Technical Note

# Modified Technique for Labral Reconstruction of Hip Joint Using Autologous Iliotibial Band (ITB)—Make Labral Reconstruction Stress-Free

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**Abstract:** Current treatments for labral tear include surgical debridement, arthroscopic repair, and labral reconstruction. Although labral debridement and labral suture repair are suitable for most patients, labral reconstruction is the first treatment option when there is extensive labral degeneration or defect. Often, however, the labral degeneration or defect is only detected intraoperatively; therefore, the surgeon should always have a backup plan. The current labral reconstruction technique has shortcomings such as long operation time, difficult autograft harvesting, cumbersome graft preparation, and the need for a large surgical incision and re-sterilization and draping. To address these problems, we developed a modified technique for draping and surgery. This technique ensures preparedness for labral reconstruction during each hip arthroscopic surgery. The method also simplifies the steps for autologous iliotibial band graft harvesting and shortens operative time. We have achieved satisfactory clinical results with use of this technique over the past 2 years. In this Technical Note, we describe our technique. This modified labral reconstruction technique greatly improves surgical efficiency and could be a promising surgical technique for hip labral reconstruction.

Labral tear in the hip joint is a cause of pain and an important pathologic finding in patients with femoroacetabular impingement. Treatment of labral tear is generally by surgical debridement, arthroscopic repair, and labral reconstruction.[1,2] Early studies did not find significant differences in outcomes with arthroscopic suture repair and labral debridement. However, long-term follow-up of patients treated with current surgical techniques shows that restoration of the structural and functional integrity of the acetabular labrum (including arthroscopic suture repair and reconstruction) can significantly improve postoperative function of the hip. Therefore, several authors now believe that labral reconstruction should be the treatment of first choice for labral degeneration or defect.[3-5]

Reports of labral repair being performed during hip arthroscopy are increasing. For some patients, the need for labral repair or labral reconstruction can be predicted preoperatively by imaging, but there are many patients in whom irreparable labral tear or degeneration is detected only intraoperatively. According to one study, patients with intraoperatively discovered hip labral degeneration of >50% were less likely to achieve clinically significant improvement after labral repair.[6] Thus, it is important to have a simple and feasible labral reconstruction technique as a backup plan.

The current technique for labral reconstruction has shortcomings such as long operation time, difficulty in harvesting autografts, cumbersome procedure for preparation of grafts, and need for large surgical incisions and re-sterilization and draping. We devised a

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**Table 1.** Indications for Labral Reconstruction of Hip

| Indications | Contradictions |
|---|---|
| Nonsalvageable acetabular labrum including labral defect, insufficient quality for suture repair and labral degeneration | Age >50 years with significant osteoarthrosis |
| Insufficient labral width or longitudinal labral tissue (developmental and traumatic) | Tönnis grade 2-3 |
| Age ≤50 years without significant degenerative changes of Hip | |
| Tönnis grade 0-1 | |

modified technique for autologous iliotibial band (ITB) graft harvesting that simplifies the labral reconstruction technique and shortens operation time. We have achieved satisfactory clinical results with this technique over the past 2 years. In this Technical Note, we describe our technique.

## Surgical Technique (With Video Illustration)

Video 1 presents the surgical procedures in detail. Table 1 presents the indications for labral reconstruction of the hip; Table 2 summarizes the pearls and pitfalls associated with the technique; and Table 3 describes the advantages and limitations of the technique.

