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MID-TERM RESULTS AFTER ARTHROSCOPIC TREATMENT OF HIGH-GRADE OSTEOCHONDRAL TALAR LESIONS WITH PLATELET-RICH FIBRIN (PRF)

Nikolay Dimitrov✉, Raycho Kehayov, Tsvetan Tsenkov

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Abstract

Arthroscopic treatment of high-grade osteochondral lesions of the talus is usually limited to retrograde drilling. Salvage options after failed marrow stimulation include osteochondral grafting. The biological potential of platelet-rich products is an opportunity to take a different path in impacting the course of these lesions.

There is limited evidence regarding platelet-rich fibrin (PRF) application in severe osteochondral talar lesions. The aim of this study was to present mid-term results after arthroscopic application of PRF in patients with high-grade talar lesions.

This is a retrospective study of 15 patients with osteochondral talar lesions. Ferkel and Sgaglione CT staging system as well as Berndt and Harty Radiographic Classification were utilized. Inclusion criteria was only stage IV lesions. The mean age was 34.2 years (SD: 5.2). Fifty-three percent of the patients ($n = 8$) were female. The Body Mass Index (BMI) ranged from 19 to 35. Mean BMI was 27 (SD: 4.4). The mean follow-up was 38.8 months (range, 35–42). The study was conducted in a single institution. All surgeries were performed by a single senior surgeon utilizing the same arthroscopic algorithm with PRF application. The Visual analogue scale (VAS), the American Orthopaedic Foot and Ankle Score (AOFAS), as well as complications rate were recorded.

Preoperative mean AOFAS score of 52.8 was converted to a mean score of 84.9 ($p < 0.05$). The mean VAS score ranged from 44.9 preoperatively to

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a 16.5 postoperative result ($p < 0.05$). Complications rate was 6.6% with one transient superficial infection.

Arthroscopic PRF application in high-grade osteochondral talar lesions showed good to excellent postoperative results, as well as a safe profile with low complications rate. Nevertheless confounding factors such as the lack of control group and the limited number of patients do exsist. More evidence is needed to acknowledge the findings of this study.

Key words: ankle arthroscopy, osteochondral lesions, platelet-rich fibrin

Introduction. Osteochondral lesions of the talus affect patients with various demographic characteristics. They are mostly associated with trauma – from ankle sprains to fractures [1]. Several nontraumatic causes have been discussed, the most important of them being osteochondritis dissecans [2].

Ankle injuries are associated with 70% and 98% of medial and lateral osteochondral talar lesions, respectively [3]. Cartilage damage can be extended with repetitive trauma, with subsequent defect size increase. This ultimately leads to progressive cartilage disorder and ankle degenerative arthritis [4].

The treatment options depend on lesion characteristics, such as the location, lesion depth, involvement of bone and cartilage, and arthroscopic access. An important prognostic factor is the bone quality and the size of the talar defect. Large lesions with cystic degeneration are associated with poor success rates. Management goals are to eliminate pain, to stabilize cartilage environment and restore normal ankle function [5].

Arthroscopic treatment is considered for symptomatic chronic lesions with poor healing potential. Surgical techniques include removal of loose fragments, debridement and marrow stimulation, retrograde drilling and/or bone grafting. Small osteochondral lesions are successfully managed with arthroscopic bone marrow stimulation. Higher failure rate is discovered for larger lesions, with an apparent threshold size of 150 mm^2. Salvage option for large lesions is osteochondral grafting – autograft transplantation, autologous chondrocyte implantation, bulk autograft. However, these management strategies are not always available in some institutions due to various reasons. Biological agents such as platelet-rich products: platelet-rich plasma (PRP), platelet-rich fibrin (PRF), and bone marrow aspirate have been more recently considered viable tools in the treatment of such lesions. Some of these products, such as the PRF are advocated to provide regeneration of cartilage with long term effects – reduction of pain, improved range of motion and reduction in recurrences.

There is limited evidence regarding platelet-rich fibrin (PRF) application in severe osteochondral talar lesions. The aim of this study was to present mid-term results after arthroscopic application of PRF in patients with high-grade talar lesions.

Materials and methods. A retrospective study was conducted in a single institution. Data was searched for and collected from the hospital's archives from

the past 10 years (from 2011 to 2021). Patient inclusion criteria were a diagnosis of osteochondral lesions of the talus and availability of CT and X-ray imaging data that showed Stage IV Ferkel and Sgaglione CT, and Berndt and Harty Radiographic Classifications. All included patients were operated on by a single senior surgeon. The same arthroscopic algorithm was utilized – arthroscopic lesion identification, debridement, osteochondroplasty, microfracturing, and application of platelet-rich fibrin (PRF) under direct arthroscopic control using the Vivostat® system [6] (Fig. 1). Postoperative care consisted of four weeks non-weight bearing combined with a rehabilitation programme.

