Technical Note

Arthroscopic Lateral Retinacular Release and Modified Goldthwait Technique for Patellar Instability

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Abstract: Surgical options for patellofemoral (PF) disorders include proximal or distal realignment, cartilage restoration techniques, open or arthroscopic lateral retinacular release, and medial soft-tissue reefing. Skeletal immaturity and donor-site morbidity can be of concern in most reconstructive procedures. The Goldthwait procedure with hemi-patellar transfer and medialization combined with arthroscopic lateral retinacular release results in medialization of the PF contact point in flexion and corrects maltracking to prevent recurrent patellar dislocation. This functional procedure is indicated for PF instability and has historically been used in children to accommodate the immaturity of the tibial tubercle and physis. The purpose of surgical correction is to improve PF tracking, reducing the lateralizing forces on the patella with the correction of the Q angle (angle between the quadriceps tendon and patellar tendon). The purpose of this Technical Note was to describe, in detail, arthroscopic lateral retinacular release combined with the modified Goldthwait procedure for recurrent patellar instability.

Patellar instability is a disabling condition due to morphologic abnormalities of the patellofemoral (PF) joint where the patella is prone to recurrent lateral dislocation. Surgical options for PF disorders include proximal or distal realignment, cartilage restoration techniques, open or arthroscopic lateral retinacular release, and medial soft-tissue reefing.[1] The aim of surgical correction is to improve the PF kinematics, restoring the retinacular anatomy and avoiding recurrent dislocations. The Goldthwait procedure with hemi-patellar transfer and medialization combined with arthroscopic lateral retinacular release results in medialization of the PF contact point in flexion and corrects maltracking to prevent recurrent patellar dislocation.[2] Moreover, this surgical technique modifies the Q angle without involving the bony structures, and the indications are extended to younger patients with open physes, when other distal bony realignment procedures and trochleoplasty are not indicated.[3]

The purpose of this Technical Note was to describe, in detail, arthroscopic lateral retinacular release combined with the modified Goldthwait procedure for recurrent patellar instability. The advantages of this technique are that it is reliable and reproducible and can universally be used in case of patellar instability even in patients with open physes as an alternative to tibial tubercle medialization.

Surgical Technique

A demonstration of the main surgical steps is provided in Video 1. The indications and advantages of the procedure are presented in Table 1. The contraindications and limitations are summarized in Table 2. Pearls and pitfalls of each step are presented in Table 3.

Patient Setting

Short-term antibiotic prophylaxis is given, and selective unilateral spinal anesthesia with 1.4 mL of hyperbaric bupivacaine (Bupisen; Galenica Senese, Siena, Italy), 5 mg/mL, is administered. Accurate clinical examination of the knee joint is then completed to

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Table 1. Indications and Advantages of Modified Goldthwait Technique

Indications
Recurrent patellar malalignment and/or instability
Increased TT-TG distance
Skeletal immaturity or adults
Advantages
Reproducible
No need for bone tunnels and fixation devices
No damage to tibial tubercle and physis
Alternative to MPFL or MPTL reconstruction or TT medialization

MPFL, medial patellofemoral ligament; MPTL, medial patellotibial ligament; TG, trochlear groove; TT, tibial tubercle.

assess patellar stability. Next, a tourniquet is placed, and the patient is positioned supine with the knee extended on the surgical table. The surgical area is prepared in the standard arthroscopic setting.

Diagnostic Arthroscopy and Lateral Retinacular Release

Diagnostic arthroscopy is routinely performed to assess the intra-articular structures. Any associated meniscal tear is treated, if necessary. With the knee in full extension, the accessory superolateral portal is created about 2.5 cm proximal to the superolateral corner of the patella.[5] Patellar tracking is evaluated through the accessory superolateral portal to identify excessive patellar lateralization with the patella riding over the lateral femoral trochlear facet with increased lateral tilt (Fig 1). Patellar engagement with the trochlear groove in 30° of knee flexion is also dynamically assessed.

