

Posterior Lateral Meniscal Root Tears and Meniscal Repair

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INTRODUCTION

Meniscal repair indications have not really changed in recent years. Typically younger, more active patients with concomitant ACL reconstruction and peripheral third vertical tears continue to be the “best” repair candidates. However, even in these “ideal” candidates, meniscal repair continues to represent a significant challenge. While most will not dispute that vertical tears greater than 1 cm in the peripheral third of the meniscus should be repaired, there has been new attention on repairing posterior root tears. With these root tear repairs, an inside-out repair is not feasible due to the posterior midline placement of the needles and the passage of the suture.

BACKGROUND:

Strength of Meniscal Repair

There has been a significant change in meniscal repair technique in the last few years. While inside-out vertical mattress repair is the gold standard, an all-inside vertical mattress repair pattern is becoming more common. Studies within the last 2-3 years have shown equal pull-out strength between all-inside and inside-out repair techniques, without the extra incisions and morbidity of inside-out repair. Barber et.al, in 2009 showed that the newer all-inside suture devices have equal or greater pull-out strength and cyclic load to failure strength compared with suture-only repairs like in an inside-out repair. However, in an earlier study in 2000, Barber also showed that a double-vertical suture-only construct was statistically stronger than any of the implants (however, the Barber article in 2000 is 10 years old, and many newer generations of all inside meniscal repairs have emerged with newer suture material). In a brief discussion of the two articles, the double vertical meniscal repair tested in 2000 used 2-0 mersaline and had a pull out strength of 113 N. In the article from 2009, the suture tested was mostly no. 0 UHMWPE suture, and had 109-124 N pull-out strengths. Given the above, a viable fixation option is to fix vertical meniscal tears with all-inside, suture-only devices in a double vertical pattern with UHMWPE suture. This particular method will help avoid gapping on the tibial surface that can be seen with vertical mattress sutures placed only on the superior surface of the meniscus. The suture-only meniscal repair can also reduce any vascular, nervous, or soft tissue entrapment that can be seen with meniscal repair implants.

There have been numerous studies to show the higher occurrence of lateral compared to medial meniscus tears with acute ACL rupture. While there has been extensive literature to favor repairing vertical peripheral tears, a slightly different tear representing a more significant challenge is the posterior lateral meniscal root tear. (Figure 1, 2)

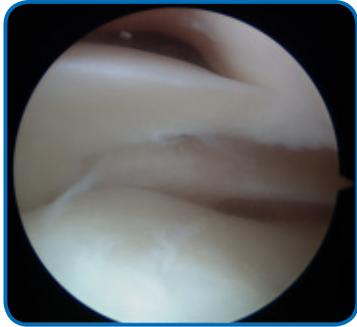


Figure 1. Left knee (arthroscopic view) posterior lateral meniscus root tear. This tear goes >50 % of the root.



Figure 2. Left knee posterior lateral meniscus root tear. This tear involves >50 % of the root.

The increase in difficulty lies not in the diagnosis, but the care of these tears. Simple meniscectomy for small radial tears on the free edge of the meniscus is not being argued, but rather radial tears that extend greater than 50 percent of the meniscus pose a significant problem. Performing a partial meniscectomy of the root tear can destabilize the entire meniscus and either lead to further mechanical symptoms or early onset osteoarthritis. Inside-out fixation of a root tear is not feasible, and all-inside techniques do not restore the anatomy, which is a meniscus anchored to the posterior central tibia plateau. With conventional all-inside suture techniques, the root would no longer be anchored to the tibia, but rather to the posterior capsule. The following is a new technique for posterior lateral meniscal root tears/avulsions using a suture-only meniscal device, passing the sutures through a bone tunnel and tying over a button on the tibial cortex. This technique is also applicable to medial meniscal root tears.

METHOD:

All-Suture Meniscal Repair

The rationale for this device is to simplify suture passage and eliminate the need for more cumbersome suture-passing or shuttling device(s). This particular device passes two simultaneous needles through the meniscus, and then has a suture grabber that grabs one end and pulls the strand into the other needle, thus throwing the suture completely behind and around the meniscus and capsule. When you remove the device, there is a pre-tied Weston knot that slides down into position and can be tensioned with a knot pusher. Two half-hitches can be added if desired.

The premise for this technique stems from a recent article by Harner, et. al, repairing medial meniscal root tears over a bone tunnel. The difference in this article is this technique encompasses passing an all-suture fixation in a 90-90 pattern with a different meniscal repair device, as opposed to a utilizing a suture passer. The suture is then brought out through a bone tunnel and tied over a button. If there are any concomitant procedures to be done, then they must be addressed first. In the pictures shown, there was a concomitant ACL disruption and if there is one present, we recommend first drilling both the femoral and tibial tunnels; however, do not pass the ACL graft before drilling the meniscal bone tunnel or prior to passing the sutures through the meniscus. This technique article will not discuss the steps performed in ACL reconstruction, as that is beyond the scope of this article.

