TECHNICAL NOTE

Loop-Post Construct, A Novel Technique for Medial Meniscus Root Repair

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Abstract

Surgical reattachment of medial meniscus posterior root tear (MMPRT) with transtibial sutures can delay the presence of medial knee joint compartment osteoarthritis. Most suture configurations are placed five mm away from the torn margin in the meniscal substance which is already degenerated and may decrease the pull out strengths of repair construct. The number of meniscus penetration may also be important considering meniscus tissue damage with more complex suture techniques impose the risk of suture cut out through the meniscus substance.
We introduce our loop postsuture construct technique which is simple, cheap and reproducible.

Level of evidence: V

Keywords: Loop construct, Meniscus root, Meniscus repair

Introduction

Medial meniscus posterior root tear results in increased contact pressure of medial knee joint compartment and development of early osteoarthritis (1). Surgical reattachment of the torn meniscus root is the treatment of choice in presence of healthy cartilage (2). Despite the reports about clinical improvement of meniscus root repair, they have failed to show complete healing of attachment site and also to decrease the amount of meniscus extrusion (3, 4).

The trans-tibial pull-out repair using different suture constructs is the most commonly accepted technique (2, 5). Mechanical studies have shown that commonly used suture constructs have different cyclic load failures in porcine and human cadaveric healthy menisci. Fiber wire sutures have been shown to be superior to PDS or Ethibond sutures, showing less displacement during the cyclic loading (6). None of these studies did focus on axial and shearing forces that are present in native circumstances (7, 8).

Most of the suture configurations are placed five mm away from the torn margin in the meniscal substance which is already degenerated and may decrease the pull out strengths of the repair construct (9).The number of meniscus penetrations may also be important considering meniscus tissue damage with more complex suture techniques impose the risk of suture cut out through the meniscus substance (10).

We introduce our loop-post suture construct technique which is simple, cheap and reproducible.

Surgical technique

General arthroscopic examination is routinely started via an anterolateral (AL) portal. A vertical anteromedial portal (AM) is created near patellar tendon under spinal needle guidance so that the working instruments can be introduced straight forward into the interval of the medial femoral condyle and PCL. A medial wall notchplasty is also performed to provide adequate space to view the torn edge of the meniscus root.

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After arthroscopic confirmation of MMPRT, the superficial medial collateral ligament (MCL) is released by percutaneous needling above the joint line and posterior to deep MCL to provide sufficient working space. Far anteromedial portal is also created in a transvers manner by guidance of a spinal needle in a way that can afford access to medial one cm of medial meniscus root. The footprint of the insertion of the posterior horn of the medial meniscus should be identified and a curette is used through the near AM portal to create a fresh bony bed at the insertion site. Arthroscopic grasper is used to check the mobility of meniscus root tear. If the reduction of meniscus cannot be performed easily, the fibrous tissue will be released from the posterior meniscocapsular attachment by an arthroscopic probe. Debridement of the torn meniscal edge is performed using a shaver. Suture hook EZpass 70 degrees (Zimmer-Biomet) of contralateral side is loaded by nylon 1/0 and then passed through the far AM portal and the meniscus is penetrated one cm medial to tear area in superior-inferior direction [Figure 1].

The thread is retrieved from near AM portal and a loop express braid 2/0 (Zimmer-Biomet) or fiber wire 2/0 (Arthrex) is attached to it and passed through the medial meniscus and brought out through the far AM portal, the leading nylon thread is released and the loop is pulled back into the joint. Both free ends of the thread are passed through the loop by suture retriever inside the joint, eliminating the risk of portal entrapment [Figure 2]. Traction is applied on the free ends of the loop and the first suture loop construct is tightened [Figure 3].

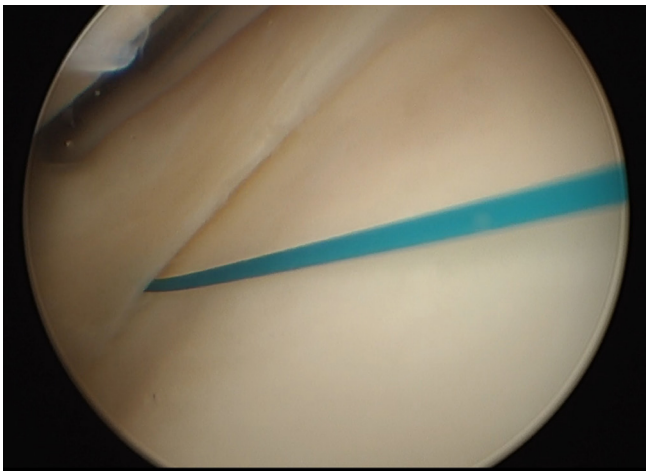

Figure1. First suture hook passage in superior-inferior direction one cm from the torn edge.

