

“Luggage Tag” Suture Modification for Closing the Quadriceps Tendon Autograft Harvest Site



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Abstract: The quadriceps tendon (QT) is increasingly used as an autograft for anterior cruciate ligament reconstruction. Closure of the harvest site helps with fluid extravasation from the joint for the duration of the procedure. In addition, closure of the QT removes the palpable defect noticed by many patients and prevents superficial infections from spreading deep to the joint. This Technical Note describes how to perform the “luggage tag” suture modification to efficiently and reproducibly close the QT harvest site with an arthroscopic self-retrieving suture passer.

The use of quadriceps tendon (QT) autograft for anterior cruciate ligament reconstruction (ACLR) is increasing in popularity because of its comparable clinical and biomechanical properties to other graft types.^{1,2} To perform ACLR with QT autograft, the central third of the QT is harvested.

Techniques for closing the harvest site are variable. No standard closure of the harvest site has been established. There is a paucity of studies that have shown that closing the harvest site improves ACLR outcomes; however, it has been shown that 80% of patients who underwent closure of the harvest site had good to excellent clinical outcomes based on International Knee Documentation Committee (IKDC) assessment.³ Closure of the harvest site improves arthroscopy fluid control intraoperatively by impeding extravasation through capsular rents at the harvest site, removes the persistence of a palpable defect that can be irritating to patients, and forms an innate barrier between the

joint and skin incision, which can help prevent superficial infections from spreading to the joint.

This Technical Note describes a technique for closing the QT harvest site using an innovative looped modification of the suture and arthroscopic self-retrieving suture passer, which cultivates a tighter and more efficient closure.

Procedural Technique

QT autograft harvest in ACLR is commonly performed through a small, 1.5- to 2-cm horizontal incision located at the superior pole of the patella. Typically, the graft measures 9 to 10 mm in width. We prefer to harvest the QT graft using a parallel-blade knife (Quadriceps Cutting Knife; Arthrex, Naples, FL) and Quadriceps Tendon Cutter (Arthrex) to complete the proximal harvest at its proximal (typically about 7 cm in length). This harvest technique leaves a central defect in the QT, which we prefer to close with a running No. 1 Vicryl suture (Ethicon, Somerville, NJ) that is anchored proximally in the apex of the graft with the “luggage tag” modification (Fig 1, Video 1). Dissolvable suture is preferred to prevent a palpable knot from being an irritant beneath the subcutaneous tissues.

To prepare the luggage tag, a No. 1 Vicryl suture is passed around any 1-cm cylindrical instrument. The suture is tied with multiple half-hitch knots, forming a fixed loop at 1 end of the suture (Fig 2). The short tail of the knot is trimmed, and the loop is removed from the instrument (Fig 3). The luggage tag is placed over the neck of the self-retrieving Scorpion Suture Passer (Arthrex) (Fig 4). The free end of the suture is then loaded into the mouth of the suture passer (Fig 5). The knee is flexed to 90°. An army-navy retractor is placed

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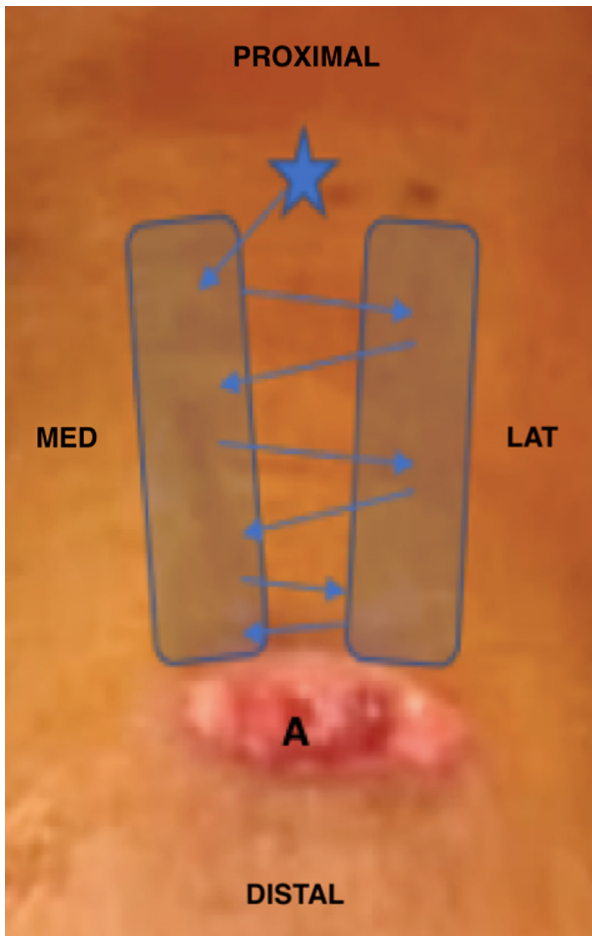


