Use of a Superolateral Portal and 70° Arthroscope to Optimize Visualization of Patellofemoral Tracking and Osteochondral Lesions in Patients With Recurrent Patellar Instability

Ryan Bell, B.S., Andrew E. Jimenez, M.D., Benjamin J. Levy, M.D., Robert Willson, M.D., M.P.H., Robert A. Arciero, M.D., and Cory M. Edgar, M.D., Ph.D.

Abstract: Surgical treatment of patellofemoral instability and associated cartilaginous lesions can be technically challenging. Visualization of patellar tracking and underlying osteochondral lesions is paramount to operative success. To treat these conditions effectively, a comprehensive arthroscopic assessment of the patellofemoral joint as well as dynamic visualization of patella tracking must be achieved. Visualization of the patellofemoral joint—in particular, the articular cartilage of the patella and trochlea morphology—can be difficult when using traditional anteromedial or anterolateral portals and a 30° arthroscope lens. The technique described here uses an accessory superolateral portal and a 70° arthroscope to achieve significantly improved visualization of the patellofemoral articulation, in particular the chondral surfaces. This vantage point aids the surgeon in effectively evaluating patellar tracking, trochlea morphology, and importantly, osteochondral lesion location to help guide treatment algorithms in the patellofemoral joint.

Dislocation of the patella is common, with an annual reported incidence of ≤42 per 100,000 patients, with higher rates observed in the young and female populations.1,2 Risk factors for recurrent instability events include young age of patient at time of initial dislocation, female sex, trochlear dysplasia, elevated tibial tuberosity/trochlear groove distance, soft tissue global laxity, and patella alta. Patients with a prior episode of instability are 7 times more likely to experience recurrence.1,3 It is important to note that osteochondral lesions of the patellofemoral joint often present in the setting of patellar instability, particularly following traumatic dislocation, which has been observed in 71% to 95% of patients.4-6 Such lesions occur most commonly along the central and medial facets of the patella; however, incidence may vary depending on acuteness of the injury.5-7

In a follow-up study designed to determine the cartilage consequence of multiple dislocations, Nomura et al.8 evaluated cartilage lesions longitudinally in patients with recurrent dislocation. In that study, 70 knees were evaluated; 96% had some level of articular cartilage damage to the patella, 76% over the central dome/ridge and 77% with fissuring or erosions over the medial facet. It was their opinion that the location in chronic erosions strongly correlated with the location of the cartilage lesion seen after the initial patella dislocation.8 Today, numerous techniques address cartilage defects within the patellofemoral compartment with variable success, but that, when performed in conjunction with realignment, may provide stability to the patella and enhance long-term success.9-11 Because of the risk for concomitant injury, significant morbidity, and loss of ability to participate in work or sports activities associated with multiple dislocations, surgical treatment is often indicated. Arthroscopic treatment in these patients aims to stabilize the patellofemoral joint and address any osteochondral pathology.12-14
Surgical intervention to address recurrent instability typically involves one or a combination of proximal- and distal-based stabilization techniques depending on patient-specific risk factors. These procedures commonly include a soft tissue reconstruction, such as a medial patellofemoral ligament (MPFL) reconstruction, and in some cases, a realignment procedure, such as a tibial tubercle osteotomy (TTO).\(^{15-18}\) The treatment of concomitant cartilage lesions is recommended to be done in conjunction to provide surgical stability. Cartilage procedures are based on critical evaluation of the articular surface at the time of surgery and relevant presurgery imaging. These include arthroscopic debridement, marrow stimulation techniques, open grafting procedures, and cell-based “on-lay” therapies.\(^{19,20}\)

Arthroscopy is used as either a primary or adjunctive method in performing diagnostic assessment with these interventions. Comprehensive arthroscopic assessment of patellar tracking can be used to confirm clinical diagnoses and identify osteochondral pathologies. Most techniques make use of a 30° arthroscope or, less often, a 45° arthroscope, for assessment of patellar tracking in the treatment of patients with recurrent patellar instability.\(^{21-23}\) However, a wider viewing angle and less peripheral image distortion can be achieved via a 70° arthroscope.\(^{23,24}\) Its benefit has also been described in

