Infinity-Lock™ 5 mm Medial Patellofemoral Ligament (MPFL) Reconstruction

Case Report: Mr Hersh Deo, James Paget University Hospital

Background

This technique provides an anatomic MPFL reconstruction without needing to harvest a medial hamstring, therefore avoiding potential donor site morbidity that can be associated with autograft harvest. The use of a polyester tape (Infinity-Lock 5 mm, Xiros Limited) provides a strong and inherently stiff graft that results in a firm endpoint to lateral patella glide. The fixation of the tape to the medial border of the patella is achieved with two suture anchors (Iconix, Stryker). This fixation technique eradicates the risk of patella fracture. Femoral fixation is completed with a soft threaded PEEK Interference screw into a socket.

Patient

The patient is a 21 year old female who had experienced recurrent patellar dislocations in her left knee since the age of 13. On examination, she had a positive apprehension test compared to the contra-lateral patella. Beighton's score for ligamentous laxity was normal. Caton-Deschamps index was 0.86 with no trochlea dysplasia.

Surgical Technique

Positioning

The patient is positioned supine on the operating table with a side support and foot bolster so that the knee can be fully extended or held at 90 degrees of flexion.

Examination Under Anaesthetic

Patella stability is tested and documented in both knees at 0 and 30 degrees of flexion. Any patello-femoral crepitus is noted. The rest of the knee is examined and documented.

Arthroscopy

An arthroscopy is performed to confirm patella maltracking and address any additional pathologies. In this case chondroplasty was performed for grade 2 articular cartilage damage to the lateral facet of the patella.

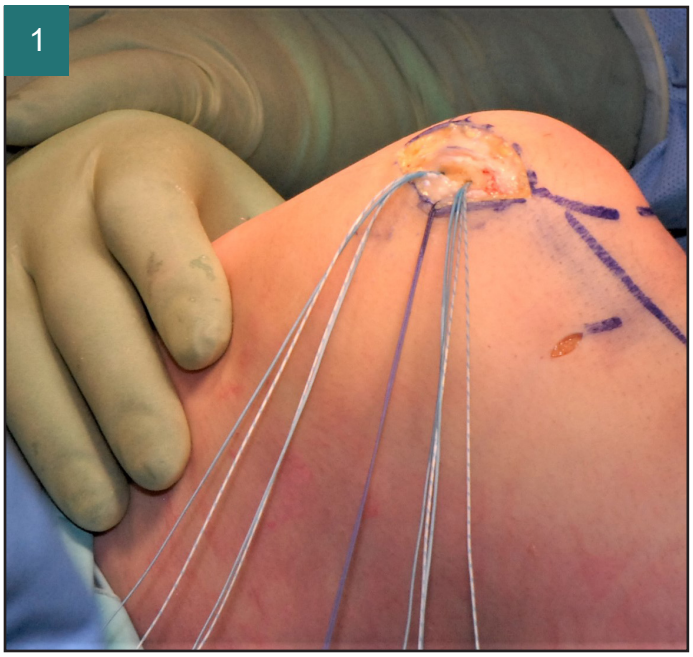

Figure 1 - Suture anchors attached into base of medial trough in the proximal ⅔ of the patella. The middle suture is the stay suture marking the passage entrance between layers two and three.

Patella Preparation

An incision is made to expose the medial border of the patella. Layer two is carefully incised using a scalpel and a long dissecting scissor is used to create a passage between layer two and three (capsule) from the medial patella down to the level of the medial epicondyle. A stay suture is placed through the edge of layer two to mark the passage entrance at the medial patella.

The periosteum is dissected off the medial border of the proximal two thirds of the patella using sharp dissection to expose cortical bone. A shallow trough into the sub-cortical bone is created using a burr on the arthroscopic shaver hand piece.

Two suture anchors are placed, one centimetre apart at the base of the trough. Three of the four needles that come with each anchor are returned to the scrub nurse, leaving each anchor with a strong suture (Force Fiber) with a free end and a needle end.

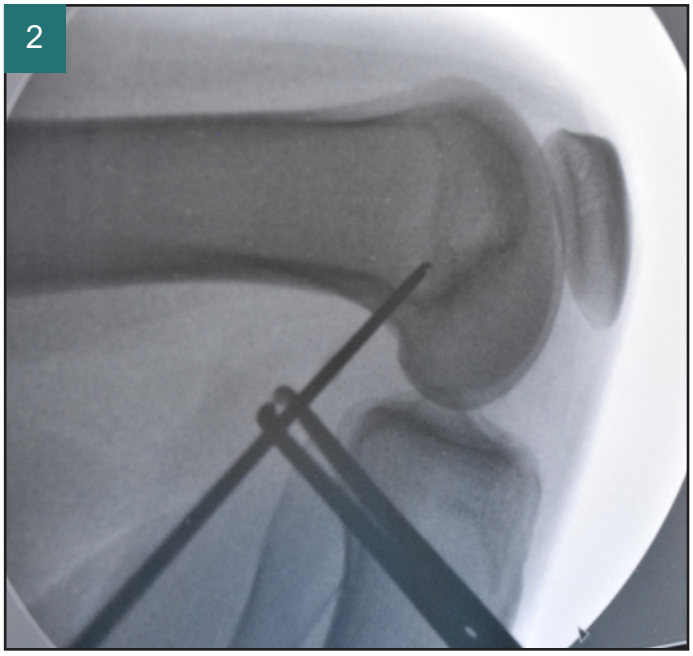

Figure 2 - Schöttle's Point is ID with II. Note the overlapping condyles indicating true lateral view.

