ORIGINAL ARTICLE

Correlation of the Rutgeerts score and recurrence of Crohn's disease in patients with end ileostomy

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Abstract

Background: Recurrence of Crohn's disease (CD) can occur after surgery, including end ileostomy (EI). The Rutgeerts score (RS) was developed to predict postsurgical CD recurrence via ileocolonoscopy in patients having ileocolonic resection. The role of ileoscopic evaluation via stoma for assessing recurrence of CD has not been investigated. The aim of this study was to evaluate the role of ileoscopy for predicting disease recurrence in CD patients after EI with the use of RS.
Methods: A total of 73 eligible CD patients with at least two ileoscopies in our institution following EI were included. Mucosal inflammation of the neo-terminal ileum was graded based on the RS. The primary outcomes were the need for endoscopic stricture dilation and subsequent surgery due to recurrence of disease. The secondary outcomes were CD-related hospitalization and the need to escalate CD-associated medications.
Results: The median duration of CD until EI was 9 years (interquartile range: 4-13 years), and the median duration from EI to the first ileoscopy was 28 months (interquartile range: 11-93 months). The RSs in the neo-terminal ileum close to EI were calculated, and subjects were divided into two groups: the normal RS group with the score being zero (n = 25) and the abnormal RS group with the RS score being ≥1 (n = 48). Patients in the abnormal RS group were more likely to have recurrence of CD (92% *vs* 27%) and need endoscopic dilation of stricture (40% *vs* 10%), subsequent bowel surgery (68% *vs* 15%), disease-related hospitalizations (80% *vs* 23%) and escalation of CD medications (64% *vs* 25%) than those in the normal RS group. Time-to-event analysis showed that patients in the abnormal RS group were at a higher risk of endoscopic dilation (odds ratio (OR) = 1.5; 95% CI: 1.09–1.9), need of second bowel surgery (OR = 1.5; 95%CI: 1.2–1.8) and disease-related hospitalizations (OR = 1.3; 95%CI: 1.1–1.6) after adjusting for factors such as duration from surgery to sensor, duration of disease and the patient's sex (all P < 0.001). Further multivariable analysis showed that patients in the abnormal RS group were more likely to need escalation of CD-related medications after adjusting for duration from surgery and age (OR = 5.3; 95% CI: 1.7–16.5; P = 0.004).
Conclusion: RS can be used to predict the recurrence of CD in patients with EI. A high RS score based on ileoscopy appeared to be associated with poor outcomes. This may be considered a useful decision-making tool for monitoring disease after ileostomy surgery.

Key words: Crohn's disease, Rutgeerts score, ileoscopy, ileostomy, recurrence

Introduction

Crohn's disease (CD), a transmural inflammatory disease that may affect any part of the gastrointestinal tract, is commonly found at the ileum [1,2]. CD patients frequently require surgery during the course of their disease [3,4]. The disease course of CD can be therapeutically altered by surgery, but inflammation tends to recur in the same disease location. End ileostomy (EI) may be performed in CD patients with severe perianal disease, distal colitis or proctitis/colitis [5].

Disease recurrence in CD has been reported to be as high as 35% after colectomy and ileostomy [6] and appears to be even higher with ileocolonic resection (ICR) and ileocolonic anastomosis (ICA) [7]. Endoscopic recurrence normally precedes symptomatic recurrence. Most endoscopic recurrences develop within the first few years after surgery, and the predisposition to recurrence persists—if not increases—indefinitely thereafter. Neo-terminal ileum and anastomotic sites are the most common sites of recurrence in patients with ICR and ICA [8], while recurrence typically occurs in the ileum proximal to the stoma in patients undergoing ileostomy with or without colectomy [7]. Reported risk factors for postoperative CD recurrence in patients after ICA include preoperative disease activity [9,10], presence of myenteric plexitis on histological findings [11, 12] and smoking [13,14]. However, the factors associated with disease recurrence in CD patients with end ileostomy have not been studied.