### Arthroscopic Technique

The patient is laid supine on a traction table (Smith & Nephew, Andover, MA) and prepared and draped in the modified fashion, as shown in Figure 1. In the traditional method for disinfection and draping, only the arthroscopic portals are exposed; this makes re-sterilization and draping necessary if labral reconstruction is found to be necessary during the operation. Our modified method presumes probable need for labral reconstruction during every hip arthroscopic surgery. Normally, 4 portals are used for the surgery: the anterolateral (AL) portal, mid-anterior portal (MAP), distal anterolateral accessory portal, and proximal mid-anterior. Establishment of the distal AL accessory and proximal mid-anterior portals (for placement of anchor sutures and management of wire sutures) and use of a cannula facilitates graft implantation. After accessing the hip joint, AL and MAP are used for instrument navigation and arthroscopic visualization during interportal capsulotomy. Traction wires applied to the proximal joint capsule allows better exposure of the acetabular labrum when necessary. AL and MAP are used to evaluate the status of labrum and identify associated pathologies such as impingement and cartilage lesions. After confirmation of labral deficiency, debridement and acetabular bony preparation are performed with shaver and burr to stabilize the labral margins. To mark the reconstruction area and for better fixation of the graft, 2.9-mm double-loaded bioabsorbable anchor sutures (Smith & Nephew) are placed at 8-mm intervals in the acetabulum from the 3-o'clock to 9-o'clock position. In the case shown in Figure 2 A-C, a total of 7 suture anchors were placed for graft fixation.

### Graft Harvest and Preparation

Keeping the lower extremity in full extension, a 2-cm longitudinal incision is made 8 to 10 cm proximal to the lateral joint line of the knee to expose the ITB (Fig 3). An 8-mm wide strip of the ITB is cut with a scalpel, and a closed tendon stripper is used to make the strip-shaped ITB graft. The open tendon stripper provides rotational shear force and makes it easy to cut the proximal site of the graft. The strip-shaped graft is harvested from the posterior two-thirds of the ITB by this technique. Normally, the graft is approximately 20 to 30 cm long and 8 mm wide. After folding (3-4 times) and tubularization, the graft diameter will be

**Table 2.** Pearls and Pitfalls

| Pearls | Pitfalls |
|---|---|
| Establishment of the DALA and PMA portals (for placement of anchor sutures and management of wire sutures) and use of a cannula facilitates graft implantation. | An 8-mm wide strip of the ITB is cut with a scalpel, and a closed tendon stripper is used to make the strip-shaped ITB graft. The open tendon stripper provides rotational shear force and makes it easy to cut the proximal site of the graft. |
| Normally, the graft is about 20-30 cm long and 8-mm wide. After folding (3-4 times) and tubularization, the graft diameter will be around 6-8 mm, which is usually sufficient for labral reconstruction. | For reconstruction of labral defects >8 cm, 2 pieces of strip-shaped ITB grafts may be necessary to meet the requirements of labral reconstruction. |
| It should be noted that, due to the curved shape of the reconstructed labrum, the graft will have to be 30% longer than the labral defect. | |
| Before fixation of the medial and lateral sides of the graft, the tension of the graft is adjusted to ensure equal tension distribution of the graft at each fixed clock position. | |

DALA, distal anterior lateral accessory; ITB, iliotibial band, PMA, proximal midanterior.

**Table 3.** Advantages and Limitations of the Technique

| Advantages | Limitations |
|---|---|
| In the traditional method for disinfection and draping, only the arthroscopic portals are exposed; this makes re-sterilization and draping necessary if labral reconstruction is found to be necessary during the operation. Our modified method presumes probable need for labral reconstruction during every hip arthroscopic surgery. | For patients with large labrum defect (exceeding 8 cm in our experience), 2 pieces of ITB graft will be necessary for labral reconstruction. |
| The length and diameter of the graft can be adjusted by cutting and folding, according to need in each case, which makes the technique suitable for individualized labral reconstruction. | Although we did not experience graft rapture during our surgery, great care must be taken during graft harvesting to avoid excessive traction and prevent the graft from rapture. |
| Different from the traditional technique (Fig 2C), the incision for graft harvest is far from the arthroscopic portals and so does not impede portal access. | |
| The harvested autograft has little muscular or fatty soft tissue and requires only a quick cleaning before folding and implantation. | |
| In the traditional technique of graft preparation, all knots are placed on one side of the graft so as to have a smooth graft–bone interface for better healing. However, during the surgery, the graft position had to be changed frequently to ensure that the smooth side faces the bone bed. With our modified technique, both sides of the graft present a smooth surface, and so implantation is easier. | |

