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Juvenile osteochondral lesions of the talus: need for surgery and surgical treatment results

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ABSTRACT

Aims: Juvenile osteochondral lesions of the talus (JOLTs) are complex lesions affecting the articular cartilage and subchondral bone of the talus. This study aimed to assess the need for surgical intervention following conservative management of JOLTs and to evaluate the early outcomes after surgery.

Methods: This retrospective study identified patients aged 18 years or younger who were surgically treated for JOLTs at our institution from 2018 to 2021. The surgical treatment indication was conservative treatment failure. Patients were followed up for 2 years using the visual analog scale (VAS) and American Orthopedic Foot and Ankle Society (AOFAS) score.

Results: The study included 12 patients with a median age of 15 (10-17) years. All lesions were stage 2-3 at initial presentation. Conservative treatment failed in 8 of 12 patients (67%), and these patients underwent surgical treatment. The median pre-operative and follow-up AOFAS scores were 39.5 (21-75) and 88 (51-100), respectively. The median pre-operative and follow-up VAS scores were 8 (5-9) and 2 (0-9), respectively.

Conclusions: The success rate of conservative treatment of JOLTs was lower than expected. This study showed early success of surgical treatment of JOLTs.

Introduction

Osteochondral lesions of the talus (OLTs) are complex injuries involving the articular cartilage and subchondral bone of the talus, often associated with persistent ankle pain and disability (1). OLTs primarily affect individuals between the ages of 10 and 40 years, with a peak incidence during the second decade of life (1). The reported incidence of OLTs ranges from 0.9-6.5% (2,3). These lesions develop before the closure of the growth plates and are referred to as juvenile osteochondral lesions of the talus (JOLTs). Although several theories regarding the etiology of OLTs exist, none have been universally accepted. OLTs often occur following acute ankle sprain or chronic ankle instability but may also be idiopathic (4,5,6).

The limited literature on OLTs has led to the application of adult OLT treatment protocols in pediatric cases. Although no standardized conservative treatment guidelines exist, conservative management is typically the first-line approach for JOLTs (7,8). The traditional conservative protocol includes immobilization and non-weight bearing, with or without non-steroidal anti-inflammatory drugs, followed by progressive

weight-bearing exercises to restore flexibility, strength, and balance. Previous studies have suggested that osteochondral lesions heal more effectively in younger patients due to open growth plates (9). However, recent studies have challenged this view, reporting high failure rates with conservative treatment (10,11).

This study aimed to assess the need for surgical intervention following conservative management of OLTs in children and to evaluate the early outcomes of surgical treatment in pediatric patients.

Methods

Study design and patient selection

This study included patients younger than 18 years at the time of the JOLTs diagnosis and at least 1 year of follow-up data. The exclusion criteria were closed growth plates and incomplete data. The Ethics Committee of Marmara University Faculty of Medicine approved the study protocol (protocol code: 09.2021.662, date: 02.07.2021). This study followed the principles outlined in the Declaration of Helsinki for research involving human subjects.

Data collection

Demographic (age, gender, height and weight), clinical (history of trauma, onset of symptoms, treatment initiation and method) and radiological data were collected from the hospital records.

The Berndt-Harty classification was used to grade lesions on plain radiographs (12). Lesion size and localization were evaluated using magnetic resonance imaging. All patients initially underwent conservative treatment for at least 6 months (Table 1). This protocol included immobilization and non-weight-bearing for 6 weeks, followed by gradual weight-bearing, physiotherapy, joint mobilization, and exercises to improve flexibility and strength. Additional treatments included personalized insoles, invasive ultrasound, and activity modification. Patients refrained from sports until symptoms resolved.

Patients unresponsive to conservative treatment underwent arthroscopically assisted surgery performed by the same surgeon. Standard two-port ankle arthroscopy with the patient in the supine position was performed to assess the lesion's size and stability.

Post-operatively, the two patients who underwent malleolar osteotomy were fitted with a short leg splint, and mobilization was allowed with crutches, avoiding weight-bearing on the operated foot. After approximately 1 week, the splint was removed, and a supervised exercises program was initiated for progressive joint mobility. No splint was applied for patients requiring only arthroscopic treatment. However, weight-bearing was restricted for 4-6 weeks, depending on the lesion size and the patient's body mass index. Six weeks post-operatively, gradual weight-bearing with crutches was permitted. Once full weight-bearing was achieved, progressive functional strengthening and activity-specific protocols were initiated. Typically, patients resume physical activities approximately 6 months after surgery.

The patients were followed clinically and radiographically for 2 years. Clinical follow-up included assessments using the visual analog scale (VAS) and American Orthopedic Foot and Ankle Society (AOFAS) scores.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, New York). Descriptive statistics included number, percentage, median, and minimum and maximum values. The normality of VAS and AOFAS outcomes was tested using the Shapiro-Wilk test, which revealed non-normal distributions. The Mann-Whitney U-test was used for between-group comparisons. A p value <0.05 was considered statistically significant.

