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Sonographic Prevalence of Peripheral Enthesitis Among Patients With Inflammatory Bowel Disease

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Abstract

Background: Musculoskeletal manifestations are the most frequent extraintestinal complications of inflammatory bowel diseases (IBDs), and they are an important cause of morbidity and impairment of quality of life.

Aim: To assess the prevalence (frequency and pattern) of peripheral enthesitis in patients with IBD by using B-mode ultrasonography and power Doppler ultrasonography with Glasgow Ultrasound Enthesitis Scoring System (GUESS) and correlate these findings with clinical and laboratory parameters of IBD.

Patients and methods: In this observational study, 50 people with IBD – ulcerative colitis, Crohn's disease, and rheumatoid arthritis – were included, there were 33 patients chosen from those who visited Al-Azhar University Hospital's outpatient Gastroenterology, Hepatology and Tropical Medicine, and Rheumatology and Rehabilitation departments from December 2021 to August 2022.

Results: There was significant relationship between inflammatory back pain and radiograph of sacroiliac joint as severity of sacroiliacs was significantly increased with patients with inflammatory back pain, significant positive correlation between GUESS score and Mayo partial score, and there was a significant positive correlation between disease duration and Mayo partial score. No significant difference between sonographic findings at enthesal sites and disease duration of IBD, musculoskeletal ultrasonographic examination at enthesal sites and comorbidity, and bilateral enthesal examination. There was a significant positive correlation between GUESS score (total) with total cholesterol and triglycerides in ulcerative colitis group only and GUESS score (total) and erythrocyte sedimentation rate in both groups. GUESS score (total) and history of extraintestinal manifestation of the studied patients: there was a significant relation regarding history of inflammatory back pain.

Conclusion: Musculoskeletal ultrasonography is a suitable and reliable method for examining enthesal structures with great resolution because most of these are superficial structures. Enthesal abnormalities can be documented by ultrasonography in clinically asymptomatic patients with IBD. These findings could be related to a subclinical enthesal inflammation.

Keywords: Enthesal abnormalities, Glasgow ultrasound enthesitis scoring system, Inflammatory bowel disease, Musculoskeletal ultrasonography

1. Introduction

More than two million people in Europe suffer from inflammatory bowel diseases (IBDs), which include Crohn's disease (CD) and ulcerative colitis (UC).¹ The clinical phenotypes of IBD-associated SpA include peripheral arthritis and axial manifestations related to sacroiliitis with or without

concurrent spondylitis.² Enthesitis is characterized by an early phase of edema, inflammatory infiltration, and destructive fibrocartilage of the ensuing vascular multiplication in the subchondral bone and in the fibrocartilage decides bone disintegrations, receptive sclerosis, and reactivation of endochondral hardening, prompting enthesophytosis.³ Normal locales of enthesitis incorporate the addition of the

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Achilles ligament to the calcaneus, inclusion of the plantar sash to the calcaneus, addition of ligaments to the tibial tuberosity, and addition of ligaments to the humerus.⁴ Enthesitis might be asymptomatic or can cause torment, it is most articulated in lower limits, especially Achilles enthesitis and plantar aponeurosis enthesitis, where agony can be extreme and disabling.⁵ Enthesitis is frequently under-diagnosed in the center; clinical appraisal and measurement of fringe enthesitis in day-to-day practice needs awareness and specificity.⁶

Radiograph needs awareness and particularity for fringe enthesitis.⁷ Outer muscle ultrasound: sonography is the strategy for the decision for examining periarticular delicate tissues since it is fit for distinguishing both the early (edema, thickening) and the late adjustments (disintegrations and enthesophytosis).⁸ A few super primary changes can happen in the ligament. A few creators have recommended that changes like ligament hypoechogenicity, thickening, peritendinous liquid, and neighboring bursitis are perhaps thought to be intense changes in enthesitis.⁹ Ultrasound evaluation of enthesal and joint locales has been perceived as a strong and solid device to assess subclinical joint contribution.¹⁰

Therefore, the aim of this study was to assess the prevalence (frequency and pattern) of subclinical peripheral enthesitis in patients with IBD by using B-mode ultrasonography and power Doppler ultrasonography with Glasgow Ultrasound Enthesitis Scoring System (GUESS) and correlate these findings with clinical, laboratory parameters, and activity index of IBD.

