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TECHNICAL NOTE

High lateral portal for sparing the infrapatellar fat-pad during ACL reconstruction

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Summary During arthroscopic ACL reconstruction, intra-articular visualization can be compromised by the interposition of the infrapatellar fat pad (IPFP) between the scope and the notch. In this technical note, we describe our technique of using lateral higher arthroscopic portal, starting arthroscopy with the resection of the ligamentum mucosum and performing the tibial tunnel in 40° of knee flexion to optimise the intra-articular view without IPFP debridement. This technique was performed in 112 consecutive arthroscopic ACL reconstructions and compared to that in the previous 112 cases in which a conventional method was used. The use of this technique was associated with a shorter operative time and no increase in the difficulty in performing associated meniscal procedures.

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Introduction

During arthroscopic ACL reconstruction, intra-articular visualization can be compromised by the interposition of the infrapatellar fat pad (IPFP) between the scope and the notch. In order to allow an adequate view of the notch shaving of the IPFP is often required. However, many recent articles highlight the biochemical function of the IPFP [1] in particular its role as a modulator of the inflammation of the injured knee [2]. In addition, the fat pad participates in the neo-vascularization of the ACL graft [3]. Biomechanically, Bohnsack et al. has found that the resection of IPFP

can influence patellar and knee kinematics [4]. Scarring of the anterior interval changes the mechanics of the anterior structures of the knee and may lead to refractory anterior knee pain [1]. Some studies have shown that the excessive resection of IPFP can have negative consequences on the operated knee [2,4,5]. Therefore, it is important to avoid an excessive resection of this tissue.

In this paper, we describe a technique that uses higher arthroscopic portals [6], resects the ligamentum mucosum and performs the tibial tunnel in 40° of knee flexion to optimise the intra-articular view without IPFP debridement.

Anatomy of infrapatellar fat pad

The IPFP occupies the anterior compartment of the knee and is intra-articular but extra-synovial [7]. Its shape and

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size is variable [8] and its blood supply is ensured by two adjacent arteries communicating through two to three horizontal branches [9]. From its posterior surface, in its middle portion, begins a fold of synovium called the infrapatellar plica or ligamentum mucosum. This extends to the apex of the intercondylar notch [10]. The ligamentum mucosum may appear as a single fibrous band or as a true septum that divides the knee in two distinct compartments medial and lateral [10].

According to Abreu et al. [11] and Broker et al. [12], this plica is found in 50 to 79% of the knees and may or may not be connected to the synovial membrane of the anterior cruciate ligament (Video 1). Abreu et al. [11] in a retrospective MRI study on patients showed that abnormalities of IPFP, such as focal and diffuse edema, tears, scars and synovial proliferation, are more common in knees with torn ACLs than in knees with intact ACLs. This demonstrates its close relationship with the ACL.

Surgical procedure

The surgical technique for ACL reconstruction has been previously described [13]. The correct placement of the arthroscopic portals is crucial for a successful and uncomplicated procedure. We now perform the anterolateral portals as described by Kim et al. [6]. The lateral portal is performed at the highest position possible just off the lateral edge of the patellar tendon and just off the inferior border of the patella (Fig. 1). This position allows the surgeon to avoid the IPFP and ensures an excellent wide view of the intra-articular structures, especially the intercondylar notch (Fig. 2). The anteromedial portal is performed just below the inferior border of the patella and about 4 mm medially to the medial border of the patellar tendon. Once inside the articulation, the first structure we find and resect is the ligamentum mucosum. This is performed with a 90° flexed knee orienting the scope toward the anterior aspect of the notch. When the ligamentum mucosum is released, the IPFP is pushed anteriorly by the pressure of the intrarticular liquid (Video 1).

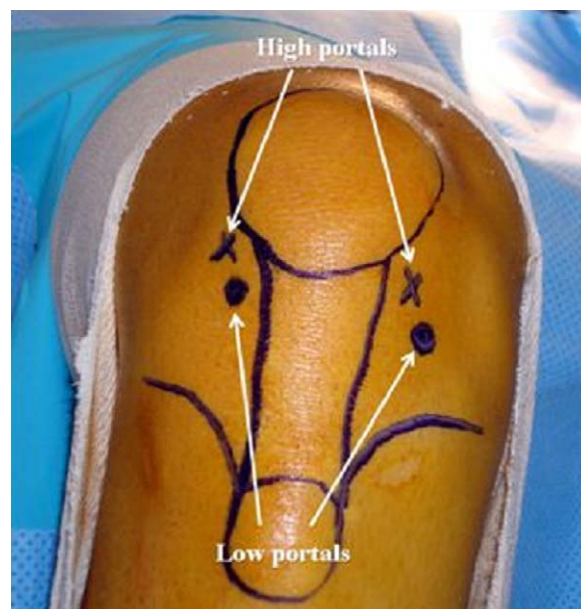


Figure 1 Classic portals and high portals.

The IPFP may also impede adequate visualization when positioning the tibial guide. When placing the tibial guide-aiming hook on the ACL footprint, the arthroscope can enter the IPFP and vision can be reduced. We solve this problem by holding the knee in 40° of flexion (Video 2). This helps to move the IPFP anteriorly with the patellar tendon, taking it away from the arthroscopic view.

