

Labral Repair of the Acetabulum Using a Toggle Suture Technique

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Abstract: Acetabular labral repair requires positioning the labrum on the edge of the acetabulum with appropriate tension and rotation to recreate the suction seal with the femoral head. Considering that the labrum is a triangular shape in cross-section, rotation of the articular face of the labrum relative to the femoral head also affects the suction seal. The purpose of the toggle suture technique described herein is to control the rotation of the labrum to allow the articular face to directly contact the femoral head and optimize the suction seal. The technique is performed by passing the midaspect of a suture around the labrum at the chondrolabral junction. The loop is retrieved and delivered outside the same portal. One of the 2 free suture tails is then passed through the loop, which is then manually tensioned. This creates a single loop around the labrum with a suture tail on either side that allows for rolling, or “toggling,” of the labrum to place the articular face in line with the femoral head.

The acetabular labrum is a cartilaginous ring around the edge of the acetabulum, completed inferiorly by the transverse acetabular ligament. It is triangular in cross-section and varies in thickness from 4.0 to 7.4 mm.¹ The labrum stabilizes the hip joint by creating a suction seal with the femoral head. The presence of a labral tear violates this seal and compromises axial and rotational hip joint stability. Acetabular labral repair, however, has been shown to restore hip stability to near physiological levels,² but the sealing effect depends on the fit of the labrum to the femoral head.³ Various labral repair techniques have been described, including a simple loop, a cinch, and a labral base repair technique.⁴⁻⁶ The labral base technique has also been termed a horizontal mattress, or inversion-eversion technique, but for simplicity, the term “labral base” will be used in this note. Regardless of the technique

used, the goal of each labral repair is to secure the torn labral tissue on the acetabular rim in a way that restores the physiological suction seal with the femoral head. To accomplish this, both the position on the acetabular rim and the rotation of the triangle-shaped labrum must be considered. The purpose of the “toggle” suture technique described in this note is to enhance rotational control of the labrum so that the articular face of the labrum is aligned with the femoral head.

Surgical Technique

Indications

Symptomatic labral tear, either traumatic or atraumatic, is the primary indication for arthroscopic labral repair. Typically, underlying femoroacetabular impingement is present as well, and treated concomitantly to protect the labral repair. Groin pain exacerbated with hip flexion and internal rotation activities is the classic symptom. Alternatively, extension and external hip rotation may trigger pain. Anterior and posterior impingement tests reproduce these positions respectively and indicate pain from labral pathology. At least 3 months of nonoperative management is tried, including nonsteroidal anti-inflammatory medications and supervised physical therapy. A diagnostic intra-articular injection may help distinguish hip pain from low back pain. Ultimately, the decision to proceed with surgical labral repair hinges on the degree to which quality of life is compromised by the symptomatic labral tear. For instance, pain with activities of daily living,