2. Patients and methods

In this observational study, 50 people with IBD – UC, CD, and rheumatoid arthritis (RA) – were included, there were 33 patients chosen from those who visited Al-Azhar University Hospital's outpatient Gastroenterology, Hepatology and Tropical Medicine, and Rheumatology and Rehabilitation Departments from December 2021 to August 2022. Their age went from 19 to 68 years. Their illness lasted anywhere from 1 month to 20 years. The presence of tendinitis because of abuse, ongoing articular injury, and patients who had obtained intra-articular or intra-enthesal corticosteroids during the beyond 90 days were rejected.

Informed consent was clarified for each patient included in this study. Approval was granted from the ethical committee from Faculty of Medicine, Al-Azhar University.

The Mayo Score takes into account patient-announced results (PROs; stool recurrence and

Table 1. Characteristics of the studied patients.

	UC (N = 42)	CD (N = 8)	P
Age (years)	41.45 ± 13.86	35.25 ± 8.81	0.231
Sex [n (%)]			
Female	14 (33.3)	3 (37.5)	0.820
Male	28 (66.7)	5 (62.5)	
BMI (kg/m ²)	24.65 ± 4.97	23.22 ± 4.32	0.452
Disease duration (years)	2.78 ± 4.12	0.989 ± 0.899	0.218
Smoking [n (%)]			
Heavy smoker	6 (14.3)	1 (12.5)	0.986
Mild smoker	11 (26.2)	2 (25)	
Nonsmoker	25 (59.5)	5 (62.5)	
Comorbidities [n (%)]			
HTN	9 (21.4)	3 (37.5)	0.329
DM	6 (14.3)	3 (37.5)	0.117
Dyslipidemia	4 (9.5)	1 (12.5)	0.797

CD, Crohn's disease; DM, diabetes mellitus; HTN, hypertension; UC, ulcerative colitis.

Table 2. Relationship between inflammatory back pain and radiograph findings of the sacroiliac joint.

	Inflammatory back pain [n (%)]		P value
	Yes	No	
Grade 0 (normal)	1 (16.7)	39 (88.6)	
Grade 1 (suspicious)	0	4 (9.1)	
Grade 2 (minimal sacroiliitis)	2 (33.3)	1 (2.3)	<0.001*
Grade 3 (moderate sacroiliitis)	3 (50)	0	

Relationship between inflammatory back pain and radiograph findings of the sacroiliac joint was highly significant difference (P < 0.001).

Table 3. Relationship between Glasgow Ultrasound Enthesitis Scoring System score and inflammatory bowel disease activity score.

	GUESS	
	r	P
Mayo partial score	0.746	<0.001
Harvey–Bradshaw index	0.615	0.105

GUESS, Glasgow Ultrasound Enthesitis Scoring System.

rectal dying). Doctor's Worldwide Evaluation (PGA), every one of which were scored on a scale from 0 to 3, giving the most extreme all-out score of 12.5. The following were done to each patient: full history-taking, including individual history, history of

Table 4. Relationship between inflammatory bowel disease activity score and disease duration of inflammatory bowel disease.

	Disease duration of IBD	
	r	P
Mayo partial score	0.403	0.008
Harvey–Bradshaw index	0.108	0.799

IBD, inflammatory bowel disease.

Table 5. Relationship between sonographic findings at enthesal sites and disease duration of inflammatory bowel disease.