ITB, iliotibial band,

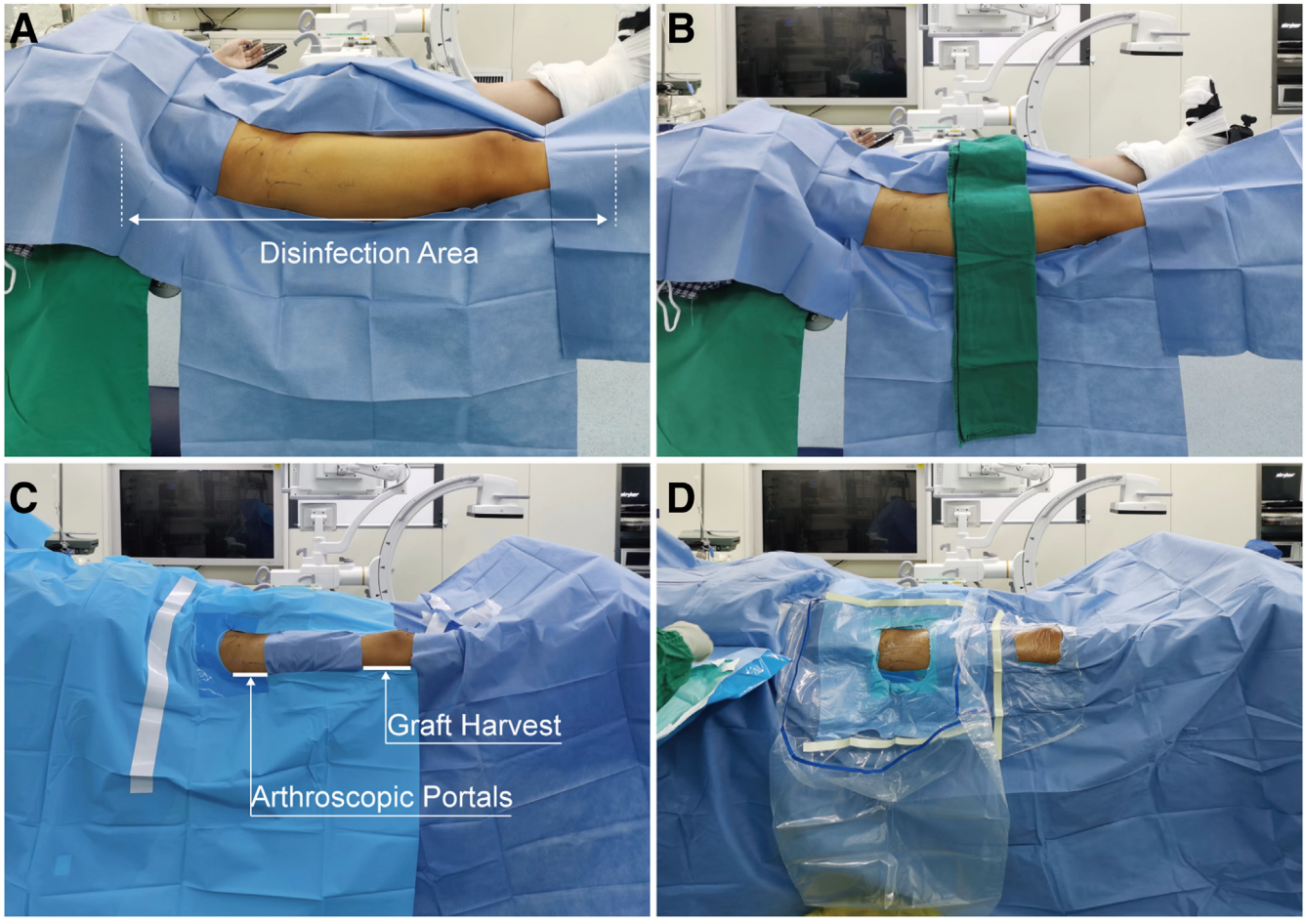


**Fig 1.** Modified draping fashion for hip arthroscopic labral reconstruction surgery. Patient in the supine position and we show the modified draping fashion with the right hip. Disinfection area and draping fashion (A and B). Two areas were prepared and exposed, one for arthroscopic portal establishment and the other for graft harvest (C and D).

