Article

Detection Rate, Risk Factors, and Outcomes of Isolated Terminal Ileal Ulcers

Dongshuai Su[1,2,3], Rongrong Cao[1], Jie Han[1], Chengkun Li[1], Cong Gao[1], Yingchao Li[1], Shiyu Wang[1], Yue Sun[1], Ke Wang[1], Xiaodong Shao[1,*], Xingshun Qi[1,2,*]

[1]Department of Gastroenterology, General Hospital of Northern Theater Command, 110840 Shenyang, Liaoning, China
[2]Postgraduate College, China Medical University, 110167 Shenyang, Liaoning, China
[3]Department of Gastroenterology, The 963rd Hospital of the Joint Logistics Support Force of the Chinese People's Liberation Army, 154002 Jiamusi, Heilongjiang, China
*Correspondence: sxdsys608@189.cn (Xiaodong Shao); xingshunqi@126.com (Xingshun Qi)
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Abstract

Aims/Background: The detection rate of isolated terminal ileal ulcers (ITIU) is increasing during colonoscopy. However, its clinical significance remains unknown. This study aimed to explore the detection rate and risk factors of ITIU in individuals undergoing colonoscopy and evaluate the outcomes of patients with nonspecific ITIU. **Methods**: Overall, 11,504 consecutive individuals who underwent colonoscopy at Department of Gastroenterology, General Hospital of Northern Theater Command between 1 July 2021 and 31 December 2022 were retrospectively screened. Among the individuals who completed terminal ileum (TI) intubation, the detection rate of ITIU was calculated. Furthermore, among the individuals with complete baseline data, logistic regression analyses were performed to identify the independent factors associated with ITIU. At least one-year follow-up outcome after the index colonoscopy was evaluated in patients with nonspecific ITIU who received and did not receive empiric therapy. **Results**: Overall, 9649 individuals completed TI intubation with an ITIU detection rate of 1.3% (123/9649). Among them, 1709 individuals had complete baseline data and were further selected in the risk factor analysis. Compared with the non-ITIU group, the ITIU group was significantly younger (56 vs. 46, $p = 0.010$). Multivariate logistic regression analyses also demonstrated that age ≤ 50 years (adjusted odds ratio [aOR] = 1.947, 95% confidence interval [CI] = 1.056–3.587, $p = 0.033$) was independently associated with ITIU. There was no significant difference in clinical symptoms ($p = 1.000$) or colonoscopic findings ($p = 0.560$) between patients with nonspecific ITIU who received empiric therapy and observational follow-up. **Conclusion**: ITIU is not rare during colonoscopy. Young individuals may have a higher probability of suffering from ITIU. Empiric therapy may not be necessary for patients with nonspecific ITIU.

Keywords: ileal diseases; Crohn disease; age; body mass index; inflammatory bowel disease

1. Introduction

Terminal ileum (TI) refers to the intestinal tract from the ileocecal valve to the proximal end of the ileum, and its length is about 30–40 cm [1]. Feces tend to accumulate at the TI, more probably causing bacterial growth; meanwhile, there is a large amount of intestinal lymphoid tissue and Peyer's patches within the TI [2,3]. Therefore, it is more likely to develop ulcers in this region. Notably, if there was no ulcer at any other part of the intestines, isolated terminal ileal ulcers (ITIU) would be defined [1]. It has been reported that the detection rate of ITIU among individuals undergoing colonoscopy screening is 1.45% [4]. Among individuals with gastrointestinal symptoms, the detection rate of ITIU was observed to be 4.90% [5]. Until now, the etiology of ITIU has not been elucidated. It may be associated with infections, drugs, inflammatory bowel disease (IBD), eosinophilic gastroenteritis, ischemic bowel disease, and neoplasms [6–9]. It has been reported that 1.07–34.5% of individuals with isolated terminal ileitis and ITIU may progress to Crohn disease (CD) during a long-term follow-up period, and the incidence of CD gradually increases over time [5,8,10–12]. Some investigators also suggest that nonspecific ITIU should be considered as an early stage of CD [5,11–13], but it usually takes a relatively long time to progress from nonspecific ITIU to CD. Thus, early treatment and close monitoring may be required [5,6,8,12]. However, there are no specific guidelines for the diagnosis and management of ITIU, because it is usually occult, asymptomatic, or nonspecific in symptoms.

