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RESEARCH

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MSCT enterography score for prediction of disease severity in patients with active ulcerative colitis

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Abstract

Background Ulcerative colitis (UC) is a chronic non-specific inflammatory bowel disease (IBD). It is characterized by diffuse inflammatory process of the bowel mucosa with a relapsing course. The precise evaluation of UC severity is pivotal in the therapeutic decision-making. Modified Mayo score is consistently used for the evaluation of the disease activity which depends on the patient's symptoms as well as the colonoscopic findings. The aim of this study is to assess the role of the CT enterography (CTE) scoring system in the evaluation of the disease severity in ulcerative colitis. From October 2022 to July 2023, 66 patients with known ulcerative colitis patients at time of disease activity were referred from the inflammatory bowel disease unit for radiological assessment by CTE. CT images were analyzed to determine the anatomical location of the affected bowel segments, mucosal thickening and hyperenhancement as well as the extra-enteric involvement. Correlation with the modified Mayo score was established.

Results Our results showed a statistical significant correlation between modified Mayo score and CTE with a *P* value of 0.000. The correlation coefficient is $r = 0.964$. The cut-off value of the optimal CTE score to predict mild and moderate UC was 7.5 with 0.996 area under the ROC curve, 92%sensitivity and 100% specificity. The cut-off value of the optimal CTE score to predict moderate and severe UC was 10.5 with 0.983 area under the ROC curve, 90.6% sensitivity and 100% specificity.

Conclusions CTE is a reliable diagnostic method in the systematic assessment of the disease severity of active ulcerative colitis. CTE score shows a strong proportionate correlation with modified Mayo score. The aggravation of the course of the disease increased the CTE score. CTE scoring system can help plan the therapeutic strategy and predict prognosis.

Keywords Ulcerative colitis, Disease severity, CTE score, Modified Mayo score

Background

Ulcerative colitis (UC) is a chronic inflammatory bowel disease (IBD) that mostly affects young adults and persist throughout life. Approximately 55% of IBD are diagnosed as ulcerative colitis. The clinical course of the disease is unforeseeable, characterized by periods of exacerbation alternating with periods of remission [1].

Abdominal tenderness with fever and peritoneal signs are worrying signs for poor prognosis in patients with severe colitis, carrying the risk of possible development of fulminant colitis, up to toxic megacolon [2].

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The progression of the disease mostly follows a gradual course. Over a period of 10 years, 50–55% of the patients remit. Strictures, mainly of the rectosigmoid colon, are one of the long-term complications of UC. [3]

Ulcerative colitis (UC) diagnosis is based on a combination of biochemical, radiological, endoscopic, and histological investigations. Endoscopic evaluation is regarded as the gold standard for evaluating the disease extent and severity, monitoring the therapeutic response, and surveillance for dysplasia and cancer. [4].

Grading the endoscopic severity of the disease is crucial to evaluate the therapeutic response. The modified Mayo score (mMayo), including stool frequency (SF), rectal bleeding (RB), and endoscopic score (ES), is currently accepted for the evaluation of disease activity in UC. Each parameter is assessed on a scale from 0 to 3 with a maximum total score of 9 [5, 6].

However, CT enterocolonography is preferred to endoscopy in UC patients with impassable stenoses, or with suspected perforation and disease exacerbation. Colonoscopy also has substantial limitations, including the need for sedation and poor patient acceptability. [7, 8] Moreover, MSCTE allows evaluation of intramural and extra-intestinal involvement of UC. [9]

Montreal classification of ulcerative colitis (UC) is based on the extent of the disease. E1 (Ulcerative proctitis): Involvement of the rectum only. E2 (Left-sided UC): Involvement of the colo-rectum just distal to splenic flexure. E3 (Extensive UC/Pancolitis): Involved segments extend proximal to the splenic flexure. [3]

MSCT enterography (MSCTE) is used to assess the extent and pattern of involvement of the different colonic segments (Table 1)**.** It is crucial to assess mural stratification and hyperenhancement, mesenteric hyperemia and perirectal stranding, as well as mesenteric lymph nodes, mucosal bubbles and intestinal pseudopolyps. Lack of haustration is also a feature of MSCTE images. [9, 10]

In this study, we assessed the different CTE features in different severity of active UC, evaluated the CTE score system for UC, and analyzed the correlation between cumulative CTE score and modified Mayo score. We aimed to assess the CTE score system as a predictor in assessing the severity of active UC.

Table 1 Cumulative CT score [9]

Cumulative CT score	
1. Extent of UC	
Normal	0
E1	1
E2	2
E3	3
2. Thickening of the bowel wall	
< 3 mm	0
4–6 mm	1
7–9 mm	2
> 10 mm	3
3. Mural stratification	1
4. Mural hyperenhancement	1
5. Mesenteric hyperemia	1
6. Perirectal stranding	1
7. Lymph node enlargement	1
8. Mucosal bubbles	1
9. Narrowing of the lumen	1
10. Loss of haustration	1
11. Intestinal pseudopolyp	1
Total score	

Methods

Ethical consideration

This study was approved by the Ethical Research Committee with code MS-526–2022. Written informed consent was acquired from all patients. The results of this research were used only for scientific purposes and not for any other purpose.

Study design

This prospective study included 66 patients (23 females, 43 males) with age ranging from 19 to 66 years with a mean age of 31.4 years. The study was conducted between October 2022 and June 2023. These patients were known ulcerative colitis patients at time of disease activity and were referred for radiological assessment. MSCT enterocolonography was done on all patients.

Inclusion criteria

Sixty-six patients (more than 18 years old) with known diagnosis of ulcerative colitis presenting at the time of disease activity.

Exclusion criteria

Patients less than 18 years old were not included. Also patients with contraindications for CT or IV contrast injection as in pregnant females, kidney impairment, or allergy to the contrast media were not included.