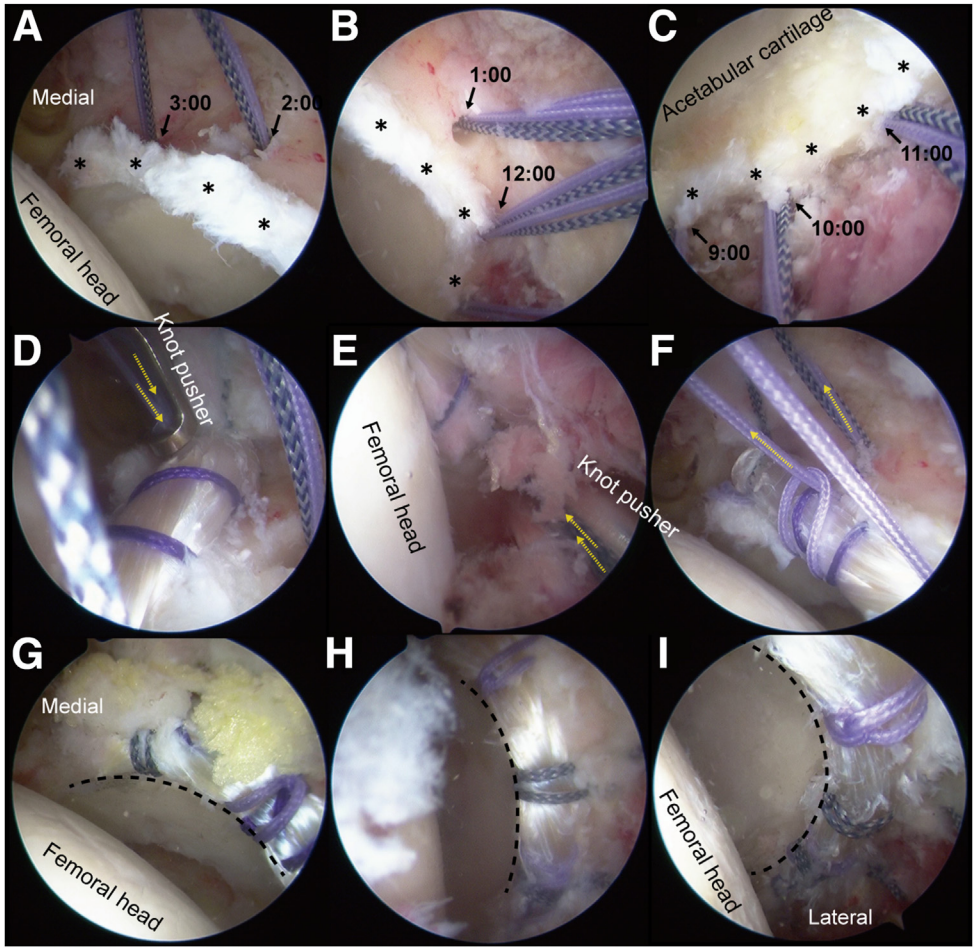


**Fig 2.** Arthroscopic implantation and fixation of the ITB graft. A-C show the placement of the suture anchors; the black arrows indicate clock positions, and the asterisks indicate the condition of labrum after debridement (Patient in the supine position, left hip). The ITB graft was implanted and fixed with wire sutures at the medial site (3 o'clock) and lateral site (9 o'clock) as shown in D and E, respectively. The graft was secured with anchor sutures from medial to lateral with luggage-tag technique (F). H-J show the shape of the reconstructed labrum; H, I, and J show the shape of medial, middle, lateral sites, respectively. (ITB, iliotibial band.)

approximately 6 to 8 mm, which is usually sufficient for labral reconstruction. However, for reconstruction of defects >8 cm, 2 strip-shaped ITB grafts may be necessary. The length and diameter of the graft can be adjusted by cutting and folding, according to need in each case. It should be noted that, due to the curved shape of the reconstructed labrum, the graft will have to be 30% longer than the labral defect. Different from the traditional technique (Fig 3C), the incision for graft harvest is far from the arthroscopic portals and so does not impede portal access. Further, the harvested autograft has little muscular or fatty soft tissue and requires only a quick cleaning before folding and implantation. In the traditional technique of graft preparation, all knots are placed on one side of the graft so as to have a smooth graft–bone interface for better healing. However, during the surgery, the graft position had to be changed frequently to ensure that the smooth side faces the bone bed. With our modified technique, both sides of the graft present a smooth surface, and so implantation is easier.