Considering the clinical significance of ITIU, it is critical to understand the epidemiology of ITIU and recognize high-risk populations for developing ITIU. It has been reported that body mass index (BMI) may be associated with the number of small intestinal ulcers, but the association of BMI with ITIU was uncertain [14]. Additionally, other potential risk factors associated with ITIU have not been identified. The present study aimed to analyze the detection rate of ITIU and its associated risk factors to strengthen the knowledge of this disease and to explore the outcomes of nonspecific ITIU.
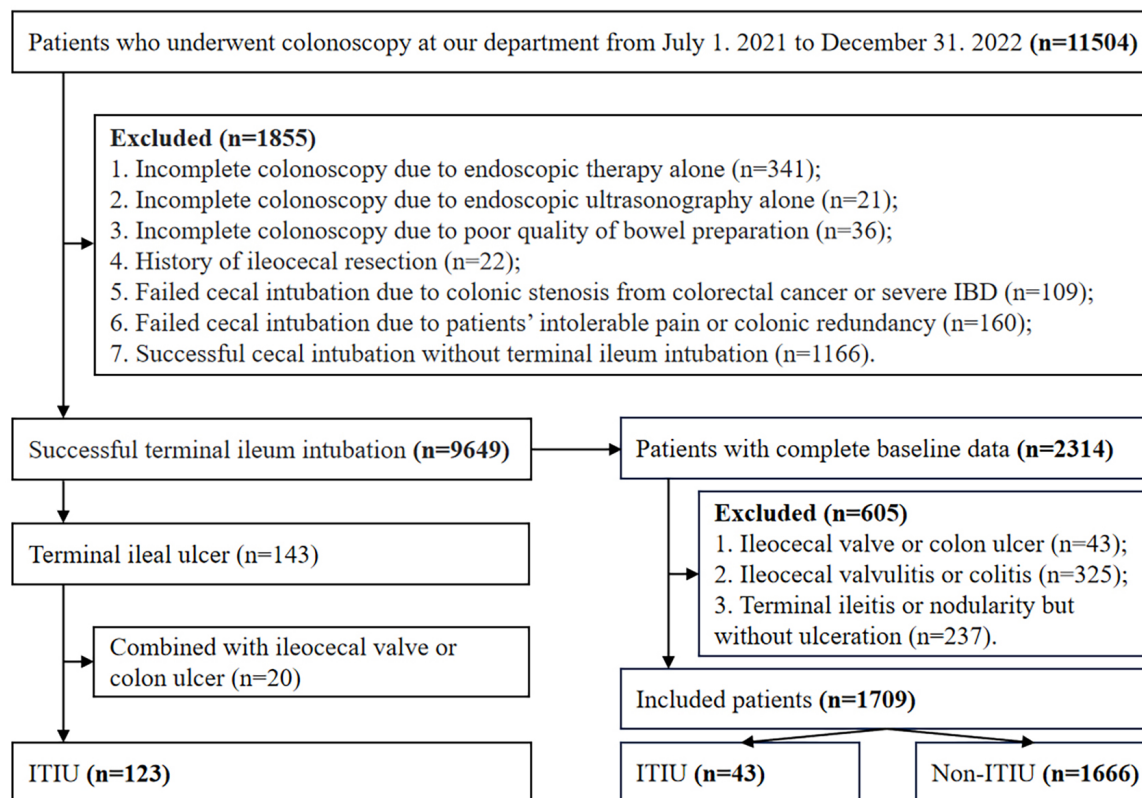
Fig. 1. Flowchart of patients' enrollment. ITIU, isolated terminal ileal ulcers; IBD, inflammatory bowel disease.