TECHNIQUE:

Capturing the Meniscal Root

Once the other pathology has been addressed, a tunnel is drilled at the meniscal root insertion utilizing an ACL drill guide (Figure 3).



Figure 3. The ACL guide at the insertion of the lateral meniscus of a right knee. The guide pin is in the corner of the guide.

Ideally, from a line-of-sight perspective, the bone tunnel should be drilled from the medial tibia parallel to an ACL tibial tunnel, as it would be for a medial root tear. However, since in this case there was a concomitant ACL reconstruction being performed also, the bone tunnel was taken from just lateral to the tibial tubercle to avoid any tunnel encroachment. The size of the tunnel does not need to be large, only a 5 or 6 mm tunnel. After the tunnel is drilled, then using an all-inside suture-only meniscal repair device, CrossFix® II (Cayenne Medical, Scottsdale, AZ), the posterior horn of the lateral meniscus is “captured” with the suture in a 90-90 fashion, giving a Mason-Allen-like suture configuration. With this particular meniscal repair device, there are dual prongs of the device that pass the suture simultaneously through the meniscus. There is a Weston knot built in to the device, and this is automatically passed when the device is fired, and the knot is advanced when the device is withdrawn. By passing one suture in a horizontal mattress fashion, then one in a vertical mattress fashion, there is 90-90 degree fixation through the meniscus (Figure 4).

Next, a suture retriever is fed through the bone tunnel and the suture ends are retrieved and pulled distally out of the bone tunnel (Figure 5).



Figures 4a & 4b. Shown is the 90-90 technique. A horizontal mattress pattern is placed with the Cayenne CrossFix® II followed by a second vertical mattress suture to give 2 pairs of suture 90 degrees to each other.

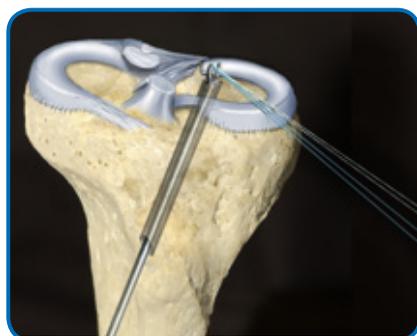


Figure 5. Suture retriever passed through bone tunnel to retrieve sutures.

The ACL graft (or other ligaments being repaired) can then be passed, tensioned, and fixed. The last step will be to tie the posterior horn sutures over a button because the hyperflexion needed for ACL drilling and the cyclic tensioning can stress the no. 0 suture, and breakage can occur. Once any ligamentous reconstruction has been completed, then the sutures can be tied over a button on the tibial cortex with the knee in flexion. We recommend tying the respective sutures from each pair together, but also taking a suture from each pair and tying it to a suture from the other pair (i.e. if suture AA is tied, and BB is tied, then take a suture A and suture B and tie them together giving two AB knots also over the button) (Figure 6).



Figure 6. The completed repair with the sutures tied over a button on the tibial cortex

RESULT:

Anatomic Restoration of the Meniscal Root

A significant advantage to this technique is anatomic restoration of the root to the tibial surface, as well as significant bony bleeding from the ACL reconstruction and the bone tunnel drilled for the meniscus. This results in significant healing factors in the joint available for healing of the meniscus and healing of the bone to the meniscal root.

We recommend limiting rehab to partial weight bearing with a hinged knee brace locked in extension, and no flexion greater than 90 degrees for 4 weeks. After 4 weeks, the patient and therapist can resume ACL rehab as outlined by the respective surgeon.

In summary, this is a new technique for posterior horn lateral meniscal root tears using the CrossFix® II meniscal repair system, a suture-only meniscal repair device, and tying the sutures through a bone tunnel over a button. We feel that this particular repair technique better restores the meniscal anatomy than previous all-inside repairs, and avoids the neurovascular structures at risk during an inside-out repair.

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He has received an honorarium from Cayenne Medical for teaching.

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Barber FA, Herbert MA, Schroeder FA, Aziz-Jacobo J, Sutker MJ. Biomechanical Testing of New Meniscal Repair Techniques Containing Ultra High-Molecular Weight Polyethylene Suture *Arthroscopy* 2009; 25:959-967.

Harner CD, Mauro CS, Lesniak BP, Romanowski JR. Biomechanical consequences of a tear of the posterior root of the medial meniscus. Surgical technique. *J Bone Joint Surg Am* 2009; 91:Suppl 2:257-70.

Ordering Information

CrossFix® Meniscal Repair System

Model #	Item Description
CM-8000	CrossFix® II Disposable Procedure Kit (Probe, Knot Pusher/Suture Cutter, and Introducer)
CM-8001	CrossFix® II Meniscal Repair Device, Straight
CM-8002	CrossFix® II Meniscal Repair Device, Up Curve



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