Fig 1. Patient is supine with left knee flexed to 90°. Diagram portraying quadriceps tendon defect after quadriceps tendon harvest (A) and flow of suture passage (arrows) during running closure. The luggage tag is passed centrally through the apex proximally (star). (LAT, lateral; MED, medial.)

into the proximal portion of the wound to retract the superficial soft tissues. An arthroscope, with the irrigation turned off, is placed into the wound to directly visualize the QT harvest site. The loaded suture passer is then placed into the wound (Fig 6). Under direct visualization with the arthroscope, the suture is passed through the apex of the QT harvest site (Fig 7). When the suture is retrieved from the wound, the luggage tag slides down the neck of the passer and over the free end of the suture, locking the suture directly to the apex of the harvest site without the need for manual tying in a deep, blind tunnel (Figs 8-10). Once the suture is anchored, the suture passer is then used to pass the suture in a running, alternating fashion toward the superior pole of the patella, where it is finally tied with a standard surgeon's knot. The skin over the harvest site is left open for the duration of the ACLR to allow any fluid that extravasates through the repair to drain rather than infiltrate the subcutaneous tissues.

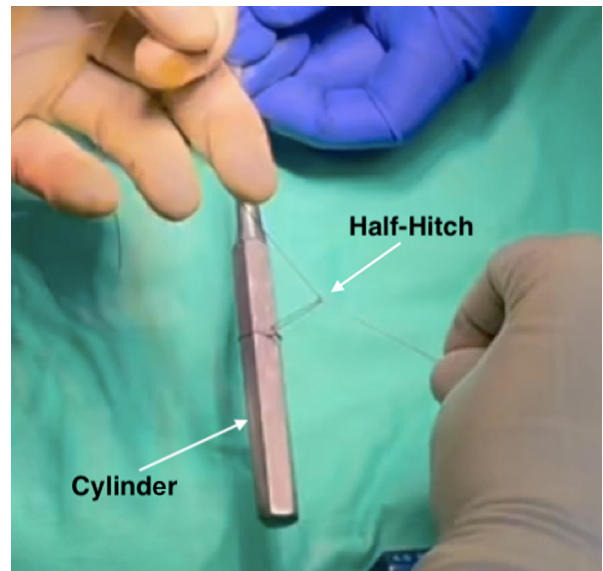


Fig 2. A No. 1 Vicryl suture is tied around the cylindrical base of an instrument with simple locking half-hitches to modify the suture into a "luggage tag."

Discussion

Closing the harvest site may not be the most alluring part of ACLR; however, optimizing the efficiency and integrity of this often-neglected part of the procedure can decrease operative time. Additionally, the luggage-tag modification allows the suture to be anchored at the apex of the harvest site, which decreases the risk of a gap being present between the apex and the knot seen with traditional knot techniques. Advantages and risks of performing the luggage-tag modification can be found in Table 1, and pearls and pitfalls are presented in Table 2.