2. Methods

2.1 Study Design

We retrospectively screened the medical records of 11,504 consecutive individuals undergoing colonoscopy at the Department of Gastroenterology, General Hospital of Northern Theater Command, between 1 July 2021 and 31 December 2022. The inclusion criteria were the individuals who underwent colonoscopy at our department between 1 July 2021 and 31 December 2022. The exclusion criteria were as follows: (1) incomplete colonoscopy due to endoscopic therapy alone, endoscopic ultrasonography alone, or poor quality of bowel preparation, etc.; (2) history of ileocecal resection; (3) failed cecal intubation due to colonic stenosis from colorectal cancer or severe IBD, patients' intolerable pain, or colonic redundancy; and (4) successful cecal intubation but without TI intubation. At the Department of Gastroenterology, TI intubation is routinely performed during colonoscopy. However, if the TI intubation is technically difficult or unsafe, endoscopists would not choose to attempt it. The study protocol was approved by the medical ethical committee of General Hospital of Northern Theater Command [Approval number: Y (2023)196]. All of our patients signed their informed consent forms for colonoscopy before undergoing the examination. As mentioned in the ethical approval document of our study protocol, considering the retrospective nature of this study, the use of anonymous data, the lack of direct intervention measures, and the extremely minimal risk to patients, the medical ethics committee of the General Hospital of the Northern Theater Command has waived the requirement for the patients' written informed consents. This is in accordance with the principles outlined in the Declaration of Helsinki.

2.2 Data Collection

Data were collected if they were reported in the medical records [15], including demographics such as gender, age, and BMI; type of patient such as outpatient, inpatient; clinical symptoms such as abdominal pain, diarrhea gastrointestinal bleeding, abdominal distension/discomfort, constipation, formless stool, and screening/surveillance; endoscopic findings such as TI ulcer, ITIU, ileocecal valvulitis/colitis, colonic diverticulosis, and colonic polyp; and diagnoses such as CD, ulcerative colitis (UC), lymphoma, and ankylosing spondylitis. Histology of the ITIU was collected, and information regarding the management of nonspecific ITIU was also collected, mainly including empiric therapy and observational follow-up. Telephone follow-up at least one year after the index colonoscopy was performed in patients with nonspecific ITIU to collect clinical symptoms, colonoscopic findings during reexamination, and follow-up outcomes [1].

2.3 Definitions

ITIU was defined as ulcers occurring only in the terminal ileum during colonoscopy with TI intubation.

Table 1. Characteristics of study population.

Variables	No. Pts.	Median (IQR) or Frequency (percentage)
Gender		
Male (%)	9649	5315 (55.1%)
Female (%)	9649	4334 (44.9%)
Age (years)	9648	53 (40, 62)
≤50 (%)	9648	4266 (44.2%)
>50 (%)	9648	5382 (55.8%)
Outpatient (%)	9649	7084 (73.4%)
Major colonoscopic findings		
TI ulcer (%)	9649	143 (1.5%)
ITIU (%)	9649	123 (1.3%)
Terminal ileitis or nodularity but without ulceration (%)	9649	582 (6.0%)
Colitis (%)	9646	937 (9.7%)
Colonic diverticulosis (%)	9646	490 (5.1%)
Colonic polyp (%)	9649	5530 (57.3%)

Abbreviations: IQR, interquartile range; No. Pts., numbers of patients; TI, terminal ileum; ITIU, isolated terminal ileal ulcers. The age was missing in one included patient, and the information regarding colitis and colonic diverticulosis were missing in three included patients based on our database.

The detection rate of ITIU was defined as the percentage of individuals who were diagnosed with ITIU among the individuals with successful TI intubation.

The number of ulcers was defined as single and multiple. Single ulcer was defined as only one ulcerative lesion was found at the TI during colonoscopy. Multiple ulcers were defined as two or more ulcerative lesions were found at the TI during colonoscopy.

Individuals with a BMI of <18.5 kg/m^2 were defined as underweight, 18.5–23.9 kg/m^2 as normal-weight, 24.0–27.9 kg/m^2 as overweight, and ≥ 28 kg/m^2 as obese individuals [16].

2.4 Statistical Analyses

Normality was evaluated using the Kolmogorov-Smirnov test for continuous variables, and non-normal distribution data were presented as median [interquartile range (IQR)], and compared by the Mann-Whitney U test. Categorical variables were expressed as frequency (percentage), and compared by the Chi-square test, Chi-squared correction test, or Fisher's exact test. Among the individuals with complete baseline data, demographics, BMI, and indications for colonoscopy were compared between ITIU and non-ITIU groups. Logistic regression analyses were performed to identify the independent factors associated with ITIU, and variables with $p < 0.10$ in the univariate logistic regression analyses were further included in the multivariate logistic regression analyses. Collinearity was tested by using the variance inflation factor (VIF) and a VIF >2 was defined as problematic collinearity. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. All statistical analyses were performed by using SPSS 26.0 (IBM Corp, Armonk, NY, USA), and a two-sided $p < 0.05$ was considered statistically significant.