Methods

All included patients were subjected to the following: at first full clinical evaluation and assessment of the laboratory investigations of all patients' including the kidney function tests (blood urea and serum creatinine). Followed by assessment of all endoscopic and previous radiological diagnostic investigations done for the patients.

Then MSCTE was performed for all patients at the time of disease activity and within a week from the colonoscopic examination. Two experienced abdominal radiologists, who were unaware of the clinical and colonoscopic findings, evaluated the results of each study. With every feature of active UC in any segment, a point was added. A cumulative CTE severity score (0–15 points) was calculated after adding all individual criteria scores (Table 1).

According to the modified Mayo score (Table 2) [5, 6] with its three components frequency of the stools, rectal bleeding, and mucosal appearance at endoscopy, 66 patients were classified to mild, moderate, and severe accordingly, mild group scored from (1–3) points, moderate group from (4–6) points and severe group (7–9) points.

MSCTE examination

Sixty-six patients were examined in this study; all of them were examined by using 64 channels MSCT scanners (GE easy vision system). The patients followed low residue diet for three days before the examination, and fasted for at least 12 h prior to the examination. A large bore (18-gauge) intravenous line was placed in the antecubital fossa. Negative oral contrast medium solution; (a mixture of 250 cc of lactulose 67% and 1250 cc of water) was given in a regular continuous manner (250 cc every 10 min) within 80 min. IV spasmolytic drug (Hyoscine-N- butyl bromide 0.2 mg / Kg body weight) was administrated prior to imaging to relax any smooth muscle spasm that would mimic abnormal enhancement and bowel wall thickening. Six patients were not given the spasmolytic drug due to the presence of a contraindication as glaucoma, cardiac disease or prostatic enlargement; however, they were included in the study because adequate colonic distention was achieved.

The patients were instructed to follow the breath hold technique. The examination took about 10 s in 64 channels MSCT scanners. IV nonionic contrast medium (about 70–120 ml) iopromide (Ultravist 300; Berlin, Germany) according to the body built (1.5 ml/kg body weight) was given at rate 3 ml/second by infusion pump.

The patient had to lay supine on the examination table to obtain images from the diaphragm down to the symphysis pubis as planned from the scout image. Portal phase images were obtained usually 40 to 50 s after the IV contrast administration. All imaging was performed with slice collimation 2.5 mm, Pitch 1 to 1.5, matrix 512 × 512, 200 to 350 milli ampere and 120 to140 kilovolt. Average scanning time was from 6 to 10 s on 64 multi-slice CT scanners.

From this data set, axial and multiplanar reformatted sagittal and coronal images of 3-mm thickness at 3-mm intervals were generated encompassing the entire bowel.

Table 2 Grading the patients according to modified Mayo score [6]

Modified Mayo score
Frequency of stools
0: Normal
1: 1–2 stools/day more than normal
2: 3–4 stools/day more than normal
3: > 4 stools/day more than normal
Rectal bleeding
0: None
1: Visible blood with stool less than half the time
2: Visible blood with stool half of the time or more
3: Passing of blood alone
Mucosal appearance at endoscopy
0: Normal or inactive disease
1: Mild disease (decreased vascular pattern, erythema)
2: Moderate disease (marked erythema, friability, absent vascular pattern, erosions)
3: Severe disease (spontaneous bleeding, ulceration)
Total score

Statistical analysis

Data were described statistically in terms of median, mean ± standard deviation (± SD), and range, or frequencies (number of cases) and percentages when appropriate. Numerical data were tested for the normal assumption using Kolmogorov–Smirnov test. For comparing categorical data, Chi-square (χ^2) test was used. Exact test was used instead when the expected frequency is less than 5. Comparison of numerical variables between the study groups was done using one-way analysis of variance (ANOVA) test with post hoc multiple two-group comparisons. Correlation between various variables was done using Pearson moment correlation equation for linear relation of normally distributed variables and Spearman rank correlation equation. Accuracy was represented using the terms sensitivity, and specificity. Receiver operator characteristic (ROC) analysis was used to determine the optimum cut-off value for CTE to differentiate moderate from severe cases according to Mayo grading. Two-sided p values less than 0.05 was considered statistically significant. IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 22 for Microsoft Windows was used for all statistical analyses.

Results

Among the included cases of 66 cases, 43 cases were males and 23 cases were females. The p value was 0.9 with no statistically significant difference between different patients' groups regarding the patients' sex.

The total number of cases was 66 with a mean age of 31.45 ranging from 19 to 66 years old, with a standard deviation of 8.374.

According to the cumulative modified Mayo score (score of 9), 66 patients were stratified into mild (9), moderate (25), and severe (32) groups. Then, further analysis in each group was done based on occurrence of the three variables.

In the mild group, 100% of patients had a stool frequency of 1–2 times/day > normal, and rectal bleeding in the form of streaks of blood. In the moderate group, 80% had a stool frequency of 3–4times/day > normal, while 20% had a stool frequency of 1–2 times/day > normal. 56% of the patients in this group had rectal bleeding in the form of obvious bleeding, and 44% had streaks of blood. In the severe group, 53.1% of the patients had stool frequency of 3–4 times/day > normal and 46.9% had stool frequency > 4 times/day > normal. While 84.4% of patients in this group had obvious blood in stool, 15.6% had mostly bloody stool.

Endoscopic assessment

In ileocolonoscopic assessment of the patients, ten cases had erythema of the mucosa with decreased vascular pattern, 33 cases had severe erythema (friability and erosions, absent vascular pattern), and 23 cases had ulceration and spontaneous bleeding.

Within the mild group, all the cases had only erythema of the mucosa and decreased vascular pattern, within the moderate group, 4% of cases had only erythema and 96% of cases had severe erythema (friability, absent vascular pattern and erosions), and finally within the severe group, 28.1% had marked erythema and 71.9% of cases had ulceration and spontaneous bleeding.