## Labral Reconstruction

The nonsalvageable labrum is debrided to a stable margin (Fig 2A). The graft is inserted through MAP. Traction is applied to the lower extremity to expose the central compartment, and the graft is pushed in through MAP with a grasping forceps holding one of the sutured sides of the graft; an 8-mm-diameter plastic cannula (Smith & Nephew) is used for assistance. The inserted graft is controlled and delivered to the defect area with a knot pusher. After the graft is properly seated on the refreshed acetabular rim, the medial side of the graft (3 o'clock in the patient shown in Fig 2D) is fixed to the refreshed acetabular rim with wire sutures (Fig 2D). The lateral side of the graft (9 o'clock in this case) is fixed similarly (Fig 2E). Then, the mid-part of the graft is fixed with wire sutures at the 12-o'clock position. Wire sutures from other anchors on both sides are knotted and fixed in turn for graft fixation and recreation of the suction seal and restoration of anatomic function of the labrum (Fig 2F). Figure 2H-J shows an ITB graft well fixed to the acetabulum and

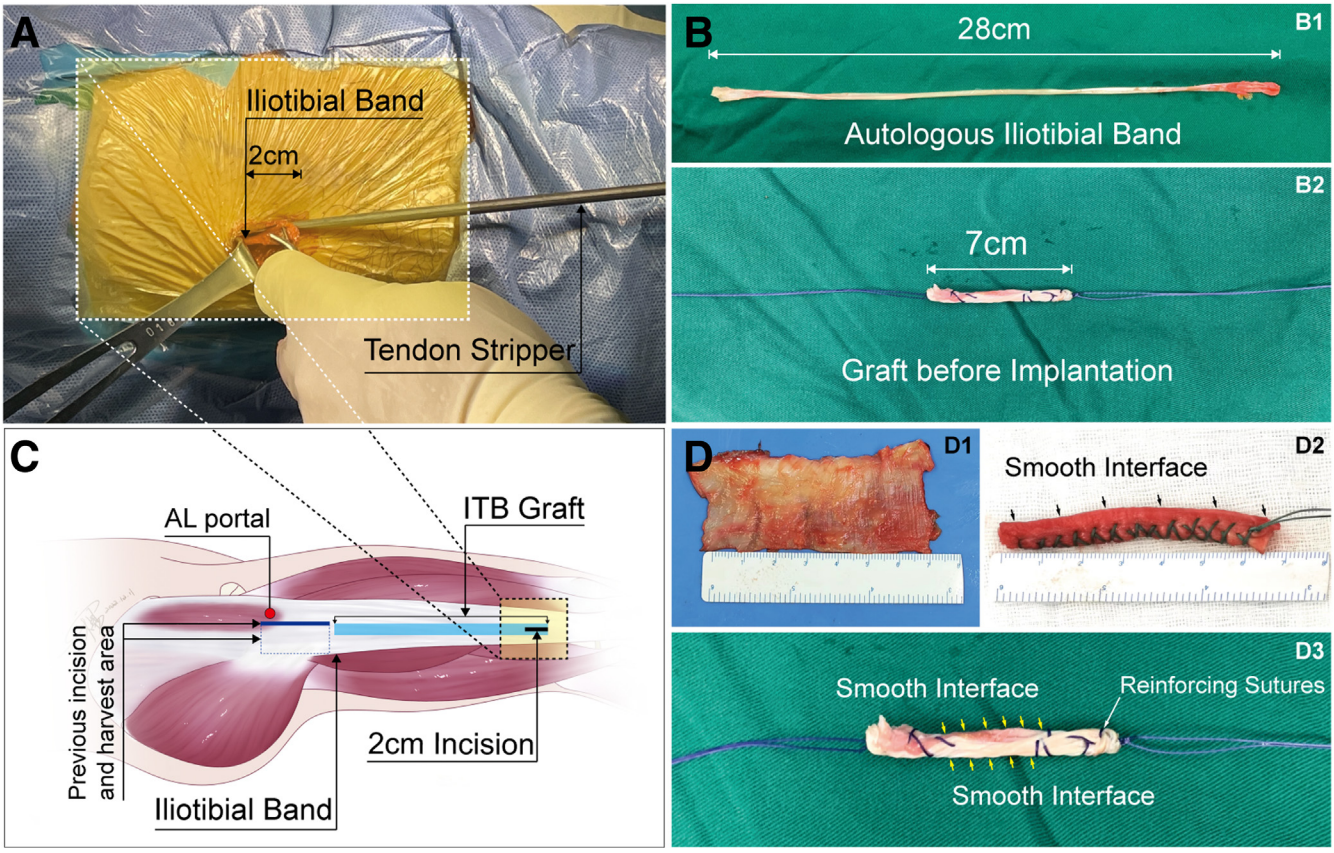


**Fig 3.** Modified surgical technique for harvest and preparation of autologous ITB graft. Surgical procedure and schematic diagram of ITB graft harvesting (A and C), patient in the supine position and we show the modified surgical technique for ITB harvesting with the right hip. The length and shape of the ITB graft after harvest (B1) and