Disease duration (years)	UC	CD	P
Thickness	3.33 ± 4.62	1.02 ± 0.956	0.201
Hypoechoogenicity	3.99 ± 5.11	1.33 ± 1.44	0.386
Brusitis	3.24 ± 4.45	1.04 ± 0.949	0.205
PD	2.9 ± 4.37	1.18 ± 1.12	0.395
Erosion	4.13 ± 5.32	0.625 ± 0.064	0.381
Calcification	4.52 ± 5.61	0.890 ± 0.535	0.294
Enthesophytes	5.15 ± 5.34	0.695 ± 0.431	0.057

CD, Crohn's disease; UC, ulcerative colitis.

present ailment with examination of the grievances of articular side effects, extra-articular side effects, previous history, and family ancestry. Complete medical examination that includes BMI, a general examination, and a locomotor examination. Investigations in the laboratory included erythrocyte sedimentation rate, C-reactive protein, rheumatoid factor, tests of liver and kidney functions, stools examined microscopically, and a lipid profile is also performed.

Plain X-beam on both sacroiliac joints (posterofront perspectives) and outer muscle ultrasound of entheses were performed of enthesal destinations reciprocally in crossover and longitudinal planes, assessment of normal extensor tendon was performed with the two elbows in expansion, approval, palms of hands together or with the elbow in flexion, assessment of the prevalent shaft of the patella, substandard shaft of the patella, and patellar tendon addition at the tibial tuberosity and assessment of the Achilles ligament and plantar aponeurosis.

All of the abnormal findings listed below were recorded: enthesal thickening, enthesal hypoechoogenicity, hard disintegrations, enthesophytes, and broadening of bursae.

Glasgow Ultrasound Enthesitis Scoring Framework (Surmise) was performed to assesses the prevalent and second rate shaft of patella, tibial tuberosity, Achilles tendon, and plantar fasciitis, tendon thickness, hard disintegration, and enthesophytes. Suppose is an effectively reproducible normalized proportion of lower appendage enthesal ultrasonographic irregularities, going from 0 to 36.¹¹

Measurable examination was finished by SPSS, v27 (IBM, Armonk, New York, USA). The normality of the data distribution was assessed with the help of the Shapiro–Wilk test and histograms. It was considered statistically significant if the two-tailed P value was less than 0.05.

Table 7. Relationship between musculoskeletal ultrasonographic examination at enthesal sites and inflammatory bowel disease activity score.

	Mayo partial score	HBI
	UC (N = 42)	CD (N = 8)
Thickness	3.58 ± 2.06	7.86 ± 4.88
Hypoechoogenicity	3.87 ± 2.24	8 ± 4.36
Brusitis	3.32 ± 2.13	8 ± 4.83
PD	3.77 ± 2.1	9 ± 5.43
Erosion	4.79 ± 1.97	11 ± 5.66
Calcification	4.31 ± 2.06	12.67 ± 2.52
Enthesophytes	4.61 ± 1.94	8.33 ± 5.16

CD, Crohn's disease; UC, ulcerative colitis.

Table 6. Relationship between musculoskeletal ultrasonographic findings at enthesal sites and comorbidities (hypertension, diabetes mellitus, and dyslipidemia).

	HTN (N = 9) [n (%)]	DM (N = 6) [n (%)]	Dyslipidemia (N = 4) [n (%)]	P
UC				
Thickness	3 (33.3)	3 (33.3)	1 (25)	0.692
Hypoechoogenicity	2 (22.2)	1 (16.7)	2 (50)	0.467
Brusitis	0	0	1 (25)	0.138
PD	2 (22.2)	1 (16.7)	0	0.596
Erosion	0	0	0	–
Calcification	1 (11.1)	1 (16.7)	0	0.700
Enthesophytes	1 (11.1)	1 (16.7)	0	0.700
CD				
	HTN (N = 3)	DM (N = 3)	Dyslipidemia (N = 1)	
Thickness	0	1 (33.3)	1 (100)	0.155
Hypoechoogenicity	0	0	0	–
Brusitis	2 (66.7)	0	0	0.155
PD	1 (33.3)	1 (33.3)	0	0.792
Erosion	0	0	0	–
Calcification	0	1 (33.3)	0	0.459
Enthesophytes	0	0	0	–

CD, Crohn's disease; DM, diabetes mellitus; HTN, hypertension; UC, ulcerative colitis.

Table 8. Relationship between musculoskeletal ultrasonographic findings at enthesal sites and bilateral enthesal examination (swelling).