3. Results

3.1 Baseline Characteristics of Individuals

A total of 9649 individuals who completed TI intubation were included (Fig. 1). Their characteristics are described in Table 1. The median age was 53 years, 55.8% (5382/9648) of these individuals were older than 50 years, and 55.1% (5315/9649) were male. Among them, 143 individuals had TI ulcer, of whom 20 were also accompanied with ileocecal valve or colon ulcer. Therefore, the detection rate of ITIU was 1.3% (123/9649). Characteristics of patients with ITIU were described in Table 2. The median age was 44 years, 41.5% (51/123) of the patients with ITIU were older than 50 years, and 60.2% (74/123) were male. Among the patients with ITIU, 37.4% (46/123) were detected with a single ulcer. The proportion of patients who were accompanied with ileocecal valvulitis/colitis, colonic diverticula, and colonic polyp was 22.8% (28/123), 5.7% (7/123), and 44.7% (55/123), respectively. Among the 123 patients, 106 had the histology of the ulcers, of whom 99 (93.4%) indicated chronic inflammation and 63 (59.4%) lymphocyte proliferation.

A total of 1709 individuals had completed baseline data, and their characteristics were described in Table 3. The median age was 56 years, 51.3% (876/1709) were male, and 63.4% (1084/1709) were older than 50 years. The median BMI was 23.90 kg/m^2. Colonoscopy was performed for formless stool in 34.5%, for screening/surveillance in 31.6%, and for abdominal pain in 21.0%. The proportion of individuals with ITIU was 2.5% (43/1709).

3.2 Differences Between Non-ITIU and ITIU Groups

Compared with the non-ITIU group, the ITIU group was significantly younger (46 vs. 56, $p = 0.010$). In the ITIU group, the common indications for colonoscopy were

Table 2. Characteristics of individuals with ITIU.

Variables	No. Pts.	Median (IQR) or Frequency (percentage)
Gender		
Male (%)	123	74 (60.2%)
Female (%)	123	49 (39.8%)
Age (years)	123	44 (34, 57)
≤50 (%)	123	72 (58.5%)
>50 (%)	123	51 (41.5%)
Outpatient (%)	123	87 (70.7%)
Major colonoscopic findings		
Ileocecal valvulitis/colitis (%)	123	28 (22.8%)
Colonic diverticulosis (%)	123	7 (5.7%)
Colonic polyp (%)	123	55 (44.7%)
Ulcer number		
Single (%)	123	46 (37.4%)
Multiple (%)	123	77 (62.6%)
Histopathologic characteristics		
Chronic inflammation (including acute phase)	106	99 (93.4%)
Lymphocyte proliferation	106	63 (59.4%)
Dysplasia	106	15 (14.2%)
Ulcer	106	11 (10.4%)
Mucosal muscle hyperplasia	106	5 (4.7%)
Eosinophilic infiltration	106	3 (2.8%)
Atypical cells	106	1 (0.9%)

Abbreviations: IQR, interquartile range; No. Pts., numbers of patients; ITIU, isolated terminal ileal ulcers.

Table 3. Characteristics of included patients with complete baseline data.

Variables	No. Pts.	Median (IQR) or Frequency (percentage)
Gender		
Male (%)	1709	876 (51.3%)
Female (%)	1709	833 (48.7%)
Age (years)	1709	56 (43, 64)
≤50 (%)	1709	625 (36.6%)
>50 (%)	1709	1084 (63.4%)
BMI (kg/m^2)	1709	23.90 (21.63, 26.12)
BMI <18.5 kg/m^2 (%)	1709	82 (4.8%)
BMI = 18.5–23.9 kg/m^2 (%)	1709	787 (46.1%)
BMI = 24.0–27.9 kg/m^2 (%)	1709	638 (37.3%)
BMI ≥28.0 kg/m^2 (%)	1709	202 (11.8%)
Sedated colonoscopy (%)	1709	218 (12.8%)
Outpatient (%)	1709	1131 (66.2%)
Indications for colonoscopy		
Abdominal pain (%)	1709	359 (21.0%)
Diarrhea (%)	1709	141 (8.3%)
Gastrointestinal bleeding (%)	1709	86 (5.0%)
Abdominal distension/discomfort (%)	1709	172 (10.1%)
Constipation (%)	1709	199 (11.6%)
Formless stool (%)	1709	590 (34.5%)
Screening/surveillance (%)	1709	540 (31.6%)
Major colonoscopic findings		
ITIU (%)	1709	43 (2.5%)

