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BONE MARROW ASPIRATE CONCENTRATE INJECTION WITH ARTHROSCOPIC REMOVAL OF LOOSE BODIES

Orthopaedics

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ABSTRACT

osteochondritis dessicans is an idiopathic disorder due to subchondral bone necrosis that generally affects the medial femoral condyle as well as above lying cartilage.[1]the incidence of patients with OCD of the knee aged 6-19 years was 9.5per 1,00,000 overall and 15.4 and 3.3 per 1,00,000 for male and female patients, respectively. [1]

The aetiology has been hypothesized as being multifactorial and could either be due to trauma or microtrauma along with metabolic, endocrine and genetic disorders leading to subchondral necrosis.

The typical treatment for stable lesions that fail nonoperative management, or have factors associated with poor healing, is trans-articular or retroarticular drilling.[2]

Bone marrow aspiration concentrate is a source of mesenchymal cells and growth factors – mesenchymal cells can differentiate into chondrocytes or osteocytes. Moreover, this process being a safe procedure, the morbidity is less. Use of BMAC has been applied in treatment of osteoarthritis, fracture non-unions, and full thickness osteochondral defects.

This article is a summation of the procedure we followed with pre op and intra operative pictures of how the BMAC was injected using an arthroscopic method.

KEYWORDS

INTRODUCTION: -

Osteocondritis dessicans is an idiopathic disease which is common in middle aged men due to a subchondral bone necrosis that affects the medial femoral condyle as well as the above lying cartilage.[3] Osteochondritis dissecans (OCD) is a joint condition in which bone underneath the cartilage loses its vitality owing to a lack of blood flow. This disease mainly affects young people practicing sports activities, and the elbow is the second-most affected site in the body (after the knee).

Indications for surgical treatment include the presence of loose bodies, mechanical symptoms (eg., articular locking), unstable lesions, and stable lesions still symptomatic after 6 months of conservative management.[4]

Several treatment techniques have been described for OCD, such as debridement, drilling, microfracture, fragment fixation, osteochondral autografting or allografting, and autologous chondrocyte implantation (ACI).[5] These techniques show well-known positive aspects but also some important drawbacks: (1) the lack of restoration of high-quality cartilaginous tissue (i.e., for microfracture), (2) the high costs and patient discomfort (i.e., ACI requires 2-step surgery and a dedicated laboratory for the cell culture), (3) donor site morbidity attributed to the plug's harvest from a healthy joint,[6] and (4) limited donor availability (i.e., for autologous or homologous osteochondral grafts). Recent acquisitions in the field of regenerative medicine have demonstrated that bone marrow–derived cells (BMDCs) on a scaffold are able to replicate and regenerate bone as well as cartilaginous tissue, without any need for laboratory treatment.[7,8,9,10]

BMDC transplantation was proposed and successfully performed for the treatment of knee and ankle OCD. Owing to the multipotential ability of bone marrow nucleated cells, in association with platelet-rich fibrin (PRF), the osteochondral layer may regenerate and show properties similar to those of the original hyaline cartilage. Bone marrow stem cells were first isolated from the bone marrow, and the potency of MSCs is currently being employed in the techniques of marrow stimulation for symptomatic small chondral defects. If bone marrow fills a cartilage defect either as a result of marrow stimulation for chondral defects or the course of the spontaneous repair of osteochondral defects, a bone marrow clot forms within the cartilage defect. Pluripotent MSCs from the subchondral bone marrow are subsequently mobilized, migrate into the defect filled with the clot, and differentiate into chondrocytes and osteoblasts. Over time, they form a fibrocartilaginous repair tissue in the defect and close the connection with the subchondral bone.

