

Osteochondritis Dissecans Treated With Autograft Cartilage Transplantation System (Mosaicplasty): MRI Contribution on Patient Follow-up - Case Report

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Abstract Articular cartilage injuries may be caused by several mechanisms, including metabolic, genetic, vascular and traumatic events. A single episode of knee trauma or chronic and repetitive mechanical stress overloading the subchondral bone can start the process. The authors report a case of a young male patient with regular exercise routine, diagnosed with osteochondritis dissecans after sudden severe right knee pain. This patient underwent surgical treatment with autograft cartilage transplantation (mosaicplasty). Comparison between initial MRI, one-year and two-year follow-up MRIs was performed. This case report illustrates the importance of the MRI in the evaluation of mosaicplasty treatment for osteochondritis dissecans. We further discuss prognostic factors related to chondral repair and MRI assessment of implant integration.

Keywords: knee, cartilage repair, magnetic resonance imaging

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1. Introduction

Osteochondritis dissecans (OCD) is a controversial knee entity, which affects the subchondral bone, typically the lateral margin of the medial femoral condyle, but can also be seen in the central area of the medial femoral condyle. It may occur bilaterally in 25% of documented cases [1].

Young individuals who develop OCD are at risk for developing osteoarthritis earlier in life. Difficulty of cartilage healing is due to absence of vascularization [2]. New surgical techniques are still evolving over the last few decades, improving outcomes in both degenerative and traumatic lesions, and increasing the number of potential treatment options. Therefore, a noninvasive diagnostic tool was required to evaluate and follow-up with these patients. MRI can provide a comprehensive characterization of chondral repair, contributing to the understanding of the architectural changes during autograft integration and to estimate prognosis [3].

2. Case Report

An otherwise healthy 27-year-old male physician in regular practice of physical activity developed severe pain in his right knee.

After a clinical evaluation of the knee, a MRI scan was performed, showing a focal osteochondral lesion on the lateral aspect of the medial condyle of the right femur, characterized by a round, osseous erosion with regular margins and no bony edema (Figure 1 and Figure 2). Subchondral bone was exposed, thickened and sclerotic, consistent with reactive changes. These findings matched the OCD criteria for a grade IV lesion, accordingly to the International Cartilage Repair Society (ICRS) [04-07].

Surgery was indicated and an autologous graft transplantation procedure (mosaicplasty) was performed. MRI follow-up one year after surgery showed signs of articular surface partial recovery. The osteochondral plug exhibited slightly hyperintense T2 signal in the medullary bone and partially defined chondral margins, remaining a minor depression (Figure 3).

After two years, a new follow-up MRI revealed decreased signal on T2w in the subchondral medullar bone, with better definition of the cortical bone limits. The two years follow-up MRI also showed leveling of the articular surface, without chondral defects (Figure 4). The patient

did well and resumed his physical activities without limitations.

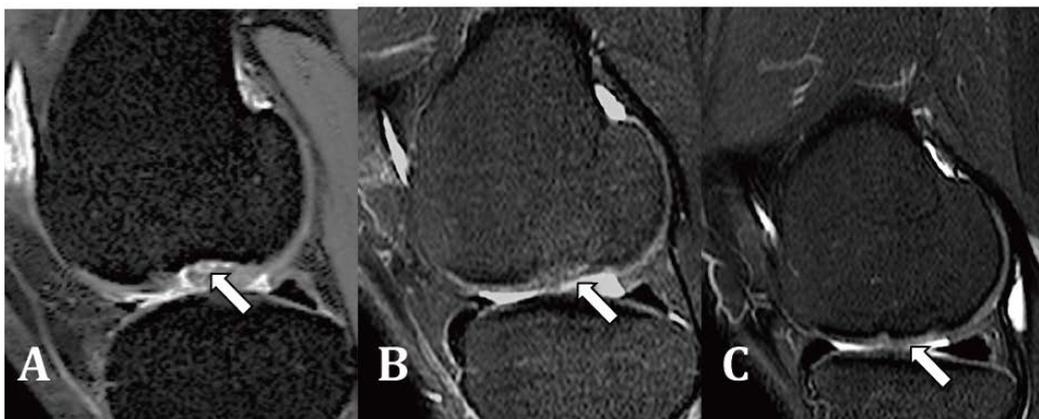


Figure 1. MRI - Sagittal FS T2 weighted image: A) Database evaluation: There is a defective osseous site in the medial femoral condyle with a bone fragment detached from the native underlying bone by a linear hyperintense image (unstable fragment). B) MRI follow-up after first year of surgery shows the chondral surface after graft harvesting with slight T2 hyperintensity in the medulla and with no definite cortical margin of the osteochondral fragment. C) Two-year follow-up showed decreased T2 signal in the subchondral medulla, better definition of the cortical margins, and leveling of the surface without chondral erosions (arrows)

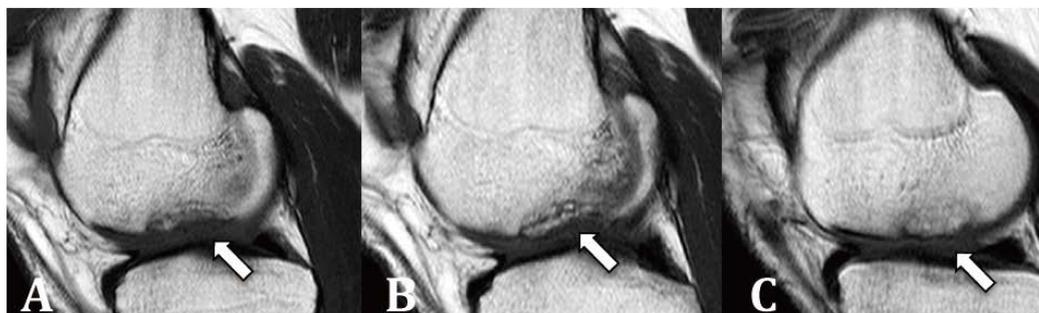


Figure 2. MRI Sagittal T1 weighted image: A) Database evaluation: Bony depression and a low signal lesion in the lateral femoral condyle (arrow). One-year follow-up (B) and 2-year follow-up (C) after mosaicplasty: substitution of the osteochondral lesion by a repairing tissue consistent with normal medulla and progressive restoring of the osteocartilaginous contour