Swelling	CET (N = 2) [n (%)]	QT (N = 0) [n (%)]	PT (N = 0) [n (%)]	AT (N = 7) [n (%)]	PF (N = 2) [n (%)]
UC					
Thickness	1 (50)	–	–	4 (57.1)	1 (50)
Hypoechoogenicity	1 (50)	–	–	4 (57.1)	1 (50)
Brusitis	1 (50)	–	–	4 (57.1)	1 (50)
PD	1 (50)	–	–	2 (28.5)	0
Erosion	1 (50)	–	–	3 (42.8)	1 (50)
Calcification	1 (50)	–	–	3 (42.8)	1 (50)
Enthesophytes	1 (50)	–	–	4 (57.1)	1 (50)
CD					
Thickness	CET (N = 0)	QT (N = 0)	PT (N = 0)	AT (N = 1)	PF (N = 0)
Hypoechoogenicity	–	–	–	1 (100)	–
Brusitis	–	–	–	1 (100)	–
PD	–	–	–	1 (100)	–
Erosion	–	–	–	1 (100)	–
Calcification	–	–	–	0	–
Enthesophytes	–	–	–	0	–

CD, Crohn's disease; UC, ulcerative colitis.

Table 9. Relationship between musculoskeletal ultrasonographic findings at enthesal sites and bilateral enthesal examination (tenderness).

Tenderness	CET (N = 19) [n (%)]	QT (N = 5) [n (%)]	PT (N = 7) [n (%)]	AT (N = 21) [n (%)]	PF (N = 40) [n (%)]
UC					
Thickness	9 (47.3)	3 (60)	4 (57.1)	9 (42.8)	16 (40)
Hypoechoogenicity	10 (52.6)	3 (60)	4 (57.1)	9 (42.8)	15 (37.5)
Brusitis	9 (47.3)	3 (60)	4 (57.1)	9 (42.8)	14 (35)
PD	7 (36.8)	3 (60)	4 (57.1)	6 (28.5)	12 (30)
Erosion	6 (31.5)	3 (60)	3 (42.8)	6 (28.5)	9 (22.5)
Calcification	4 (21)	1 (20)	2 (28.5)	6 (28.5)	9 (22.5)
Enthesophytes	9 (47.3)	3 (60)	4 (57.1)	9 (42.8)	14 (35)
CD					
Thickness	CET (N = 4)	QT (N = 1)	PT (N = 0)	AT (N = 4)	PF (N = 7)
Hypoechoogenicity	1 (25)	1 (100)	–	3 (75)	5 (71.4)
Brusitis	1 (25)	1 (100)	–	2 (50)	3 (42.8)
PD	1 (25)	1 (100)	–	3 (75)	4 (57.1)
Erosion	1 (25)	0	–	0	0
Calcification	0	1 (100)	–	2 (50)	2 (28.5)
Enthesophytes	1 (25)	1 (100)	–	2 (50)	4 (57.1)

CD, Crohn's disease; UC, ulcerative colitis.

Table 10. Relationship between Glasgow Ultrasound Enthesitis Scoring System score (total) and laboratory parameters.

	UC		CD	
	r	P	r	P
Hb (g/dl)	–0.157	0.322	–0.112	0.792
Cholesterol (mg/dl)	0.443	0.003	0.108	0.798
Triglycerides (mg/dl)	0.368	0.016	0.430	0.287
LDL (mg/dl)	0.090	0.573	0.552	0.156
HDL (mg/dl)	–0.085	0.591	–0.412	0.310
CRP	–ve	+ve	–ve	+ve
CRP	10.73 ± 9.51	15.5 ± 3.54	10.75 ± 6.84	0
P value	0.488	–	–	–
ESR	9.41 ± 9.14	17.5 ± 7.58	9.43 ± 6.19	20
P value	0.028	–	<0.001	–
RF	10.88 ± 9.55	12.5 ± 4.95	10.75 ± 6.84	0
P value	0.814	–	–	–

CD, Crohn's disease; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; UC, ulcerative colitis.

