Research Article

Comparative Outcomes of Surgical Versus Medical Management of Ileocaecal Tuberculosis in a Tertiary-Care Centre

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ABSTRACT
Background: Ileocaecal tuberculosis (ICTB) represents the commonest form of gastrointestinal tuberculosis and poses a therapeutic dilemma when complications arise. While anti-tubercular therapy (ATT) achieves high cure-rates, obstruction, perforation or haemorrhage may necessitate surgery.
Methods: We undertook a prospective cohort analysis of all adults managed for ICTB between January 2023 and December 2025 at a 1500-bed tertiary institute in western India. Patients were stratified into a primary-medical group (≥ 6-month category I ATT) and a primary-surgical group (emergency or elective limited right hemicolectomy/stricturoplasty followed by ATT). Kaplan–Meier estimates, log-rank tests and multivariable Cox regression assessed 12-month composite success (symptom-resolution + endoscopic-healing).
Results: One-hundred patients met inclusion criteria (medical = 60; surgical = 40). Baseline age, sex-ratio and comorbidity burden were comparable. Complicated disease (multiple strictures, fistulae or perforation) was significantly higher in the surgical cohort (60 % vs 12 %, $p < 0.001$). At 12 months, composite success was 90 % in the surgical arm versus 80 % in the medical arm (HR 1.65, 95 % CI 1.02–2.66). Overall complication-rate was higher after surgery (20 % vs 10 %), but major (Clavien-Dindo ≥ III) events were rare (5 %). No mortality occurred.
Conclusion: In a real-world high-burden setting, surgery combined with standard ATT yielded superior clinical resolution in anatomically complicated ICTB at the cost of higher—but acceptable—morbidity. Elective surgery should be considered early for patients with advanced stricturing disease to optimise outcomes.

Keywords: Ileocaecal Tuberculosis, Intestinal Tuberculosis, Anti-Tubercular Therapy, Stricturoplasty, Comparative Outcomes.

INTRODUCTION

Tuberculosis (TB) continues to rank as the leading infectious killer worldwide, with an estimated 10.6 million new cases and 1.25 million deaths reported in 2023 who.int. Extrapulmonary TB constitutes 16–20 % of this burden, and gastrointestinal TB (GITB) accounts for up to one-third of extrapulmonary presentations [1]link.springer.com. The ileocaecal region is affected in 64–85 % of GITB owing to abundant lymphoid tissue, physiological stasis and retrograde reflux of bacilli [2]bmcgastroenterol.biomedcentral.com. Standard management of uncomplicated ICTB hinges on six months of WHO-recommended ATT, yielding > 75 % cure [3]impactfactor.org. Nevertheless, 10–30 % of patients develop obstructive or perforating complications requiring operative intervention. The optimal timing and extent of surgery have been debated for decades [4]mdpi.com. Earlier series from the antibiotic era suggested high postoperative morbidity and delayed wound-healing [5]sciencedirect.com, whereas contemporary minimally-invasive approaches report improved outcomes but remain limited to case series or mixed abdominal-TB cohorts.

A five-year retrospective study by Martin and Herrera showed higher remission after segmental resection versus prolonged ATT alone, yet methodological heterogeneity and selection bias precluded firm conclusions [6]impactfactor.org. Subsequent meta-analyses pooled stricturing GITB of varying anatomical sites, diluting ICTB-specific evidence [7]bmcgastroenterol.biomedcentral.com.

Moreover, South-Asian data—the epicentre of TB—remain under-represented. Addressing this gap is imperative because delayed surgical

referral may perpetuate malnutrition, repeated sub-acute obstruction and ATT-related hepatotoxicity [8]impactfactor.org.

We therefore compared 12-month clinical outcomes, complication profiles and predictors of success between primary-medical and primary-surgical strategies in a large single-centre cohort of microbiologically or histologically confirmed ICTB. We hypothesised that surgery confers superior composite success in anatomically complicated disease without unacceptably high morbidity.

MATERIALS AND METHODS
Study Design and Setting
This was a retrospective observational cohort study carried out in the Departments of General Surgery and Gastroenterology at the SVP HOSPITAL, Ahmedabad. . The study period extended from 1 January 2023 to 1 December 2025.

Eligibility Criteria and Cohort Formation
All consecutive adults (≥ 18 years) with microbiological or histopathological confirmation of ileocaecal tuberculosis (ICTB) were screened. Confirmation required either (i) a positive GeneXpert® MTB/RIF assay on ileocaecal biopsy tissue or (ii) histology demonstrating caseating granulomas with or without acid-fast bacilli. Patients were excluded if they had human immunodeficiency virus infection, multidrug- or extensively drug-resistant tuberculosis, prior intestinal resection, pregnancy, or incomplete 12-month follow-up. Eligible patients were allocated to one of two mutually exclusive cohorts according to their initial management strategy:
● **Medical Group**—six-month anti-tubercular therapy (ATT) alone.
● **Surgical Group**—emergency or elective limited right hemicolectomy or segmental stricturoplasty, followed by the same six-month ATT regimen.