Retrograde ileoscopy via stoma has been shown to be a useful and reliable tool for detecting CD recurrence in the neo-terminal ileum in CD patients with ileostomy [15] and can identify individuals who may benefit from early aggressive postoperative pharmacotherapy. However, there have been no published scoring systems for evaluating and quantifying the mucosal inflammation in the neo-terminal ileum in these patients. The Rutgeerts score (RS) was developed in the early 1990s as a tool for predicting the postoperative recurrence in CD patients after ICR and ICA [16]. This scoring system encompasses five different categories (i,0–i,4) for the endoscopic findings based on the extent and severity of lesions detected at the anastomosis and neo-terminal ileum. This scoring system was found to correlate closely with endoscopic recurrence after surgery. Patients with low-grade mucosal inflammation (i,0 and i,1) had a symptomatic recurrence rate of 9% in 7 years, while those with high-grade disease (i,3 and i,4) had a symptomatic recurrence rate of almost 100% in a 4-year interval. This scoring system is widely used in clinical practice, and endoscopic recurrence after resection for CD is defined as a score of i2, i3 or i4. However, this score was not intended to be used in CD patients with ileostomy. The aims of this study were to evaluate the risk factors for abnormal RS scores and to assess RS for the prediction of clinical outcomes in CD patients with permanent EI.

Patients and methods

Patient population

This study was approved by the Cleveland Clinic Institutional Review Board. A total of 73 CD patients with EI were evaluated from January 2007 to January 2013. Inclusion criteria were patients with (1) diagnosis of CD, (2) diagnosis of EI or (3) patients with history of at least two ileoscopies via stoma at our institution following EI. Exclusion criteria were those with (1) ileostomy for bowel malignancy, (2) ulcerative colitis or indeterminate colitis or (3) temporary ileostomy.

Demographic and clinical variables

A total of 24 demographic, clinical, endoscopic and histological variables were evaluated. The following clinical variables were included: age at CD diagnosis, age at bowel resection and age at CD-related surgery (except for abscess drainage and seton placement), use of medications for >6 months before and after permanent ileostomy (5aminosalicylates [5-ASA], corticosteroids, antibiotics, 6-mercaptopurine [6-MP] / azathiopurine
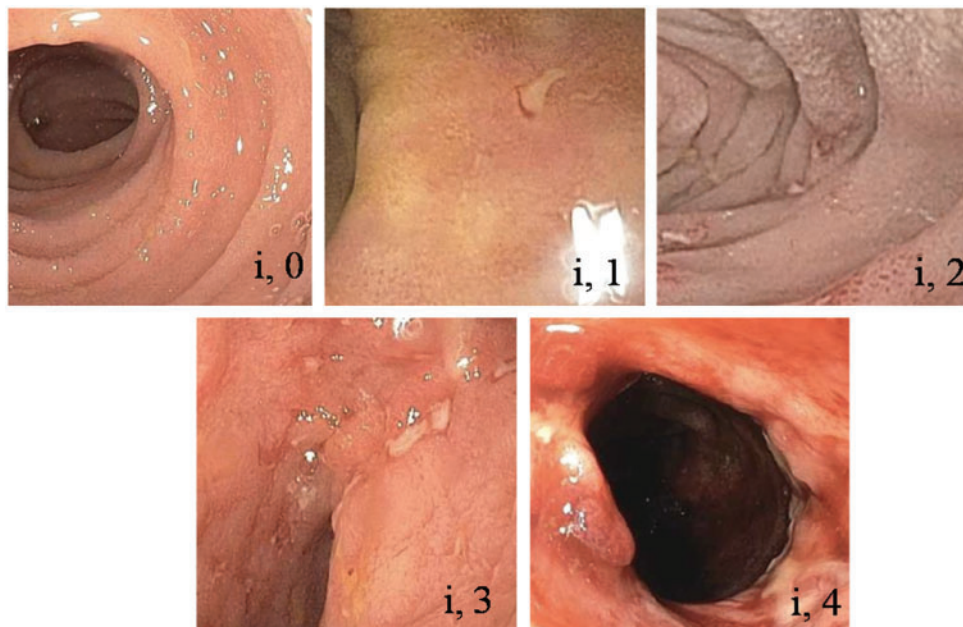
Figure 1: The Rutgeerts score for ileoscopy via stoma: i,0: no lesions; i,1: < 5 aphthous lesions; i,2: >5 aphthous lesions with normal mucosa between the lesions or skip areas of larger lesions; i,3: diffuse aphthous ileitis with diffusely inflamed mucosa; i,4: diffuse inflammation with already larger ulcers, nodules and/or narrowing.