Lateral retinacular release is performed with the scope inserted through the anterolateral portal and a radiofrequency electrode system (VAPR 3; DePuy Mitek, Norwood, MA) in the anteromedial portal. The superior limit of the release is identified as the vastus lateralis muscle fibers. The radiofrequency instrument is passed through the superolateral portal, and accurate hemostasis of the superolateral genicular artery is completed to avoid painful postoperative hemarthrosis (Fig 2).

After the first 2 to 3 cm of release, the scope is switched to the superolateral portal to have better visualization of the distal retinaculum, and the release is completed to the tibiofemoral joint with the radiofrequency instrument inserted through the anteromedial portal. In this phase, gentle knee hyperextension can help the passage of the instruments through the PF joint. Final assessment of PF tracking is completed to verify the resulting centralization of the patella, with the patella well centered within the trochlear groove and improvement in the lateral tilt (Fig 3).

Surgical Exposure

A straight midline longitudinal incision centered on the patellar tendon is performed. Sharp dissection is completed from the inferior pole of the patella to the anterior tibial tubercle with the knee positioned in 90° of flexion. After accurate dissection of the superficial aponeurotic layer and the paratenon, the patellar tendon is carefully isolated and its lateral border is identified.

Hemi-patellar Transfer

The patellar tendon is longitudinally divided starting from the patellar pole down to the anterior tibial tuberosity with a No. 10 blade (Fig 4). The lateral half of the tendon is carefully detached from the anterior tibial tuberosity and successively dissected and mobilized from the anterior fat pad (Fig 5). Blunt dissection of the deep part of the medial patellar tendon left attached is completed to ensure optimal sliding of the lateral tendon transfer.

The knee is bent at 30° of flexion, and the lateral half of the patellar tendon is passed behind its medial part and fixed with interrupted stitches to the tibial periosteum 1 cm medial to the tibial tuberosity. Absorbable No. 1 Vicryl wires (Ethicon, Somerville, NJ) are used. Care must be taken not to over-tension the lateral patellar transfer to avoid excessive medialization, increased lateral patellar tilt, or patella baja. The procedure is completed by suturing the lateral margin of the tendon transfer to the medial margin of the patellar tendon (Fig 6).

Closure

The tourniquet is released, and careful hemostasis and electrocauterization are completed. The aponeurotic layer should be preserved and then sutured with interrupted No. 2-0 Vicryl stitches (Ethicon) covering the tendon transfer to ensure a biological support promoting soft-tissue healing (Fig 7). The fascial and skin incisions are closed, and medication is applied. At the end of the procedure, the knee is placed in a brace with range of motion locked at 30° of flexion.

Postoperative Rehabilitation

The patient is hospitalized for 1 night for observation and discharged from the hospital the next day. No weight bearing is recommended for 3 weeks, followed by partial weight bearing with crutches and a brace for the following 5 weeks. The brace is locked at 30° for the

Table 2. Contraindications and Limitations of Modified Goldthwait Technique

Contraindications
High-grade trochlear dysplasia (Dejour[4] type B or D)
Severe PF osteochondral damage
Previous patellar tendon surgery
Limitations
Prolonged postoperative immobilization
Weaker fixation than TT transfer

PF, patellofemoral; TT, tibial tubercle.