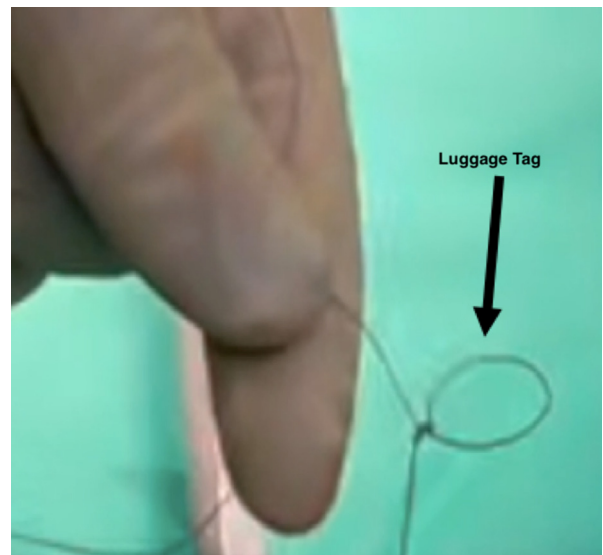
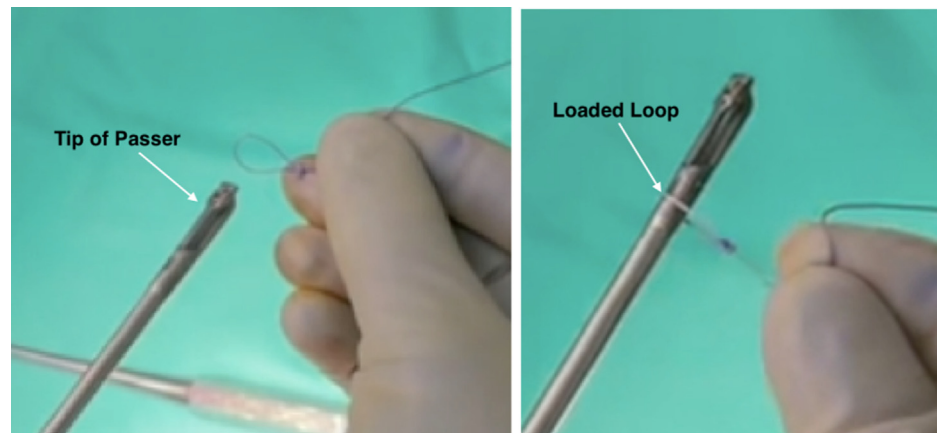


Fig 3. The completed luggage-tag suture is ready for passage once removed from the cylinder.

Fig 4. The loop is loaded over the tip of a suture passer.



In ACLR using bone–patellar tendon–bone autograft, studies have shown that closing the patellar tendon defect does not appear to affect outcomes.⁴ However, the patellar tendon spans 2 osseous insertions, whereas the QT differs in that it has a proximal musculotendinous attachment. This unique aspect of the QT autograft moves us to recommend an investigation into the effect of quadriceps closure on outcomes. A recent systematic review did report that 80% of patients who underwent closure of the harvest site had good to excellent outcomes.³

In the literature, details concerning QT harvest site closure are routinely lacking. Akoto and Hoehner⁵ harvested the QT through a 5-cm longitudinal incision and “the tendon defect was closed with a running suture.” Iriuchishima et al.⁶ stated that the harvest site was closed in a “side by side” manner. Runer et al.⁷

indicated that they closed the harvest site through a small horizontal skin incision “with Vicryl sutures.” Schulz et al.⁸ stated that the tendon “was approximated with a number 1 Vicryl suture.” Our Technical Note offers a detailed description of a reproducible, efficient option for QT harvest site closure.

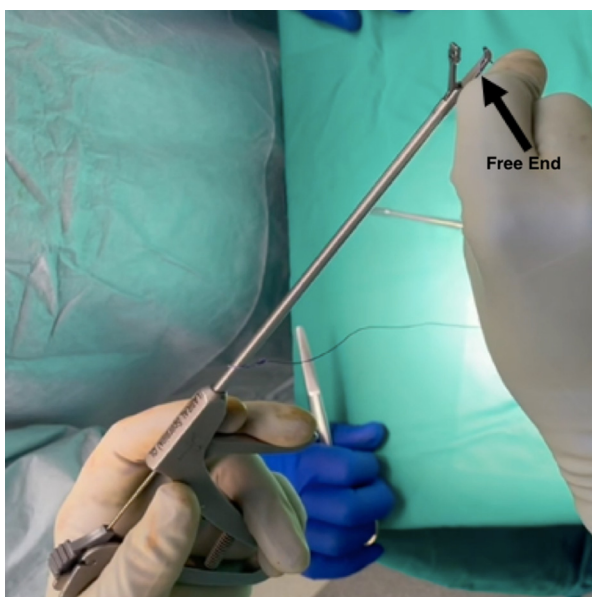


Fig 5. The free end of the suture is loaded into the suture passer.

