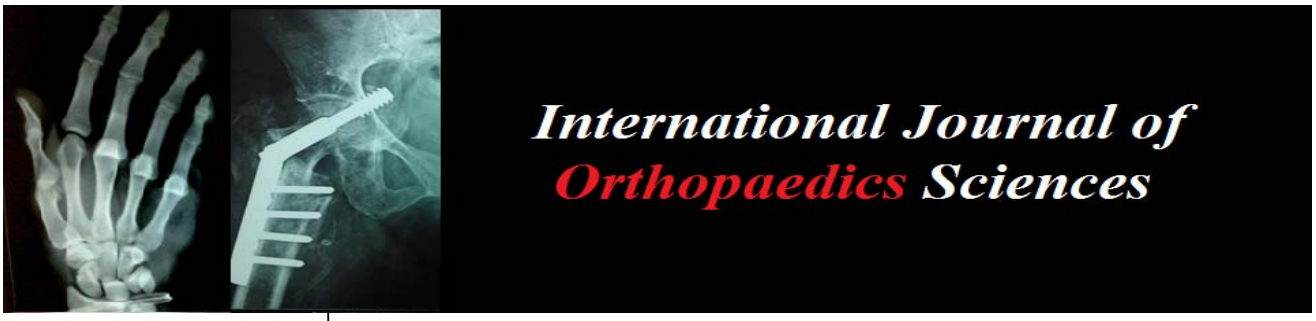

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Combined autologous chondrocyte implantation (ACI) and mosaicplasty for "Kissing" osteochondral defects of the patellofemoral joint

S Vijayan, G Bentley

Abstract
Bipolar "kissing" lesions involving the patellofemoral joint are extremely rare and difficult-to-treat. We report the 10-year clinical and arthroscopic outcome of a patient with longstanding chronic anterior knee pain, as a result of "kissing" osteochondral defects of the patella and trochlea groove of the knee. The patient had undergone previously failed treatment and was managed with simultaneous salvage patellar autologous chondrocyte implantation (ACI) with porcine type I/III collagen (chondrogide) membrane and trochlea mosaicplasty. Long-term clinical success was achieved using this method, illustrating the effective use of trochlea mosaicplasty for re-creating the anatomical contour of the joint and therefore reducing the likelihood of disrupting the opposing patellar ACI. This is the first reported case of such a technique being used to treat "kissing" lesions of the patellofemoral joint.

Keywords: knee, cartilage, ACI, mosaicplasty, patello-femoral joint, cartilage transplantation

1. Introduction
Cartilaginous lesions of the knee are common, causing pain, swelling and disability[1]. If left untreated they can progress to 'early-onset' osteoarthritis[2]. Articular cartilage bipolar "kissing" lesions of the patellofemoral joint (PFJ) are extremely difficult to treat and reports remain sparse [3].

In this case, autologous chondrocyte implantation (ACI) with a porcine type I/III collagen ('Chondrogide') membrane (Geistlich Biomaterials, Wolhusen, Switzerland) was performed for an osteochondral lesion of the patella, with a coincidental finding of a kissing defect in the opposing patello-femoral (trochlea) groove, which was successfully managed with simultaneous trochlea mosaicplasty in order to provide a rapid structural surface repair, thus fully protecting the patellar ACI. This is the first reported case of such a procedure in managing a kissing lesion of the PFJ.

Case Report
A 23 year-old male presented to his local Orthopaedic outpatient department complaining of a long history of progressive and chronic bilateral anterior knee pain since his teenage years. He complained the left side was worse than the right. Radiographic imaging and magnetic resonance imaging of the left knee did not highlight any gross abnormalities or patello-femoral mal-alignment. Subsequently, the patient was managed with physiotherapy for one year, and was discharged from the clinic. Complaining of persistent pain in the left knee, he presented to the department again, and a diagnostic arthroscopy was undertaken given the chronic nature of his symptoms. Arthroscopy showed chondromalacic changes of his left patella with early onset osteoarthritis of the PFJ joint. Therefore cartilaginous shaving and abrasion chondroplasty of the osteochondral defect in his left patella was undertaken. Despite treatment, he remained in severe pain and the patient was then referred to our tertiary referral unit.