before implantation (B2). The shape of the grafts is compared in B and D. In the previous technique of graft preparation, all knots were placed on one side of the graft so as to have one smooth graft–bone interface for implantation (D1, D2); this required frequent changing of the graft position. With the modified technique, both side of the graft are smooth (D3), making implantation easier. (ITB, iliotibial band.)

resembling the native labrum. Normally, 6 or 7 suture anchors, placed at 8-mm to 10-mm intervals, are sufficient.

Before fixation of the medial and lateral sides of the graft, the tension of the graft is adjusted to ensure equal tension distribution of the graft at each fixed clock position. Traction is released, and the distal joint capsule traction wires are used to achieve femoral neck exposure. A hip burr is used to perform femoroplasty/arthroscopic femoral head–neck resection osteoplasty

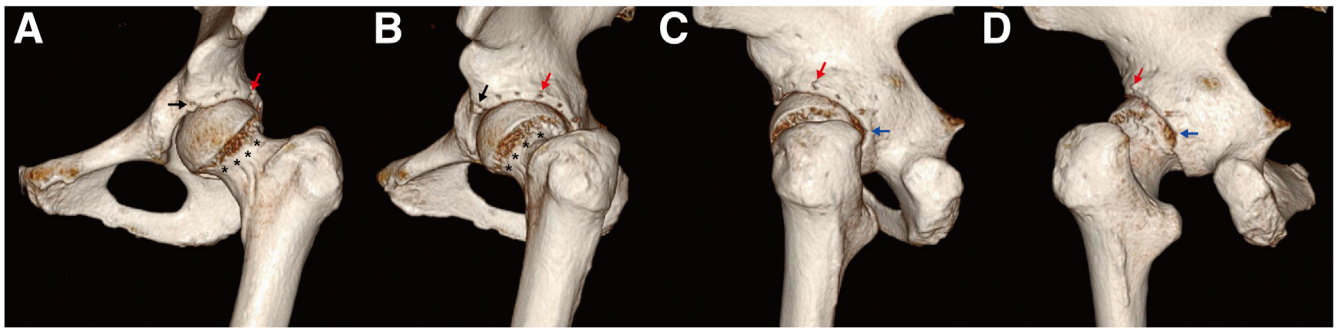


**Fig 4.** Position of suture anchors and shape of femoral head–neck junction after Cam osteoplasty. Anterior view (A, D), posterior view (D), and lateral view (B, C) of femoral head–neck junction in postoperative computed tomography 3-dimensional reconstructed images (left hip, the same patient as in the arthroscopic view); The black, red, and blue arrows indicate the 3 o'clock, 12 o'clock, and 9 o'clock positions, respectively. A and B show the shape of femoral head–neck junction after Cam osteoplasty (black asterisks).