**Table 1. Summary of Procedural steps: Main Technical Points**

- Preoperative x-rays, magnetic resonance imaging, and clinical examination to diagnose and determine the underlying cause of patellar instability and imaging evidence of osteochondral lesions
- Use of a 30° arthroscope through a standard anterolateral (AL) portal for initial assessment of the patellofemoral joint
- Arthroscopic visualization localization, using an 18G spinal needle, 2 to 3 cm proximal and lateral to superior pole of patella with the knee in extension, to demarcate the new superolateral (SL) portal
- Creation of the SL portal via longitudinal incision (11 blade scalpel)
- Insertion of switching stick to SL portal
- Switch to 70° arthroscope and insert through newly created SL portal
- Assessment of all 4 quadrants and the odd facet of the patella for chondral defects
- Assess patellar tracking by ranging knee through extension/flexion

**Fig 1.** (A) Anterior view of the anterolateral (AL), anteromedial (AM), and superolateral (SL) portals marked on a patient’s left knee. The AL portal is located distal to the most inferior aspect of the patella, ~1 cm superior to the joint line, directly lateral to the patella tendon. The AM portal is located in an identical position, on the medial side of the patella. The SL portal is located 2 to 3 cm proximal and lateral to the superior pole of patella with the knee in extension. (B) Lateral view of the AL, AM, and SL portals. (C) Medial view of the AL, AM, and SL portals. (D) Anterior view of the patient’s left knee with the SL portal marked 2 to 3 cm proximal and lateral to the superior pole of the patella. The 2 dashed lines and corresponding angular measurements represent the viewing axis afforded via the 30° and 70° arthroscope relative to the horizontal and vertical axes.
various surgical applications and has allowed for superior visualization of the patellofemoral joint via an accessory superolateral portal.23,25,26

At this time, there has been no published description of the use of a 70° arthroscope via a superolateral portal in the diagnosis and treatment of patellar instability. The authors of this Technical Note hypothesize that use of this technique will allow for superior visualization of the patellofemoral joint to aid in the assessment of patellar maltracking and the diagnosis of chondral lesions in the setting of patellar instability.

Surgical Technique

Key points are summarized in Table 1 with a visual demonstration depicted in the Video 1.

Initial Evaluation

The patient is placed in a supine position with the operative limb free on the operating table; if a leg holder is used it must be placed midthigh to allow sufficient space for the proximal portal and scope handle. A standard anterolateral peritendinous portal is created (Fig 1), and diagnostic arthroscopy is performed. With the 30° arthroscope in the suprapatellar pouch, an accessory superolateral portal is first localized with an 18G spinal needle (Fig 2) and then created using a longitudinal incision immediately lateral and proximal to the patella with the knee in an extended position. A switching stick is introduced into the suprapatellofemoral space. The camera is then changed to a 70° arthroscope (Arthrex, Naples, FL) which is placed in the accessory superolateral portal (Table 2). Assessment of patellar tracking, localization, characterization, and treatment of osteochondral lesions is performed with the arthroscope view positioned toward the trochlear groove and overlying patella while using the anterior parapatella tendon portals as working portals (Video 1).

Assessment of Osteochondral Lesions

With the 70° arthroscope in the superolateral portal, a comprehensive assessment of the patellar and trochlear cartilage can be performed. The 70° arthroscope allows for complete visualization of the chondral surface of the patellofemoral joint, including the odd facet and superomedial aspects of the patella, often difficult to visualize with traditional approaches. Chondral lesions along the central and medial facet of the patella are easily identified in the patient example via the 70° arthroscope in the superolateral portal (Fig 3).

Assessment of Patellar Tracking and Trochlea Morphology

A clear viewing axis, proximal to the patella, looking “down” on the patellar/trochlear articulation, is achieved with the 70° arthroscope, compared with the 30° arthroscope, which provides an off-axis view of this articulation (Fig 4). Diagnosis and quantification of patellar maltracking is made possible with more direct visualization using this technique. The knee can be brought through a full range of motion while visualizing the tracking of the patella with this technique. This is critical when performing MPFL reconstruction or TTO to ensure that the patella tracks normally and is not overconstrained medially after correction is made.