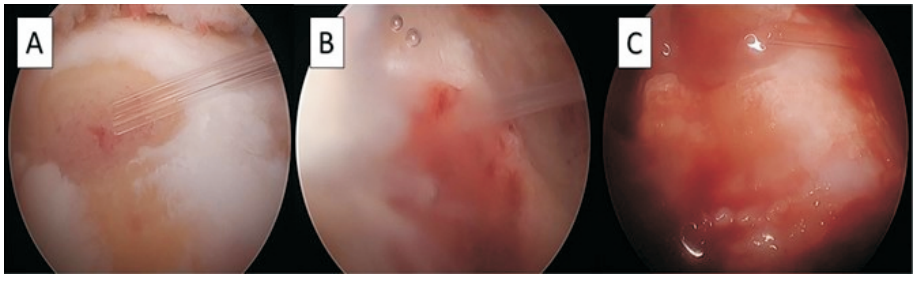

Fig. 1. Application of PRF under direct arthroscopic control – locus targeting (A), application (B), and follow-up (C)

Excluded from the study were pediatric population (below 18 years of age), patients with insufficient imaging data (lack of CT and/or X-ray imaging), and patients with lower grade lesions.

Fifteen patients met the criteria and were included in the study. The demographic data were as follows: the mean age was 34.2 years (SD: 5.2). 53% ($n = 8$) were female. The Body Mass Index (BMI) ranged from 19 to 35. Mean BMI was 27 (SD: 4.4).

The mean follow-up was 38.8 months (range, 35–42). The results were evaluated by the Visual analogue scale (VAS) and the American Orthopaedic Foot and Ankle Score (AOFAS). Complications were also recorded.

Results. Preoperative mean AOFAS score of 52.8 was converted to a mean score of 84.9 ($p < 0.05$). The mean VAS score ranged from 44.9 preoperatively to a 16.5 postoperative result ($p < 0.05$) (Table 1).

T a b l e 1

Functional results (VAS – Visual analogue scale; AOFAS – American Orthopedic Foot and Ankle Score)

Mean values	Preoperative score	Postoperative score (weight-bearing)	12 months follow-up	36 months follow-up
VAS	44.9	25.5	17.2	16.5
AOFAS	52.8	77.8	85.5	84.9

66.6% (n=10) of the patients presented with an MRI on the last follow-up visit. The MOCART (Magnetic Resonance Observation of Cartilage Repair Tissue) score was used to assess the available data and showed a mean score of 67.5 with visible integration and defect filling (Fig. 2A, B).

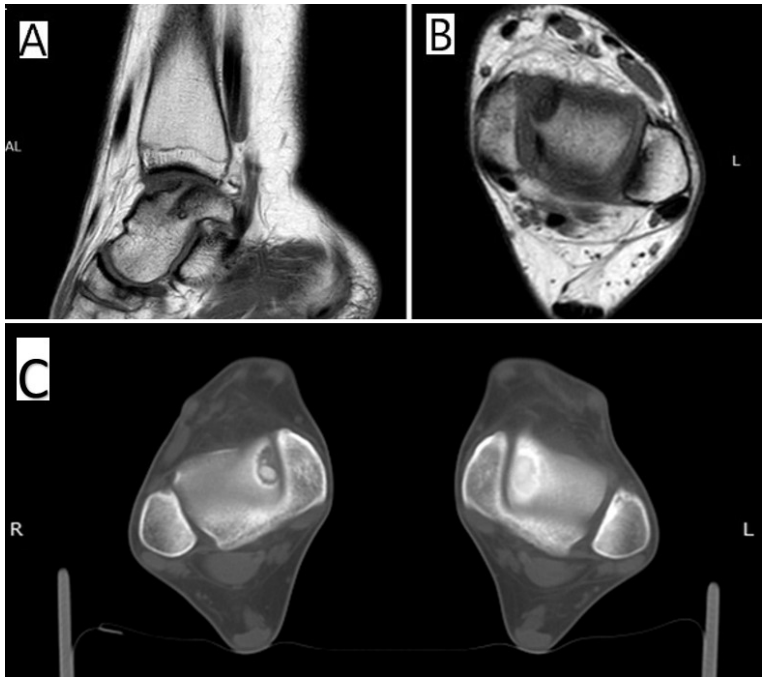

Fig. 2. Chondral integration in defected talar areas shown on MRI – sagital (A) and transverse (B) planes, as well as in cases with billateral involvement (C)

X-ray data showed downstaging of the defects in 13 patients (86.6%). Conversion from Stage IV to Stage III Berndt and Harty Radiographic Classifications was seen on the 36 months follow-up (Fig. 3).