Abbreviations: IQR, interquartile range; No. Pts., numbers of patients; BMI, body mass index; ITIU, isolated terminal ileal ulcers.

Table 4. Comparison between Non-ITIU and ITIU groups.

Variable	N ("Non-ITIU, n = 1666")	N ("ITIU, n = 43")	χ^2/Z value	p-value
	Median (IQR) or Frequency (percentage)	Median (IQR) or Frequency (percentage)		
Age (years)	56 (43, 64)	46 (33, 59)	–2.567	0.010
Female (%)	813 (48.8%)	20 (46.5%)	0.088	0.767
BMI (kg/m^2)	23.91 (21.64, 26.12)	23.15 (20.20, 25.71)	–0.897	0.370
BMI <18.5 kg/m^2 (%)	78 (4.7%)	4 (9.3%)	1.078	0.299*
BMI = 18.5–23.9 kg/m^2 (%)	769 (46.2%)	18 (41.9%)	0.312	0.577
BMI = 24.0–27.9 kg/m^2 (%)	626 (37.6%)	12 (27.9%)	1.675	0.196
BMI ≥28.0 kg/m^2 (%)	193 (11.6%)	9 (20.9%)	3.513	0.061
Indications for colonoscopy				
Abdominal pain (%)	349 (20.9%)	10 (23.3%)	0.134	0.714
Diarrhea (%)	139 (8.3%)	2 (4.7%)	0.346	0.556*
Gastrointestinal bleeding (%)	84 (5.0%)	2 (4.7%)	0.000	1.000*
Abdominal distension/discomfort (%)	167 (10.0%)	5 (11.6%)	0.008	0.930*
Constipation (%)	194 (11.6%)	5 (11.6%)	0.000	0.997
Formless stool (%)	575 (34.5%)	15 (34.9%)	0.003	0.960
Screening/surveillance (%)	526 (31.6%)	14 (32.6%)	0.019	0.891

*Chi-squared correction test. Abbreviations: IQR, interquartile range; BMI, body mass index; ITIU, isolated terminal ileal ulcers.

formless stool (34.9%), screening/surveillance (32.6%), and abdominal pain (23.3%) (Table 4).

3.3 Factors Associated With ITIU

No significant multicollinearity was detected among the variables included in the multivariate logistic regression model (all VIF <2). Multivariate logistic regression analyses demonstrated that age ≤50 years old (adjusted odds ratio [aOR] = 1.947, 95% CI = 1.056–3.587, p = 0.033) remained independently associated with ITIU (Table 5).

3.4 Diagnoses of ITIU

A total of 17 patients with ITIU had their specific causes, including 9 with drug-induced ulcer, 2 with CD, 3 with UC, 2 with lymphoma, and 1 with ankylosing spondylitis (Fig. 2).

3.5 Management and Outcomes of Nonspecific ITIU

A total of 106 patients who had nonspecific ITIU received empiric therapy, including 5-Aminosalicylic Acid (5-ASA), probiotics, and 5-ASA plus probiotics, and observational follow-up. Among them, 48 patients could not be further contacted during the follow-up period, and 58 could be followed by telephone at least one year after the index colonoscopy. Furthermore, 36 of the 58 patients received empiric therapy during their median follow-up period of 25 months, and another 22 did not receive further therapy during their median follow-up period of 23 months. Neither clinical symptoms (p = 1.000) nor colonoscopic findings (p = 0.560) were significantly different between patients who received empiric therapy and those who received observational follow-up assessment (Table 6).

4. Discussion

Our study showed that the detection rate of ITIU in individuals undergoing colonoscopy was 1.3% (123/9649). Among them, 4.1% (5/123) were diagnosed with IBD (2 with CD and 3 with UC). Common clinical manifestations of ITIU were formless stool and abdominal pain. In addition, age ≤50 years was independently associated with ITIU. Subsequently, there was no difference in the follow-up outcomes between patients with nonspecific ITIU who received empiric therapy and those who received observational follow-up.