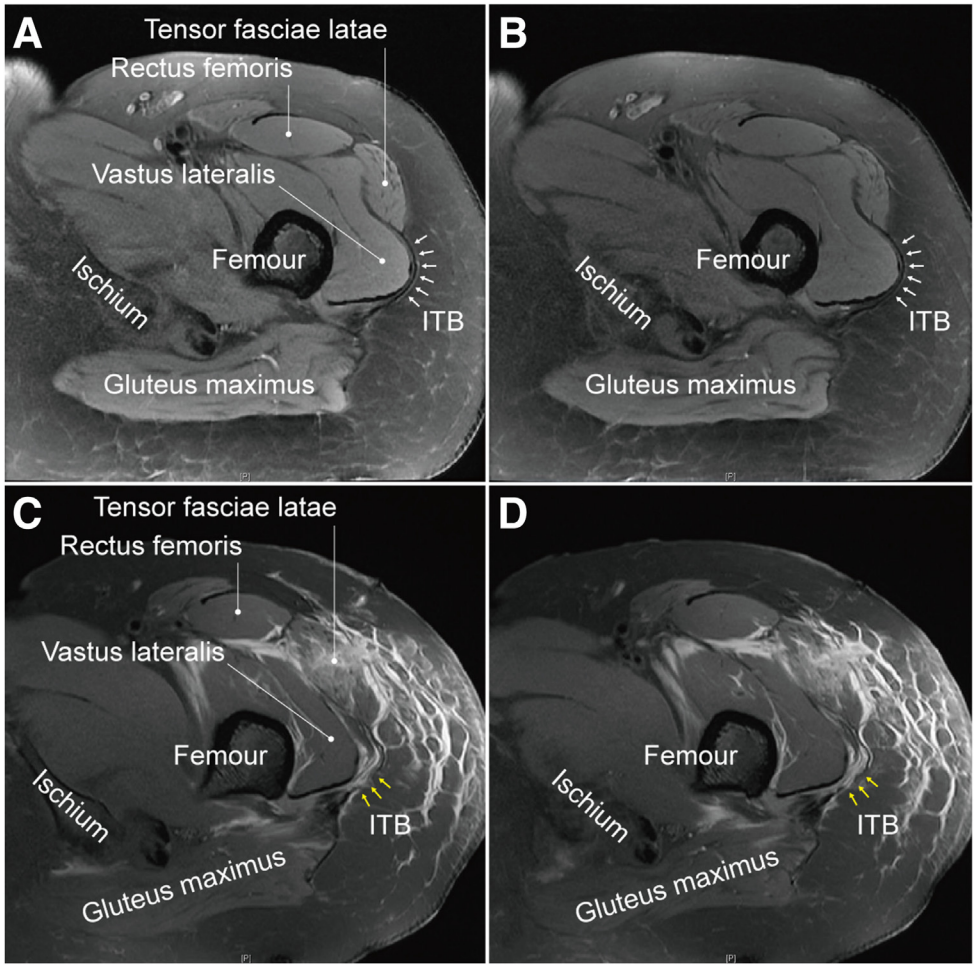


**Fig 5.** MRI comparison of the donor site before and after harvest of the ITB graft. Axial MRI of ITB donor site clearly demonstrates the shape of the ITB (white arrows in A and B), which is continuous and intact. Axial MRI of the ITB donor site at 24 hours postoperation (left hip, the same patient as in the arthroscopic view); the yellow arrows indicate the anatomical disruption site (C, D). (ITB, iliotibial band; MRI, magnetic resonance imaging.)

to protect the labral graft from mechanical failure. Finally, the reconstruction is evaluated in all planes of motion to assess fixation and correct positioning of the graft and restoration of the seal function on the femoral head. Position of suture anchors and shape of femoral head–neck junction after Cam osteoplasty is shown in Figure 4, comparison on magnetic resonance imaging of the donor site before and after harvest of the ITB graft is shown in Figure 5. The usual postoperative protocol is followed. Crutch-protected ambulation is recommended for 3 weeks, with elliptical trainer practice started at 1 month after surgery and unrestricted joint movement at 3 months after surgery.