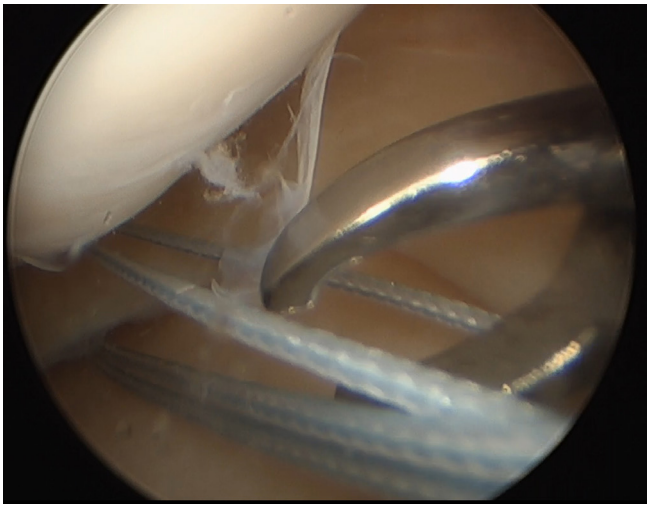

Figure 2. Creation of the first loop.

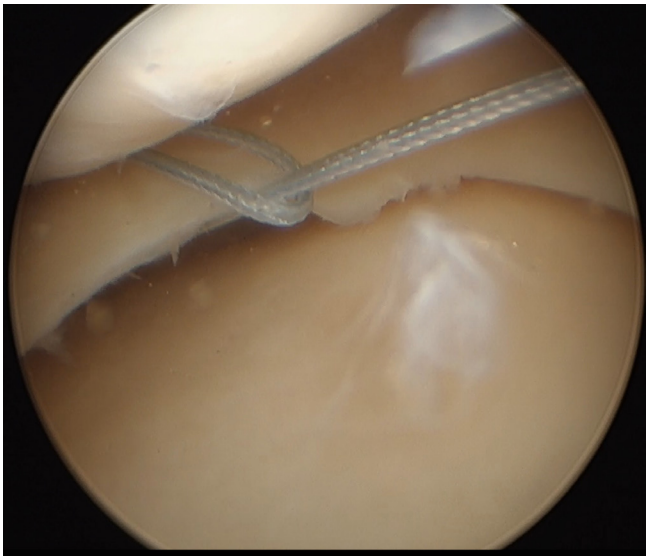

Figure 3. Tightening of the first loop.

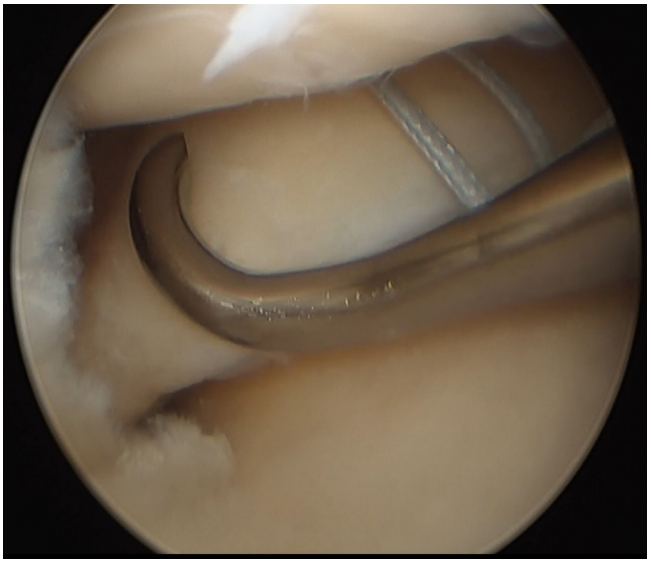

Figure 4. Second suture hook passage in superior-inferior direction five mm from the torn edge.

The same steps are repeated for making the second suture loop construct 5 mm from the torn edge of medial meniscus, but, the loop is not tightened [Figure 4].

