

# Use of the Quadriceps Tendon in Arthroscopic Acetabular Labral Reconstruction: Potential and Benefits as an Autograft Option

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**Abstract:** The acetabular labrum serves many integral functions within the hip joint. As a result, novel surgical techniques that aim to preserve or reconstruct the labrum have entered the spotlight. We have performed labral reconstruction using the quadriceps tendon as an autograft for a patient with a moderate labral defect. The purpose of this report is to propose this novel donor site as a viable alternative for labral reconstruction using an autograft; the potential benefits over currently popular methods are discussed.

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In patients with acetabular labral tears, a simple labral debridement may not be an effective surgical option in many cases because of the loss of the sealing effect and the subsequent associated degenerative changes within the joint.<sup>1</sup> As a consequence, an increasing number of surgeons are favoring techniques that aim to preserve or reconstruct the labrum. In our clinical case, we performed a labral reconstruction using the patient's own quadriceps tendon (QT). We believe that the QT would be a reasonable alternative, with its potential advantages over currently proposed options (Table 1).

## Case Report

A 42-year-old woman presented with left hip pain in 2012. The first arthroscopy was performed, and an anterosuperior labral tear was confirmed to be at the 2-o'clock position; the articular surfaces were well preserved without any cartilage damage. She subsequently underwent partial labrectomy by arthroscopy, osteoplasty of the femoral head-neck junction, and synovectomy. After the labrectomy, her pain subsided and she was able to continue with her daily activities. However, pain returned after 1 month, and conservative

treatment failed to resolve this. On physical examination, left inguinal tenderness was noted, despite normal range of motion in the left hip. The Patrick test was negative, the anterior impingement test was positive, and hip failure was suspected in this patient. Radiography showed no obvious bony pathology, and the joint alignment was well preserved. The center-edge angle was 35° and the alpha angle was 48°, which—according to the radiographic index—were both within the normal range. The magnetic resonance arthrography did not show any pathology of the bony matrix or soft tissue, and the articular surfaces appeared to be normal; however, a contrast leak was found after labrectomy (Fig 1). The modified Harrison Hip Score (HSS) was 58, and the Western Ontario and McMaster Universities Arthritis Index (WOMAC) score was 49. The HSS measures the functional levels of the hip joint, whereas the WOMAC measures the pain and discomfort of the joint. A defect in the anterosuperior aspect of the labrum was noted during the second arthroscopy, and labral reconstruction was performed with a QT autograft to restore the normal labral function and its sealing effect.

## Surgical Technique

The patient was placed in a supine position, and 2 portals were established at the midanterior and anterolateral aspects of the hip joint. Partial capsulotomy was also performed to facilitate mobility, and we were then able to visualize the joint through the anterolateral portal. An anterosuperior labral defect was confirmed to be at the 2-o'clock position.

The labrum was debrided to the margins of viable tissue, and partial synovectomy was performed. Trimming of the

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**Table 1.** Tips for Arthroscopic Acetabular Labral Reconstruction Using QT

	Description
Radial suture at graft center	Radial sutures should be evenly spaced with a distance of 1 to 1.5 cm between each suture. This is necessary to strengthen the weakness against shearing force at the center of the graft.
Graft entrance	Because the arthroscopic view is narrow, 1 anchor should be drilled first, and a suture from the anchor should be passed through the graft free end by use of a straight needle. The graft can then be placed in the hip joint with a knot pusher through the accessory anterior medial portal.
Control knot	Because of the arthroscopic water pressure, the control knot moves around in the joint and may flip. To achieve better manipulation, the other anchor should be drilled at the expected end, and by use of a grasper or a bird beak, a suture from the anchor can be passed through the control knot. If this is impossible, the suture can be passed through the graft end, and by doing so, the graft can be attached to the acetabular bone bed.

acetabular rim followed, and 2 Gryphon suture anchors (DePuy Mitek, Andover, MA) were drilled into each end of the planned graft site. The labral deficiency was approximated to be 25 mm by use of a probe tip.

A small longitudinal incision at the distal femur was made, and 2.5 cm of the patient's QT was harvested. Only the 3 upper layers of the tendon were used, giving it a sufficient depth of 7 mm; the vastus intermedius tendon layer was excluded to preserve the normal function of the QT as much as possible. Two sutures were created on the harvested tendon: one at the free end for graft anchoring purposes and the other at the midpoint to reinforce resistance against shearing forces (Fig 2). The defect of the tendon at the donor site was sutured, and the incision was closed.

The graft was inserted into the hip joint and was attached to the 2 suture anchors (Fig 3). The stability of the suture was assessed by measurement of hip joint range of motion and direct visualization with a probe. The techniques are demonstrated in Video 1.



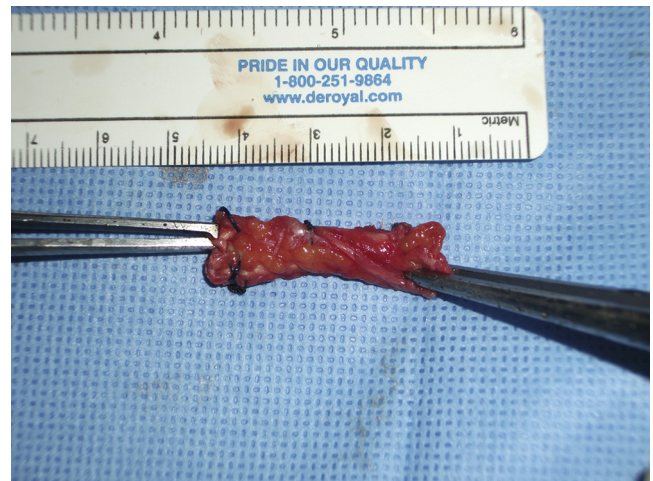
**Fig 1.** Preoperative magnetic resonance image of left hip in coronal view. A contrast leak is noted.