Results

Descriptive statistics

The study included 12 patients (4 men and 8 women). The median age at diagnosis was 15 (10-17) years. All patients presented with stage 2-3 lesions, and no stage 4 lesions were observed. Table 1 shows the descriptive data. Conservative treatment was unsuccessful in 8 of 12 patients (67%) who required surgical intervention. In addition, nine patients (75%) had a history of trauma.

Arthroscopic shavers and microfracture techniques were used in six patients to excise damaged cartilage and stimulate the subchondral bone. In two patients with intact but unstable lesions, medial malleolar osteotomies were performed with grafting and bioabsorbable screw fixation (Table 2).

The median baseline AOFAS score of patients treated conservatively was 31.5 (11-75), which improved to 39.5 (17-100) at the 2-year follow-up (p=0.687). The median baseline VAS score of these patients was 6.5 (5-9), which decreased slightly to 6 (0-9) at the final follow-up (p=0.496).

Among the surgically treated patients, the median pre-operative AOFAS score was 39.5 (21-75), which improved significantly to 88 (51-100) at the 2-year follow-up (p=0.0036). Similarly, the median pre-operative VAS score was 8 (5-9), which improved to 2 (0-9) at the final follow-up (p=0.011). Of the eight patients who underwent surgery, seven (87.5%) achieved a successful outcome. No minor or major complications were reported, and no reoperations were performed. Although reoperation was recommended for the patient (12.5%), the patient declined.

Table 1. Demographic data and outcomes of patients treated conservatively

Case	Sex	Age	BMI	Side	Trauma history	AOFAS baseline/lost control	VAS baseline/last evaluation
1	F	12	18.8	R	+	21/100	8/0
2	F	15	18.6	R	+	74/87	6/3
3	M	10	21.2	L	-	14/17	7/6
4	F	15	27.2	L	+	11/19	9/5
5	F	14	22.5	R	+	25/25	6/6
6	F	14	25.4	R	+	32/25	6/8
7	F	15	36.7	R	+	65/58	6/6
8	M	17	30.1	L	+	24/21	7/9
9	F	17	24.5	R	+	75/75	5/5
10	M	16	21.6	R	+	57/58	9/9
11	F	13	27.1	R	-	67/48	6/8
12	M	16	26.6	L	-	31/31	7/8

BMI: Body mass index, AOFAS: American Orthopedic Foot and Ankle Society scale, VAS: Visual analog scale, F: Female, M: Male, R: Right, L: Left

Table 2. Demographic data and outcomes of patients undergoing surgical treatment

Case	Sex	Age	BMI	Side	Trauma history	AOFAS baseline/conservative treatment/last treatment	VAS baseline/ conservative treatment/ last treatment	Surgical treatment
1	F	14	22.5	R	+	25/25/88	6/6/2	Arthroscopic debridement and microfracture
2	F	14	25.4	R	+	32/25/88	6/8/2	Arthroscopic debridement and microfracture
3	F	15	36.7	R	+	65/58/88	6/6/2	Arthroscopic debridement and microfracture
4	M	17	30.1	L	+	24/21/100	7/9/0	Arthroscopic debridement and microfracture
5	F	17	24.5	R	+	75/75/51	5/5/9	Arthroscopic debridement and microfracture
6	M	16	21.6	R	+	57/58/100	9/9/0	Arthroscopic debridement, medial malleolar osteotomy, and the osteochondral fragment fixed with a bioabsorbable screw
7	F	13	27.1	R	-	67/48/88	6/8/1	Arthroscopic debridement and microfracture
8	M	16	26.6	L	-	31/31/68	7/8/4	Arthroscopic debridement, medial malleolar osteotomy, and the osteochondral fragment were fixed with a bioabsorbable screw (This patient had a three-year history of pain and had received 6 months of conservative therapy before surgery).

BMI: Body mass index, AOFAS: American Orthopedic Foot and Ankle Society scale, VAS: Visual analog scale, F: Female, M: Male, R: Right, L: Left

Discussion

OLTs are more common in adolescents than in adults or children. However, there is limited knowledge regarding optimal treatment protocols and outcomes of JOLTs in pediatric patients (13). The primary finding of this study was the success rate of conservative treatment in JOLTs, which was lower than expected (33.3%), requiring surgical intervention in most patients.

Despite previous studies suggesting that JOLTs have higher spontaneous healing potential and lower rates of joint degeneration than adult cases (7,14,15), the present findings highlight the limited success of conservative treatment, particularly for advanced lesions (16). Previous studies have reported varied outcomes with conservative treatment (14,15). Lam et al. (14) achieved 100% good to excellent outcomes in six patients with JOLTs treated non-surgically, whereas Higuera et al. (15) observed favorable results in 68% of cases treated conservatively. However, Heyse et al. (10) reported a 39% success rate in conservative treatment. The authors noted that non-surgical treatment led to poor outcomes in patients with stage 3 OLT lesions and older children. Similarly, Kim et al. (11) achieved successful results in 37 (67%) of 55 JOLTs managed conservatively. However, only six (16.2%) out of 22 patients with stage 3 lesions responded favorably, with success rates decreasing in older patients. In line with these findings, our study observed successful outcomes in only four (33.3%) of the 12 patients who underwent conservative treatment for at least 6 months. These findings emphasize the need for close follow up of pediatric OLT patients treated conservatively.