Table 11. Relationship between Glasgow Ultrasound Enthesitis Scoring System score (total) and history of extraintestinal manifestation of the studied patients.

Positive history	UC (N = 42)	CD (N = 8)	P
History of arthritis	18.7 ± 7.75	14	0.577
History of peripheral enthesitis	20.6 ± 7.8	0	–
History of inflammatory back pain	25.75 ± 4.35	8 ± 4.24	0.009
History of alternative buttock pain	17.9 ± 8.81	8 ± 4.24	0.162
History of red eye	11.33 ± 8.67	0	–
History of skin manifestations	11.71 ± 7.04	14.5 ± 7.78	0.641
History of oral ulcer	16.89 ± 10.66	12 ± 7.55	0.485

CD, Crohn's disease; UC, ulcerative colitis.

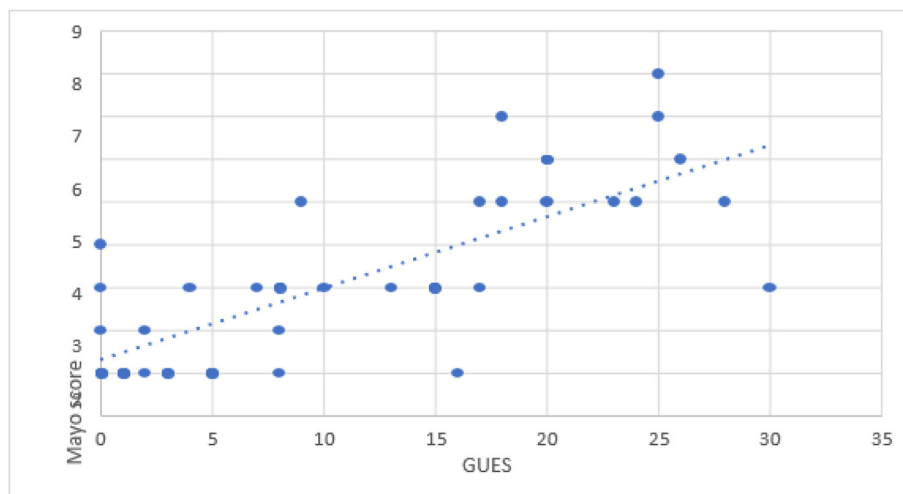


Fig. 1. Relationship between GUESS score and Mayo partial score of the ulcerative colitis patients. GUESS, Glasgow Ultrasound Enthesitis Scoring System.

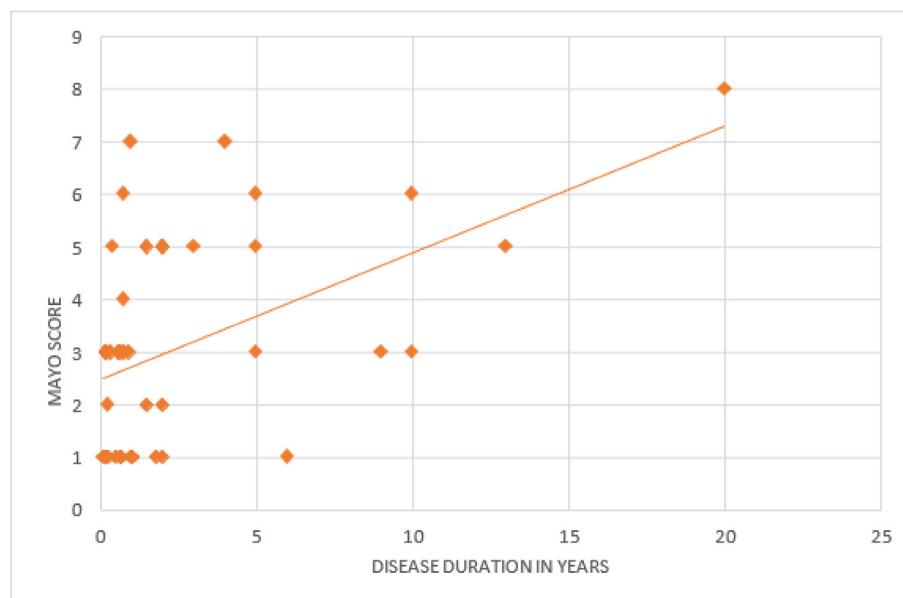


Fig. 2. Relationship between Mayo partial score and disease duration of the ulcerative colitis patients.