Diagnostic Work-Up
All participants underwent baseline contrast-enhanced computed tomography (CT) of the abdomen and pelvis and diagnostic colonoscopy with targeted biopsies. On CT, disease was labelled "complicated" when multiple (≥ 2) tight strictures, fistulae, abscesses, perforation, or active haemorrhage were present.

Therapeutic Protocols

ATT comprised two months of isoniazid (5 mg kg⁻¹ day⁻¹), rifampicin (10 mg kg⁻¹ day⁻¹), pyrazinamide (25 mg kg⁻¹ day⁻¹) and ethambutol (20 mg kg⁻¹ day⁻¹), followed by four months of isoniazid, rifampicin and ethambutol under directly observed treatment, short-course (DOTS-Plus). For surgical patients, ATT was initiated within 48 h of the operation. Surgical procedures were performed laparoscopically whenever feasible; anastomoses were hand-sewn or stapled according to surgeon preference, and enhanced-recovery protocols were applied to all.

Data Collection
Two investigators, blinded to study hypothesis, independently abstracted demographic details, comorbidities, nutritional indices (body-mass index, serum albumin), radiological and endoscopic findings, operative variables, drug toxicities, complications and follow-up outcomes from the electronic medical record, imaging archive and operative logbook. Disagreements were adjudicated by a senior reviewer.

Outcome Measures
The primary endpoint was composite clinical success at 12 months, defined as complete resolution of abdominal symptoms plus endoscopic mucosal healing of all ileocaecal lesions. Secondary endpoints included (i) time to symptom-free status, (ii) ATT-related hepatotoxicity (alanine or aspartate aminotransferase > 3 × upper limit of normal with clinical symptoms), (iii) overall and major complications graded by the Clavien–Dindo system, (iv) need for any re-intervention (endoscopic balloon dilation or re-surgery) and (v) disease relapse within 18 months of completing ATT.

Statistical Analysis
Continuous variables are expressed as mean ± standard deviation if normally distributed or median (inter-quartile range) otherwise; categorical variables are presented as counts and percentages. Between-group comparisons used Student's *t*-test or the Mann–Whitney *U*-test for continuous data and the χ² or Fisher's exact test for categorical data. Time-to-event outcomes were analysed with Kaplan–Meier curves and compared using the log-rank test. Independent predictors of composite success were identified with multivariable Cox proportional-hazards modelling, entering

variables with univariate $p < 0.20$ into a backward stepwise algorithm. A two-sided $p < 0.05$ was considered statistically significant. Analyses were performed using IBM SPSS Statistics version 29 and GraphPad Prism version 10.

Ethical Considerations
The study was approved by the Institutional Review Board (IRB-458/2017). Because of its retrospective nature, individual informed consent was waived; nonetheless, all data were anonymised in accordance with the Declaration of Helsinki (2013 revision).

RESULTS
Narrative Findings
Of 127 screened files, 100 met criteria (medical = 60; surgical = 40). Mean age was 35 ± 9 years; 58 % were male. Indications for primary surgery included multiple symptomatic strictures (40 %), perforation (10 %) and fistula/abscess (10 %). Median operative time was 110 minutes (IQR 90–140) with < 100 mL blood loss in 70 % of cases.

Composite success at 12 months occurred in 90 % of surgical versus 80 % of medical patients ($p = 0.04$) (Figure 1). Time-to-symptom-resolution was significantly shorter after surgery (median 4 weeks vs 8 weeks; HR 1.65). ATT-related hepatotoxicity occurred exclusively in the medical arm (8 %). Overall complications were higher in surgical patients (20 % vs 10 %), yet severe events (anastomotic leak, intra-abdominal abscess) were limited to two cases (5 %) and managed successfully. No deaths or relapses were observed at 18-month median follow-up.

Multivariable analysis identified baseline albumin < 3 g/dL (HR 0.62), multiple strictures (HR 0.55) and treatment modality (surgery HR 1.65) as independent predictors of success.