The arthroscope is changed to near medial portal and the first loop free ends are retrieved through the anterolateral portal using the space that is now created in the second loop construct [Figure 5 a; b]. The second loop is tightened now which acts as a post for the first loop, and the free ends of the first loop are retrieved through the far anteromedial portal again [Figure 6 a; b].

In the next step, to create a tibial tunnel, the anteromedial aspect of the proximal tibia is incised and an anterior cruciate ligament reconstruction tibial tunnel guide is inserted through the near AM portal, with its tip placed in the curetted area. A 3/32 Kirschner (K-wire) is then drilled through the guide, with the K-wire visualized directly with the arthroscope inserted via the AL portal. After confirmation of the correct position of the K-wire tip, reaming is done by a 4.3 mm cannulated reamer in the ACL set. A nylon loop is passed through the eyelet end of the guide-wire and introduced into the joint via the tibial canal. The first and second suture loop ends are retrieved and brought out of the tibial canal [Figure 7]. After cyclic tensioning of both sutures in 30 degrees of knee flexion, a screw post is used to fix both loops ends over the tibial cortex [Figure 8].

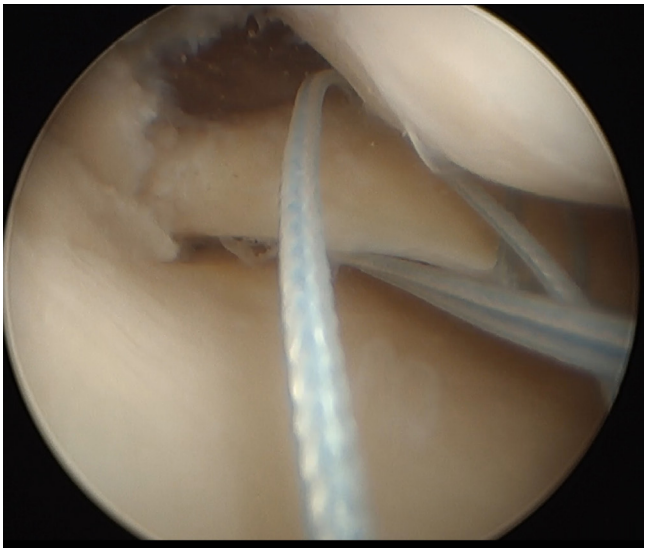

Figure 5a. Creation of the second loop.

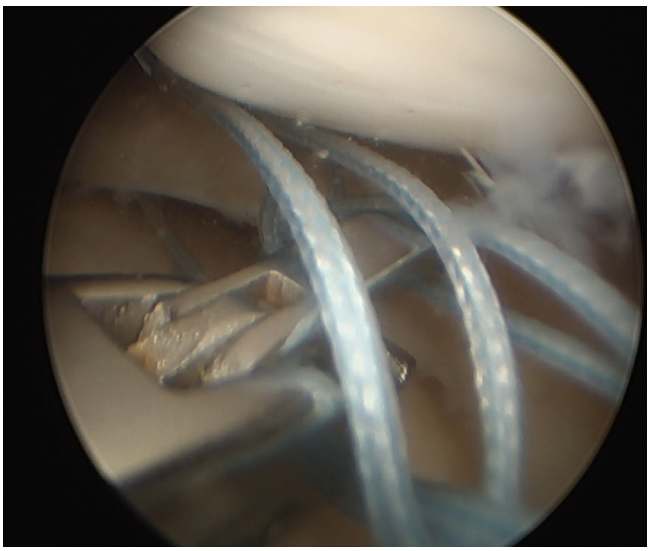

Figure 5b. Creation of the post by passing the suture retriever through the space of the loose second loop.