Lower grade defects provided comparatively lower improvements in the AOFAS, but a significant improvement in the VAS scores (Fig. 4).

Complications rate was 6.6%. One patient presented with portal-site superficial infection that was resolved after one week of antibiotic treatment.

Discussion. A variety of treatment modalities for osteochondral talar lesions have been proposed but with limited high-grade evidence (level I). No particular approach has been shown to be superior [7].

Conservative approach for symptomatic lesions that are nondisplaced has shown to be less successful whitin the adult population [8]. Operative management is favoured for chronic lesions with displaced fragments and for large above one centimeter defects. Small lesions that are below 1.5 cm have proved successfully manageable by bone marrow stimulation. The procedure is often used

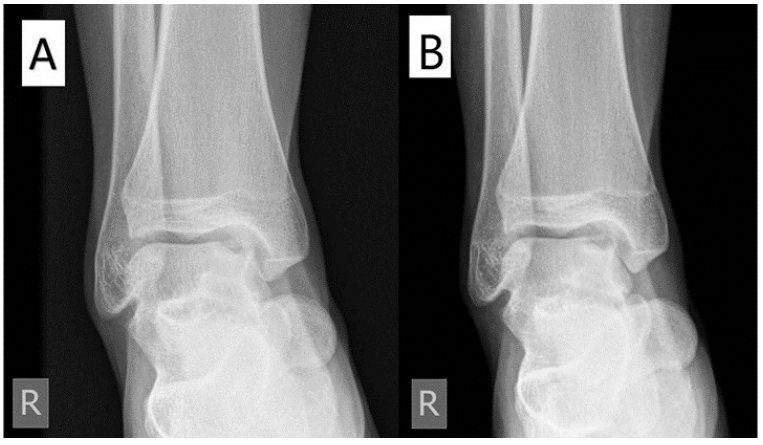

Fig. 3. Preoperative (A) versus postoperative (B) conversion of an osteochondral talar dome defect

Fig. 4. Preoperative (A, C) and postoperative (B, D) radiographs of a low-grade osteochondral talar defect combined with a bony impingement – before (A) and after (B) arthroscopic resection

as first line of treatment because of its advantages – cost-effectiveness, procedure simplicity and low complication rate [9]. Other methods such as the use of osteochondral autograft have the advantage of transposing native hyaline car-

tilage. A disadvantage is the need for harvesting (ipsilateral knee being most common site). This is associated with a second surgical procedure and potential minor or major surgical complications. Osteochondral allograft transplant is considered a treatment option when there is data for poor integrity of the subchondral bone. Techniques utilizing cell-based repair (autologous chondrocyte and matrix-associated chondrocyte implantation) also rely on providing hyaline cartilage in the defect site. The main disadvantage being the requirement of adequate subchondral bone. More recently, biological agents (platelet-rich plasma, bone marrow aspirate, platelet-rich fibrin) have been proposed as an add-on to operative treatment [10, 11]. Theoretical and animal-based research has shown the potential for cartilage regeneration, reduction of pain and recurrences using platelet-rich products [12]. In particular, platelet-rich fibrin has been shown to have superior characteristics over platelet-rich plasma [3, 13]. Recent studies of biological and regenerative properties of platelet-rich fibrin have increased the interest in applying these products in various osteochondral defects with promising results [14]. Such well documented papers show excellent data for treating osteochondral lesions of the knee and shoulder joints [15, 16]. There is a lack of papers describing the application of these agents in the talus and the ankle joint [17]. Our study provided good to excellent functional scores and a high level of patient satisfaction, however, we did not account for confounding factors such as the low number of patients that were involved. Additionaly, bias may exsist due to the fact that there was no control group included in this study.

Conclusion. Arthroscopic PRF application in high-grade osteochondral talar lesions showed good to excellent postoperative results, as well as a safe profile with a low complications rate. Despite some limitations regarding sample size and a lack of control group more evidence is needed to acknowledge the findings of this study.

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Department of Orthopaedics and Traumatology, Medical University of Sofia,
University Hospital of Orthopaedics "Prof. B. Boichev"
56 Nikola Petkov Blvd, 1614 Sofia, Bulgaria
e-mails: dimitrovniki@abv.bg, rkehayov@abv.bg, tsvetan.tsenkov@icloud.com