Figure 3. Coronal FS T2 weighted image: A) Database evaluation: Osteochondral lesion with unstable fragment in the lateral aspect of the medial femoral condyle. B) and C) Respectively 1 and 2 years after mosaicplasty, demonstrate the healing progression, showing engraftment and leveling of the chondral surface (arrow).

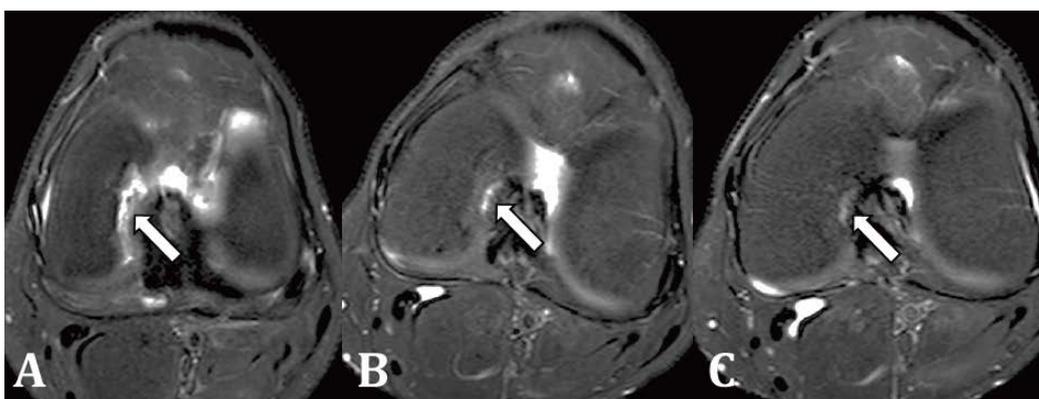


Figure 4. Axial FS T2 weighted image: A) Early osteochondral lesion (arrow). B) and C) Follow-up MRIs 1 and 2-year period after mosaicplasty, showing progressive filling of the chondral defect and leveling of the articular surface

3. Discussion

OCD is a disease with uncertain etiology. Despite its controversial origin, the mechanical or traumatic theory remains the most accepted cause. MRI is the modality of choice for diagnosis, and when joined with clinical status, can guide treatment management [5].

ICRS classified OCD based in two criteria: depth of the lesion and subchondral bone involvement, being graded as: Grade 1 (superficial fissure); Grade 2 (fissures or defects with less than 50% of the cartilage thickness); Grade 3 (fissure or defect with more than 50% of cartilage thickness); and Grade 4 (full thickness fissure or defect, reaching subchondral bone) [6].

Osteochondral autograft transplantation (OATS), or mosaicplasty, is one of the surgical options to repair focal cartilage lesions. Small cylindrical plugs of bone and cartilage (graft) are taken from a non-weight-bearing surface, usually the margin of the femoral condyle or trochlea, and transplanted to the weight-bearing surface of the joint [8].

MRI is an excellent noninvasive method to assess the articular surface and monitor post-surgical integration of both cartilage and bone [9]. MRI is useful to show graft incorporation. Eventually, complications might be identified, such as fluid signal at the graft interface, surrounding bony marrow edema, chondral defects or delamination, and also subchondral cystic changes, osteonecrosis or osteoarthritis [8].

In an ideal OATS procedure, osteochondral plugs should be perfectly even to the native cartilage and perpendicular to the articular surface. MRI can further provide information about leveling, engraftment, congruence and repair tissue [8].

Outcomes of osteochondral transplantation are better in young patients (<40 years), small lesions (<2cm³), and when there is reasonable implantation of the graft [9].

In the first four weeks after surgery, graft plugs and the adjacent bone marrow exhibit hyperintense signal on T2-weighted sequences. About 12 months later, bone marrow should have normal signal. Edema persistence after this period may be related to graft failure or inappropriate incorporation. MOCART scoring system (MR Observations of Cartilage Tissue Repair) is an efficient and reproducible method of graft evaluation, enabling objectivity on graft follow-up and comparisons between multicenter studies [10].

Unsatisfactory results of OATS include: graft failure followed by delamination of cartilage, cartilage hypertrophy, and infection [11]. Delamination refers to the osteochondral plug release in the joint after fluid infiltration around the graft. Hypertrophy of the graft may occur from 3 to 7 months after the procedure and its

reported incidence ranges from 10 to 63% of cases. Depending on the severity of complications, reoperation for debridement may be required, and in cases of delamination, a new transplant procedure may be warranted [11].

We presented a typical case of knee OCD following repetitive trauma, with good surgical treatment outcome depicted by MRI. MRI is currently the preferred method for the diagnosis and monitoring of OCD. Healing evaluation after mosaicplasty allows appreciation of the osteochondral defect filling and the evaluation of the integration of the repaired tissue to native bone. Therefore, radiologists should be aware of the growing role for MRI in osteochondral autograft transplantation follow-up. The radiologist needs to be prepared to recognize and to describe the osteochondral graft positioning and signs of graft integration, helping to differentiate between a failed or a successful procedure.

Disclosures

Nothing to disclose.

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