Outcome of Arthroscopic Bone Marrow Stimulation in Osteochondritis Dissecans of the Talus in a Tertiary Care Hospital

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ABSTRACT

Introduction: Osteochondritis dissecans of the talus is a rare condition that can create challenges for both the patient and the treating surgeon. Arthroscopic bone marrow stimulation (i.e. microfracture, drilling) is a well-accepted and proven technique to allow fibrocartilage differentiation and thereby provide infill at the site of a cartilage defect in several joints, including the ankle. The aim of our study was to examine the role of arthroscopic bone marrow stimulation techniques as a means of treatment for osteochondral lesions of the talus.

Material and methods: Thirty two ankles were identified between January 2012 and January 2020 with talus OCD that underwent arthroscopic bone marrow stimulation. Each lesion was classified according to the Berndt and Harty classification. Study patients were evaluated at 6 weeks, 3 months, 6 months, 12 months, and annually after surgery. Assessments via a visual analogue scale (VAS) for pain during daily activities and sport activity and the American Orthopaedic Foot & Ankle Society (AOFAS) scoring system were obtained at each visit.

Result: There were 25 men and 4 women of average age 35 years (range 17–50) and mean body mass index (BMI) 22 kg/m² (range 20–34) at the time of surgery. Quantitative MRI measurements on 3D FSPGR Sequence showed that mean area of the lesions were 0.801 ± 0.505 cm². Mean AOFAS scores improved from 66 points (range 53–77) preoperatively to 90 points (range 83–100) at final follow-up (p<0.05) and mean Visual Analogue Scale (VAS) scores from 6 points (range 5–8) to 2 points (range 0–5) with p value <0.05 which is statistically significant.

Conclusion: Arthroscopic management of osteochondral lesions of the talus has the advantages of better cosmetic results, less pain, and less surgical trauma. This technique is technically demanding and should be reserved for the experienced foot and ankle arthroscopist.

Keywords: Ankle arthroscopy, Microfracture, Osteochondritis Dissecans, Talus

INTRODUCTION

Osteochondritis dissecans (OCD) is an acquired idiopathic lesion of subchondral bone that can produce delamination and sequestration with or without articular cartilage involvement and instability. In 1888 Konig was the first author to use the term osteochondritis dissecans to describe loose bodies found in the knee joint; he believed them to be fragments from an avascular bone lesion. The ankle is the third most frequently affected anatomical site, after the knee and the elbow joints. In the ankle, the anterolateral and posteromedial aspects of the talar dome are the most frequently involved areas. According to the literature, OCD of the talus has an incidence of 0.09% and a prevalence of 0.002/100,000 person/year. The etiology of osteochondritis dissecans was once controversial, but most investigators now consider trauma to be the main causative factor in osteochondral lesions of the lateral talar dome. In contrast, 80% of medial fractures are not accompanied by a clear history of trauma. MRI is invaluable in correctly staging osteochondritis dissecans and is particularly useful in distinguishing between stable and unstable lesions. Although, over the years, various classifications have been proposed using CT, MRI or arthroscopy, Berndt and Harty’s classification is still the most widely used. For these lesions, diverse treatment options have been published in the last decades, however the goals of the current article are to summarise the outcome of arthroscopic bone marrow stimulation different for treating Osteochondritis dissecans of the talus.

MATERIAL AND METHODS

Thirty two ankles were identified between January 2012 and January 2020 with talus OCD that underwent arthroscopic bone marrow stimulation. Isolated osteochondral lesions of the talus without combined lesions, in patients of less than 50 years old with lesions of <15mm were included in our study. Patients with osteoarthritis, impingement or kissing lesions of the ankle, and patients with rheumatoid arthritis were excluded from the study. Demographic data, mechanism of injury, conservative treatment history, surgical details of initial treatment and subsequent treatment, if necessary was collected. Pre-operatively, radiographs and MRI were evaluated for location of the lesion, border, and size of the lesion. Each lesion was classified according to the Berndt and Harty classification (table-1). Study patients were evaluated at 6 weeks, 3 months, 6 months, 12 months, and annually after surgery. Assessments via a visual analogue scale (VAS)

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for pain during daily activities and sport activity and the American Orthopaedic Foot & Ankle Society (AOFAS) scoring system were obtained at each visit (Figure-1). Radiographs at each follow-up visit were evaluated by a Healing matrix that assessed serial changes in lesion length, lesion depth, perilesional sclerosis or density of the lesion. At final follow-up, lesion size, border, Berndt and Harty classification, and signs of osteoarthritis were recorded. The data were evaluated using IBM SPSS. The paired Student’s t-test was used for assessing changes between preoperative and postoperative scores and p value < 0.05 was accepted as statistically significant.