On general examination, he had a normal alignment of both legs and marked wasting of the left quadriceps. Clinical examination of the left knee revealed patellofemoral crepitus during a limited range of movement of 0-50 degrees. Patellar tracking, ligaments and gait were satisfactory. Haematological and metabolic results were unremarkable. Pre-operative functional assessment revealed a modified Cincinnati score [4] (28 out of 100), Bentley

functional score [5] (4 out of 5) and 9 out of 10 on the visual analogue pain score (VAS) scale. In view of his symptoms, young age and previously failed debridement and abrasion chondroplasty, it was decided to undertake a diagnostic arthroscopy to assess the state of the joint, with a view to performing first-stage ACI.

Arthroscopy revealed an osteochondral defect of the articular cartilage in the left patella approximately 1.5x1.5cm in diameter (figure 1). Cartilage from the margin of the lateral femoral condyle was harvested and sent for laboratory culture (Verigen/Genzyme, Copenhagen, Denmark). Second-stage ACI procedure was performed 6 weeks later via a medial arthrotomy incision. On operative exposure, an osteochondral defect of the trochlea measuring $2cm^2$ post-debridement was identified. It was decided to address the trochlea lesion first with mosaicplasty, whereby three 4.5mm diameter osteochondral plugs taken from the margin of the intercondylar notch were gently impacted into the defect. Subsequently, 10 million expanded cultured chondrocytes were injected under a porcine type I/III collagen membrane, used to cover the patella lesion (figure 2). The knee was put through a gentle range of motion to ensure graft stability. Post-operatively, the leg was rested and elevated for 12 hours, with commencement of active foot movement and quadriceps thereafter. The patient was allowed to mobilise at 24 hours post-operatively, fully weight-bearing in a light-weight cylinder cast, to be removed at 2 weeks and underwent an intensive 8 week protected low-impact physiotherapy programme. Modified Cincinnati, Bentley and VAS scores were taken at 6, 12 and 24 months post-operatively. The respective scores were Modified Cincinnati 43, 62, 67, Bentley 3, 2, 2 and VAS scores were 3, 2 and 2.

Ten years post-operatively, the patient presented to our unit complaining of mild anterior knee pain. Given his prolonged clinical history, young age and graft longevity, investigatory arthroscopy was performed, which demonstrated an intact looking patella (figure 3) and trochlea (figure 4) graft site, which was stable, adequately filled and firm to probing. The knee was washed out and the patient returned to full activities. His current modified Cincinatti Score is 87, Bentley 1 and Visual Analogue Score 0.

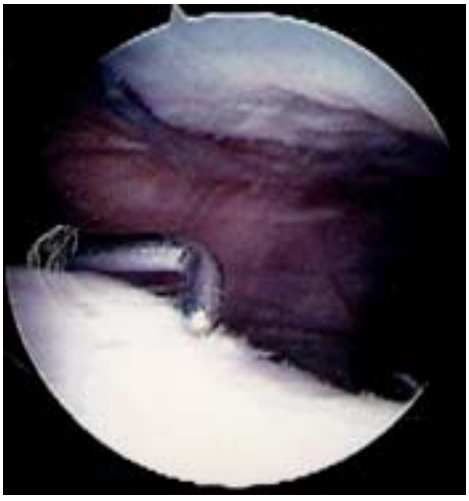

Fig 1: Arthroscopic view of the left knee showing erosion of articular cartilage to subchondral bone of the patella and opposing trochlea prior to stage 1 ACI