Bone marrow stem cells have been successfully transformed into several cell types among which chondrocytes, osteoblasts, adipocytes, angioblasts [9], and neural cells [10], to potentially be used to treat a variety of illnesses [11–14]. In the orthopaedic field, additional application of a bone marrow aspirate (BMA) to the procedure of marrow stimulation has been recently studied, since the bone marrow itself is both a source of MSCs, providing a cell population capable of chondrogenesis and of various growth factors stimulating cartilage repair [15–18].

This case report is to describe the surgical technique and clinical outcome of the patient at a mean follow up of 6 months. The study was approved by the institutional review board and the patient was provided with an informed consent.

CASE REPORT :-

A 34 year old man presented to our institution with complains of right sided knee pain since the past 2 months which was aggrevated in the past 2 weeks. The pain was gradual in onset and dull aching type and was associated with locking.

The patient presented to us with a inability to extend the knee fully and the knee in 10 degrees of flexion.

The pain was not radiating type, and there was no history of drug intake, or history of fever thereby ruling out infectious arthritis.

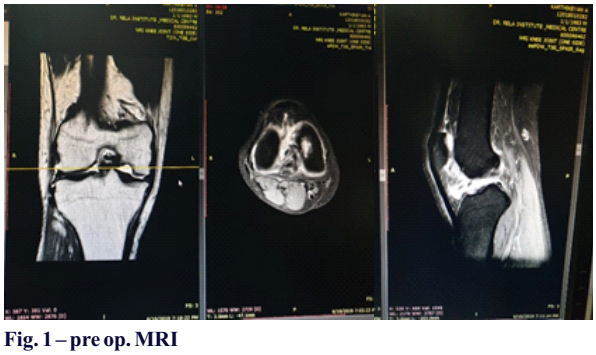

Fig. 1 – pre op. MRI

On examining the patient, there was tenderness noted in the posterior and medial joint line with inability to extend. The range of motion for the patient was 10 degrees to 95 degrees beyond which, the patient complained of pain.

There was no warmth noted and the special tests were performed.

The drawer's for the patient were negative as well as Slokam's and Lachman's thus ruling out instability of the knee joint.

However, Mcmurray's test couldn't be completely assessed and thus the patient was advised to take an x ray.

The x ray showed two loose bodies one which was visible in the AP view and the other one which was visible in the lateral one showing the position being the posterior. Each loose body was about 1x 2 cm in size. Patient was then advised to go for an MRI scan where the status of the menisci, and internal ligamentous structures was assessed and a chondral defect was identified in the medial condyle of the femur which was about 2x2cm in size. Hence, we decided to go for a definitive regenerative procedure for the patient to relive hi of his symptoms and regain near normal range of motion and attain a pain free mobile joint.

With appropriate pre-operative planning and consent from the patient and clearance from the department of anaesthesia, patient was taken up for surgery.

While patient in supine position and the right knee free for movement during intra-op mobilisation, standard supero-lateral and supero-medial portals were made and a diagnostic arthroscopy was performed.

The findings in diagnostic arthroscopy were as follows :-

1. Later gutter was free
2. Medial gutter was free
3. Suprapatellar pouch and infrapatellar pouch was free
4. Loose body found in the anterior and the posterior region of the knee joint.
5. Examination of the medial and lateral menisci was found to be normal, with no tear
6. The anterior cruciate ligament and the posterior cruciate ligament was identified and no abnormality detected.
7. The popliteus tendon was visualised as well
8. However, a defect of size 2 x 2cm was found in the inferior portion of the medial condyle which was devoid of the cartilage as a whole in the affected region.

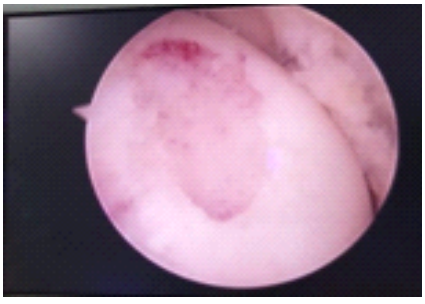

Fig. 2 – osteochondral defect over the medial femoral condyle

The procedure then revolved around excision of the loose body and freshening the chondral defect.