CT enterocolonography

Wold et al. [11] standard study stated that sufficient luminal distention was achieved by distention of the colonic lumen by enteric contrast material. All patients ($n=66$) of this study had sufficient distension of all colonic segments.

Extent of UC according to Montreal classification: involvement of the rectum only was seen in 6 cases (E1). Involvement of the colorectal distal to the splenic flexure was seen in 22 cases (E2), and involvement of the colon proximal to the splenic flexure was seen in 38 cases (E3). 66.7% of the mild cases were E1and 33.3% were E2. 76% of the moderate cases were E2 and 24% were E3. 100% of severe group cases were E3.

Thickening of the bowel wall was seen in 64 cases (as shown in Figs. 1, 3, 4 and 5), only two cases were with average bowel wall thickness, 31 cases with bowel wall thickening measured from 4 to 6 mm, 30 cases measured from 7 to 10 mm, and three cases measured more than 10 mm.

Mural stratification was present in 60 cases (Fig. 1), eight cases were mild, 22 were moderate, and 30 cases were severe regarding modified Mayo score severity.

Mural hyperenhancement was observed in 63 cases (Figs. 2, 3, 4, 5 and 6), and only three cases had no mural hyperenhancement and were classified as mild in severity on modified Mayo score. Six cases of the mild group (66.7%) showed mural hyperenhancement. 100% of the mild and severe groups showed mural hyperenhancement.

Mesenteric hyperemia was present in 46 cases (Figs. 3, 5 and 6); it was present in 11.1% of the mild group, 76% of the moderate group, and 81.3% of the severe group. No statistical difference between the moderate and severe groups regarding the presence of mesenteric hyperemia. But its presence was significantly higher in the moderate and severe groups than in the mild group.

Perirectal stranding and enlargement of the lymph nodes (Fig. 6) were present in all cases (66 cases), with 100% of the total included cases; so no significant statistical difference was found between the three groups.

Mucosal bubbles were present in 35 cases, 20 cases were with severe disease activity (62.5%), 14 cases with moderate disease activity (56%), and only one case was in the mild group (11.1%).

Luminal narrowing was seen in seven cases (Fig. 3), all of them in the severe group with a percentage of 21.9% of the severe group and 10.8% of the total examined cases.

Loss of haustration was identified in 24 cases (Fig. 4), 17 cases (70.8%) were in the severe group (53.1% of the severe cases), and seven cases (29.2%) were in the moderate group (28% of the moderate cases). Loss of haustration was higher in the severe group than in the moderate group.

Intestinal pseudopolyps were detected in 26 patients (as shown in Figs. 2, 3, 5) with a percentage of 39.4% of the total included cases, 23.1% of them were in the moderate group and 76.9% of them were in the severe group.

CTE score and modified Mayo score

Patients classified with mild symptoms were nine cases with a modified Mayo score's mean of 3 and standard deviation of 0.000, and their CTE score's mean was 6.11, and the standard deviation was 0.333 and ranged from 6 to 7 points.

Patients classified with moderate symptoms were 25 cases with modified Mayo score's mean of 5.36, a standard deviation of 0.757 and ranged from 4 to 6 points, and their CTE score's mean was 9.08, and the standard deviation was 0.909 and ranged from 7 to 10 points.

Fig. 1 CT enterocolonography with IV contrast (**A**) axial image shows uniform circumferential mural thickening of descending colon with stratification of its wall (arrow) and mesenteric hyperemia (curved arrow) (**B**) Sagittal reformatted image shows lymph node enlargement and perirectal stranding (arrow) and rectosigmoid luminal narrowing (curved arrow) and (**C**) Coronal image shows two areas of luminal narrowing, rectosigmoid one (arrow) and another one in descending colon (curved arrow). *CTE score: 13. Modified Mayo score: 9*

Patients classified with severe symptoms were 32 cases with modified Mayo score's mean of 7.34, a standard deviation of 0.545 and ranged from 7 to 9 points and their CTE score's mean was 11.72, and the standard deviation was 0.991 and ranged from 10 to 14 points (Figs. 7 and 8).

ROC curve for CTE in differentiating mild from moderate cases according to Mayo grade

The optimal cut-off value of the CTE score for predicting mild and moderate UC was 7.5 with 0.996 area under the ROC curve (Fig. 9 and Table 3). The sensitivity was 92% and specificity was 100%.

ROC curve for CTE to differentiate moderate from severe cases according to Mayo grading

The optimal cut-off value of the CTE score for predicting moderate and severe UC was 10.5 with 0.983 area under the ROC curve (Fig. 10 and Table 4). The sensitivity was 90.6% and specificity was 100%.

Correlation between CTE score and modified Mayo score

Our results showed that P value is 0.000, so there is a statistical significant correlation between modified Mayo score and CTE.

The correlation coefficient is r = 0.964, so the CTE score shows a strong proportionate correlation with modified Mayo score. With the progression of the course of the disease, CTE score increased, as given in Table 5.