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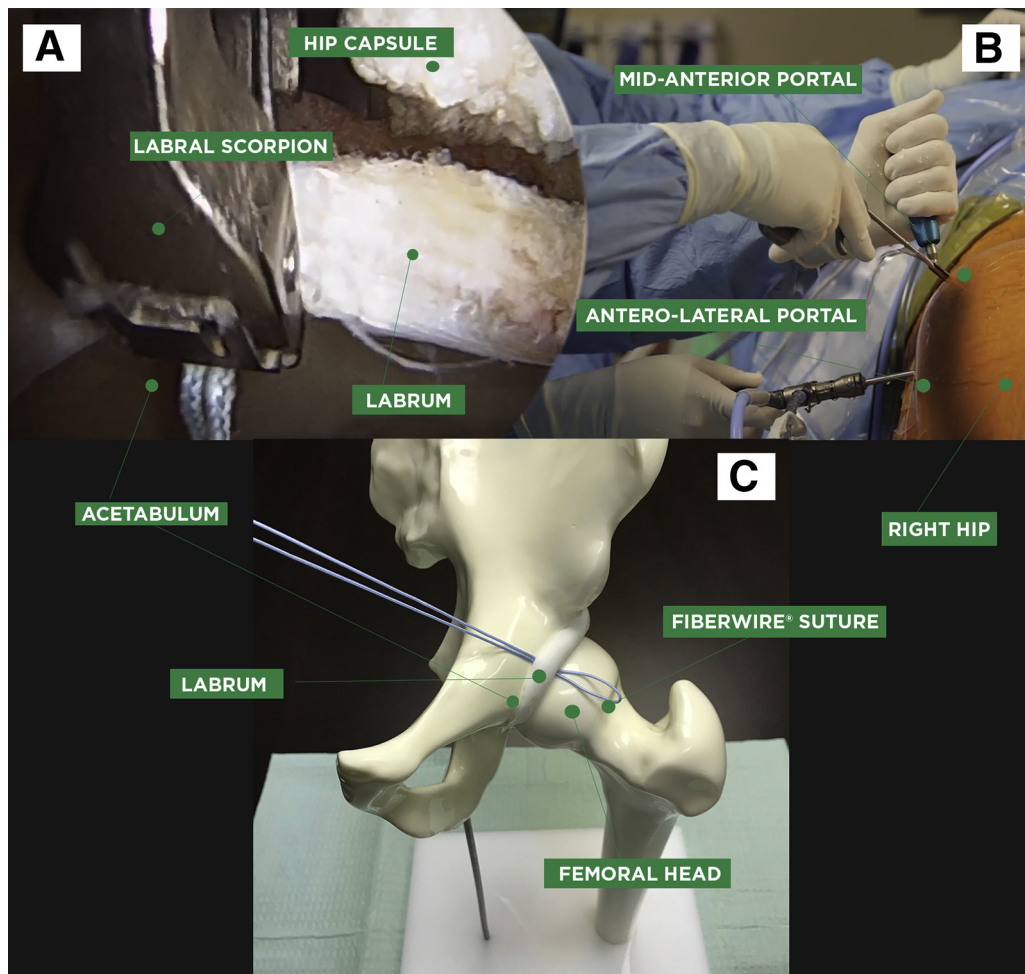


Fig 1. (A) Arthroscopic view of the anterior-superior labrum of a right hip with the patient in the supine position. A Labral Scorpion passes a “0” gauge FiberWire suture that has been folded in half at the chondrolabral junction. (B) External view showing the camera in the anterolateral portal and a slotted cannula and Labral Scorpion in the midanterior portal. The slotted cannula retracts the proximal capsule to help visualize the acetabular rim. (C) Left hip model view showing the folded suture passed at the chondrolabral junction.

inability to work or exercise, mechanical symptoms, and waking from sleep are quality-of-life indicators to consider.

Patient Positioning

The patient is positioned in the supine position on a Hana table (Mizuho, Union City, CA) with a 9.5” diameter perineal pad and padded foot restraints (American Surgical, Nashville, TN). Traction is applied to the surgical hip, and confirmed fluoroscopically, to create a working space in the joint. An anterolateral portal is created under fluoroscopic guidance, and the arthroscope is inserted using a cannulated technique. A midanterior portal is established under arthroscopic visualization. The working portal is the midanterior portal. A diagnostic examination is performed to confirm labral tear. After diagnostic examination confirms labral tear, the acetabuloplasty is performed to

treat pincer pathology and create a cancellous bony bed to facilitate labral repair.

Labral Repair Using the Toggle Suture Technique

Pilot holes for the hip length 2.4 mm PEEK (polyether ether ketone) PushLock anchors (Arthrex, Naples, FL) are drilled at the anticipated location of the repair sutures. In this case, 3 pilot holes are drilled, one at the 10:30, one at the 12-o’clock, and one at the 1:30 position (Video 1). To repair the labrum, a “0” FiberWire suture (Arthrex) is folded in half, and the midpoint is secured to a Hip Labral Scorpion (Arthrex). The suture is then passed at the chondrolabral junction aligned with the central pilot hole (Fig 1). The looped aspect of the suture, which was just passed under the labrum, is brought out through the same portal (Fig 2). The key to the surgical technique is that 1 end of the suture tails, but not both, is passed through this loop (Fig 3).

