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MOSAICPLASTY - A TREATMENT FOR OSTEOCHONDRAL DEFECTS IN THE PATELLO FEMORAL JOINT

Orthopaedics

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ABSTRACT

Osteochondritis dissecans (OCD) primarily affects subchondral bone. Multiple drilling, implant fixation or autogenous osteochondral grafts are reported as treatment options. The use of autologous osteochondral grafts (mosaicplasty) to repair articular cartilage defects is an established technique. Articular cartilage damage in an adult knee, if left untreated, will proceed to degenerative osteoarthritis and is a serious cause of disability and loss of function in an individual. Surgical cartilage repair of an osteochondral defect can give them significant relief from symptoms and preserve the functional life of the joint. A patient with a cartilage defect in the knee joint was treated by mosaicplasty in this study.

KEYWORDS

OCD, Mosaicplasty, Osteochondral defects, knee joint, osteochondral grafting.

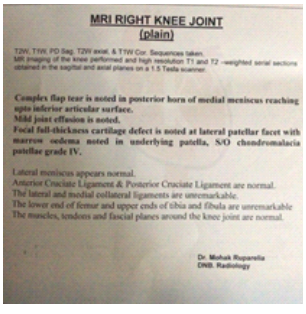
INTRODUCTION:

Articular cartilage lesions are a common problem and 63% of knees have these lesions at arthroscopy. Five percent are in patients less than 40 years old and in the form of full–thickness cartilage defects[1]. Large amount of patients are diagnosed with secondary and early onset primary OA, as a result of articular cartilage injury. Presenting symptoms include severe pain, swelling and clicking of joints. Often these cases are due to misdiagnosed and poor management of predisposing conditions like trauma etc.,. Surgical modalities such as abrasion arthroplasty, drilling and microfracture have been described [24]. Drilling which may increase the blood supply to the fragment increases the recovery potential of osteochondral fragment .But development of autologous chondrocyte implantation (ACI) has shown the production of hyaline or hyaline-like cartilage in the treatment of symptomatic articular cartilage injuries[5-8], leading to improved function in the long-term.

MATERIALS AND METHODS:

A 45 year old male patient with complaints of knee pain, sensation of burning inside the knee, difficulty in stair climbing and descending, and difficulty in performing daily activities presented to our OPD. On general examination, he had a normal alignment of both legs. Clinical examination of the knee revealed patellofemoral crepitus during a limited range of movement of 0-50 degrees. Patellar tracking, ligaments and gait were satisfactory. Haematological results were under normal limits. Pre-operative functional assessment revealed a modified Cincinnati score[9] 28 out of 100. Defect located in the femoral condyles on MRI was diagnosed. According to the classification of OCD lesions by the International Cartilage Repair Society (ICRS), ICRS-OCD I is a stable lesion with a continuous but softened area covered by intact articular cartilage. ICRS-OCD II is classified as a stable lesion with partial cartilage discontinuity when probed and ICRS-OCD III is classified as an unstable lesion with complete cartilage discontinuity, but without dislocated fragment. He was planned for autologous chondrocyte implantation (ACI) after anaesthesia fitness.

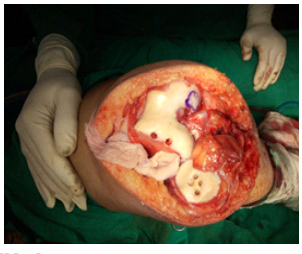
He was taken in for surgery with open arthrotomy of the knee joint, Multiple drill hole with the help of K wire done and changed to the width of lesion, usually 10 mm depth, 1 mm wide, and the space between each drill was 3 mm. Mosaicplasty was performed in the lesion area by osteochondral autograft plugs an average of 2. Osteochondral plug diameter was 6 mm and depth was 20 mm was used. Post operatively, knee was immobilized for initial 3 weeks and knee bending was started in 1 week, Later she was mobilized after initial 3 weeks with partial weight bearing and later progressed to full weight in 6 weeks in a gradual manner. Patient was followed up with regular radiographs and MRI after 6 weeks Ridge and osteophyte formation, flattening or squaring of the femoral condyle and joint space narrowing were also assessed during follow up examination and radiological investigation. The patient was evaluated clinically using the Lysholm knee score[11] grading the patient as excellent, good, fair and poor. MRI examination at the follow-up visit revealed that congruency was restored without any signs of fissuring or delamination.