Table 3. Pearls and Pitfalls of Modified Goldthwait Procedure

Step	Pearls	Pitfalls
Patient setting	Perform the procedure with the knee in flexion.	Perform arthroscopy with a standard table.
Diagnostic arthroscopy and lateral retinacular release	Assess patellar tracking through the accessory superolateral portal.	Create the accessory superolateral portal with the knee in full extension.
	Gently hyperextend the knee to facilitate instrument passage through the femoropatellar joint during the lateral release.	Take care to avoid vastus lateralis muscle fiber injuries.
	Identify the vastus lateralis fibers as the proximal landmark for the release.	Coagulate the superolateral genicular artery.
	Switch the scope through the superolateral portal to ensure direct visualization of a proper distal release.	Take care to avoid an inadequate distal release.
Surgical exposure	Ensure a sufficiently long incision with adequate visualization of the patellar tendon.	Bear in mind that soft-tissue moistening after arthroscopy may raise difficulties in dissection.
	Carefully dissect and preserve the superficial aponeurotic layer.	Accurately identify the lateral border of the patellar tendon.
Hemi-patellar transfer	Mobilize the tendon half from the anterior fat pat.	When detaching the lateral half of the patellar tendon at the distal attachment to the anterior tibial tuberosity, avoid injury to its medial half .
	Bluntly dissect the deep portion of the medial tendon half left attached.	Avoid excessive distalization and medialization of the tendon transfer.
	Ensure meticulous control of knee flexion (30°) and neutral tibial rotation.	Avoid fixation of the transfer in extension or flexion and tibial internal or external rotation.
Closure	Cover the tendon transfer with a superficial aponeurotic layer to ensure biological protection.	Obtain accurate hemostasis to avoid hematoma formation.
Postoperative rehabilitation	Encourage the patient to perform isometric quadriceps exercises.	Advise a protocol of protected weight bearing postoperatively to prevent failure of soft-tissue fixation.

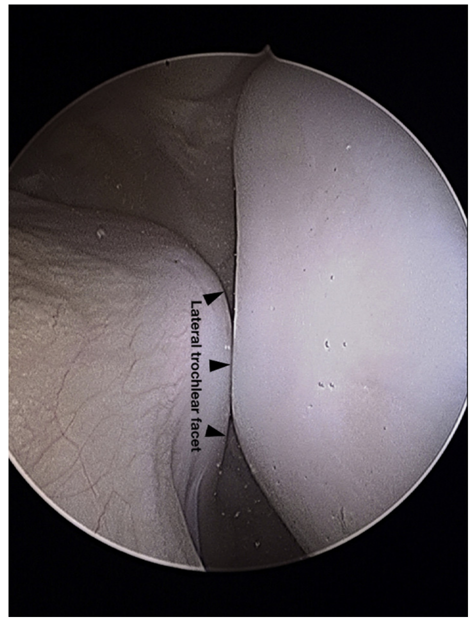

Fig 1. Arthroscopic view from the superolateral accessory portal in a left knee showing evaluation of patellar tracking and patellar engagement at 30° of flexion. One should note the increased patellar tilt and the lateralization of patellar tracking with the patella sliding on the lateral trochlear facet (arrowheads).

first 3 weeks after surgery, thereafter progressively increasing by 10° to 15° weekly. Use of the knee immobilizer is discontinued when the patient has gained full quadriceps recruitment. Free ambulation is normally allowed at 8 weeks. The patient should obtain full range of motion by 12 to 16 weeks. Restricted activity is recommended for 20 weeks to ensure proper soft-tissue healing.

Discussion

Skeletal immaturity and donor-site morbidity can be of concern in most reconstructive procedures for patellar instability. The modified Goldthwait technique

Fig 2. Arthroscopic view from the anterolateral portal in a left knee with identification of the vastus lateralis muscle fibers at the proximal extent of the release and localization of the superolateral genicular artery (arrowheads). The radiofrequency instrument is inserted through the superolateral accessory portal.