As well known, IBD often occurs in young adults, and the peak age of its onset is 18 to 49 years [17]. Considering a potential correlation between ITIU and IBD [5,6], it is reasonable to believe that the age of individuals also influences the occurrence of ITIU, which is consistent with the findings of our current study. There are some possible explanations for this association, as follows. First, ITIU alone, without any involvement of the rest of the intestines, can be observed at the early stage of IBD [6,18]. Specifically, nearly 30% of patients with CD have ulcers confined to the TI alone [19], and nearly 17% of patients with UC can be accompanied by ulcers in the TI [20]. Our study found that 10.7% (3/28) of patients with ITIU and concurrent ileocecal valvulitis/colitis were finally diagnosed with UC, probably because backwash ileitis resulted in ileal ulcers. Therefore, a higher risk of ITIU in individuals younger than 50 years old can be explained by a higher incidence of IBD in younger individuals [17]. Second, TI is a special part of the intestinal tract where feces tend to accumulate, and bacteria thrive. It contains a large amount of Peyer's patches, which are responsible for the intestinal immune system or intestinal immunity. Notably, the number of Peyer's patches gra-

Table 5. Univariate and multivariate logistic regression analyses of factors associated with ITIU.

Variable	No. Pts.	Univariate analyses					Multivariate analyses				
		β	SE	Wald	OR (95% CI)	p-value	β	SE	Wald	aOR (95% CI)	p-value
Age $\leq$50 years vs. age >50 years	1709	0.709	0.310	5.236	2.033 (1.107–3.732)	0.022	0.666	0.312	4.562	1.947 (1.056–3.587)	0.033
Female vs. male	1709	–0.092	0.310	0.088	0.912 (0.497–1.674)	0.767					
BMI (kg/m^2)											
BMI <18.5 kg/m^2 (yes vs. no)	1709	0.736	0.538	1.875	2.088 (0.728–5.990)	0.171					
BMI = 18.5–23.9 kg/m^2 (yes vs. no)	1709	–0.175	0.313	0.311	0.840 (0.455–1.551)	0.577					
BMI = 24.0–27.9 kg/m^2 (yes vs. no)	1709	–0.441	0.344	1.649	0.643 (0.328–1.261)	0.199					
BMI $\geq$28.0 kg/m^2 (yes vs. no)	1709	0.703	0.383	3.378	2.020 (0.954–4.276)	0.066	0.617	0.385	2.564	1.854 (0.871–3.945)	0.109
Indications for colonoscopy											
Abdominal pain (yes vs. no)	1709	0.134	0.366	0.134	1.144 (0.558–2.343)	0.714					
Diarrhea (yes vs. no)	1709	–0.624	0.730	0.731	0.536 (0.128–2.239)	0.392					
Gastrointestinal bleeding (yes vs. no)	1709	–0.085	0.733	0.013	0.919 (0.219–3.863)	0.908					
Abdominal distension/discomfort (yes vs. no)	1709	0.166	0.483	0.119	1.181 (0.459–3.042)	0.730					
Constipation (yes vs. no)	1709	–0.002	0.482	0.000	0.998 (0.388–2.567)	0.997					
Formless stool (yes vs. no)	1709	0.016	0.324	0.003	1.016 (0.539–1.918)	0.960					
Screening/surveillance (yes vs. no)	1709	0.045	0.330	0.019	1.046 (0.548–1.997)	0.891					