Discussion

Precise estimation of the severity of active UC using an agreeable method is crucial for management. The methods frequently used to assess the severity of UC (depending on symptoms, endoscopy and histology findings) have some limitations [12, 13]. Nevertheless, these are indirect indices, mainly relying on self-assessment of symptoms by the patient [14]. Moreover, endoscopy cannot provide information on bowel wall, extra-intestinal manifestations and complications of UC [15]. Few studies have evaluated the accuracy of

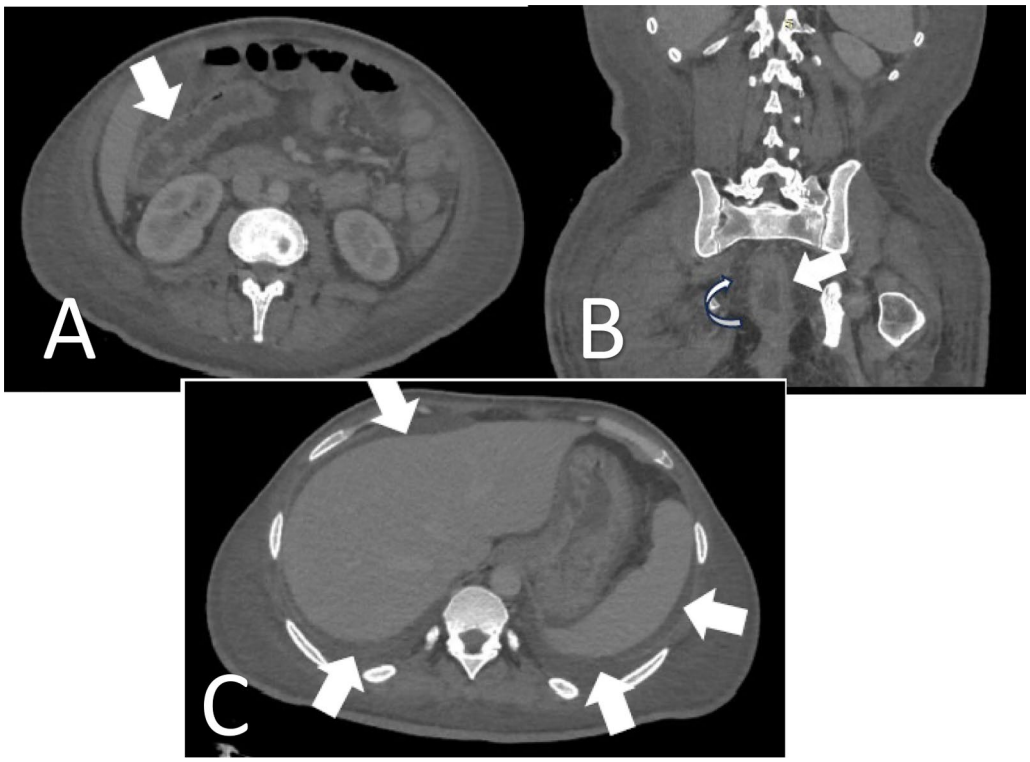

Fig. 2 CT enterocolonography with IV contrast (**A**) axial image shows uniform circumferential mural thickening of hepatic flexure and transverse colon with multiple pseudopolyps and mucosal hyperenhancement (arrow) (**B**) coronal image shows uniform circumferential mural thickening of rectal wall with mucosal hyperenhancement and submucosal edema (arrow) with perirectal stranding (curved arrow) and (**C**) Axial image shows bilateral pleural effusion and perihepatic and perisplenic ascites (arrows). *CTE score: 9. Modified Mayo score: 6*

CTE scoring system for the detection of severity of UC. Johnson et al. [16] reported an overall sensitivity of 74% for the detection of IBD (either Crohn or UC), and Andersen et al. [17] reported a moderate correlation of the loss of haustration, rigid bowel wall, and bowel thickness with severity of UC. Our study and previous studies showed that CTE highly correlated with colonoscopic findings in assessment with the extent of UC. Consequently, CTE is an ideal method and has great potential in evaluation for UC.

In the current study, a larger sample size was included compared to Jia et al. and Ahmed et al., [9, 18], CTE and ileocolonoscopy were performed for all patients to assess disease severity. According to the severity of symptoms and extent of inflammatory changes by ileocolonoscopy, the severity of the active inflammation was divided into mild, moderate, and severe diseases.

Our results showed a *P* value of 0.000 denoting a statistical significant correlation with a correlation coefficient of $r=0.964$ indicating that the CTE score had a strong proportionate correlation with the modified Mayo score and increased with the progression of the disease course. This was in accordance with Jia et al. [9] study that also showed that CTE score remarkably correlated with modified Mayo score ($r=0.835$), and CTE score increased significantly with the aggravation of the disease course.

Jia et al. [9] stated that the wider the extent of UC involvement, the worse are the symptoms. That's why the extent of UC was added to the CTE score system. In our present study, pancolitis was present in 57.6% of cases, left-sided colitis was present in 33.3%, and proctosigmoiditis was present in 9.1%. CTE was strongly related to the colonoscopic findings in the assessment of the UC extent.

Jia et al., Ahmed et al. and others [9, 18] stated that CTE findings in the form of bowel wall thickening and hyperenhancement were fundamental characteristics of UC and were correlated with all histopathological findings, whereas lymph node enlargement and mesenteric hyperemia did not show statistical significance with disease activity in Ahmed et al. study [18].

In contrary to Ahmed et al. [18], our CTE results reported related lymphadenopathy and perirectal stranding in 100% of cases. But regarding the bowel wall thickening, it was a characteristic feature in CT imaging of UC in 97% of cases, mural hyperenhancement in 95.5% of cases, mural stratification in 90.9% of cases, and to