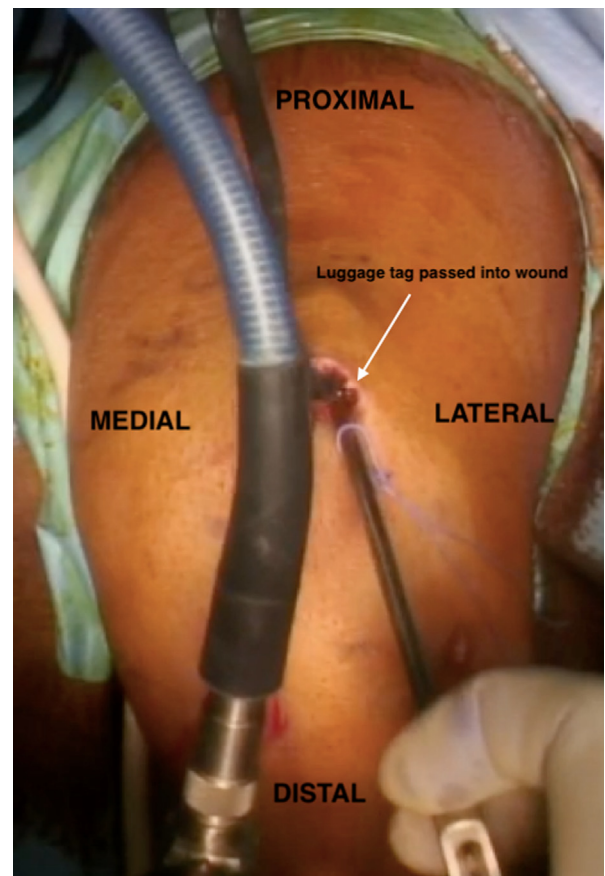


Fig 6. A retractor is placed into the wound to lift the soft tissues off of the tendon. The arthroscope is placed into the wound to view the tendon defect. The luggage tag–loaded suture passer is passed into the wound.

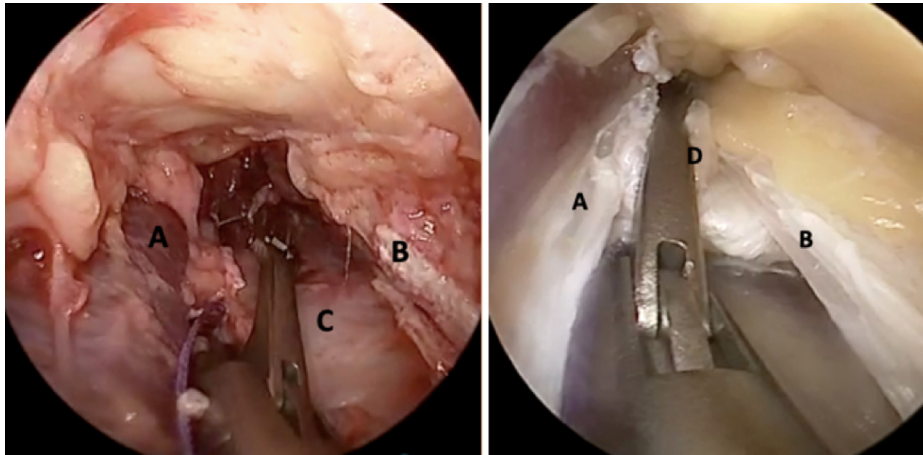


Fig 7. Arthroscopic view of quadriceps tendon (QT) harvest site with suture passer grasping proximal aspect of defect in preparation for luggage-tag passage. (A) Medial border of harvest site. (B) Lateral border of harvest site. (C) Central portion of QT defect with capsule in floor. (D) Apex of harvest site: proximal extent of central QT.

