

Relationship between the Morphology of Osteophytes and Cartilage Lesions in Anterior Ankle Impingement in Athletes: A Cross-Sectional Study

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INTRODUCTION: The present study aimed to describe the frequency and severity of tram-track lesions in anterior ankle impingement in athletes and to evaluate the association between osteophyte morphology and severity of tram-track lesions, the distinctive cartilage lesions associated with tibial osteophytes in anterior ankle impingement syndrome.

METHODS: We retrospectively evaluated consecutive athletes who underwent arthroscopic osteophyte resection for anterior ankle impingement syndrome. The indication for surgery was persistent symptoms of anterior ankle impingement syndrome, refractory to conservative treatment. Athletes with a history of ankle fracture or previous ankle surgery, those with incomplete study data, and those with findings of joint space narrowing on plain radiographs were excluded. By reviewing the arthroscopic findings from a database, the presence of the tram-track lesions was assessed, and the cartilage lesion severity of tram-track lesions was graded using the International Cartilage Repair Society (ICRS) cartilage injury classification. We measured the length from the anterior tip of the distal tibia's articular surface to the osteophyte's tip on each sagittal slice of computed tomography (CT). Their maximum value was defined as the osteophyte size. We also assessed the presence of spur protrusion into joint space using the following procedure. First, we marked a dot on the anterior tip of the distal tibia's articular surface on the sagittal CT view using freeware. Second, we marked two more dots at 5 mm intervals from the first dot on the articular surface. Third, we calculated the coordinate of the center of a circle passing through these three dots, which correspond to the morphology of the anterior part of the tibial articular surface. Lastly, we marked a dot on the osteophyte tip and calculated the distance between the circle's center and the dot on the osteophyte tips from their coordinates. If the distance is shorter than the circle's radius by > 1 mm, osteophyte protrusion is confirmed to be present and defined as a protrusion type. (Fig. 1) The correlation between the ICRS grade and osteophyte size was evaluated using Spearman's rank correlation coefficient. The Kruskal–Wallis test was used to examine the differences in ICRS grade and osteophyte size between rugby, soccer, and basketball, which have many participants. The difference in ICRS grade concerning the presence or absence of osteophyte protrusion was evaluated using the Mann–Whitney U test. Osteophyte size was compared between protrusion and non-protrusion type groups using the Mann–Whitney U test.

RESULTS:

Eventually, the data of 34 athletes were included in the present study. There were 27 male and 7 female athletes. The mean age was 24.6 years (range 17–39), the mean height was 174.8 cm (range 148–195), and the mean body weight was 74.9 kg (range 52.6–98). Other participants' clinical characteristics are shown in Table 1. We found tram-track lesions in 26 athletes (76.5%). Arthroscopic findings revealed the distribution of the International Cartilage Repair Society grades of tram-track lesions (grade 0, eight; grade 1, seven; grade 2, ten; grade 3, nine; grade 4, zero). These findings indicate that athletes with anterior ankle impingement syndrome may have more severe cartilage lesions than non-athletes. There was a positive correlation between the International Cartilage Repair Society grade and osteophyte size ($r = 0.393$, $p = 0.021$). There was no significant difference in osteophyte size and ICRS grade between the three sport types. We divided athletes into two groups according to the presence or absence of osteophyte protrusion into the joint space. Osteophyte protrusion was present in 14 athletes (41.2%). All athletes in the protrusion-type group had tram-track lesions; seven (50%) had ICRS grade 3 (Table 2). The protrusion-type group's ICRS grade was significantly higher than that of the non-protrusion-type group ($p = 0.008$). The osteophyte sizes in the two groups were not significantly different ($p = 0.341$).

DISCUSSION AND CONCLUSION:

This is the first study to describe the frequency and severity of tram-track lesions in anterior ankle impingement syndrome in athletes and evaluate the association between osteophyte morphology and tram-track lesion severity. In the present study, athletes with anterior ankle impingement syndrome had more frequent and severe tram-track lesions than those previously reported. The severity of cartilage lesions was associated with the size and protrusion of osteophytes. Protrusion-type osteophyte was more common in male athletes. Based on these findings, osteophyte protrusion should be assessed when an indication of arthroscopic treatment for anterior ankle impingement syndrome is considered, particularly in athletes.

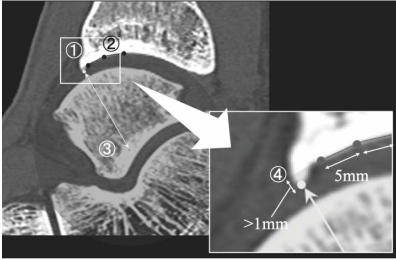


Table 1. Participant characteristics

Sex	
Male, n (%)	27 (79.4)
Female, n (%)	7 (20.6)
Age, mean (range)	24.6 (17–39)
Height (cm), mean (range)	174.8 (148.0–195.0)
Body weight (kg), mean (range)	74.9 (52.6–98.0)
Body mass index (kg/m ²), mean (range)	24.4 (17.1–32.0)
Affected side	
Right, n (%)	19 (55.9)
Left, n (%)	15 (44.1)
Level of sports activity	
Student athlete, n (%)	12 (35.3)
Professional athlete, n (%)	22 (64.7)
Sport	
Rugby, n (%)	10 (29.4)
Soccer, n (%)	9 (26.5)
Basketball, n (%)	6 (17.6)
Volleyball, n (%)	3 (8.8)
Baseball, n (%)	2 (5.9)
Track and field, n (%)	2 (5.9)
Hockey, n (%)	1 (2.9)
Badminton, n (%)	1 (2.9)

n, number

Table 2. Distribution of International Cartilage Repair Society (ICRS) grades according to the presence or absence of protrusion of osteophyte protrusion into the joint space in 34 patients

	ICRS grade					Total
	0	1	2	3	4	
Non-protrusion, n	8	3	7	2	0	20
Protrusion, n	0	4	3	7	0	14
Total, n	8	7	10	9	0	34

ICRS grade 0 indicates absence of tram track lesions. n, number