Fig. 3. Male patient aged 56 years old with ulcerative colitis (moderate disease activity by Mayo partial score), shows quadriceps tendon enthesopathy with increase in the tendon diameter about 9.1 mm, longitudinal scan of quadriceps tendon showing suprapatellar bursa (arrow).

3. Results

There was no significant difference between the groups regarding age, sex, BMI, disease duration, smoking, and comorbidities distribution of locomotor examination of UC and CD patients. There was a significant relationship between inflammatory back pain and radiograph of the sacroiliac joint as severity of sacroiliitis was significantly increased with patients with inflammatory back pain ($P < 0.001$) (Tables 1–11, Figs 1–6).

4. Discussion

Enthesitis might be asymptomatic or can cause torment, it is most articulated in lower limits, especially Achilles enthesitis and plantar aponeurosis enthesitis, where agony can be serious and disabling.⁵

The aim of this study was to survey the commonness of fringe enthesitis in patients with IBD by utilizing power Doppler ultrasonography with Surmise and relate these discoveries with clinical and lab boundaries of IBD.

In this study, there were no significant differences between the gatherings in regard to progress in years, sex, BMI, sickness span, smoking, and comorbidities.

Eder *et al.*¹² found that the mean age of patients was 32.5 years, while that of controls was 30.2 years, which was in line with our findings ($P = 0.22$). IBD typically lasted for 33.2 months on average. Patients' and controls' mean BMIs were 20.91 and 20.31 kg/m², respectively.

In the current review, 12 (24%) with a history of joint pain, five (10%) with a history of fringe enthesitis, six (12%) with a history of provocative



Fig. 4. Male patient aged 30 years old with ulcerative colitis (low disease activity by Mayo partial score), longitudinal scan of quadriceps tendon showing suprapatellar bursa (arrow).

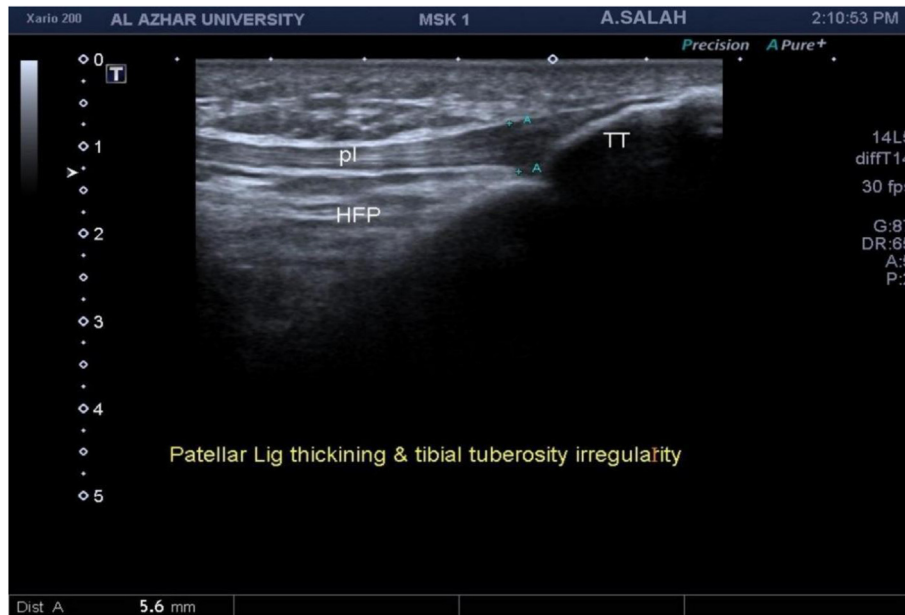


Fig. 5. Female patient aged 36 years old with ulcerative colitis (moderate disease activity by Mayo partial score) shows distal patellar ligament enthesopathy, longitudinal scan of patellar ligament showing increase of tendon thickness about 5.6 mm, and tibial tuberosity irregularities at the insertion site.

back torment, 12 (24%) with a history of elective butt cheek torment, 11 (22%) with a history of red eyes, eight (16%) with a history of skin signs, and 11 (22%) with a history of oral ulcer.