Table 1. Demographic and clinical characteristics

Factor	Overall (N = 73)	RS = 0 (N = 48)	RS 1–4 (N = 25)	P-value
Age at diagnosis, years	24.5±11.1	24.9±11.8	23.7±9.7	0.66[a]
Age at time of the first surgery, years	29.9±11.7	31.2±11.9	27.3±11.1	0.17[a]
Age at time of ileostomy, years	35.1±12.5	36.4±13.3	32.6±10.6	0.22[a]
Age at entry, years	47.2±13.6	47.8±13.1	46.0±14.7	0.60[a]
Female	52 (71.2)	38 (79.2)	14 (56.0)	0.038[c]
Smoking status				0.64[c]
Never	33 (45.2)	23 (47.9)	10 (40.0)	
Current smoker	16 (21.9)	9 (18.8)	7 (28.0)	
Ex-smoker	24 (32.9)	16 (33.3)	8 (32.0)	
Excessive alcohol use	4 (5.5)	2 (4.2)	2 (8.0)	0.60
Family history of IBD	9 (12.3)	7 (14.6)	2 (8.0)	0.42[c]
Duration from diagnosis to the first bowel resection, years	4.0 [2.0,8.0]	4.0 [2.0,8.5]	2.0 [1.00,6.0]	0.19[b]
Duration from diagnosis to time of ileostomy, years	9.0 [4.0,13.0]	9.0 [4.0,15.0]	8.0 [4.0,12.0]	0.62[b]
Number of surgeries prior to ileostomy	3.0 [2.0,4.0]	2.0 [2.0,3.0]	4.0 [3.0,5.0]	0.001[b]
Indication for ileostomy				0.99
Perforation	4 (5.5)	3 (6.3)	1 (4.0)	
Non-perforation	69 (94.5)	45 (93.8)	24 (96.0)	
Type of surgery at time of ileostomy				0.33[c]
Colectomy	26 (35.6)	19 (39.6)	7 (28.0)	
Proctocolectomy	47 (64.4)	29 (60.4)	18 (72.0)	
Immunosuppressants before EI > 6 months	70 (95.9)	47 (97.9)	23 (92.0)	0.27[c]
Immunosuppressants after EI > 6 months	44 (60.3)	27 (56.3)	17 (68.0)	0.33
Long-term TPN after ileostomy	7 (9.6)	4 (8.3)	3 (12.0)	0.68
Duration from EI to the first ileoscopy, months	28.0 [11.0,92.8]	28.0 [11.0,74.8]	33.9 [13.0,123.7]	0.31[b]

Values presented as mean ± standard deviation, median [interquartile range] or N (%).
P-values: a = ANOVA, b = Kruskal-Wallis test, c = Pearson's *chi*-square test.
RS, Rutgeerts score; IBD, inflammatory bowel disease; EI, end ileostomy; TPN, total parental nutrition.

(AZA), methotrexate and antitumor necrosis factor [TNF] agents), history of long-term total parental nutrition (TPN) (>6months in total). Clinical symptoms of recurrence were defined as one or more of the following: long-lasting abdominal pain, increased ileostomy output and periodical intravenous fluid-required dehydration.

Endoscopic evaluation

Endoscopic images in electronic records were reviewed, and evidence of CD recurrence after ileostomy was evaluated based on the criteria from adopted from RS. Lesions from the bowel segment >5 cm from skin were scored as follows: i0: no lesions; i1: < 5 aphthous lesions; i2: > or equal to 5 aphthous lesions with normal mucosa between lesions or skip areas of larger lesions or lesions; i3: diffuse aphthous ileitis with diffusely inflamed mucosa and i4: diffuse inflammation with larger ulcers, nodules and/or narrowing [16].

Outcome measurements

Primary outcomes were defined as the need for endoscopic stricture dilation, subsequent second surgery for the disease including bowel resection and stoma revision or stoma relocation. The secondary outcomes were post-EI disease recurrence-related hospitalization or requirement of escalation of CD-associated medications for disease control.