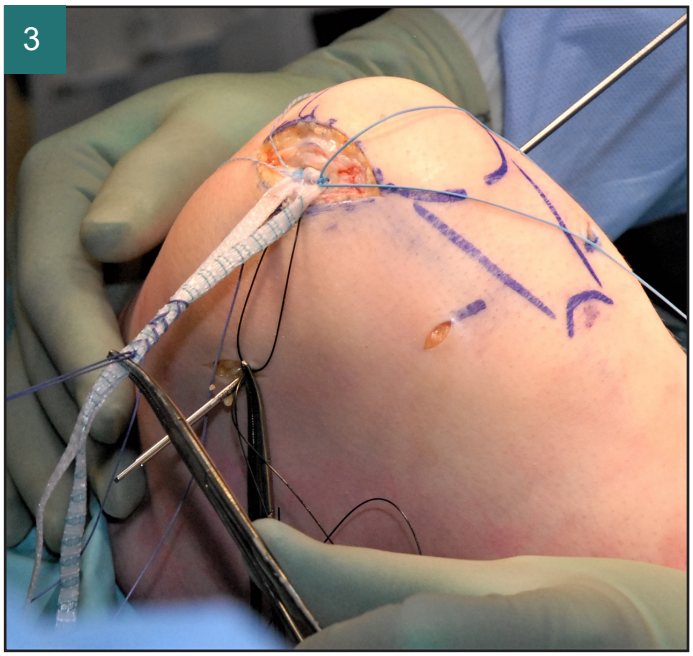

Figure 3 - Infinity-Lock 5 mm attached to medial patella and whip stitched 25 mm beyond Schöttle's point.

Femoral Attachment Point

The image intensifier is brought in from the side of the operated knee for an over-the-top lateral of the distal femur, while the operator moves round to the medial side of the knee. It is important to get a true lateral at this point (overlapping femoral condyles as shown below).

The passing pin is held with a clamp and Schöttle's point is identified. A 1-2 cm longitudinal incision is made at this point and soft tissue dissected down to medial femoral periosteum. The pin position is rechecked and passed across the femur using a wire driver until about 2 cm is left protruding medially.

A socket is made in the medial femur with a 6 mm cannulated reamer to a depth of 25 mm. The periosteum around the tunnel entrance should be cleared to aid graft insertion.

Graft Attachment

The midpoint of the Infinity-Lock tape is attached to the patella suture anchors by the two sutures. The tape limbs are double breasted and whip stitched to form a triangle (1 Vicryl), with the base at the medial patella and the point at the passing pin entry point. The whipped end should extend 25 mm beyond the protruding medial passing pin. The excess length of the Infinity-Lock tape is trimmed, and the whip stitch suture is left long.

The passage between layer two and three is now fully opened by placing and opening a clip from the patella incision to the medial incision. A looped passing suture (1 Ethilon) is then pulled up from the medial incision and out of the patella incision using the clip. The ends of the whip sutures are passed into the passing loop and are delivered through the passage between layers two and three.

The graft is then delivered through the medial incision. A guide wire for the interference screw is placed into the femoral socket. The whip stitch suture limbs are placed through the eyelet of the passing pin and firmly pulled out of the lateral femur with pliers. By pulling on the whip stitch, the end of the graft can then be docked into the femoral socket under direct vision.

Figure 4 - Graft has been clipped to adjacent tissue allowing full range of motion and correct graft tensioning before committing to screw placement.

Tensioning

A clip is placed under the limbs of the tape at the patella border to create some slack and then the clip is used to secure it to the passage entrance, thereby setting the tension of the graft.

The knee can now be taken through a full range of movement. The tension of the graft can now be tested in full extension with the clip still attached before committing to fixing the graft to the femur. The lateral glide should equal the other knee (if normal) i.e. lateral movement with a firm end point.

A 6 x 25 mm soft threaded PEEK interference screw is then advanced over the guide wire until it is flush with the medial femoral cortex. A final confirmatory test of patella stability and ROM is made. All suture tails are then cut, high volume local anaesthetic infiltrated (100 ml 0.2% ropivacaine) and the incisions are closed.