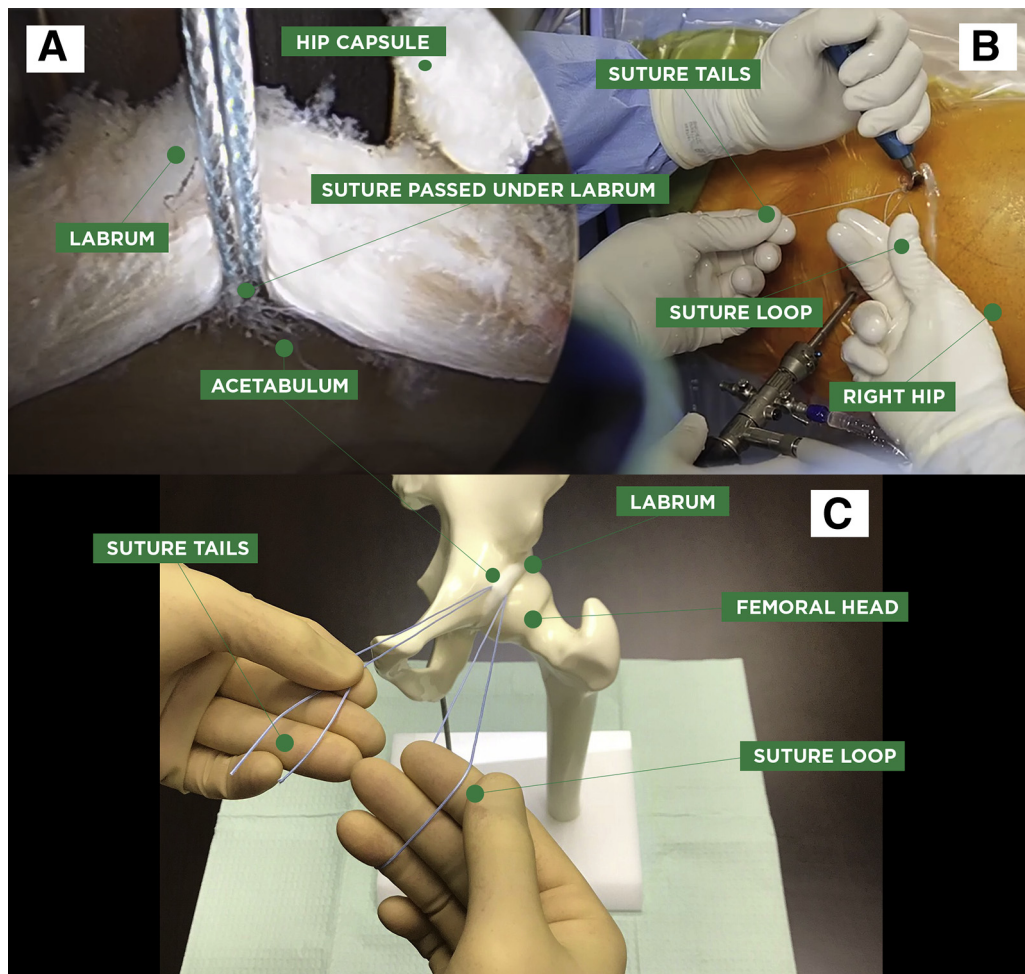


Fig 2. (A) Arthroscopic view showing the passed suture retrieved through the midanterior portal. (B) External view showing the suture loop pulled out of the midanterior portal. The surgeon uses one hand to open the loop and the other hand to hold the free tails. (C) Left hip model view showing the orientation of the passed suture loop and free tails.

Tension is manually applied to the suture tails, which creates a cerclage around the labrum with a suture tail on each side of the labrum (Fig 4). The cerclage component provides enough friction that the suture tails can then be independently tensioned to control the rotation of the apex of the labrum so the articular face aligns with the femoral head. Within the suture looped around the labrum, there is a hitch, or area where the suture crosses over itself. This is rolled to the capsular side of the labrum so that it does not create a prominent pressure point on the femoral head (Fig 5). The suture tails are then passed through the eyelet of the 2.4-mm PEEK PushLock anchor, which is then inserted into the pilot hole to the level of the eyelet. Further fine-tuning of rotation is performed by independent tensioning of the sutures before the anchor is inserted fully. The excess length of the suture tails is then trimmed with a flush arthroscopic suture cutter. This process is repeated for all the anchors used in the repair.