Statistical analysis

All statistical analyses were performed using SPSS software version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Continuous variables were presented as mean ± standard deviation (SD) and categorical variables as N%. Univariate analysis was used to identify potential factors associated with RS > 0. Student's t test (or Wilcoxon rank-sum test when appropriate) was used for continuous variables, while *chi*-square test (or Fishers exact test, when appropriate) was used for categorical variables. Kaplan-Meier analysis was used to estimate the cumulative recurrence rates for both endoscopic and surgical recurrences. Cox regression analysis was used to assess RS in the prediction of clinical outcomes.

Results

This study included a total of 73 patients, of whom 21 (29%) were male. The overall age at the time of the diagnosis of CD was 24.5±11.1 years with the age at the time of the EI being 35.1±12.5 years. The median duration of CD until EI was 9 years (interquartile range (IQR): 4–13 years), and the median duration from the construction of EI to the first ileoscopy via stoma was 28 months (IQR: 11–93 months). The main indication for ileostomy in the cohort was failure of medical therapy in 69 patients (94.5%) and bowel obstruction in 4 patients (5.5%).

All patients had their ileoscopy findings evaluated, and RS was calculated accordingly (Figure 1). The 73 patients included in the study were divided into two groups according to RS: (1) normal RS (the study group) and (2) abnormal RS (the control group).

Table 2. Outcomes after end ileostomy

Factor	Overall (N = 73)	RS = 0 (N = 48)	RS 1–4 (N = 25)	P-value
Clinical recurrence				< 0.001[a]
No recurrence	37 (50.7)	35 (72.9)	2 (8.0)	
Recurrence within 3 years	18 (24.7)	6 (12.5)	12 (48.0)	
Recurrence after 3 years	18 (24.7)	7 (14.6)	11 (44.0)	
Need for endoscopic stricture dilation	15 (20.5)	5 (10.4)	10 (40.0)	0.003[a]
Need for the 2nd bowel surgery	24 (32.9)	7 (14.6)	17 (68.0)	< 0.001[a]
IBD recurrence-related hospitalization	31 (42.5)	11 (22.9)	20 (80.0)	< 0.001[a]
Need of escalation of IBD medications	28 (38.4)	12 (25.0)	16 (64.0)	0.001[a]
Duration of follow-up, years	9.0 [5.0,14.0]	8.5 [4.5,13.0]	9.0 [5.0,15.0]	0.89[b]

Values presented as median [interquartile range] or N (%).
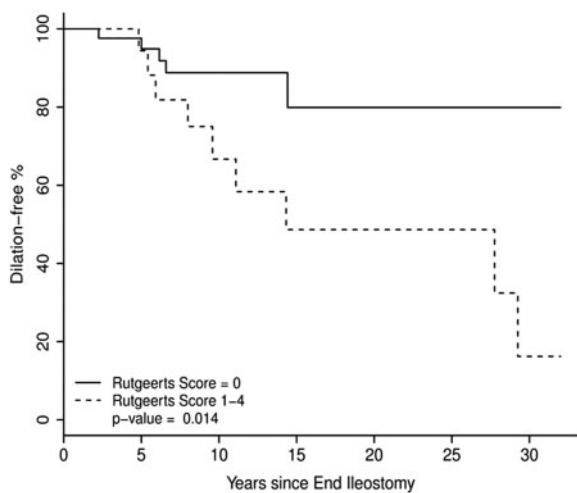P-values: a = Pearson's *chi*-square test, b = Kruskal-Wallis test.

Rutgeerts=0 (n=48) 95±4 (36) 89±5 (21) 80±10 (9) 80±10 (6) 80±10 (5) 80±10 (2)
Rutgeerts>0 (n=25) 94±5 (17) 67±12 (8) 49±14 (5) 49±14 (4) 49±14 (3) 16±14 (1)

Figure 2: The Rutgeerts score and the need for endoscopic balloon dilation of stricture: Kaplan-Meier plot