## Discussion

The acetabular labrum is an important stabilizing structure in the hip joint, providing increased depth, surface area, volume, congruity, and stability during joint movements.[7-9] The suction seal it produces reduces cartilage stress and strain by providing a pressurized layer of synovial fluid to distribute compressive loads evenly.[7,9-12] Labral tear and the resulting joint pain are indication for hip arthroscopic surgery.[13] Labral tear alters the physiology and biomechanics within the hip joint and leads to degenerative changes of the articular cartilage and osteoarthritis over time.[7,12] Previous surgical management of labral tear focused on arthroscopic labral debridement; however, long-term studies show that labral repair, including suture repair and reconstruction, provides better functional outcome.[7,11,12,14,15] Labral reconstruction is a good option for patients with poor labral quality, labral calcification, or segmental defects.[10,12] Before labral reconstruction, labral quality and functional requirements need to be considered, in addition to patient age and Tönnis osteoarthritis grade.[7,10,12,16-18] Various surgical techniques for labrum reconstruction have been described. Although long-term follow-up data are limited, both segmental and circumferential labral reconstruction are reported to provide satisfactory clinical outcomes.[8-10,12,18-20] With rapid development in hip arthroscopic treatment techniques, labral reconstruction is being increasingly performed,[21] the

choice of technique and graft type depending on the indication, degree of pathology, patient variables, tissue availability, as well as the capabilities and preferences of the surgeon.

For labral reconstruction using autograft, autologous hip joint capsule and ITB are most commonly used.[10,12] The choice of autologous joint capsule may result in failure to close the capsule and so is unsuitable for patients with ligament laxity, borderline hip dysplasia, or lateral center–edge angle <25°. Meanwhile, autologous ITB is suitable for treatment of various types of labral defects. Besides having the inherent advantages of autograft tissue, ITB can be folded to obtain the optimal length and thickness for labral reconstruction. Philippon used ITB autograft for labral reconstruction,[11,12] with open graft harvesting through a separate incision, in 82 patients and followed them up for at least 10 years. Previous studies reported an arthroscopic technique for graft harvesting and arthroscopic labral reconstruction using open ITB autografts. Importantly, there is histologic evidence of tissue repair after labral reconstruction with ITB autograft, with one report showing evidence of viable fibrovascular connective tissue with focal benign syntonical-type lining at revision surgery 25 months after ITB autograft implantation; this is encouraging demonstration of satisfactory healing and graft incorporation into native tissue.[16]

Overall, long-term clinical and histologic outcomes are satisfactory after labral reconstruction with ITB autograft. However, the current labral reconstruction technique requires a large incision (commonly >5 cm) for graft harvest and a cumbersome preparation process for graft implantation, which prolongs—and sometimes even doubles—operative time. Moreover, the surgical incision for ITB harvest is near the standard incision site or arthroscopic portals, which impedes access through the portals.[12] Our modified technique simplifies the surgical steps and shortens operative time. The modified draping ensures that labral reconstruction can be performed if needed during any hip arthroscopic surgery. Our modified method has several advantages: First, the length and diameter of the ITB graft can be adjusted by cutting and folding to match the need of individual patients. Second, different from the traditional incision (shown in Fig 3C), the incision for the graft harvest is far from the arthroscopic portals and so does not impede access through portals. Third, the harvested autograft has little muscular or fatty soft tissue attached, and so can be quickly cleaned. Fourth, graft implantation is easier as both sides of the draft are smooth; the graft position does not have to be repeatedly changed during surgery, as is necessary with the traditional technique. We believe that these advantages improve surgical efficiency and make this a promising technique for hip labral reconstruction using autologous ITB.

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