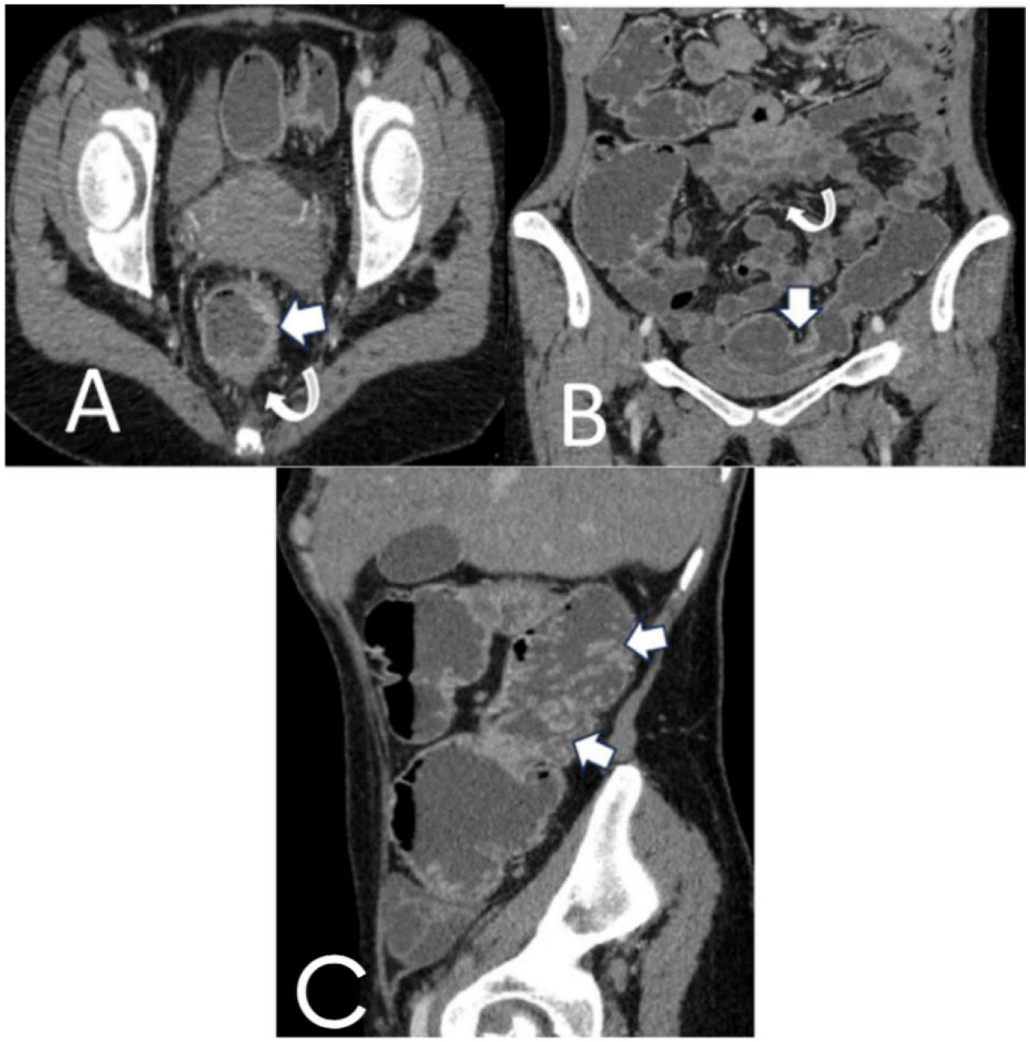

Fig. 3 CT enterography with IV contrast (**A**) axial image shows uniform circumferential mural thickening of rectal wall with mucosal hyperenhancement (arrow) with perirectal stranding and lymph node enlargement (curved arrow), (**B**) coronal image shows luminal narrowing in the sigmoid(arrow) and mesenteric vascular engorgement (curved arrow) and (**C**) Sagittal reformatted image shows mild mural thickening and mucosal hyperenhancement of ascending and transverse colon with multiple pseudopolyps (arrows). *CTE score: 11. Modified Mayo score: 7*

less extent the mesenteric hyperemia in 69.7%, mucosal bubbles in 53% of cases, pseudopolyps in 39.4%, loss of haustration in 36.4% of cases, and luminal narrowing in 10.8%. Moreover, Ahmed et al. [18] study did not correlate with the modified Mayo score.

In the current study, mucosal bubbles were seen in 53% of cases, 62.5% of them in the severe group, 56% of them in the moderate group, and 11.1% in the mild group, corresponding to Jia et al. [9], mucosal bubbles in the moderate group were more commonly detected than in the mild group.

In our present study, mural stratification, and loss of haustration were remarkably higher in the severe group than that in the moderate and mild group which was the same results observed in the study of Jia et al. [9].

In the present study, the optimal cut-off value of the CTE score for estimating mild and moderate UC were 7.5 with 0.996 area under the ROC curve. The sensitivity was 92% and the specificity was100%. On the other hand, Jia et al. [9] did not propose an optimal cut-off value for estimating mild and moderate UC due to the low AUC (0.280).

