Arthroscopic Technique for the Treatment of Patellar Chondral Lesions With the Patient in the Supine Position

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Abstract: We describe an arthroscopic approach for the treatment of patellar chondral lesions with the patient in the supine position. This approach can be used to perform certain procedures such as matrix autologous chondrocyte implantation and autologous matrix–induced chondrogenesis. It is possible to perform these arthroscopic techniques working at an angle perpendicular to the patellar joint surface. First, with the patient in the supine position, arthroscopic longitudinal sectioning of the lateral patellar retinaculum is performed, and the patella is reverted with the help of a Codivilla forceps. It is then possible to place the chondral surface perpendicular to the floor, and it can be accessed directly through a lateral parapatellar portal. Short-term follow-up has shown the benignity of opening the patellar retinaculum. This procedure reduces morbidity compared with the traditional open surgery.

The treatment of cartilage lesions in the patellofemoral compartment is controversial. A recent study showed poor results and a significant rate of complications related to standard techniques and a high rate of revision surgery. The use of matrix-assisted autologous chondrocyte implantation (MACI) has acquired great popularity over the past few years for the treatment of chondral lesions in the knee joint. The use of collagen or hyaluronic acid membranes combined with microfractures (autologous matrix–induced chondrogenesis [AMIC]) is widening the treatment options for these types of lesions. Other biological matrix–based techniques using liquid application work in a similar manner. The use of these matrixes in a single procedure has facilitated the arthroscopic application of both the MACI and AMIC techniques. Both techniques have been used for the treatment of femoral condylar or, less frequently, tibial plateau lesions. There are very few reports on the treatment of patellar lesions using these techniques arthroscopically.

We describe an arthroscopic approach to the patella with the patient lying in the supine position. This approach provides good access to the patellar joint surface, allowing the use of both AMIC and MACI techniques arthroscopically.

Techniques

The technique’s feasibility was tested on 4 cadaveric specimens in which a chondral lesion had been artificially in the lateral patellar facet joint. The procedure was then performed in clinical cases in which an AMIC technique with collagen-type Chondro-Gide membrane (Geistlich Pharma, Wolhusen, Switzerland) or a liquid membrane, BST-CarGel (Piramal Pharma Solutions, Mumbai, India), was used to treat lesions at the patellar chondral surface.

Collagen Membrane Surgical Technique

The patient is positioned in the standard arthroscopic supine position (Video 1, Fig 1, Table 1). The ordinary anterolateral and anteromedial portals are used. An initial assessment of the size and location of the lesion is made. Then, the lateral patellar expansion is fully opened by use of radiofrequency from an accessory superolateral portal. A full opening of the patellar expansion allows the vertical eversion of the patella, thus exposing its articular surface. The vertical position is secured with a Codivilla forceps. The lateral facet joint
(which is the joint most often affected) is then approached perpendicularly through a lateral para-patellar fourth portal (Fig 1). The fibrous tissue of the lesion is debrided and the unstable cartilage is removed with curettes and a motorized synoviotome. Microfractures are then made using the technique and instrumentation designed by Steadman et al. The chondral defect is measured with a gauge. By use of mosaicplasty trephines (Smith & Nephew, Andover, MA), a patch with the appropriate measurements to cover the defect is obtained from a Chondro-Gide type I/III collagen membrane, as described previously. We recommend that the patch be cut 1 mm smaller than the lesion, anticipating that it will expand slightly when in contact with the moisture of the joint. The saline solution irrigation is interrupted, and the lesion bed is dried. First, suction is used to extract most of the remaining saline solution; then, the lesion itself is carefully dried with gauze or a small Codman 13 × 13 mm sponge (Cottonoid, Johnson & Johnson, New Brunswick, NJ). Tisucol biological fibrin glue is applied on the lesion bed, and the membrane is introduced by use of a mosaicplasty cannula. This facilitates its introduction in the joint and its correct placement over the desired area on the lesion. An arthroscopy hook is used to stretch the membrane and cover the full extension of the chondral defect. Pressure should be applied over the implanted membrane at least for 5 to 10 minutes. This can be achieved using gauged instruments or using a Foley catheter balloon, which can be inflated inside the joint, pressurizing the membrane over the lesion as described previously; although this system does not allow for uniform pressure to be placed along the defect, it is sufficient to keep the membrane in place. The membrane stability is then checked by repeated flexion and extension knee movements (Fig 2A). The fibrin biological glue allows us to manipulate the membrane for at least 5 minutes after its application. At this stage, additional fibrin glue can be applied should it be necessary. If necessary, additional patches can be used to cover the entire defect area. The membrane patches can overlap one another, and this does not affect the outcome of the repair. Usually, the lateral retinaculum is left open.