Abbreviations: No. Pts., numbers of patients; OR, odds ratio; aOR, adjusted odds ratio; CI, confidence interval; BMI, body mass index; ITIU, isolated terminal ileal ulcers; SE, standard error.
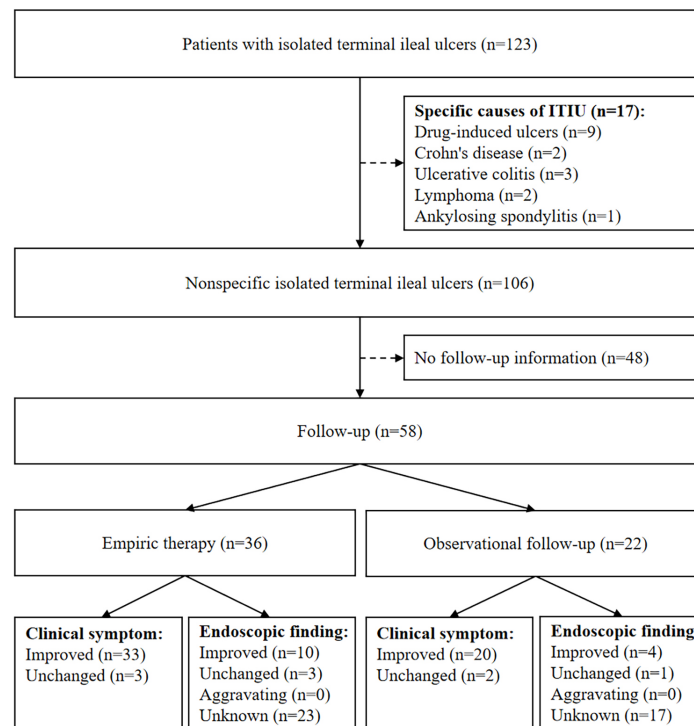
Fig. 2. Flowchart of follow-up. ITIU, isolated terminal ileal ulcers.

Table 6. Outcomes of nonspecific ITIU receiving empiric therapy or observational follow-up.

Outcomes	Empiric therapy* (n = 36)	Observational follow-up (n = 22)	χ^2/Z value	p-value
Duration of follow-up months [Median (IQR)]	25 (20, 28.75)	23 (16.75, 27.50)	−1.293	0.196
Clinical symptom				
Improved	33 (91.7%)	20 (90.9%)	Not available	1.000^a
Unchanged	3 (8.3%)	2 (9.1%)		
Endoscopic finding				
Improved	10 (27.8%)	4 (18.2%)		
Unchanged	3 (8.3%)	1 (4.5%)	1.16	0.560
Aggravating	0 (0%)	0 (0%)		
Unknown	23 (63.9%)	17 (77.3%)		

*Empiric therapy includes 5-Aminosalicylic Acid (5-ASA), probiotics, and 5-ASA plus probiotics; ^{a} Fisher's exact test; ITIU, isolated terminal ileal ulcers; IQR, interquartile range.

dually decreases with age, and peaks at the age of 15–25 years old. Once the bacteria thrive, the immune response would be strong at the TI owing to the presence of Peyer's patches. Taken together, it is more likely to develop ulcers in the TI in young individuals [2,3,21,22].

There seems to be a positive correlation between the number of small intestinal ulcers and BMI [14]. Previous studies suggest that the diversity of gut microbiota is lower in obese people [23–25]. Especially, most obese people have diets that are low in fiber but high in protein and fat. Notably, these diets can alter the ratios of microbes and metabolites that modulate inflammation [26–28]. Therefore, intestinal inflammation can be more easily increased in obese people. Moreover, the presence of certain bacteria in obese people can impair the function of intestinal tight

junctions, allowing bacterial products to pass through the intestinal wall easily and then induce an inflammatory response [14,23,29]. By comparison, our study demonstrated only a marginally positive association between ITIU and BMI ≥28.0 kg/m². This issue can be further explored in large-scale studies.

At present, there is no consensus on routine TI intubation during screening colonoscopy. Traditionally, considering the time-consuming nature of TI intubation and a low detection rate of TI lesions, routine TI intubation is not recommended, and TI intubation is only recommended for individuals with gastrointestinal symptoms or suspected IBD [4,30,31]. However, our study showed that the detection rate of ITIU was 1.3% and that approximately 90% of individuals undergoing colonoscopy completed the TI intuba-

tion. Interestingly, we found that a relatively high proportion of ITIU individuals underwent screening colonoscopy, who did not have any obvious gastrointestinal symptoms and were asymptomatic. Thus, it seems that clinical manifestations are not associated with ITIU, and the necessity of TI intubation should be recognized in all individuals undergoing screening colonoscopy.