Discussion

The 70° arthroscope has been described as a useful tool in several different arthroscopic procedures, as has the use of accessory portals for knee arthroscopy.23,25-28 To our knowledge, this is the first technique to describe the use of a 70° arthroscope in an accessory superolateral portal to aid in the effective diagnosis and treatment of patients with recurrent patellar instability. As demonstrated above, the ability to visualize the entirety of the patellofemoral joint and

Table 2. Pearls and Pitfalls

| Pearls | Pitfalls |
|--------|----------|
| Keep knee at full extension for creation of the superolateral (SL) portal | An accessory SL portal causes additional morbidity |
| Position 30° arthroscope in anterolateral (AL) portal to visualize 18G spinal needle 2 to 3 cm proximal and lateral to superior pole of patella | Increased operative time |
| Insert switching stick into newly created SL portal with trochar over switching stick | Use of additional surgical equipment (70° arthroscope) |
| Locate landmarks with knee at full extension before assessment of patellar tracking and chondral lesions | Making SL portal too distal will obviate utility of 70° arthroscope |
the full extent of patellar tracking is unmatched by a 30° arthroscope through conventional portals. This technique specifically offers improved ability to diagnose and treat articular lesions of the patellofemoral joint. Such lesions can result in significant morbidity and acceleration of osteoarthritis if left untreated. In the cadaveric knee specimen (Video 1), several portions of the patella were not easily visible with a 30° arthroscope, even with the use of accessory portals. The use of the 70° arthroscope and the superolateral portal offered improved visibility to locate and assess patellofemoral cartilage integrity. The authors of this Technical Note recommend the use of this technique to ensure complete assessment of chondral integrity.

With the increased visualization of the patellar/trochlear articulation afforded by this technique, patella tracking can be assessed accurately in real time. A more complete field of view may allow knee surgeons to better estimate the amount of tracking correction necessary to relieve symptoms before surgical intervention and evaluate the necessity for combined procedures to produce additional stability, e.g. MPFL with concomitant TTO. Moreover, the technique allows for intraoperative assessment of tracking correction in real time while performing stabilization techniques to determine whether adequate improvement has been achieved. Thus, the amount of tracking correction achieved can be reviewed to minimize the risk of over- or underconstraint. This allows surgeons to make more informed intraoperative decisions, easily determine the amount of correction required, and potentially minimize the risks associated with over- or underconstraint.

Advantages of this technique include a significantly improved view of the patellofemoral joint and the lack of technical difficulty in the creation of the superolateral portal (Table 3). Disadvantages include the additional, though minimal, morbidity due to the creation of an accessory portal and a potential learning curve that accompanies the use of a 70° arthroscope (Table 2). However, the authors support the use of a superolateral portal and a 70° arthroscope, as it offers an enhanced view of the patellofemoral joint relative to the 30° arthroscope. This technique will aid surgeons in

**Fig 3.** Clinical example of variability in visualization with a change in portal and scope prism angle to assess cartilage injury. All pictures are from the same clinical case example. (A) Chondral lesions identified arthroscopically along the trochlea and patella upon examination with a 30° arthroscope via an inferior lateral portal. (B) Increased visual field and arthroscopic identification of novel chondral lesions along the patella upon examination with a 70° arthroscope via a superolateral portal.
the diagnosis and treatment of osteochondral lesions and allow for more informed decisions to be made as to the optimal patella tracking correction required.

Table 3. Advantages and Disadvantages

| Advantages                                                                 | Disadvantages                                |
|---------------------------------------------------------------------------|----------------------------------------------|
| Significantly improved view of patellar tracking                          | Additional morbidity due to creation of the accessory SL portal |
| More complete visualization of osteochondral lesions                      | Additional time of procedure                  |
| Intraoperative assessment of surgical improvement with concomitant stabilization procedures in real time | Added surgical equipment to be available (70° arthroscope) |
| Low technical difficulty in creation of superolateral (SL) portal        | Learning curve of use of the 70° arthroscope |

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