Technique: The principal objective of arthroscopic bone marrow stimulation is to create multiple openings in the subchondral bone whereby pluripotent mesenchymal stem cells aggregate to the defect site and, in response to growth factors, stimulate the differentiation of fibrocartilaginous tissue. The patient is positioned supine on the operative table with a blanket roll under the ipsilateral right hip. A thigh tourniquet is placed on the operative right leg. Under traction, an anteromedial portal to the ankle is established medial to the tibialis anterior tendon, approximately 1 cm proximal to the tip of the medial malleolus. A 2.7 mm 30 degree arthroscope is used. An anterolateral portal is established under arthroscopic visualization with use of an 18-gauge needle. This portal is lateral to peroneus tertius and about 1.5 cm proximal to the tip of the lateral malleolus. However the location of the osteochondral lesion should be accurately determined by preoperative imaging to choose the appropriate arthroscopic approach. Routine diagnostic ankle arthroscopy is performed and a 3.5-mm shaver is used to debride the extensive synovitis to allow for full visualization of the ankle joint. An arthroscopic probe is used to identify the borders of the lesion (Fig 2). The cartilage over the lesion which is friable and nonviable is debrided with the use of a curette. The underlying subchondral bone also is debrided using both portals with both a curette and an arthroscopic burr until bleeding bone is encountered. Microfracture of the base of the osteochondritis dissecans (OCD) is performed using an arthroscopic awl or a k wire at 3- to 4-mm intervals to promote vascularization.

Rehabilitation: Postoperatively, the patient is placed into a well-padded below knee splint for 3 weeks. At the 3-week visit, the patient is allowed for ankle range of motion exercises. The patient is kept non-weightbearing for 10 to 12 weeks.

RESULT

Twenty nine patients (32 ankles) with isolated osteochondral lesions of the talus belonging to stage II and stage III were treated by arthroscopic micro fracture. There were 25 men and 4 women of average age 35 years (range 17–50) and mean body mass index (BMI) 22 kg/m$^2$ (range 20–34) at the time of surgery. The lesions were located medially in 29 cases (95%) and laterally in 3 cases. Quantitative MRI measurements on 3D FSPGR Sequence showed that mean area of the lesions were $0.801 \pm 0.505$ cm$^2$ (Table-2). The
DISCUSSION

Based on the current literature, arthroscopic microfracture is defined as first line of treatment option for talus OCD especially for the lesions smaller than 1.5 cm² or 15 mm³.8,9 With microfracture, vascularized subchondral bone is penetrated. This results with the formation of a blood clot that contains growth factors and progenitor cells that stimulate healing. With time, blood clot shows metaplastic changes and promote formation of fibrous cartilage repair tissue. Although formed fibrous cartilage has less resistance to compression and shear forces than the normal articular cartilage tissue; it is shown that approximately 78% to 86% of patients achieve good to excellent results after arthroscopic microfracture.10,11,12

There have been multiple studies addressing different patient factors and lesion characteristics that may yield a poorer outcome. Lesions smaller than 15 mm, contained lesions, and anterolateral lesions are considered to be the positive prognostic indicators; negative indicators include older age (> 33-40 years old), lesions deeper than 7 mm, lesions larger than 15 mm, cystic lesions, medial talar lesions, higher BMI, history of trauma, longer duration of symptom, and presence of osteophytes.13,14,15 Our study also yielded similar results in terms of VAS Score and AOFAS Score. Zengerink et al.16 performed a review of the literature on the surgical treatment of OCD lesions. Fragment removal led to a clinical success rate of 54%; the addition of debridement of the crater increased the success rate to 88%. The association of removal, debridement and marrow stimulation techniques led to the best result, with a success rate of 85% in stage III or IV lesions smaller than 1.5 cm. Chuckpaiwong et al.17 reviewing 105 OCD lesions treated with microfractures, reported no failures in the case of lesions smaller than 15 mm (73 patients), but obtained only one good result in lesions greater than 15 mm (32 cases). An older age, a high body mass index, a traumatic etiology and the presence of osteophytes are all factors that negatively affect the result.

In a current concepts review, Giannini and Vannini18 suggested that marrow stimulation can even be attempted in lesions up to sizes of 2.0 cm². One recent study by Choi et al.19 reported successful results at a mean 44.5 months following surgery in 89.5% of patients with lesion sizes less than 150 mm² and increased success (94.8%) with lesion sizes less than 100 mm². The depth of the lesion was found to only weakly correlate with the overall clinical outcome. The short- and medium-term results of arthroscopic bone marrow stimulation techniques in treating osteochondral lesions of the talus are primarily good. Saxena and Eakin20 studied the results of microfracture in high-demand athletes at a mean follow-up of 32 months and showed significant improvement in AOFAS scores of 54.6 preoperatively to 94.4 following surgery (96% good to excellent). Lee et al.21 reported 89% good and excellent outcomes following microfracture at a mean follow-up of 33 months and a postoperative American Orthopaedic Foot and Ankle Society...
pain, and less surgical trauma. This technique is technically demanding and should be reserved for the experienced foot and ankle arthroscopist. Use of 3D FSPGR sequence in MRI makes quantitative assessment of cartilage thickness more accurately to advocate microfracture pre operatively and that’s why the results in our study is quite promising. Nevertheless, the results of research in this area are sporadic and despite a number of promising future directions for the treatment of OCD, more scientific evidence is needed to obtain a treatment that demonstrates adequate safety and efficacy.

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