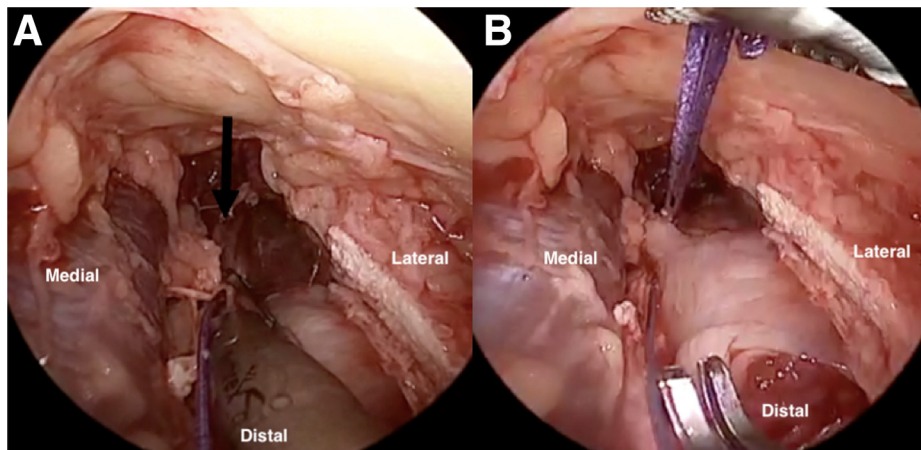


Fig 8. (A) The suture passer is used to pass the Vicryl proximally through the apex (arrow) of the quadriceps tendon defect. (B) The luggage tag has been passed through the apex of the quadriceps tendon defect and is being retrieved through the wound.

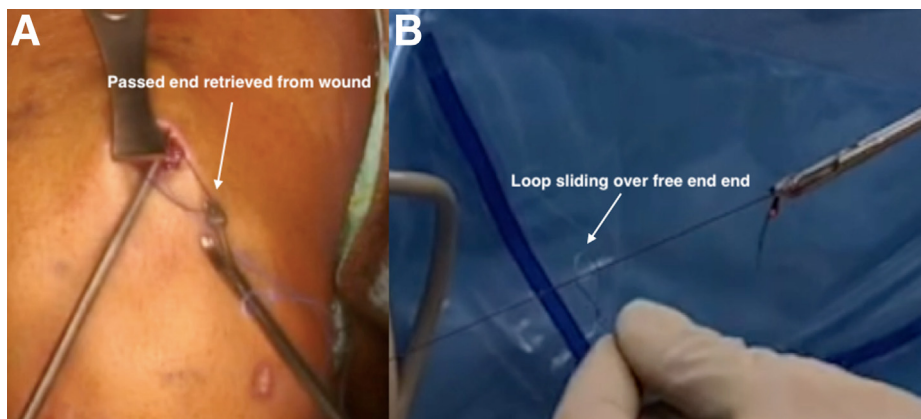


Fig 9. (A) The free end of the suture is pulled from the wound. (B) The loop is slid off the instrument and over the free end of the suture, completing the luggage tag.

Fig 10. The luggage tag is cinched down to the apex of the harvest defect, anchoring the suture proximally (arrows), as shown in 2 different cases.

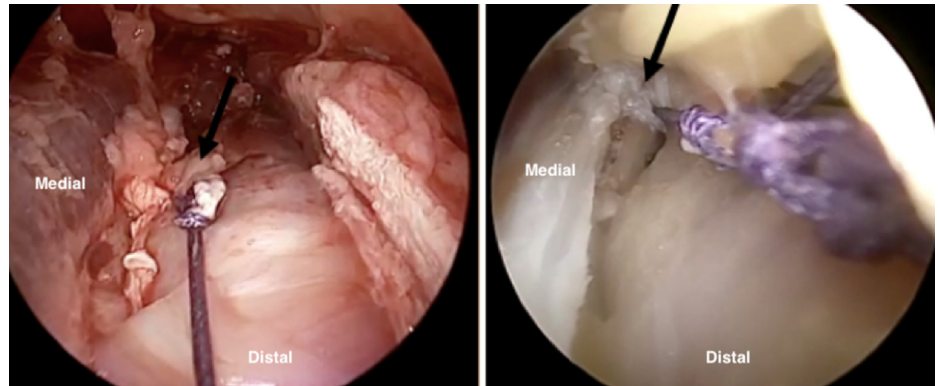


Table 1. Advantages and Risks of Technique

Advantages
Suture can be passed through the apex of the harvest site.
The need for arthroscopic knot tying is negated.
Risks
Increased costs accompany the suture passer device.

Table 2. Pearls and Pitfalls

Pearls
Teach an assistant how to tie the luggage tag so that it is ready for passage.
Tie the luggage tag around a cylindrical instrument with a diameter of about 1 cm.
Use a No. 1 Vicryl suture because the suture passer retrieves it more reliably than sutures of smaller sizes.
Pitfalls
Beware of the superior pole of the patella, which can bend the suture passer needle at the most distal extent of closure.

In conclusion, the luggage-tag modification offers a fast, reproducible technique for closing the QT autograft harvest site during ACLR. This technique negates the need to anchor the suture proximally in a deep wound with a hand-tied knot, saving time and removing the risk of proximal gapping between the knot and the apex.

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