

Original article

## Bone density in young males with recently diagnosed inflammatory bowel disease

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### Abstract

**Objectives:** Patients with inflammatory bowel disease are at increased risk of developing osteopenia and osteoporosis. Our study was designed to determine the degree of decreased bone density in steroid naïve young male patients with inflammatory bowel disease and to unmask possible risk factors.

**Methods:** Before the initiation of any treatment in young male patients aged  $26 \pm 4.8$  years with inflammatory bowel disease, ultrasound bone density measurement at the right calcaneus was performed using a Lunar Achilles plus device. Stiffness Index and T-score were measured. We also performed an ultrasound bone density measurement at right calcaneus in healthy age- and sex-matched controls.

**Results:** Nine out of 32 patients with inflammatory bowel disease had osteopenia or osteoporosis (~28%). Of controls, two individuals had osteopenia (~7%). There was a positive correlation between T-score and body mass index, but not between T-score and age in patients with inflammatory bowel disease. There was a statistically significant difference in T-score between patients with disease duration > 6 months and those with disease duration < 6 months ( $P = 0.032$ ), but not between the patients with Crohn's disease compared with the patients with ulcerative colitis.

**Conclusion:** Steroid naïve young male patients with inflammatory bowel disease have lower bone density values than healthy controls. According to our findings, duration of disease above 6 months and low body mass index are major risk factors for low bone density in these patients. Bone density measurement should be performed in all patients with inflammatory bowel disease in an early stage of the disease.

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**Keywords:** Crohn's disease; Ulcerative colitis; Quantitative ultrasound; Osteoporosis; Osteopenia

### 1. Introduction

Patients with inflammatory bowel disease (IBD) have lower bone mineral density (BMD) values than healthy controls [1–4]. At diagnosis, low BMD appears to be more common in those with Crohn's disease (CD) than in those with ulcerative colitis (UC) [5]. The pathogenesis of osteopenia and/or osteoporosis associated with IBD is multifactorial [6]. Steroid therapy plays an important role in some patients with IBD and osteopenia [7], while the pathogenesis of disease might be in-

involved in the BMD reduction in patients with CD [8]. The nutrients important to bone formation (especially calcium and vitamin D) are absorbed in the small intestine, so people with CD who have had extensive disease of the small intestine may be at additional risk for low bone density [9,10]. It is also possible that a high inflammatory activity directly induces bone degradation via yet unknown pathways in IBD-associated bone disease [6]. It is important to determine whether IBD has a direct bearing on those patients who ultimately become osteopenic. This study was designed to determine the degree of decreased bone density in steroid naïve young male patients with IBD at the time of initial diagnosis and the possible risk factors.

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## 2. Methods

Young male patients aged over 20 years with recently diagnosed IBD were enrolled in the study. The diagnosis of IBD was based on endoscopy with histological findings. Before the initiation of any treatment, ultrasound bone density measurement at the right calcaneus was performed using a Lunar Achilles plus device. Further, we performed an ultrasound bone density measurement at right calcaneus in age-matched young normal males. Individuals having a history of previous corticosteroid use for any reason or a history of any disorder that affect the bone metabolism, such as endocrine disease, renal disease etc., were excluded from the study.

Stiffness index (SI) and T-score were the results of ultrasound bone measurement. SI was estimated by the following two parameters, broadband ultrasound attenuation (BUA) and speed of sound (SOS) [ $SI = (0.67 \cdot BUA) + (0.28 \cdot SOS) - 420$ ]. T-score expressed the number of standard deviations (S.D.s) above or below the mean SI for German young healthy adults aged 20 years. The data from German young healthy adults, which was built into the system software, was provided by the manufacturer.

The following parameters were recorded: age, weight, height and body mass index (BMI) ( $\text{kg}/\text{m}^2$ ) for all individuals, type of disease and the duration of symptoms before diagnosis for patients with IBD. In regard to duration of symptoms, the patients were separated in two groups, one group with estimated disease duration longer than 6 months and another group with estimated disease duration shorter than 6 months. The individuals with T-score below or equal to  $-2.5$  were described as osteoporosis and those with T-score between  $-1$  and  $-2.5$  were described as osteopenia.

Non-parametric methods were used for the statistical analysis (SPSS, version 8.0 for Windows).