Rutgeerts=0 (n=48) 83±6 (31) 80±6 (18) 64±11 (7) 64±11 (6) 64±11 (5) 32±23 (1)
Rutgeerts>0 (n=25) 54±10 (13) 37±10 (8) 32±10 (7) 27±9 (5) 20±9 (3) 7±6 (1)
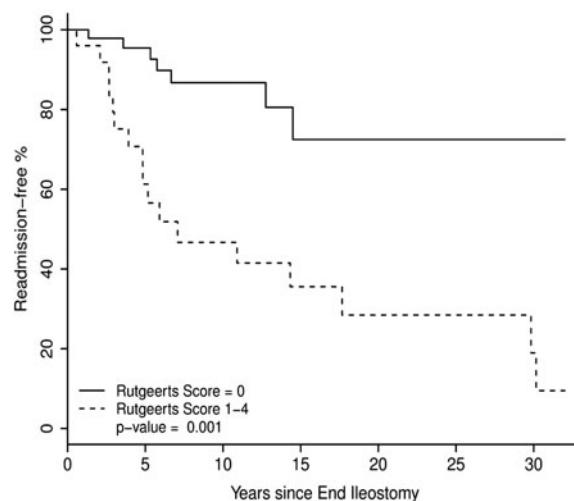
Figure 4: The Rutgeerts score and Crohn's disease-related hospital admission: Kaplan-Meier plot

Rutgeerts=0 (n=48) 95±3 (35) 87±6 (21) 72±10 (9) 72±10 (6) 72±10 (5) 72±10 (2)
Rutgeerts>0 (n=25) 61±10 (13) 47±11 (9) 36±11 (6) 28±11 (4) 28±11 (3) 19±11 (2)
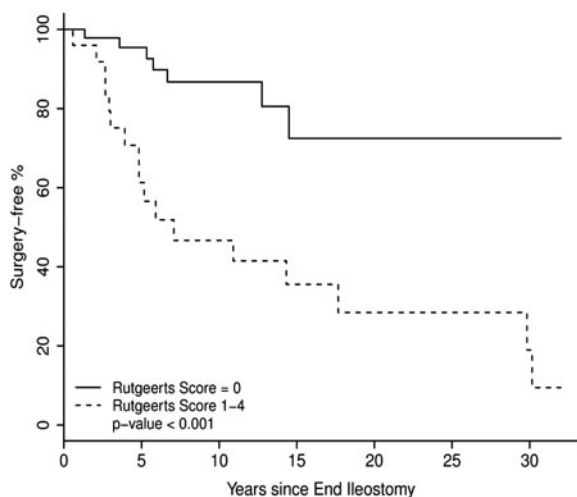
Figure 3: The Rutgeerts score and the need for subsequent Crohn's disease-related bowel surgery: Kaplan-Meier plot

Risk factors associated with abnormal RS

In a univariable analysis, male sex and a higher number of prior surgeries were found to be related to abnormal RS (P = 0.038 and P = 0.001, respectively) (Table 1). In addition, patients in the abnormal RS group were more likely to have a higher rate of CD recurrence (P < 0.001) and need for endoscopic stricture dilation (P = 0.003), disease-related hospitalization, (P < 0.001), escalation of CD medications (P < 0.001) and subsequent bowel surgery (P < 0.001) (Table 2).

Time-to-event analysis showed that patients with an abnormal RS were at a higher risk of endoscopic stricture dilation and the need for disease-related hospitalization or a subsequent bowel surgery (Figures 2–4). In the Cox model, this remained statistically significant after adjusting for factors such as duration from ileostomy surgery to score determination or time of sensor, duration of disease and sex (P < 0.001) (Table 3). Unadjusted analysis showed that patients with an abnormal RS had 5.3 times increased odds of needing escalation of CD-related medications (odds ratio (OR) = 5.3; 95% confidence interval (CI): 1.9–15.2; P = 0.001). This remained significant after adjusting for duration from the stoma surgery to inception and age (OR = 5.3; 95% CI:1.7–16.5; P = 0.004).

Table 3. The Rutgeerts score and outcomes of end ileostomy in Crohn's disease: Cox regression analysis