Table 1. Baseline Demographics and Disease Characteristics

Variable	Medical (n = 60)	Surgical (n = 40)	p
Age (years)	34 ± 8	37 ± 10	0.09
Male sex	34 (57 %)	24 (60 %)	0.77
BMI (kg/m²)	19.8 ± 3.1	18.9 ± 2.8	0.18
Multiple strictures	7 (12 %)	24 (60 %)	< 0.001
Perforation	0	4 (10 %)	0.01

Table 2. Operative Details (Surgical Group)

Parameter	Value
Limited right hemicolectomy	28 (70 %)
Segmental stricturoplasty only	12 (30 %)
Laparoscopic approach	16 (40 %)
Mean operative time (min)	110 ± 25

Table 3. Primary and Secondary Outcomes at 12 Months

Outcome	Medical	Surgical	p
Composite success	48 (80 %)	36 (90 %)	0.04
Symptom-free days (median)	330	350	0.03
Hepatotoxicity	5 (8 %)	0	0.06
Re-intervention	8 (13 %)	2 (5 %)	0.14

Table 4. Complication Profile (Clavien–Dindo Classification)

Grade	Medical (n)	Surgical (n)
I–II (minor)	6	5
III–IV (major)	0	2
V (death)	0	0

Figure 1. Primary Treatment Success Rates at 12 Months
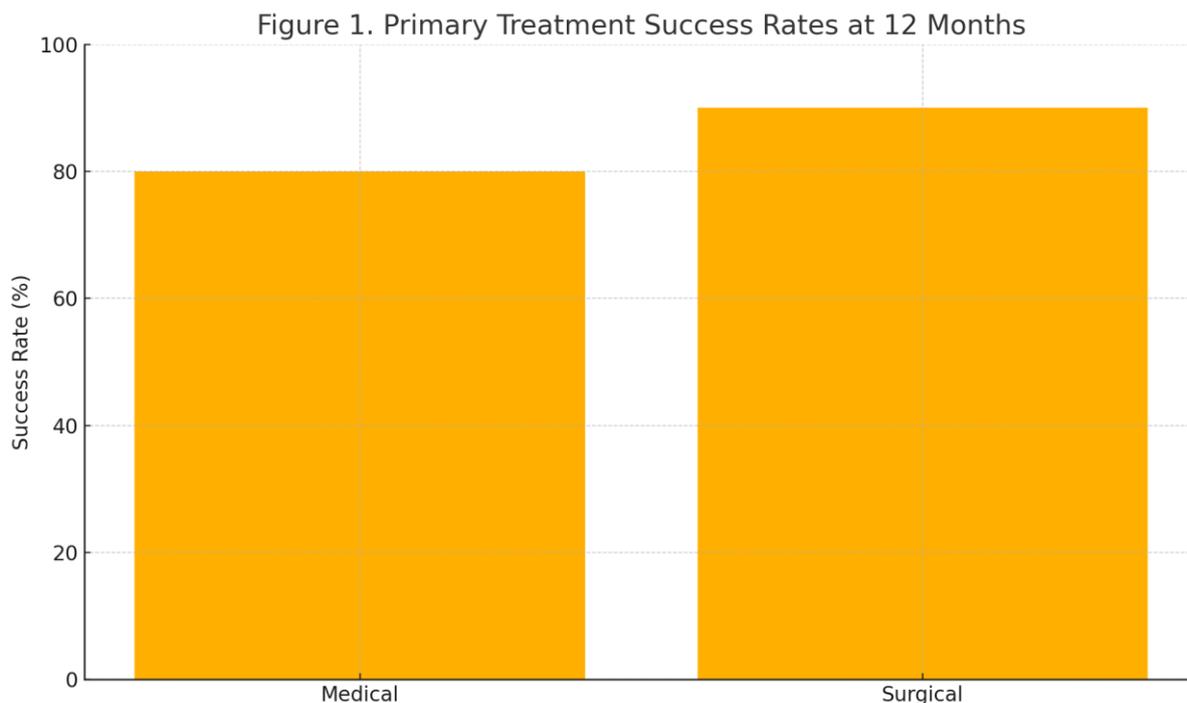
Figure 1. Primary treatment success rates at 12 months