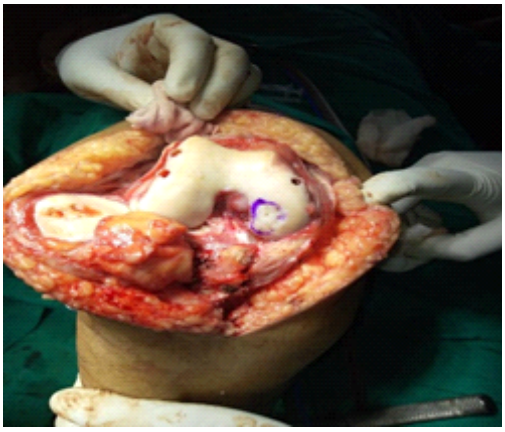
MRI Report



Intra op image of osteochondral grafting



Multiple drill holes



Cartilage defect marked with marker



Hollow Mill

RESULT:

Patient at final follow up had good outcome according to Lysholm Knee Score Moreover, during follow up MRIs did not reveal any developing intra-articular problems except the treated pathology. Although osteochondral graft integration was almost complete in last follow up MRI of the patient, it was observed that the gap between the fixated fragment and subchondral bone was not completely filled, but the integrity of the joint surface was adequate. In addition, it was found that the regions, where osteochondral grafts had been harvested, were filled with bone.

DISCUSSION:

Autologous osteochondral grafting (mosaicplasty) was first proposed as a treatment and popularised by Hangody et al[17].He reported 91% excellent and good outcomes in a total of 57 patients in age group of less than 45 years for a 3 year follow up period with osteochondral lesions of 1–8.5 cm^2 in size[18-22]. It is being applied in an effort to reconstruct the affected articular surface with properties similar to those of hyaline cartilage. Primary Osteoarthritis (OA) of the knee increases with age throughout the human race and is commonly encountered by many clinicians in patients over 50 years of age. Many of these patients become candidates for Total Knee Replacement. Microfracture is considered as the first line treatment for osteochondral defects of the knee[12], providing symptomatic relief in the short-term and with rapid deterioration in patient function thereafter[13]. Fixation by bioabsorbable screw or Herbert screw, autologous chondrocyte transplantation and nowadays osteochondral autograft transplantation (mosaicplasty) are the modalities available for osteochondral defects. Established limitations of the technique include technical difficulty, donor site morbidity, limited amount of donor tissue, poor lateral tissue integration with native tissue, chondrocyte death from osteochondral plug impaction and the great difficulty in trying to recreate the smooth articular surface of the knee joint when fitting the plugs into the OCD. mosaicplasty has been show to produce islands of mature functioning hyaline articular cartilage surrounded by Fibro-cartilage filling the margins around the plugs, Osteochondral allograft is another treatment option. Because it has an advantage of grafting large defects, the disadvantage includes transmission of disease with an added adverse effects of preservation techniques on chondrocyte viability. The cost and tissue availability also limits the use of it[14-16]. It is being debated whether the clinical results of mosaicplasty affected by age of the patient. Kish et al[23] and Marracci et al[24] reported better results in younger patients. However, Chow et al[25] said that patient's age is not a limiting factor for mosaicplasty and even found that even older patients with an isolated chondral defect and a stable joint without osteoarthritic changes benefits from mosaicplasty.

The major advantage of using mosaicplasty for osteochondral defect is mosaicplasty never depend on a laboratory for procedures of chondrocyte proliferation, matrix implantation or mesenchymal cell proliferation. The hyaline cartilage is harvested from the donor site of the same knee joint. Thus, mosaicplasty is a safe, one–stage and low-cost procedure having no risk of disease transmission or immunological reaction to the graft. This also can be applied as minimally invasive arthroscopically or a mini-incision arthrotomy. The major challenge in repair of osteochondral defects is to maintain joint congruency. Chow et al mentioned graft harvesting and insertion should be perpendicular to the articular surface and a wrong angle would compromise the end result. Marcacci et al also supported this and said that in their 3 cases which failed, they had problems with osteointegration and surface matching. Jakob et al also stressed the importance of surface congruity. They pointed out the challenge for the lesions of greater than 4 cm^2 for which they mentioned certain angle alterations in order to ensure that the graft conformed to the local radius of the joint curvature. Hangody and Füles also supported the importance of surface match between the graft and recipient site[20-25]. We attribute the same good result to the importance of surface match between recipient and graft site.

To assess the functional outcome and integrity of joint surface, Arthroscopy would be the best modality but, keeping in mind of the patients factor. MRI is a non invasive method for the assessment of articular cartilage abnormalities. It can be used to examine both the degree to which the defect is filled with repair tissue and the integration of repair tissue with adjacent tissues. Additionally, MRI can be used to evaluate the subchondral bone plate and marrow beneath the repair site. Integration of the cartilage repair tissue must be considered in conjuction with the incorporation of the osseous portion of the graft into the bone. An interface that consists of fluid-like signal intensity suggests that integration between the repair tissue and the native cartilage is incomplete and a fissure may exist.

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