Outcome	Factor	Unadjusted HR (95% CI)	P-value	EI to score-adjusted HR (95% CI)	P-value	CD duration-adjusted HR (95% CI)	P-value	Sex-adjusted HR (95% CI)	P-value
Need for endoscopic dilation	Rutgeerts score > 0	3.6 (1.2, 10.9)	0.022	7.7 (2.3, 26.0)	0.001	3.6 (1.2, 10.9)	0.022	5.4 (1.5, 19.5)	0.009
	Rutgeerts score (1 unit increase)	1.5 (1.09, 1.9)	0.01	1.9 (1.4, 2.6)	< 0.001	1.5 (1.1, 2.0)	0.008	1.6 (1.2, 2.3)	0.005
Need for second surgery	Rutgeerts score > 0	4.9 (2.0, 11.9)	< 0.001	8.4 (3.3, 21.3)	< 0.001	4.9 (2.0, 11.9)	< 0.001	7.8 (3.0, 20.6)	< 0.001
	Rutgeerts score (1 unit increase)	1.5 (1.2, 1.8)	< 0.001	1.7 (1.4, 2.2)	< 0.001	1.5 (1.2, 1.8)	< 0.001	1.6 (1.3, 2.1)	< 0.001
Hospital readmission	Rutgeerts score > 0	3.3 (1.6, 7.1)	0.002	5.2 (2.4, 11.3)	< 0.001	3.3 (1.6, 7.1)	0.002	4.7 (2.0, 10.8)	< 0.001
	Rutgeerts score (1 unit increase)	1.3 (1.1, 1.6)	0.003	1.5 (1.2, 1.8)	< 0.001	1.3 (1.1, 1.6)	0.003	1.4 (1.2, 1.8)	0.001

HR: hazard ratio

Discussion

In this study we found that an abnormal RS, defined as RS > 0 on retrograde ileoscopy via stoma was associated with male sex and more surgical interventions prior to EI. Furthermore, patients with an abnormal RS had worse outcomes than those with a normal RS as they were more likely to require endoscopic dilation, surgical intervention and hospital readmission.

After ICR and ICA for CD, lesions are frequently observed during colonoscopy regardless of the presence or absence of symptoms. The severity of lesions found on postoperative colonoscopy is reported to be a strong predictive factor for future clinical recurrence [17]. In fact, the grading system (i.e. RS) used in conventional ileocolonoscopy for lesions in the neo-terminal ileum is a well-recognized approach for predicting postoperative CD recurrence and is routinely used in clinical practice [18].

Recurrence after total proctocolectomy with definitive end ileostomy for Crohn's disease is not uncommon. Approximately one-third of patients with CD have overall recurrence of disease after treatment with total colectomy and EI [19,20] and often require immunosuppressants or surgical procedures to control the disease [15,21,22].

There are scant published data in the literature evaluating the risk factors for recurrent CD after EI. Retrograde ileoscopy via stoma is a safe and effective procedure for evaluating the recurrence of CD in the neo-terminal ileum. In addition, ileoscopy allows for therapeutic interventions such as balloon dilatation of strictures [15]. The role of postoperative endoscopic findings such as RS for predicting recurrence in CD patients with EI has not been studied systematically, and thus routine ileoscopy via stoma cannot be recommended due to lack of prior validated studies [21].

We found that a postoperative abnormal RS on retrograde ileoscopy via stoma in CD patients with EI was associated with a higher risk of endoscopic stricture dilation, hospital readmission and surgical intervention. RS can serve as an invaluable tool for identifying patients at high risk of disease progression. These patients may benefit from aggressive medical treatment early on to prevent the need for subsequent surgery. RS may be implemented in routine clinical practice. The scoring system may have a role in the assessment of treatment response with documentation of mucosal healing. The use of RS in patients with EI may help decision making regarding step-up or step-down therapy.

There are several limitations to our study. This study was performed in a tertiary center, and thus the population was mainly characterized by a complex, refractory-diseased population which may not correspond to the overall CD population who required EI. This was also a retrospective study with possible subsequent limitations regarding the sample size as well as the number of variables included. The relatively small number of patients limited our power to identify weaker associations. Finally, endoscopic assessment of disease severity might have been subject to interpersonal interpretations.

In conclusion, we demonstrated that in CD patients who submitted to total colectomy and end ileostomy, an abnormal RS on postsurgical ileoscopy is associated with worst outcomes when compared with patients having normal RS. This suggests that determining RS through retrograde ileoscopy in CD post EI is a valuable tool for indicating those patients who would most likely benefit from close endoscopic surveillance and possible treatment escalation. Further prospective studies using this systematic approach are necessary to demonstrate a positive impact on recurrence rates and severity of recurrence in patients with close endoscopic surveillance.

Conflict of interest statement: none declared.

Acknowledgement

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