**Table 1. Arthroscopic Treatment of Patellar Chondral Lesions With Patient in Supine Position: Surgical Tips and Steps**

1. Placement of patient in supine position, with thigh secured 10 cm above patella
2. Definition of 4 arthroscopic portals (standard anteromedial and anterolateral, superolateral, and lateral patellar portals)
3. Extended lateral release and eversion of patella with Codivilla forceps
4. Lesion bed preparation with curettes and burr
5. Microfractures using technique of Steadman et al.
6. Measurement and preparation of membrane using mosaicplasty instrumentation
7. Drying of lesion with suction and cotton buds
8. Membrane placement with fibrin glue
9. Precise positioning of membrane with hook
10. Pressurizing with Foley balloon (5 to 10 min)
11. Ability to perform precise adjustment of membrane for 5 to 10 min
12. Assessment of membrane stability with knee flexion and extension

**Fig 1.** Perpendicular approach to lateral patellar facet joint using Codivilla forceps (left knee, with arthroscope in anterolateral portal and instrumentation in lateral patellar portal). (A) Stable sustained eversion. (B) The instrumentation can access the lesion perpendicularly. (C) The lesion bed is dried completely. (D) Focal compression is applied with a Foley catheter.
Liquid Membrane Surgical Technique

Once the patella is vertical and kept stable in that position using a Codivilla forceps, it is possible to perform any articular cartilage repair technique. The main difficulty when using a liquid membrane relates to the effect of gravity. The chitosan-type liquid membrane (BST-CarGel) creates a different electrical polarity that allows molecular attraction and, therefore, adhesion between the membrane and the chondral surface.3-4 It is necessary to slowly and gradually apply the liquid membrane from the upper pole of the lesion, creating a film that finally covers the complete diameter of the chondral defect (Fig 2B). We performed this technique in a cadaveric specimen, together with the repair of 2 concomitant lesions in the external patellar facet joint and in the intercondylar notch.

Discussion

The main advantage of the described technique is that it allows for complete arthroscopic management of most patellar chondral lesions. The treatment of cartilage lesions in the patellofemoral compartment is controversial. There are a number of well-established techniques when treating chondral lesions (Table 2), promoting new cartilage formation (perforations, microfractures), and implanting an allograft or autologous osteochondral graft (mosaicplasty), autologous chondrocyte implant, or patellofemoral joint implant (patellofemoral arthroplasty). The use of collagen or hyaluronic acid membranes combined with microfractures provides a matrix for cellular differentiation. This new technique is known as AMIC.3-4 Other biological matrix-based techniques of liquid application work in a similar manner.5 Autologous chondrocyte implant techniques are effective treatments for chondral and osteochondral lesions,6 but the use of these matrixes in a single procedure has facilitated the arthroscopic application of both the MACI6,7,8 and AMIC techniques.10

There are very few reports on the treatment of patellar lesions using these techniques arthroscopically.12,13,16 The main difficulty when dealing with patellar chondral lesions arthroscopically is the inability to approach the articular surface perpendicularly.3,4,17 We describe an arthroscopic approach to the patella with the patient lying in the supine position. The described procedure avoids the aforementioned limitation, allowing the surgeon to perform the best repair techniques in a fully arthroscopic way, and it is possible to maintain the verticality of the patella without the need for any instruments that might interfere with the different surgical stages when making perforations or microfractures, as has been described previously.13 The arthroscopic approach to the patella is well described,13,16 but this is the first detailed description of an arthroscopic technique to repair the patellar cartilage with the patient in the supine position. Until now, these lesions have been treated through an arthrotomy17,18 or by placing the patient in the prone position.16 Our technique allows the repair of the chondral lesions fully arthroscopically without opening the knee joint. It provides good access to the most common lesions in the external facet joint and in the apex of the patella. Lesions located partially or totally in the medial facet joint may require a conventional arthrotomy.

It is not the aim of this article to compare the results of either technique or to show the clinical outcome of the 4 patients who were operated on with our approach; rather, our aim is to describe our arthroscopic technique in a simple, precise, and reproducible way. Magnetic resonance imaging (MRI) control scans have allowed us.
to confirm the following in the clinical cases: (1) the correct perpendicularity of the microfractures (3-month MRI scans); (2) the stability of the implanted membranes (3- and 6-month MRI scans); and (3) the correct healing of the lateral patellar expansion, not showing any signs of malpositioning (3-month MRI scans).

The lateral patellar expansion is not usually repaired at the end of the procedure. This might cause patellar instability in some patients; however, lateral release is often performed in patients with other indications without further problems, and no clinical signs of patellar instability were found at 3 and 6 months' follow-up. If the patient has clear signs of patellar laxity, the surgeon should consider repairing the retinaculum or using another approach.

It is possible to obtain and maintain the verticality of the patella, allowing a perpendicular approach to its articular surface and thus allowing for the application of semi-liquid biological matrices with the patient in the supine position, despite the effect of gravity. This technique could also be used during other procedures such as internal fixation of osteochondral patellar fragments or extensor mechanism realignment procedures in association with a limited arthrotomy (Table 3).19

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