This technique was performed in 112 consecutive arthroscopic ACL reconstructions and compared to that in the previous 112 cases in which a conventional method was used.

The ligamentum mucosum was present in 78% of knees. We encountered no particular problems in performing these procedures using the higher portals. The mean operating time using the classical portals were 38,3 mins (min 22, max 63) and 33,2 mins (min 20, max 48) using the modified technique to preserve the IPFP.

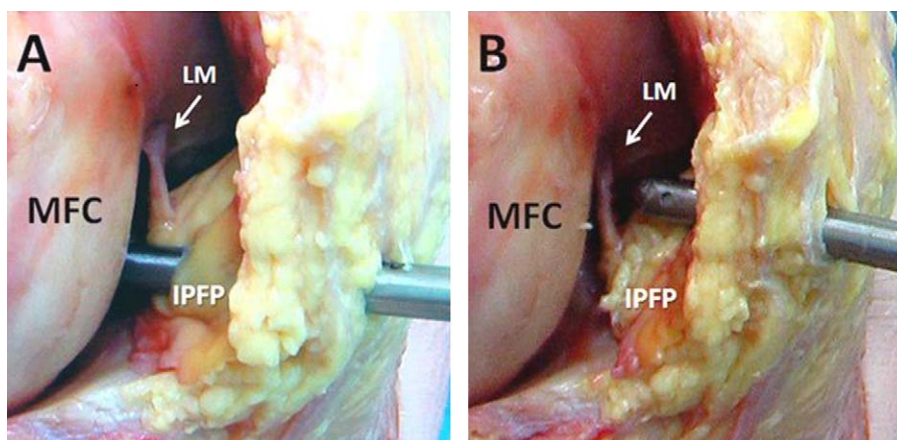


Figure 2 Cadaveric dissection of a left knee. A Classic anteromedial portal: the scope passes through the IPFP, making its resection necessary to adequately visualise the notch. B. A higher portal avoids the IPFP and makes the resection of the ligamentum mucosum easier. MFC: Medial femoral condyle. IPFP: Infra patellar fat pad. LM: Ligamentum mucosum.

Discussion

The classical anterolateral portal has been described as being located approximately 1 cm lateral to the patellar tendon and 1 cm superior to the lateral joint line. Alternatively, it can be just lateral to the patellar tendon and approximately 2 mm above the anterior horn of the lateral meniscus identified by palpating the depression above Gerdy's tubercle and incising just above it [14]. The inferior pole of the patella is commonly used as a vertical landmark for this portal. As advocated by Kim [6], we believe that the best way to avoid the fat pad is to perform a high anterolateral portal (Fig. 2). Moreover, higher portal placement allows a wider field of view, facilitates visualization of the medial gutter and the anterior horn of the lateral meniscus, which can be hard to see through a lower anterolateral portal. The use of a high anteromedial portal decreases the risk of IPFP penetration and facilitates the resection of the ligamentum mucosum. As we routinely use an outside in femoral guide, femoral tunnel positioning is not compromised with this high portal but this could be challenging using an inside out technique.

Surgeons can be reluctant to perform high portals in case of a simultaneous meniscal and ACL tear, as portal placement is critical while performing meniscectomy or meniscal repairs. However, if a lateral tear is encountered, high portals do not limit the access to the meniscus because the anteromedial portal needs to be high to allow instruments to pass freely above the tibial spines. Furthermore, when the knee is positioned in the four-figure position high portals afford an excellent view and easy access within the joint. The main concern with high portals is how to perform a posteromedial meniscectomy or a posteromedial meniscal repair without damaging the articular surface of the medial condyle. A high portal allows this type of procedure to be performed without increased difficulty, especially when using the specific curved meniscal suture devices. However, if the anteromedial portal is too high and the instruments cannot access the torn meniscus we simply recommend distal extension of the portal to adequately perform the meniscal procedure.

The ligamentum mucosum functions to restrict anterior subluxation of the IPFP [4]. In this study, it was found to be present in 78% of cases. When well developed, it can hinder the correct evaluation of the integrity of ACL [15]. Performing higher arthroscopic portals decreases the risk of penetration into the IPFP and facilitates the visualization and resection of the ligamentum mucosum, without changing the quality of ACL reconstruction. After the resection of ligamentum mucosum, an anterior translation of the IPFP occurs bringing it away from the field of view and thus reducing the need to shave it.

In a normal knee, the anterior structures are mobile during flexion and extension. During flexion, due to the pressure caused by the patellar tendon, there is posterior displacement of Hoffa's fat pad [16]. Conversely, extension moves the fat pad anteriorly away from the tibia [16]. Therefore, the tibial tunnel is performed while holding the knee in 30 to 40 degrees of flexion. This provides adequate visualization of the tibial footprint of the ACL, without further shaving of the IPFP.

In conclusion, during ACL reconstruction evidence suggests that it is important to preserve the IPFP. In our practice, this can be achieved by the use of higher arthroscopic portals, by resecting the ligamentum mucosum at the start of the procedure and by performing the tibial tunnel in 40° of knee flexion. This results in a shorter operative time with no additional increase in the difficulty of performing additional meniscal procedures.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://www.sciencedirect.com> and doi:10.1016/j.otsr.2011.08.007.

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