The hip is then taken out of traction, and the cam deformity is burred. A dynamic examination is performed by bringing the hip into flexion, and internal and external rotation confirms the resolution of labral deflection and presence of a suction seal with the femoral head. Capsular closure is then routinely performed prior to closure of skin incisions and application of surgical dressing.

Rehabilitation

Postoperative care includes protective weight bearing with crutches, supervised physical therapy, and appropriate oral analgesia. Patients are typically discharged home the day of surgery. Supervised physical therapy is initiated on the first postoperative day, with an emphasis on passive hip motion within a comfortable range, and quadriceps and gluteus muscle isometric exercises are prescribed. Up to 50% weight bearing with crutches is encouraged immediately according to the patients'

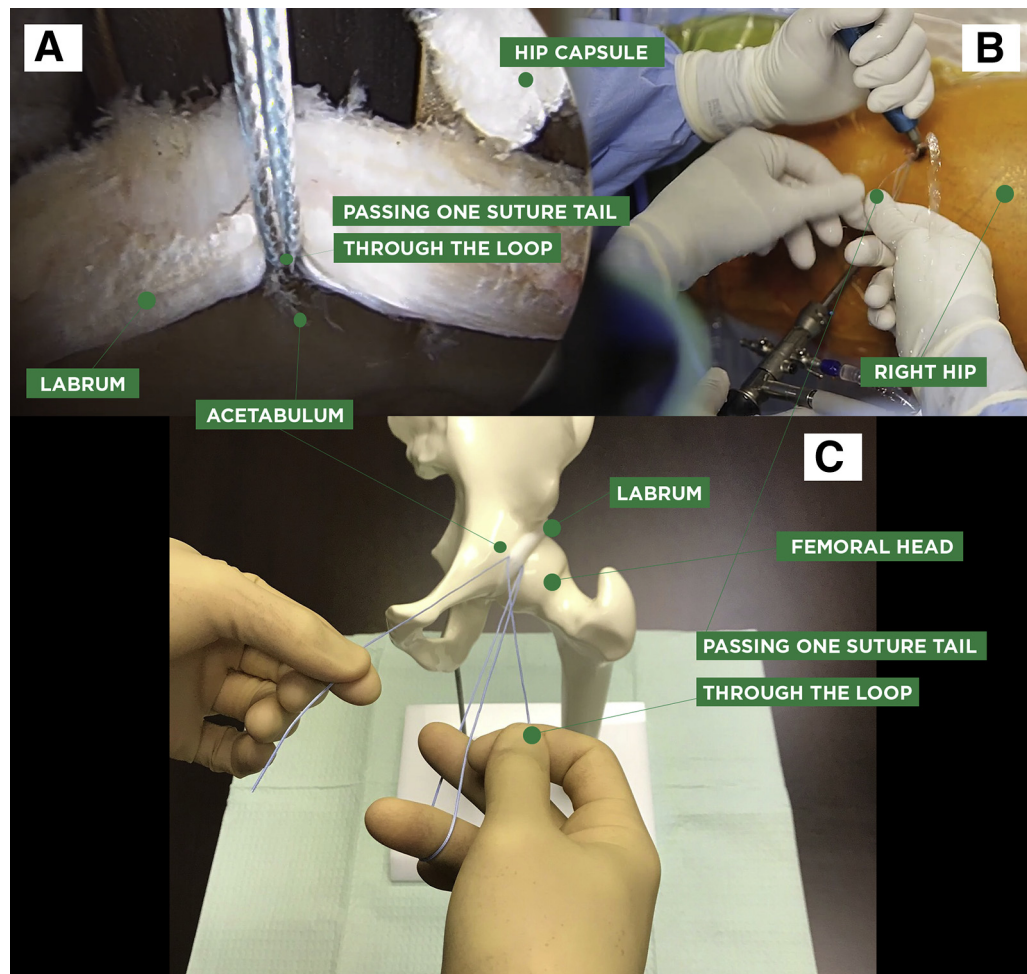


Fig 3. (A) Arthroscopic view showing the passed suture retrieved through the midanterior portal. (B) External view showing the surgeon pulling 1 free tail of the suture through the loop to create the toggle suture. (C) Left hip model showing 1 free suture tail passed through the loop.

comfort, with patients weaning off crutches 3 weeks postoperatively if they do not have pain and radiographs show no evidence of femoral neck insufficiency. Strengthening exercises of the core and hip girdle muscles are initiated at postoperative week 3, building up to endurance exercises by week 8. Full return to activity, including sport, is made on an individual basis but does not typically occur for 4 months after the surgery.