In a randomized controlled trial (RCT) enrolling 82 patients with ITIU, there was no significant difference in clinical efficacy or endoscopic outcome during short-term and 1-year follow-up periods between patients who received experimental treatment with mesalazine (orally, 4.0 g, quaque die [qd]) for 3 months and those who received observational follow-up [32]. Our current study also showed no significant difference in the efficacy between patients receiving empiric therapy and observational follow-up after 1-year follow-up. Recently, another RCT enrolling 60 patients with isolated terminal ileum abnormalities demonstrated no significant difference in clinical or endoscopic efficacy between patients who received combination antimicrobial therapy (rifaximin, orally, 550 mg, bid, for two weeks; albendazole, orally, 400 mg, as a single dose; tinidazole, orally, 1 g, bis in die [bid], for three days) and those who received symptomatic treatment (probiotics; proton pump inhibitors; prokinetic) during short-term and 3-month follow-up periods [33]. It has been reported that the rate of progression from ITIU to IBD is high, ranging from 29% to 54%, during a follow-up period of 4 to 7 years. Therefore, nonspecific ITIU should be considered as an early stage of IBD and treated early and monitored closely [13,18,34–36]. Considering that it is difficult to distinguish between IBD and ITIU, especially in asymptomatic individuals [10,31], long-term follow-up and an adaptable treatment strategy seem to be necessary for patients with ITIU.

Our study has a few limitations. First, owing to the retrospective nature of this study, some baseline data, such as height, weight, and indications for colonoscopy, and follow-up information, were unavailable for all individuals. Second, in our study, some patients received probiotics or 5-ASA as empiric therapy for ileal ulcers. However, a systematic review and meta-analysis regarding the efficacy of aminosalicylic acid preparations for the treatment of CD revealed that the effectiveness of sulfasalazine for treating mild-to-moderate active CD was marginal. Additionally, olsalazine and mesalazine, at a low (1–2 g/d) or high (3.2–4.0 g/d) dosage, did not significantly differ from placebo in inducing remission of CD [37]. Furthermore, the current European Crohn's and Colitis Organization guidelines do not recommend the use of oral 5-ASA for the treatment of ileal CD [38]. Finally, in our study, the BMI classifications are based on the China-specific criteria, which differ from the World Health Organization standards, particularly in establishing thresholds for overweight and obesity. This is primarily because the risk stratification of comorbidities and mortality in the Chinese population is dependent upon lower BMI cut-off values [39–41]. Further studies should validate this conclusion in population outside the China according to the World Health Organization standards of BMI.

5. Conclusion

In conclusion, ITIU is not rare during colonoscopy, and predominates in younger individuals with an age ≤50 years. However, empiric therapy does not improve the outcomes of patients with nonspecific ITIU. Therefore, the cost-effectiveness or time-efficiency of TI intubation should be comprehensively evaluated in long-term follow-up studies.

Key Points

• ITIU had a detection rate of 1.3% and is predominantly observed in younger individuals with an age ≤50 years.
• The necessity of TI intubation should be recognized in all individuals undergoing screening colonoscopy.
• Younger age is an independent risk factor for ITIU.
• Empiric therapy does not improve the outcomes of patients with nonspecific ITIU.

Availability of Data and Materials

All data included in this study are available from the corresponding authors upon reasonable request.

Author Contributions

Conceptualization: XS, XQ; Formal analysis: DS, XS and XQ; Data curation: DS, RC, CL, YL, JH, SW, YS, KW, CG and XQ; Writing—original draft: DS, RC, JH, CL, CG, and XQ; Writing—review and editing: DS, RC, JH, CL, CG, YL, XS, XQ; Supervision: XS, XQ. All authors contributed to the important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This work was approved by the medical ethical committee of General Hospital of Northern Theater Command [Approval number: Y (2023)196]. All of our patients signed their informed consent forms for colonoscopy before undergoing the examination. Considering the retrospective nature of this study, the use of anonymous data, the lack of direct intervention measures, and the extremely minimal risk to patients, the medical ethics committee of the General Hospital of the Northern Theater Command has waived the requirement for the patients' written informed consents. This is in accordance with the principles outlined in the Declaration of Helsinki.

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Conflict of Interest

Given his role as Editorial Board member, Xingshun Qi had no involvement in the peer-review of this article and has no access to information regarding its peer-review. Full responsibility for the editorial process for this article was delegated to John Alcolado. Other authors declared no conflict of interest.

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