The loose bodies were identified and excised using graspers and microfractures were created in the osteochondral defect site.

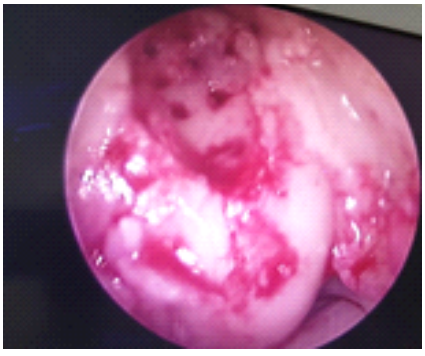

fig. 3 – preparing the raw surface for BMAC

Meanwhile this was performed, a team of a surgeon and an assistant proceeded for the bone marrow to be aspirated from the iliac crest after localising it on the c arm.

About 45 ml of bone marrow was aspirated from the iliac bone in a pre-heparinised syringe and the aspirate was then placed in a TRICELL BMC PROCESS DISPOSABLE KIT.

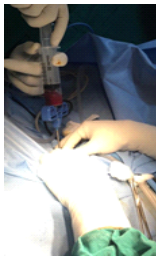

Fig. 4 – bone marrow aspiration from the iliac crest

The chamber we used for the procedure was provided by the company and the following procedure was followed for the same:-

1. Bone marrow aspirate transferred to the kit.
2. Unscrew the cap of the PD and connect the syringe to built-in luer-lock connection.
3. The anticoagulant is then transferred to the PD.

The following figure shows the exact procedure and the sterile method of transfer to the syringe.

Fig. 5 – procedure steps for processing BMAC

After the syringe was filled with the concentrate, the concentrate was filled with a 2 component fibrin sealant material and was injected in to the joint and filled the defect.

Following are the pictures showing the procedure.

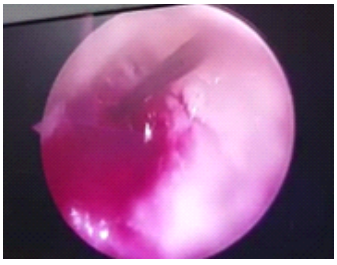

Fig. 6 – after bone marrow aspirate processing and fibrin sealant placed on the defect.

The wound was then closed and the limb was immobilised after a sterile dressing was applied.

Post operative protocol :

The patient was placed in a long knee brace for 2 days and after that the patient was allowed controlled 30 degrees of knee flexion with partial weight bearing with walker support.

At the end of 14 days the sutures were removed and the wound was healthy.

At the end of two months the patient was allowed 90 degrees of flexion and the patient was pain free and was thus relieved of symptoms.

This case report is consistent with the rare case report in the A MODERN TREATMENT OF BILATERAL OSTEOCHONDRITIS DISSECANS IN KNEES: FROM A CASE REPORT TO LITERATURE'S REVIEW by Marco Corzani for healing of the osteochondral defects.

Eleven studies were considered. Of these, 5 were prospective studies, 1 was a retrospective study, 2 were case series, and 3 were case reports. Three comparative studies (2 with level 2 evidence, 1 with level 3 evidence) were found in our search; noneof them were randomized. Three studies investigated the clinical efficacy of BMAC in the treatment of osteoarthritis, and 8 studies evaluated the efficacy of BMAC on focal cartilage injuries. All 3 studies regarding osteoarthritis and all 8 studies regarding focal chondral defects reported good to excellent overall outcomes with the use of BMAC. [19]

Conclusion :- the treatment of osteochondral bone defects primarily using bone marrow concentrate is an effective method to give the patient a pain free joint and help in healing of the joint surface. However, this method stills needs some randomised control trials to prve its efficacy on a larger scale. Here our motive was to present the idea at its primary level which works on a subjective aspect of the patient.

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