Discussion

This Technical Note illustrates a knotless labral repair technique for acetabular labral tear. Arthroscopic labral repair has become the primary treatment for painful labral tear pathology. Various repair techniques have been described including a simple, cinch, and labral base fixation.⁴⁻⁶ Labra vary in size, and some techniques may offer advantages over others based on labral dimension⁴ (Table 1). For instance, a labral base stitch technique may be ideal for fixation of larger

diameter labra so that the labral tissue is not deflected too far away from the acetabular rim. In contrast, more diminutive labra may not support a labral base fixation technique due to the inherent tissue damage that occurs when passing the suture through the labral tissue itself. In this situation a simple or cinch technique may be preferable. The toggle stitch technique described in this Technical Note adds to these labral repair options as a modification of the cinch stitch technique. It is distinct from the cinch technique in that only 1 suture tail is passed through the suture loop, resulting in a tail on each side of the labrum. This allows for rotational control of the labral tissue. The primary function of the labrum is to provide hip stability via a suction seal with the femoral head. Rotational control of the labrum during repair is preferred to guide placement of the articular face adjacent to the femoral head and recreate the native suction seal. Technical pearls and pitfalls of this technique are shown in Table 2.

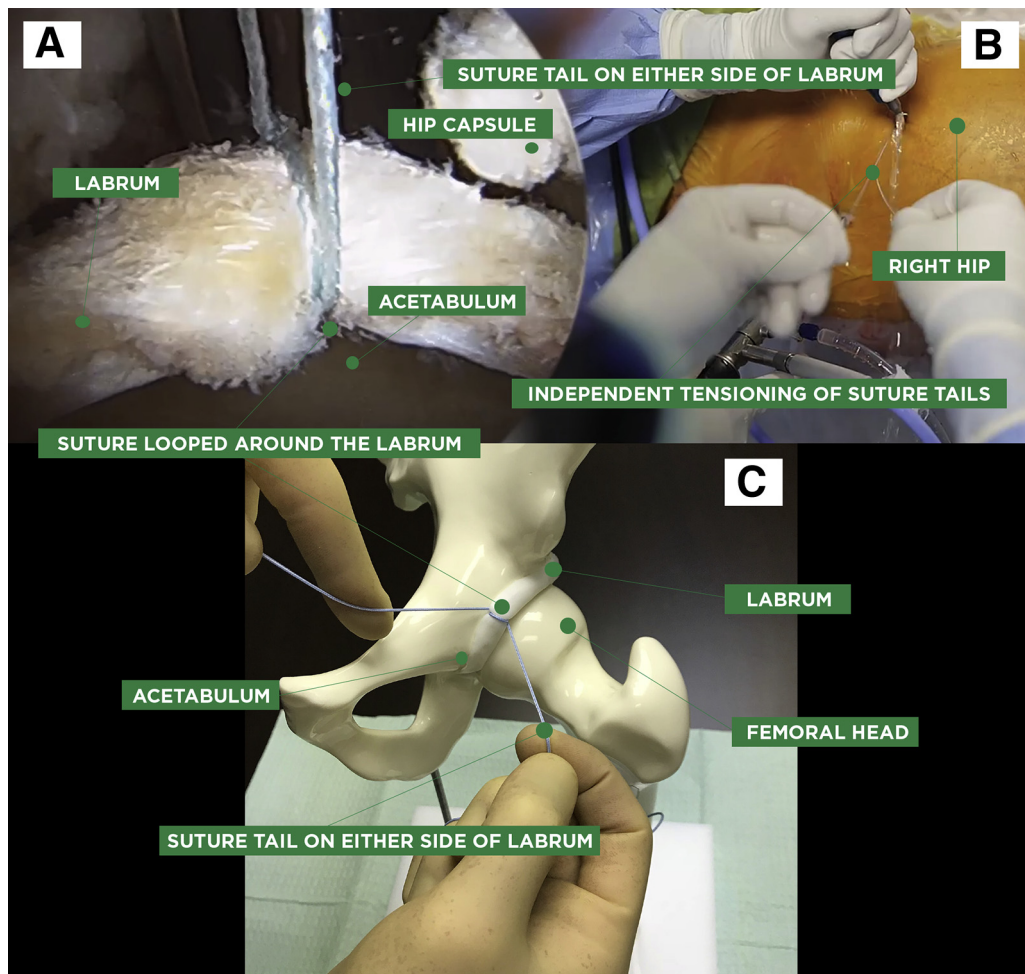


Fig 4. (A) Arthroscopic view showing initial placement of the toggle suture. Note that the suture tails are positioned on either side of the labrum. The “hitch” or crossover area of the suture is positioned on the backside of the labrum. The gross rotation of the labrum is adjusted before initial anchor placement. (B) External view showing independent tensioning of the suture tails to optimize rotational position of the labrum. (C) Left hip model showing the suture looped around the labrum with a tail on each side.