Post-Operative Rehabilitation

- Early ROM is encouraged to prevent stiffness.
- The patient can fully weight bear without a knee brace.
- Ice therapy will reduce pain and swelling.
- Inner quadriceps (VMO) strengthening is important to preserve good extensor function and to aid patella tracking and proprioception.

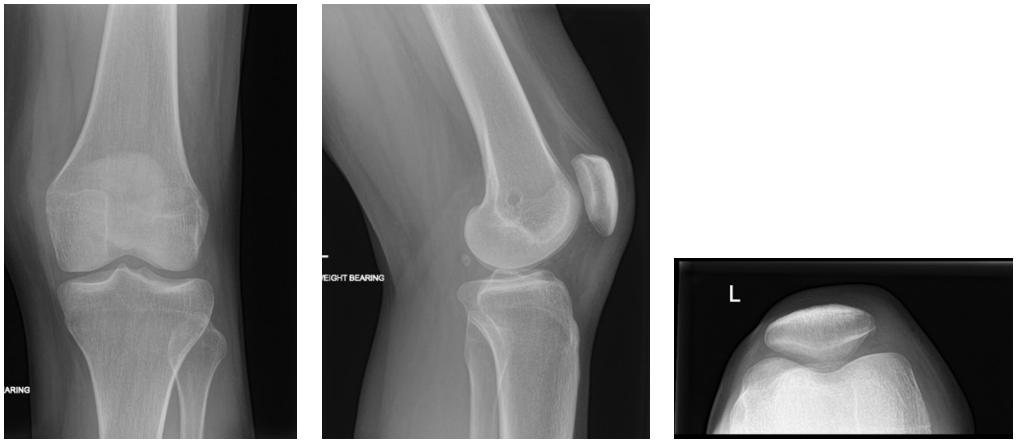

Figure 5 - Post-operative radiographs showing a central, concentric patella.

Discussion and Pearls

- Medial patello-femoral ligament (MPFL) reconstruction is the procedure of choice for recurrent lateral patella instability. Reviewing the literature, the graft choice is almost exclusively hamstring autograft (semitendinosis or gracilis).[1] MPFL reconstruction using hamstring autograft has a re-dislocation rate of 1-10%.[1, 2] Persistence of a positive apprehension post-surgery is 4.1%.[3]
- Other common complications include flexion deficit (stiffness), sensation of joint instability, patella drill hole-related problems (including fracture), hypoesthesia, anterior knee pain, pain at the medial femoral condyle, and hypertrophic wound scarring.
- In my opinion, persistent post-operative patella instability is most commonly associated with femoral tunnel malposition, but long-term could be due to failure of the autograft collagen.
- Patella instability patients often have generalised ligamentous laxity caused by collagen disorders – so why implant their own defective tissue which has the potential of stretching over time leading to re-dislocation or persistence of a positive apprehension test? [1, 2, 3]
- Artificial graft for MPFL reconstruction is a safe and cost effective graft choice. It is easier to tension, will never stretch over time and therefore should never re-dislocate. The lack of hamstring harvest in my method decreases operative time, post-operative pain and eradicates complications from hamstring harvest (pain, bruising, tightness in extension). The artificial graft is also easier to tension correctly as it has no inherent creep compared to hamstring graft.
- In my series of over 100 cases using artificial graft, I have had no re-dislocations and no issues with soft tissue reactions or stiffness. I have had no cases of residual patella apprehension. My technique of suture anchor fixation to the patella eradicates the risk of patella fracture or patella drill hole-related problems. I have had to remove medial hardware in three patients which resolved their pain. These have all been done as day case procedures under a general anaesthetic.
- Preoperatively, it is important to exclude patella alta, trochlea dysplasia or significant rotational or sagittal malalignments.
- It is vital to identify Schöttle's point using an image intensifier. Anatomic variations mean that using palpable anatomic landmarks (medial epicondyle / adductor tubercle) risks the malposition of Schöttle's point, which could result in an increased patello-femoral joint reaction force, (stiffness, anterior knee pain) or re-dislocation.[4] To achieve this, it is vital to get a true lateral of the distal femur with the image intensifier by overlapping the femoral condyles otherwise Schöttle's point will be incorrect.
- Whip stitching the graft creates an anatomic, triangular graft (as opposed to non-anatomic / strip graft) which can be secured into a socket rather than drilling a 6 mm tunnel that breaches the lateral cortex. This reduces pain and bleeding post op and increases mobility.
- It is vital to tension the graft correctly. A common cause of a poor outcome is over-tensioning the graft. My technique creates slack and then by clipping the graft to the soft tissue, sets the tension so that the stability can be tested in full extension before committing to fixation.
- Before removing the passing pin laterally, ensure that a nitinol wire is placed into the socket and remove periosteum from the socket entrance to aid graft docking.

References

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4. **Elias JJ, Cosgarea AJ.** Technical errors during medial patellofemoral ligament reconstruction could overload medial patellofemoral cartilage: a computational analysis. Am J Sports Med. 2006;34(9):1478–85

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