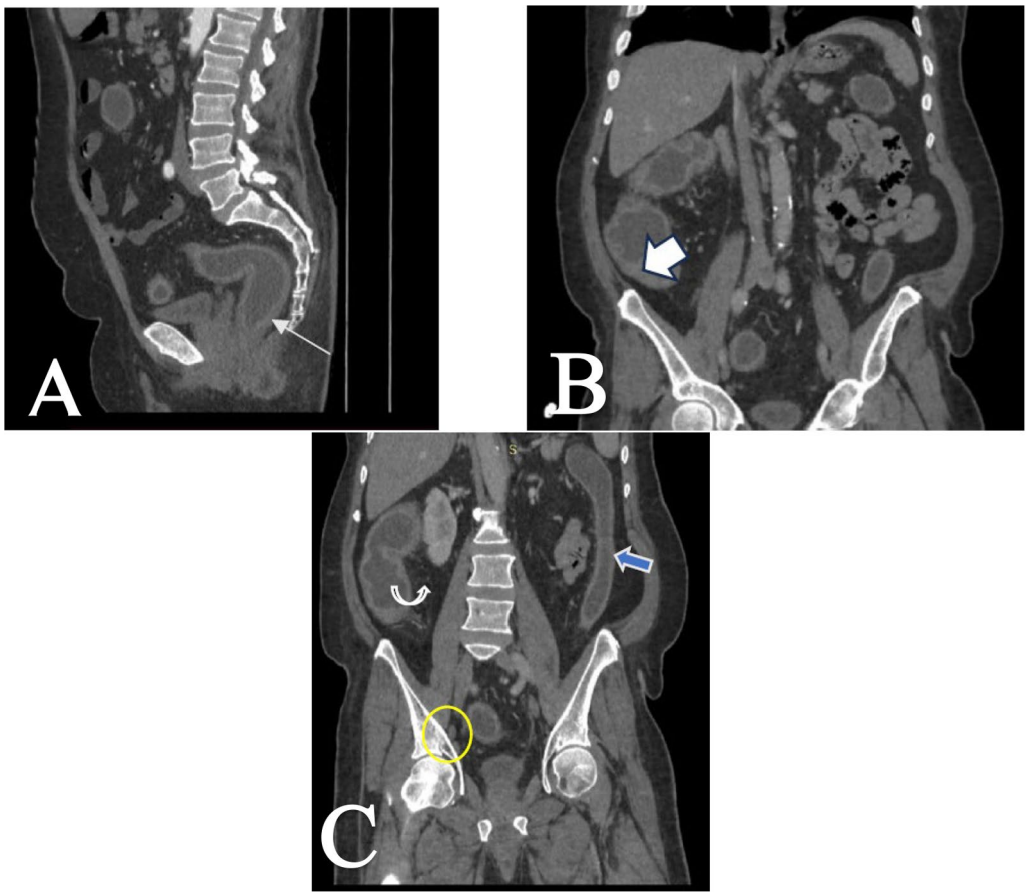

Fig. 4 CT enterography with IV contrast (**A**) sagittal image shows uniform circumferential mural thickening of rectosigmoid with stratification of the rectal wall (arrow). (**B**) Stratification of the cecum and ascending colon, mucosal hyperenhancement and submucosal edema (arrow) and (**C**) Coronal image shows loss of haustration (lead pipe rigidity) of the descending colon up to the splenic flexure (arrow), lymph node enlargement (circle), mesenteric hyperemia (curved arrow) *CTE score: 14. Modified Mayo score: 9*

The optimal cut-off value of the CTE score for estimating moderate and severe UC was 10.5 with 0.983 area under the ROC curve. The sensitivity was 90.6% and the specificity was 100%. Jia et al. [9] suggested that patients with UC and CTE score more than 9.5 were diagnosed as moderate or severe inflammatory process.

In the present cross-sectional analytic study of CTE score, our results showed a significant statistical correlation (*P* value of 0.000) between the modified Mayo score and CTE. The correlation coefficient is $r=0.964$, so the CTE score is strongly proportionately correlated with modified Mayo score. And it correlates with the progression of the course of the disease expressing the matching severity of intestinal inflammation.

Accordingly, CTE is a reliable tool for the comprehensive assessment of the disease activity in UC. It can be used together with conventional colonoscopy to evaluate the degree of inflammatory process in ulcerative colitis. CTE score system can contribute to a precise quantitative assessment of the severity of UC. It can be regarded as a potential predictor for the severity of active UC, help to plan the optimal therapeutic strategy, and expect the prognosis. These advantages are of clinic relevance in the diagnosis and classification of UC. Thus, CTE can be a reliable examination method that helps in systematic evaluation of the severity of UC.