Khalili *et al.*¹³ noted that there was no significant age, sex, or BMI difference between the patients and controls. None of the patients had a history of uveitis or skin rash, but two (14.3%) had oral ulcers.

In the ongoing review, enlarging joint number went from 0 to 2 with a mean \pm SD of 0.1 ± 0.36 . The tender joint number ranged from 0 to 9, with a mean and SD of 1.52–2.42. In total, seven patients, or 14%, had a positive finger-to-floor test, and three patients, or 6%, had a positive Schober's test.

According to Magro *et al.*¹⁴ clinical proof (delicacy and additionally enlarging) of enthesitis was seen in



Fig. 6. Female patient aged 42 years old with ulcerative colitis (low disease activity by Mayo partial score), longitudinal scan of common extensor tendon showing irregularities at the insertion site (arrow).

33% of the absolute IBD patients, and it was essentially more regular in UC patients contrasted with album patients (37.7 vs. 25.0%, $P = 0.012$).

In our radiograph study of the sacroiliac joint, 40 (80%) patients had grade 0 (normal), four (8%) had grade 1 (suspicious), three (6%) had grade 2 (minimal sacroiliitis), and three (6%) had grade 3 (moderate sacroiliitis).

Sag *et al.*¹⁵ expressed that irregularities of the sacroiliac joint X-beams were distinguished in 12/130 (9.2%) patients: 10 (14.1%) patients of the compact disc gathering and two (3.4%) of the UC bunch ($P = 0.072$), being reciprocal in most of the cases (91.7%).

With regard to PF enthesophytes, our current findings clearly demonstrated that there is a significant difference between the groups.

Naredo *et al.*¹⁶ on the other hand, noticed that the most well-known unusual enthesopathy was enthesal thickness of the proximal patellar tendon, distal proximal patellar tendon, and quadriceps ligament, trailed by bursitis of the quadriceps ligament enthesis. Enthesophytes were not normal, and bone disintegration was not noticed.

Likewise, no huge contrast between the gatherings in regard to connection between outer muscle ultrasonographic assessment at enthesal locales and comorbidities. However, in Agache *et al.*¹⁷ public service announcement had a fundamentally higher middle age (59.7 contrasted with 48.2 years, $P = 0.044$), a significantly higher incidence of arterial hypertension (62.5 vs. 16.7%, $P = 0.015$), and a higher commonness of metabolic disorder (25.0% contrasted with none, $P = 0.061$).

Moreover, there was a huge positive relationship between Surmise score with all-out cholesterol and fatty oils in the UC bunch just and there was a critical relationship between Surmise score and erythrocyte sedimentation rate in the two gatherings. AbdelKareem *et al.*¹⁸ directed to evaluate the recurrence and example of enthesopathy in fibromyalgia utilizing outer muscle ultrasound with Glasgow Ultrasound Enthesitis Scoring Framework (Surmise) and connect these discoveries with clinical and research facility boundaries of fibromyalgia.

We found a correlation between Surmise score (aggregate) and history of extraintestinal indication of the concentrate on patients showed that there is a huge relationship in regard to the history of fiery back torment. Musculoskeletal symptoms, such as fibromyalgia, osteoporosis, and periarticular and muscular involvement, are the most common extraintestinal manifestations of IBD and affect 6–46% of patients, according to Balint *et al.*¹⁹

4.1. Conclusion

IBD patients are more likely to have ultrasound-confirmed enthesitis components. Ultrasonography can show enthesal abnormalities in IBD patients with no clinical symptoms. An enthesal inflammation that is subclinical may be connected to these findings.

Conflicts of interest

None declared.

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