Surgical treatment is the next step when conservative management fails or when there are unstable stage 4 lesions (7,8,15,17). A variety of arthroscopic and open-surgical methods are available for the treatment of JOLT. The choice of surgical procedure depends on the surgeon's experience and the lesion's location, depth, and size (18,19). Common surgical interventions include bone marrow stimulation techniques (drilling and microfracture), fixation of displaced subchondral bone fragments, and tissue transplantation (e.g., mosaicplasty, osteochondral allograft, or autologous chondrocyte implantation). Carlson et al. (20) performed arthroscopic bone marrow stimulation in 22 patients with JOLTs and described a surgical algorithm based on arthroscopic evaluation. The size and stability of the lesions were assessed using direct visualization and arthroscopic probes. In the cases of stable lesions, translator drilling was performed under fluoroscopic guidance to preserve the cartilage layer. If the lesion was unstable, excision followed by translator drilling and microfracture was performed to promote fibrocartilage formation. The authors report satisfactory clinical outcomes with minimal ankle osteoarthritis progression at a minimum follow-up duration of 2 years. Pallamar et al. (21) reported on 30 patients (32 joints) treated for osteochondritis dissecans of the immature talus over a mean follow-up period of 6 years. Retrograde drilling was performed for stable lesions; fixation was used for unstable lesions with intact cartilage. In cases of cartilage damage, microfracture or osteochondral allografts were used, depending on the lesion size. The study found that stable OLTs treated with drilling resulted in better clinical and radiographic outcomes and lower joint degeneration rates in fixation and reconstruction procedures for unstable lesions.

Positive short-and long-term outcomes have been reported following microfracture treatment (22-24). However, some researchers caution against the potential for fibrocartilage formed through microfracture to lead to osteoarthrosis over time (16,25). Ferkel et al. (25) reported worsened clinical scores in six patients (35%) 5 years after treatment, although these findings pertain to adults. Long-term outcomes of pediatric surgical treatment remain unclear. Körner et al. (26) reported a reoperation rate of 25.9% in 27 patients after a mean follow-up of 31 months and attributed this high rate to the closure of the distal tibia and fibular physis. However, younger age and an open tibial physis are associated with better healing potential (27). Perumal et al. (7) observed clinical improvement in all patients (100%) and radiographic improvement in 11 patients (85%) at a 1-year follow-up of 13 patients (1 of whom underwent open arthrotomy and 12 of whom underwent arthroscopic retrograde drilling. Minokawa et al. (28) also reported significant clinical improvement in six patients (eight ankles) who underwent retrograde drilling. In our study, six patients with cartilage lesions underwent arthroscopic debridement and microfracture, whereas two patients with intact cartilage had their osteochondral fragments fixed using bioabsorbable screws. The VAS and AOFAS scores improved in seven patients who underwent arthroscopic surgery (success rate: 87.5%). One patient experienced deteriorating outcomes despite standard arthroscopic cartilage debridement, microfracture, and post-operative rehabilitation. During follow-up, the patient experinced progressive worsening of pain and functional outcomes but rejected reoperation. These findings and recent studies in the literatıre suggest that arthroscopic surgery is highly effective in the early management of JOLT, although long-term outcomes remain to be determined.

The most common cause of OLTs is ankle trauma. A recent systematic review found that osteochondral lesions occurred in 45% of ankle fractures, with nearly half involving the talus. Ferkel et al. (25) reported that 37 (74%) of 50 patients with OLTs had a history of trauma. Kramer et al. (29) found that 38 (35%) of 109 OLT cases in patients aged ≤18 years had a traumatic origin. Similarly, Letts et al. (8) identified trauma in 19 (79%) of 24 pediatric patients with OLTs. In our study, nine out of 12 patients (75%) had a documented history of trauma, supporting the widely accepted notion that ankle osteochondritis dissecans is primarily trauma-induced.

This study has several limitations. The retrospective design of the study and the small sample size hinder the generalizability

of the findings, as talus osteochondral lesions are less common in adolescents than in adults. Additionally, a follow-up period of 2 years is insufficient to assess medium to long-term outcomes or to determine the optimal surgical procedure. Finally, a single surgeon proformed because the operations the results might require external validity.

Conclusion

This study demonstrated that conservative treatment of JOLTs achieved a lower success rate than anticipated. Although conservative management is the initial treatment approach, close monitoring is necessary because the likelihood of success is limited. When conservative treatment fails, surgical intervention is required. This study highlighted favorable early outcomes of arthroscopic surgery for JOLTs, although further research is needed to evaluate long-term outcomes.

Ethics

Ethics Committee Approval: The Ethics Committee of Marmara University Faculty of Medicine (protocol code: 09.2021.662, date: 02.07.2021) approved the study protocol.

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: O.Ç., Concept: O.Ç., K.S.I., Design: O.Ç., K.S.I., Data Collection or Processing: O.Ç., K.S.I., Analysis or Interpretation: O.Ç., Literature Search: O.Ç., Writing: O.Ç., K.S.I.

Conflict of Interest: No conflict of interest was declared by the authors.

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