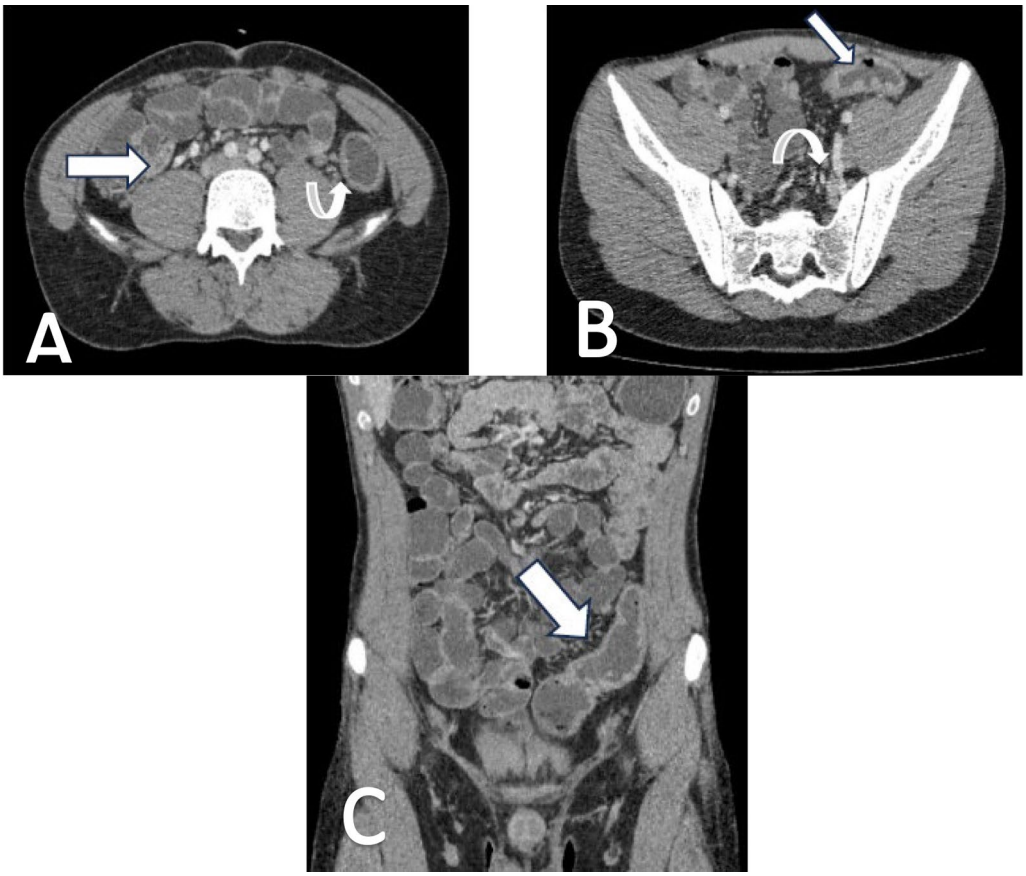

Fig. 5 CT enterography with IV contrast (**A**) axial image shows uniform circumferential mural thickening of distal ileum with mucosal hyperenhancement (arrow) and lymph node enlargement (curved arrow) (**B**) Axial image shows uniform circumferential mural thickening of sigmoid with pseudopolyps formation in sigmoid colon (arrow) and marked mesenteric hyperemia (curved arrow) and (**C**) Coronal image shows marked mesenteric vascular engorgement (arrow). *CTE score: 12. Modified Mayo score:8*

Limitations

The study included only symptomatic patients. So, it cannot be stated whether the described findings can be used to differentiate diseases in asymptomatic patients or not.

Recommendations

All the patients were assessed for disease severity before starting anti-inflammatory therapy. Proper colonic preparation will always provide reliable CTE images to better detect the activity of ulcerative colitis inflammation. Adequate colonic distention increases the sensitivity for disease detection.

Conclusions

Precise evaluation of UC is fundamental for planning the therapeutic strategy. Accordingly assessment of UC necessitates a combination of clinical examination, colonoscopic, and histological in addition to the radiological examinations.

The CTE score system offers a quantitative accurate assessment of the UC severity. The CTE score shows a strong proportionate correlation with modified Mayo score. Thus, CTE is a valuable noninvasive supplement that can be used as a prospective interpretation of severity evaluation of active UC, to plan the strategy of therapy and predict the prognosis.

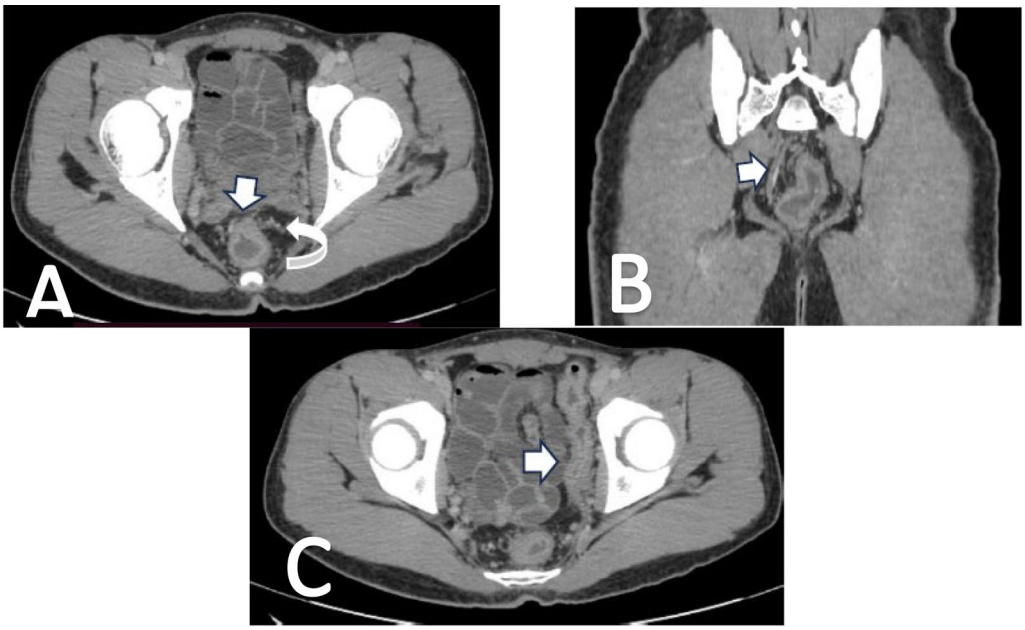

Fig. 6 CT enterography with IV contrast (**A**) axial image shows uniform circumferential mural thickening of rectal wall with mucosal hyperenhancement (arrow) with perirectal stranding and lymph node enlargement (curved arrow), (**B**) coronal image shows marked mesenteric vascular engorgement (arrow) and (**C**) axial image shows mural thickening, mucosal hyperenhancement and submucosal edema of sigmoid colon with luminal narrowing (arrow). *CTE score: 9. Modified Mayo score: 6*