## 3. Results

Thirty-two young male patients with recently diagnosed IBD [mean ( $\pm$  S.D.) age  $26 \pm 4.8$  (range 20–36) years and mean BMI ( $\pm$  S.D.)  $24.1 \pm 4.3$  (range 15.4–31)  $\text{kg}/\text{m}^2$ ] and 28 young healthy males [mean ( $\pm$  S.D.) age  $24.6 \pm 6.2$  (range 20–40) years and mean BMI ( $\pm$  S.D.)  $23.2 \pm 4.5$  (range 17.5–34.8)  $\text{kg}/\text{m}^2$ ] participated in the study. Patients and controls' data is shown in Table 1. Of 32 patients, eighteen had CD and 14 had UC. In regard to estimated duration of symptoms, 18 patients, 10 with CD and the remainder with UC, had disease duration  $> 6$  months and 14, eight with CD and six with UC, had disease duration  $< 6$  months. Mean ( $\pm$  S.D.) SI and mean ( $\pm$  S.D.) T-score were  $98.1 \pm 19.7$  and  $-0.15 \pm 1.51$  in IBD patients, and  $107.6 \pm 20$  and  $0.57 \pm 1.54$  in controls, respectively. In regard to the type and duration of disease, mean ( $\pm$  S.D.) T-score was  $-0.19 \pm 1.72$  in CD patients,  $-0.11 \pm 1.26$  in UC patients,  $-0.63 \pm 1.58$  in patients with disease duration  $> 6$  months and  $0.47 \pm 1.21$  in patients with disease duration  $< 6$  months.

Of 32 patients, two (6.25%) patients, both with CD, had osteoporosis and seven (21.87%), four with CD and three with

Table 1

Mean age, BMI and T-score of the controls, and of the patients with IBD in relation to type and duration of disease

	Age (years)	BMI ( $\text{kg}/\text{m}^2$ )	T-score
Controls ( $N = 28$ )	24.6 (6.2)	23.2 (4.5)	0.57 (1.54)
Patients with IBD ( $N = 32$ )	26 (4.8)	24.1 (4.3)	-0.15 (1.51)
Patients with CD ( $N = 18$ )	26.3 (5)	24.1 (4.6)	-0.19 (1.72)
Patients with UC ( $N = 14$ )	25.8 (4.6)	24.2 (4.2)	-0.11 (1.26)
Patients with disease duration $> 6$ months ( $N = 18$ )	28.4 (4.5)	23.7 (5.2)	-0.63 (1.58)
Patients with disease duration $< 6$ months ( $N = 14$ )	23.1 (3.4)	24.7 (2.9)	0.47 (1.21)

Values are mean (S.D.). BMI: body mass index; IBD: inflammatory bowel disease; CD: Crohn's disease; UC: ulcerative colitis.

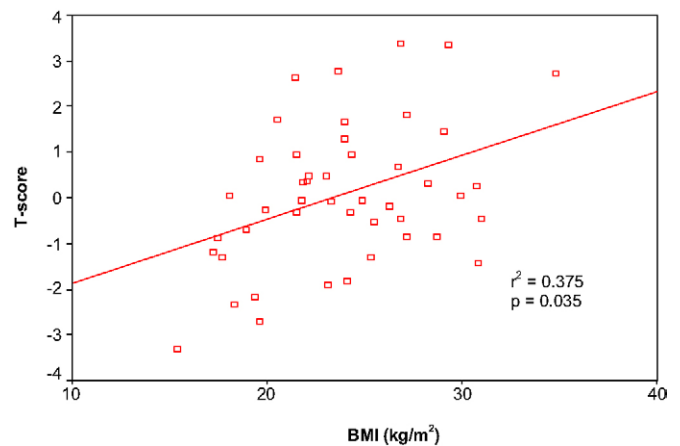


Fig. 1. Correlation between T-score and BMI in patients with IBD.

UC, had osteopenia. Of 28 controls, two (7.14%) individuals had osteopenia and none osteoporosis. Patients with IBD had a weak positive correlation between T-score and BMI, with Spearman correlation coefficient of 0.375 ( $P = 0.035$ ) (Fig. 1), but not between T-score and age. It was found no correlation of T-score with BMI and age in controls. One possible explanation of absence of correlation between T-score and age in both patients and controls was the low range of age. Compared T-score values of IBD patients with controls by Mann–Whitney  $U$  test, it was found that there was difference, but the result was not statistically significant ( $P = 0.12$ ). Using Mann–Whitney  $U$  tests, there was a statistically significant difference in T score between patients with disease duration  $> 6$  months and those with disease duration  $< 6$  months ( $P = 0.03$ ), but not between patients with CD compared with patients with UC ( $P = 0.86$ ).

## 4. Discussion

Because the pathogenesis of osteoporosis in IBD is still not clear, a careful analysis of the metabolic state of the bone at the initial phase of IBD may provide some important clues. In this prospective compared-control study, we found that nine ( $\sim 28\%$ ) of 32 steroid naïve young male patients with recently diagnosed IBD had osteopenia or osteoporosis compared with two ( $\sim 7\%$ ) of controls who had osteopenia. Bone density was associated with BMI only in patients with IBD but not in controls. Patients with IBD who had low BMI had also reduced

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