## Rehabilitation and Follow-up

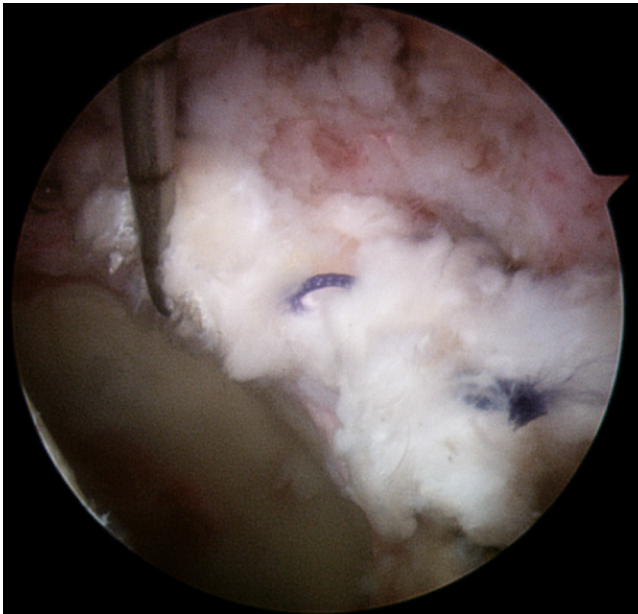
Four hours of continuous passive motion was used for 6 weeks to prevent adhesions. The patient was allowed partial weight bearing at week 6 and full weight bearing at week 8. A hip brace was worn for 3 weeks postoperatively, to limit extension and internal and external rotation. At the latest follow-up, which was 3 months postoperatively, the HSS increased to 83 and the WOMAC score decreased to 15.

## Discussion

Many studies have expounded the importance of the acetabular labrum, because it prevents early osteoarthritic changes and ensures joint stability.<sup>2</sup> There are 3 broad surgical methods for treating labral lesions: labral debridement, repair, or reconstruction. Labral debridement is a simple treatment option but provides benefits in only a limited spectrum of cases. Enduring symptomatic relief is much more remarkable with labral repair or reconstruction. One study showed that the majority of patients who underwent labral reconstruction reported more notable improvements in hip function and pain postoperatively versus those who simply underwent debridement.<sup>3</sup>



**Fig 2.** Two sutures were created on the harvested QT: One at the free end and the other at the midpoint. The midpoint suture was created with the aim of improving resistance against shearing forces.



**Fig 3.** A QT autograft was anchored at the prepared site of the acetabular rim.

Innovative techniques to reconstruct the labrum have been the subject of much interest; however, proposed autograft options for labral transplantation are relatively limited to date. Philippon et al.<sup>4</sup> suggest arthroscopic iliotibial band (ITB) autograft for labral reconstruction. This involves anchoring and engrafting the tubulized ITB at the site of the labral deficiency. The ligamentum teres capitis (LTC) was also introduced as an alternative autograft.<sup>5</sup> Studies showed good outcomes for both techniques: maintenance of suction seal and graft incorporation were evidenced through second-look arthroscopies for the ITB graft,<sup>6</sup> and a significant improvement in symptoms was noted for the LTC graft.<sup>3</sup>

To our knowledge, there have been no articles to date proposing and demonstrating the use of a QT autograft for labral reconstruction. There are, however, numerous studies that have reported the benefits of a QT autograft for anterior and posterior cruciate ligament reconstructions.<sup>7,8</sup> Biomechanical compatibility was noted in that instance: depth and length were sufficient, providing a comparable graft size to other options, and donor-site morbidity was adequately low.

Noting these advantages over other graft donor sites, we used the QT for labral reconstruction in our patient. A graft of sufficient length can be harvested from the QT, even for a large labral defect, in contrast to the LTC. Furthermore, a QT harvest can be achieved in a less invasive way whereas an open surgical hip dislocation is required for LTC. We also believe that a QT graft will

successfully incorporate, based on its biomechanical characteristics: the tendon consists of longitudinal fibers, meaning that radial side-to-side anastomosis with the remaining labrum is likely to occur.

Tubulization of the ITB provides a cushion effect in the short term, but this effect may be lost in the long term if the air within the graft is resorbed. In addition, the space created within a tubulized ITB graft may impede successful incorporation. A cushion effect may not occur; even so, the QT is, in our opinion, a better option in the long term. Theoretically, the tendon may better incorporate into the labrum and provide greater tensile strength as explained earlier.

Disadvantages of a QT graft include the difficulty of manipulation during anchoring because of laxity and its weakness under shearing force despite strong tensile strength. To address such weakness, we made an extra suture at the midpoint of the graft, which we hope will resist shearing force.

Long-term effects and, therefore, the full extent of advantages and disadvantages of a QT graft have yet to be quantified. On the basis of our experience thus far, however, we believe it to be a viable alternative for future labral reconstructions.

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