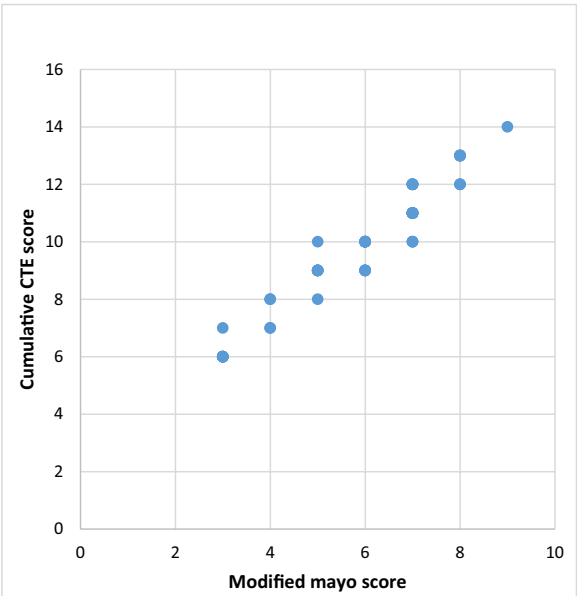

Fig. 7 Correlation between modified Mayo score and CTE score

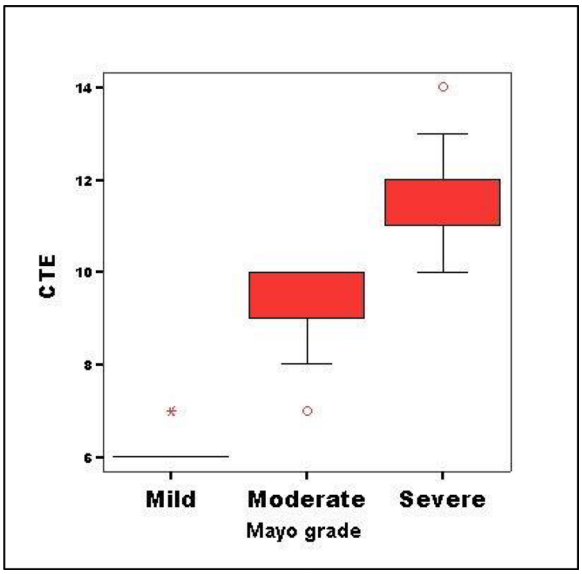

Fig. 8 Distribution of the cumulative CTE score

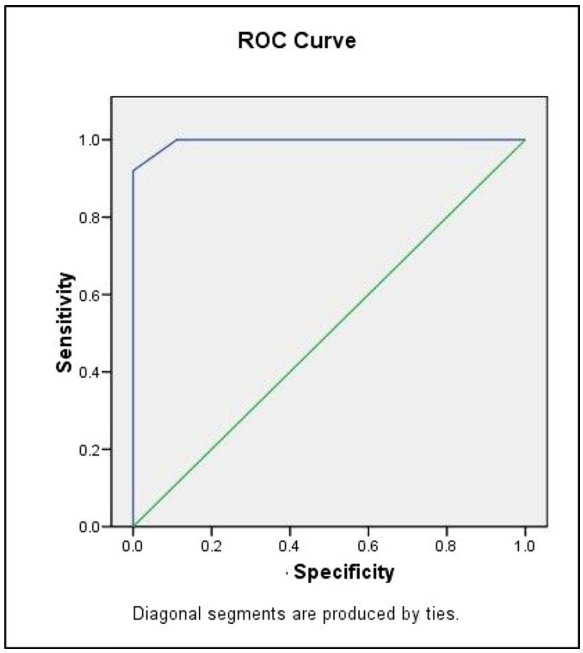

Fig. 9 Shows ROC curve sensitivity and specificity between mild and moderate cases

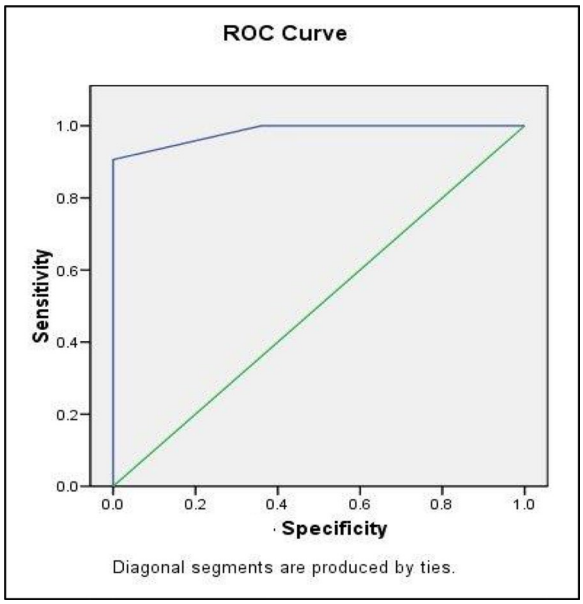

Fig. 10 Shows ROC curve between moderate and severe group

Table 3 Shows area under the curve between mild and moderate groupArea Under the Curve (AUC)

Area	Std. error(a)	Asymptotic Sig. (b)	Asymptotic 95% Confidence interval	
			Upper bound	Lower bound
Test Result Variable(s): CTE				
0.996	0.007	0.000	0.981	1.010

The test result variable(s): CTE has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Table 4 Shows area under the curve between moderate and severe group

Area	Std. error(a)	*p* value	Asymptotic 95% Confidence interval	
			Upper bound	Lower bound
Test Result Variable(s): CTE				
0.983	0.013	0.000	0.958	1.008

The test result variable(s): CTE has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased

a. Under the nonparametric assumption

Table 5 Correlation between CTE score and modified Mayo score

		Mayo score
CTE	Pearson correlation	0.964
	p value	0.000
	N	66

Abbreviations

MSCT	Multi-slice computed tomography
UC	Ulcerative colitis
IBD	Inflammatory bowel disease
CRC	Colorectal cancer
mMayo	Modified Mayo score
SF	Stool frequency
RB	Rectal bleeding
ES	Endoscopic score
HU	Hounsfield unit
MSCTE	Multi-slice computed tomographic enterography
CT	Computed tomography
CTE	Computed tomography enterography
IV	Intravenous
SD	Standard deviation
ROC	Receiver operator characteristic
AUC	Area under the curve
MRE	Magnetic resonance enterography

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Author contributions
MS and MB have designed this study together. HS, MB, MS and AM contributed to the data collection, MS and RM contributed to data analysis. MS, RM, MB and MSS contributed to data processing. MS and MSS shared in writing the manuscript together. The authors read and approved the final manuscript.

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Data available within the article.

Declarations

Ethics approval and consent to participate
This study was approved by the Ethical Research Committee of Faculty of Medicine Cairo University in Egypt on March 2023. The ethics committee reference number is MS-526–2022. All patients provided a written consent accepting to participate in our research work.

Consent for publication
All patients included in this research gave written informed consent to publish the data contained within this study.

Competing interests
The authors declared that they have no competing interests.

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