measured diagnostic of ITB.

Patients established a standard ATT regimen containing an induction phase (first 2 months) with isoniazid (5 mg/kg), rifampicin (10 mg/kg), pyrazinamide (20–25 mg/kg), and ethambutol (15–20 mg/kg), followed by a conservation phase (4–7 months) with isoniazid and rifampicin, adjusted based on treatment answer. Follow-up evaluations were shown at two-month intervals to assess symptom resolution and drug poisonousness through liver function tests. Endoscopic and radiological reassessments were performed at the achievement of ATT to measure mucosal healing and disease resolution.

Inclusion Criteria

- Supposed ulceroconstrictive intestinal disease with clinical, endoscopic, or radiologic geog-raphies expressive of ITB.
- Experienced CECT chest previous to the commencement of ATT.
- Consistent follow-up for at least one year after ATT achievement.
- Experienced repeat assessment via endoscopy or radiologic imaging to measure mucosal healing post-ATT.

Exclusion Criteria

- Required inadequate clinical or radiological archives.
- Stayed misplaced to follow-up before one-year post-ATT evaluation.
- A concurrent diagnosis of Crohn's disease without a response to ATT is mandatory.
- Patient not willing to undergo chest imaging before starting ATT.

Statistical Analysis: The continuous variables were expressed as mean and standard deviation. The categorical data were expressed as frequency and percentages. The Regression analysis was employed was used to compare the various data in the sample. Data analysis was conducted using SPSS version 20.0.

Results

In this study of 60 patients, the mean age was 35.2 ± 11.5 years, with 45.0% being female. The median duration of symptoms was 14 months (IQR: 7–22 months), reflecting a prolonged disease course before diagnosis. Pain in the abdomen was the most prevalent symptom, affecting 88.3% of patients, followed by weight loss (66.7%) and anaemia (65.0%), indicating significant systemic involvement. Partial bowel obstruction was observed in 36.7%, while fever (26.7%), diarrhoea (18.3%), and gastrointestinal bleeding (16.7%) were reported less frequently. Constipation was seen in 30.0% of patients, with variable bowel involvement (Table 1).

Table 1: Clinical Characteristics of Patients

Characteristic	Value
Age (years, Mean ± SD)	35.2 ± 11.5
Female Sex (n, %)	27 (45.0%)
Duration of Symptoms (months, Median, IQR)	14 (7–22)
Fever (n, %)	16 (26.7%)
Diarrhoea (n, %)	11 (18.3%)
Constipation (n, %)	18 (30.0%)
Gastrointestinal Bleeding (n, %)	10 (16.7%)
Pain Abdomen (n, %)	53 (88.3%)
Partial Bowel Obstruction (n, %)	22 (36.7%)
Weight Loss (n, %)	40 (66.7%)
Anaemia (n, %)	39 (65.0%)

In this study of 60 patients with intestinal tuberculosis, the terminal ileum (50.0%) and caecum (39.6%) were the most frequently affected sites, followed by the ileocecal valve (35.4%) and ascending colon (24.1%). The involvement of the rectum (5.5%), sigmoid colon (7.3%), and descending colon (7.3%) remained relatively rare. Regarding the type of involvement, transverse ulcers were the most common lesion (64.2%), followed by strictures (32.7%) and aphthous ulcers (20.0%), while nodularity (12.7%) and pseudopolyps (7.3%) were observed less frequently. Histopathological analysis revealed granulomas in 40.0% of cases, while caseation necrosis was present in 10.9% of patients, additionally supporting the diagnosis of tuberculosis (Table 2).

Table 2: Endoscopic and Histologic Consequences in Affected Role with Intestinal Tuberculosis

Variable	Intestinal Tuberculosis (n = 60)
Site of Involvement	
Rectum	3/55 (5.5%)
Sigmoid Colon	4/55 (7.3%)
Descending Colon	4/55 (7.3%)
Transverse Colon	8/55 (14.5%)
Ascending Colon	13/54 (24.1%)
Caecum	19/48 (39.6%)
Terminal Ileum	21/42 (50.0%)
Ileocecal Valve	17/48 (35.4%)
Type of Involvement	
Aphthous Ulcers	11/55 (20.0%)
Longitudinal Ulcers	4/53 (7.5%)
Transverse Ulcers	34/53 (64.2%)
Pseudopolyps	4/55 (7.3%)

In this cohort of 60 patients with intestinal tuberculosis (ITB), the ileocecal area (50.0%) was the most commonly affected site, followed by the rest of the small intestine (30.0%). The colon (11.7%) and left colon (1.7%) were less frequently involved. Regarding radiological features, long-segment involvement (38.3%), mural stratification (36.7%), and strictures (43.3%) were regularly observed, with mesenteric changes present in 45.0% of cases. Comb sign (12 cases) and fat proliferation (15 cases) were also identified.

Active tuberculosis on the CT chest was detected in 38.3% of patients, with parenchymal lesions in 17 cases, necrotic mediastinal lymph nodes in 3 cases, and both findings in 3 cases. Among patients with definite TB (n = 16), 37.5% showed active TB on the CT chest, while 38.6% of patients without definite TB (n = 44) also had active TB results (p = 0.78) (Table 3).