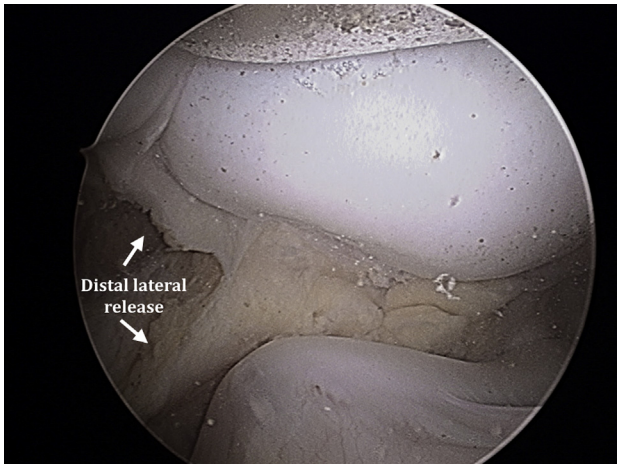

Fig 3. Arthroscopic view of the patellofemoral joint in a left knee from the superolateral accessory portal. When the lateral release (arrows) is completed, significant improvement in patellar tracking and the patellar tilt is noted, with the patella well centered on the trochlear groove.

combined with arthroscopic lateral retinacular release provides a reliable solution to modify the PF kinematics without involvement of the bony structures.[3] The Roux-Goldthwait procedure was described in 1895 for the treatment of recurrent patellar dislocation,[6] and it has been combined with retinacular procedures (open or arthroscopic lateral retinacular release, vastus medialis advancement, and medial capsular imbrication).[1,2]

This functional, nonanatomic procedure is indicated for PF instability and has historically been used in children to accommodate the immaturity of the tibial tubercle and physis. The purpose of surgical correction is to improve PF tracking, reducing the lateralizing forces on the patella with the correction of the Q angle.

Grammont et al.[7] described a further method of altering the vector of the patellar tendon without compromising the tuberosity insertion. The procedure

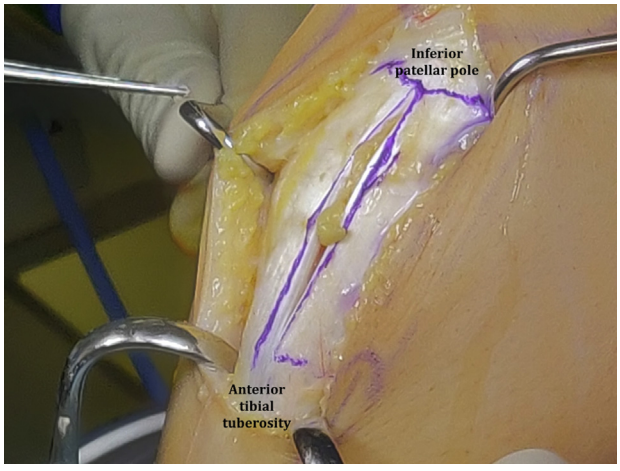

Fig 4. Intraoperative view of a left knee with the patellar tendon longitudinally split.

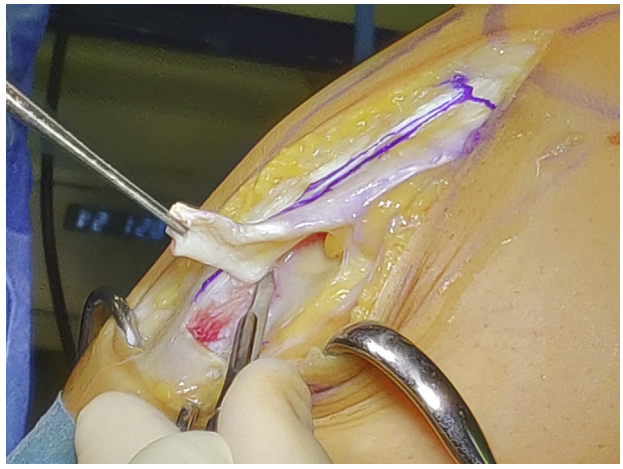

Fig 5. Careful detachment of the lateral hemi-patellar tendon to the anterior tibial tuberosity insertion in a left knee.

involves medial reinsertion of the entire patellar tendon (except for the most distal section) so that it may slide more medially; the patellar tendon is then held in the new position with trans-periosteal sutures. However, the risk of excessive PF joint compression and impairment of the tendon vascular supply may be increased with this technique.