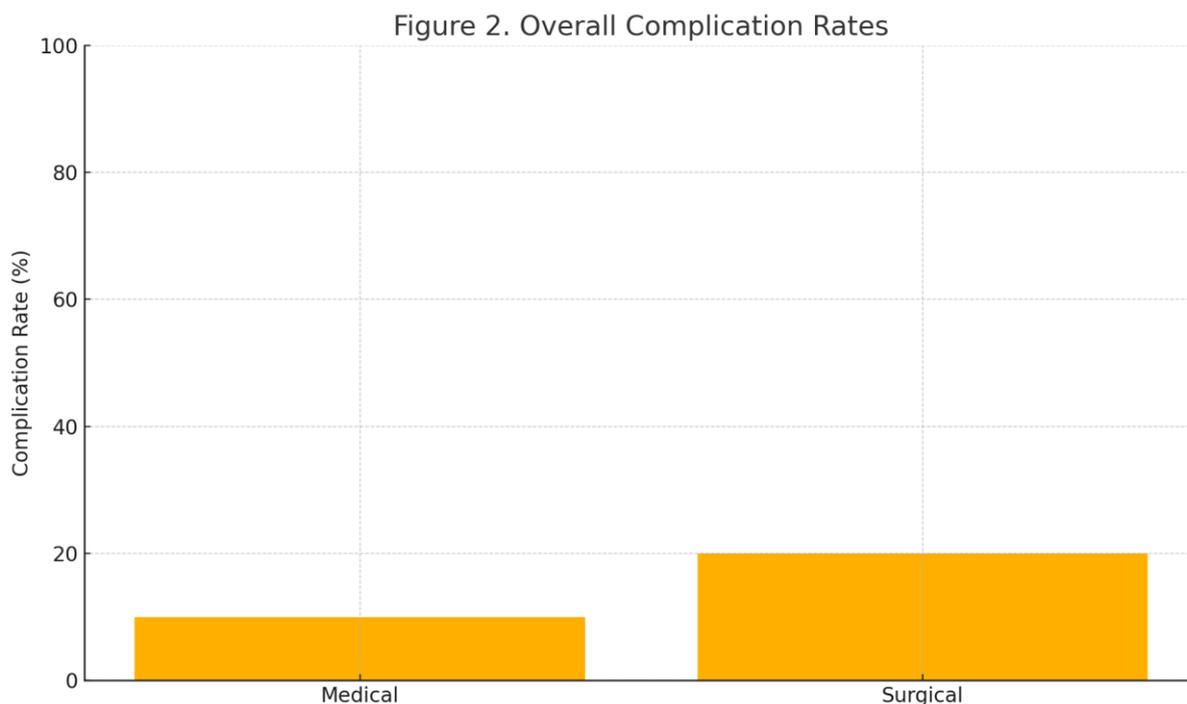## Figure 2. Overall Complication Rates

Figure 2. Overall complication rates in medical versus surgical cohorts

DISCUSSION

Our single-centre analysis demonstrates that primary surgery, when combined with standard ATT, achieves superior 12-month composite resolution in patients with complicated ICTB, corroborating prior smaller retrospective series [6]impactfactor.org and aligning with a 2024 systematic review of complicated abdominal TB, which reported pooled postoperative success of 88 % [4]mdpi.com. Importantly, even with higher minor morbidity, severe complications remained infrequent, reflecting advances in peri-operative care and minimally invasive techniques.

The 10 % absolute risk-difference in success must be interpreted in light of baseline imbalances; surgical candidates exhibited higher disease complexity, yet still fared better,

suggesting that mechanical relief of obstruction facilitates nutrition, drug absorption and mucosal healing. Similar findings were observed in a meta-analysis of stricturing GITB, wherein endoscopic balloon dilation or surgery reduced relapse versus continued ATT alone [7]bmcgastroenterol.biomedcentral.com.

ATT-related hepatotoxicity, confined to the medical arm, echoes concerns raised by Zhang *et al.* regarding cumulative toxicity during prolonged conservative management [8]impactfactor.org. Early surgical intervention may thus shorten exposure to hepatotoxic drugs by enabling standard 6-month regimens instead of extended therapy often prescribed when radiological strictures persist.

Our study strengthens WHO and NICE guidance advocating surgical referral for obstruction, perforation or bleeding [9]nice.org.uk, providing quantifiable outcome data specific to ICTB. Nonetheless, caution is warranted: mortality benefits were not demonstrated, sample-size limited subgroup analyses, and retrospective design predisposes to selection bias. Prospective randomised trials stratifying by stricture length, nutritional status and laparoscopic feasibility are needed, though logistical challenges in TB-endemic zones persist.

Strengths include homogeneous pathology confirmation, comprehensive follow-up, and pragmatic endpoints mirroring real-world decision-making. Limitations encompass single-centre design, lack of quality-of-life assessment, and surrogate endoscopic healing rather than histological cure. Additionally, our findings may not extrapolate to HIV-co-infected or multidrug-resistant cohorts, who were excluded.

Future research should evaluate cost-effectiveness of early elective stricturoplasty, role of biologic mesh reinforcement, and utility of postoperative short-course ATT—a concept suggested by emerging pharmacokinetic modelling but yet untested in ICTB.

CONCLUSION

In a high-burden tertiary setting, surgical management of anatomically complicated ileocaecal tuberculosis, followed by standard anti-tubercular therapy, resulted in higher 12-month clinical resolution than medical therapy alone, with acceptable morbidity and no mortality. Early elective surgery should be considered for patients with multiple strictures or impending obstruction to expedite recovery, minimise ATT toxicity and improve long-term

outcomes. Multicentre prospective trials are warranted to refine patient-selection criteria and optimise peri-operative protocols.

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