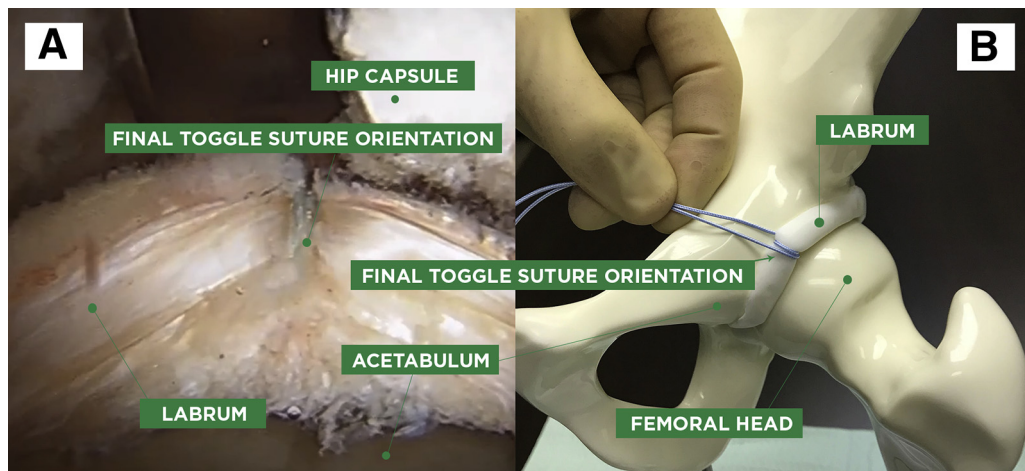


Fig 5. (A) Arthroscopic view of the repositioned labrum after it is secured with a 2.4-mm PEEK PushLock suture anchor. (B) Left hip model view showing final suture orientation with suture tails directed toward the acetabular rim.

Table 1. Advantages and Disadvantages of Suture Repair Techniques

Labral Repair Technique	Advantages	Disadvantages
Toggle stitch	Provides rotational control, no labral puncture	Pinches the free edge of the labrum
Labral base	Prevents overdeflection of large labra	Labral puncture required, not suitable for smaller labra
Cinch/simple	No labral puncture, technically easier than a labral base stitch	May overdeflect large labra, pinches the free edge of the labrum

Table 2. Technical Pearls and Pitfalls of the Toggle Stitch Technique

Technical Pearl	Technical Pitfall
Pass central aspect of suture loop at the chondrolabral junction.	Passing suture through the labral tissue itself
Pass 1 free end of suture through the retrieved loop.	Passing both suture tails through the suture loop
Slide hitch of the loop to the capsular side of the labrum.	Over- or undertensioning suture
Tension suture ends independently to achieve desired rotation of labral tissue.	

One potential disadvantage of any of the looped suture techniques is blunting of the apex of the acetabular labrum. This is a purported advantage of the labral base refixation technique, particularly in larger labra, where the blunting can compromise the physiological suction seal with the femoral head to a greater degree. The clinical impact, however, of the suture blunting the free edge of the labrum has not been found to compromise clinical outcomes.^{7,8} Although outcomes from labral repair based on labral thickness have not been reported, one can visually optimize the placement of the labrum on the acetabular rim, and the toggle stitch technique is one tool to enhance rotational control of the labrum relative to the femoral head.

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