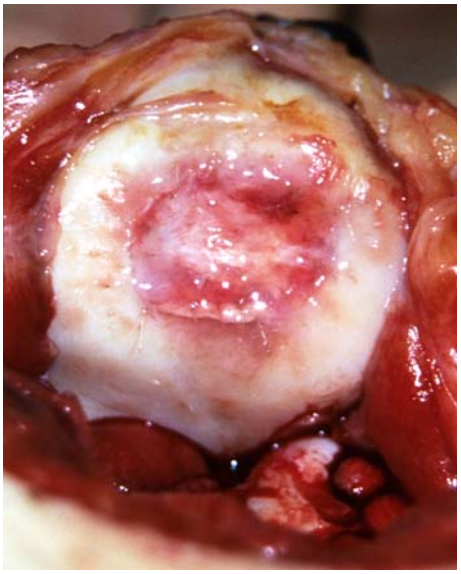

Fig 2: Intra-operative photograph demonstrating ACI of the left patella with a 'chondrogide' membrane and an opposing mosaicplasty of the trochlea

Fig 3: Arthroscopic view of left patella 10 years post-operatively showing complete healing of the patellar cartilage defect treated with ACI

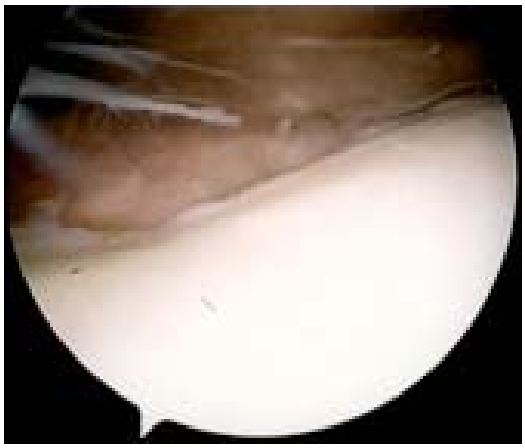

Fig 4: Arthroscopic view of left trochlea 10 years post–operatively showing incorporation of the mosaicplasty plugs to native tissue

2. Discussion

Patella and trochlea lesions are commonly associated with patella dislocation, maltracking of the PFJ, with the natural concave structure of the trochlea and median longituidinal ridge of the patella making reconstruction of both articular surfaces extremely challenging [3].

Microfracture is considered as the first line treatment for osteochondral defects of the knee [6], providing symptomatic relief in the short-term and with rapid deterioration in patient function thereafter [7]. ACI secondary to failed bone marrow stimulation has shown acceptable results [8], however it is suggested that primary microfracture can cause damage to the sub-chondral bone plate, reducing the likehood of success with secondary ACI [9]. Mosaicplasty has shown short-term satisfactory results, but regenerative tissue made has been shown to deteriorate, resulting in poor clinical outcomes [7, 10]. ACI has shown good to excellent results in the treatment of isolated patella and trochlea lesions of the knee, and shown to produce hyaline cartilage over time [7, 10].

Bipolar "kissing lesions" of the PFJ, have been shown to do less well following ACI, when compared to other regions of the knee [11, 12]. It has been suggested that smaller chondral and osteochondral defects of the femoral condyles are better suited for microfracture or mosaicplasty [7, 10], as opposed to larger lesions including those of the patella, which are better treated with ACI [7, 10]. For lesions of the trochlea, it has been suggested that plugs harvested from the intercondylar notch may give a greater anatomical match given that both surfaces are concave [13].

In this case we demonstrated the successful treatment of "kissing" osteochondral lesions on the trochlea by mosaicplasty and ACI on the patella. We highlight the need for a detailed examination of the knee joint, thereby identifying any co-existing lesions or patellar maltracking that can be corrected before or during ACI to avoid uneven stress on the PFJ and patella ACI graft. This was appropriate given the "kissing" nature of both lesions, where if the PFJ lesion is left untreated, there is a risk of continued anterior knee pain, and increased likelihood of disrupting the ACI graft site on the opposing patella.

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