Zaffagnini et al.[8] presented the results of medial patellotibial ligament reconstruction with the medial half of the patellar tendon with a bone plug combined with extensive open lateral release. This procedure provides for the transposition of the medial part of the patellar tendon with its bony insertion on the anterior tibial tubercle on the anatomic tibial insertion of the medial patellotibial ligament with a metallic screw or staple. The results of this procedure showed improved knee function in 86% of cases at 6 years.

Sillanpää et al.[9] showed that the functional outcomes and redislocation rates of the Goldthwait technique are

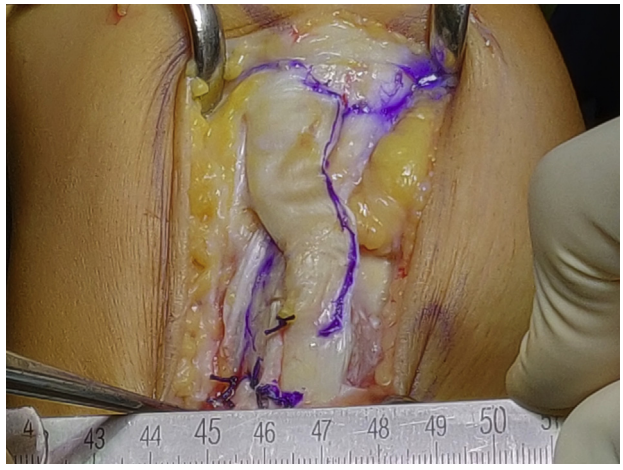

Fig 6. Final aspect of the modified Goldthwait technique with a left knee in 30° of flexion and fixation via interrupted absorbable No. 1 stitches to the tibial periosteum 1 cm medial to the center of the anterior tibial tuberosity.

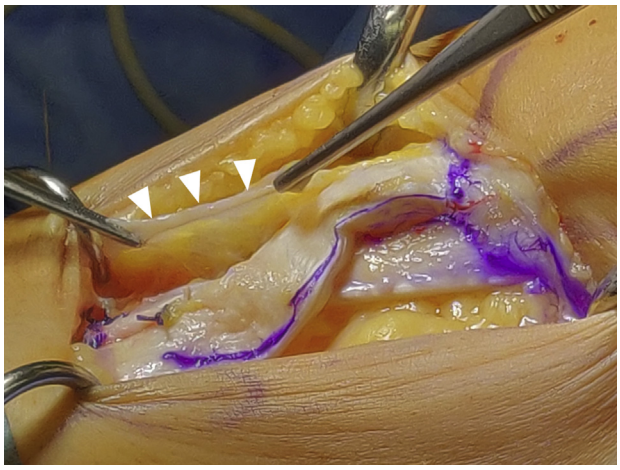

Fig 7. Intraoperative view of a left knee at 30° of flexion. The preserved superficial aponeurotic layer (arrowheads) is sutured to cover and protect the tibial attachment of the hemipatellar transfer with absorbable No. 2-0 wire.

comparable to those of medial PF ligament reconstruction with the adductor magnus tendon. Nevertheless, their study reported a 25% rate of PF osteoarthritis at 7 years.

Shortening of the patellar tendon and long-term PF osteoarthritis are possible consequences of the Goldthwait procedure for recurrent patellar dislocation, but the association with lateral retinacular release seems to provide better long-term outcomes.[1-3,5] Aärimaa et al.[10] reported patellar tibial tendon shortening with postoperative patella baja in 7% of treated patients.

The main advantages of the described technique are that it is reliable and reproducible and can universally be used in cases of patellar malalignment and/or instability. It has been shown to be effective at preventing symptom recurrence and improving the functional outcome of the knee joint with acceptable risks for the patient.[11] Nonetheless, the main disadvantages are related to prolonged postoperative immobilization for the weak tibial fixation that requires biological healing of the tendon transfer. The redislocation rate, clinical outcomes, and overall complication rate of the described technique are comparable to those of medial PF ligament reconstruction or tibial tuberosity osteotomy, with good or excellent results reported in 80% to 96% of patients.[2]

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