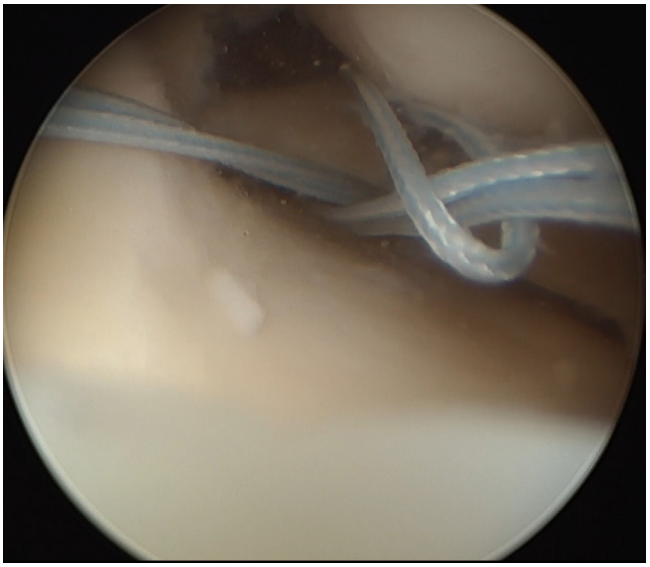

Figure 6a. Passage of the free ends of the first loop through the post created by the second loop.

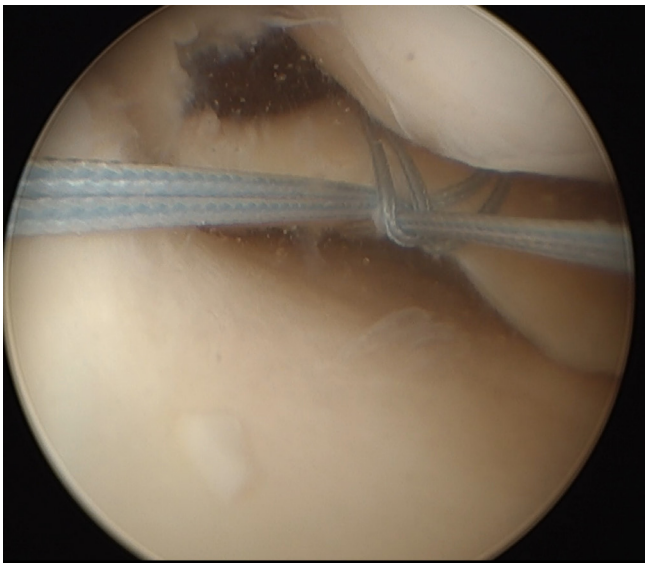

Figure 6b. Tightening of the second loop.

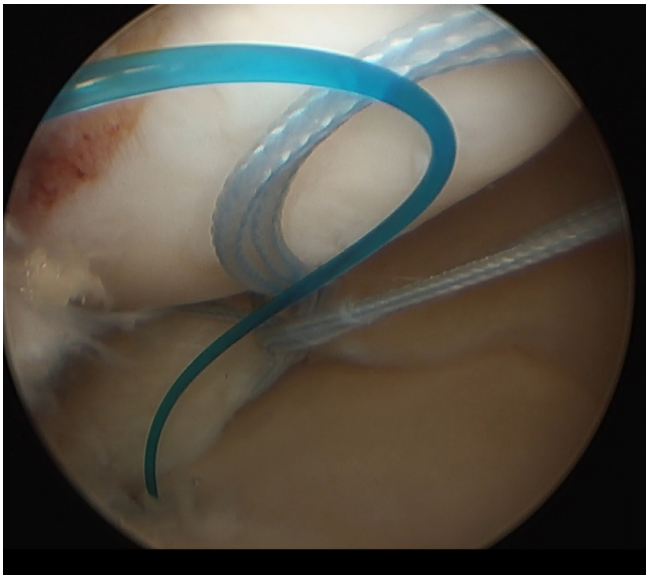

Figure 7. Passage of nylon loop through the tibial canal.

Figure 8. The final repair construct.

Postoperative Rehabilitation

The knee is immobilized for the first two weeks and range of motion exercises are started afterwards to reach up to 90 degrees of flexion at six weeks postoperatively. Partial weight-bearing exercises (i.e., toe touching using crutches) commence six weeks postoperatively, with the brace locked to allow for full extension of the knee joint in the first two postoperative weeks. Full weight-bearing and progressive closed kinetic chain strengthening exercises are permitted six weeks after surgery.

Discussion

Our technique has some advantages over other constructs. First, the meniscus body is penetrated at one cm and five mm distances from the torn edge which may have better pull out strength in degenerated meniscus substance (9). Second, passing the first loop through the space that is created in the second loop helps to change the direction of tensioning force of the first loop from more anterior and less medial to more medial and less anterior which may help to decrease the amount of meniscus extrusion (4). Third, the meniscus is penetrated at two areas which are similar to most of simple constructs comparing to two times more penetrations that are necessary for more complex constructs (10).

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