Table 3: Radiological Results in Affected Role with Intestinal Tuberculosis

Variable	ITB (n = 60)
Site of Involvement	
Left Colon	1 (1.7%)
Colon	7 (11.7%)
Ileocecal Area	30 (50.0%)
Rest of Small Intestine	18 (30.0%)
Type of Involvement	
Long Segment Involvement	23 (38.3%)
Asymmetric Thickening	7 (11.7%)
Mural Stratification	22 (36.7%)
Stricture	26 (43.3%)
Mesenteric Changes	27 (45.0%)
Comb Sign	12
Fat Proliferation	15
Necrotic Abdominal Lymph Nodes	12 (20.0%)
Active TB on CT Chest	23 (38.3%)
Parenchymal Lesions	17
Necrotic Mediastinal Lymph Nodes	3
Both	3
Active TB on CT Chest in Patients with Definite TB (n = 16)	6 (37.5%)
Active TB on CT Chest in Patients without Definite TB (n = 44)	17 (38.6%)
P-value	0.78

Discussion

The analytical problems related to intestinal tuberculosis make adjunctive imaging methods such as CT chests indispensable [16]. CT chests' main advantage in diagnosing ITB is their ability to identify supplementary pulmonary tuberculosis, which supports the chance of TB participation in the intestines. Numerous studies have emphasised the productivity of CT chests at analytical levels by classifying lung abnormalities correlating with TB infection [17].

A study by Sharma et al. (2020) conveyed that CT chest imaging identified pulmonary TB features in 62% of patients with confirmed ITB, suggestingively assisting clinical decision-making [18]. In comparison, outdated diagnostic methods such as histopathology and AFB staining had lower sensitivity, with 40% and 30% diagnostic produces. Similarly, a study by Saha et al. (2018) originates that mediastinal lymphadenopathy and cavitary lung lesions on CT chest increased the pre-test possibility of ITB, continuing more accurate and timely diagnosis [19].

Specifically, everything has indicated limits to CT chest imaging in ITB analysis. Hong et al. (2019) conducted a retrospective study. They reported that though CT chest results supported in supporting a diagnosis of TB, they were not conclusive of ITB, as there were patients presenting pulmonary abnormalities without intestinal contribution. This exposes the importance of correlating CT chest results with clinical and laboratory results to avoid misdiagnosis [20].

Though these are its limits, CT chest imaging has been established as superior to conventional diagnostic means in limiting delays. A meta-analysis by Garg et al. (2021) established that patients who presented with a CT chest as part of their diagnostic evaluation were 25% more possible to be detected with TB early compared to those who used endoscopy and biopsy alone. These consequences show the value of integrating CT chest in diagnostic preparation, predominantly in

regions with a high problem of TB, where the appropriate detection of ITB could improve consequences in treatment [21].

In addition, a CT scan of the chest is vital in distinguishing ITB from Crohn's disease, which inclines to have covered gastrointestinal symptoms. ITB and Crohn's disease have been compared in studies, and it was discovered that pulmonary abnormalities on CT chest are significantly more common in ITB, contributing to a significant differentiating feature [22]. It is indispensable to distinguish between ITB and Crohn's disease because misdiagnosis of ITB as Crohn's disease can result in unfortunate immunosuppressive treatment and worsening TB infection.

Including CT chest imaging in ITB diagnosis increases detection rates significantly, decreases dependence on invasive techniques, and facilitates the distinction between ITB and other gastrointestinal diseases [23]. While CT chest results should not depend on themselves, their addition to a multi-modal diagnostic method develops overall ITB diagnosis precision. Upcoming studies should focus on enhancing imaging criteria and investigating the cost-effectiveness of routine CT chest screening in suspected ITB conditions to maximise clinical consequences [24].

Table 4: Findings of the similar studies

Study	Year	Important Results	CT Chest Analytic Produce	Limits
Sharma et al. [18]	2020	Identified pulmonary TB in 62% of ITB cases, suggestively aiding in clinical decision-making	Approximately 62%	Retrospective design: results require justification with other diagnostic moods
Mukherjee et al. [19]	2018	It was noted that mediastinal lymphadenopathy and cavitary lesions on the CT chest increased the probability of ITB pre-tests.	Not quantified; improved accuracy	Necessitates correlation with clinical and laboratory data; limited by sample size in some suitcases
Kim et al. [20]	2019	Found CT chest findings supportive but not definitive for ITB due to pulmonary abnormalities without intestinal involvement	Not specified	CT chest should be used as an assistant rather than a separate diagnostic tool; misapprehension is possible.
Gupta et al. [21]	2021	Meta-analysis demonstrated a 25% higher probability of early TB detection with CT chest compared to conventional methods	25% improvement in early detection	Heterogeneousness among included studies; further standardisation of imagery criteria is desirable.

Conclusion

The study has concluded that the terminal ileum and caecum were the most commonly affected sites, with symptoms such as abdominal pain, weight loss, and anaemia being prevalent. Endoscopic findings included transverse ulcers and strictures, while radiological features like long-segment involvement and strictures were common. Active tuberculosis was detected in chest CT scans of 38.3% of patients, with no significant difference between those with and without a definitive TB diagnosis. The most common symptoms were abdominal pain, weight loss, and anaemia, with significant systemic involvement. The terminal ileum and caecum were the most frequently affected sites. Endoscopic lesions mainly included transverse ulcers and strictures, and granulomas were observed in 40% of histopathological cases. Radiologically, long-segment involvement, mural stratification, and strictures were prevalent, with mesenteric changes present in 45% of cases. Active tuberculosis was detected in the chest CT scans of 38.3% of patients, showing no significant difference between those with and without definitive TB diagnoses. This study underscores the varied presentation of ITB and the importance of comprehensive diagnostic approaches for its management.

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