Case Report With Video Illustration

Arthroscopic Reconstruction of the Ligamentum Teres

James M. Simpson, F.R.C.S.Ed.(Tr&Orth), Richard E. Field, F.R.C.S.(Orth), and Richard N. Villar, F.R.C.S.

Abstract: We describe a case of arthroscopic reconstruction of the ligamentum teres using a novel technique. This technique is both simple and reproducible. We believe it to be a useful addition to the procedures available to the arthroscopic hip surgeon.

This article describes the arthroscopic reconstruction of the ligamentum teres in a 20-year-old dancer performed by the 2 senior authors. The concept and methods were tested over a 2-year period by use of 12 cadaveric hips before the first patient underwent surgery (Table 1). The ligamentum teres is a powerful static restraint between the acetabulum and femoral head with a tensile strength, in a porcine model, similar to the anterior cruciate ligament (ACL) of the knee.1 Furthermore, the position in which the hip is least stable corresponds to that in which the ligamentum teres is most taught: adduction, flexion, and external rotation.2 Evidence exists that rupture of this ligament can be a potent source of hip pain,3-6 which may be successfully treated by debridement. However, in some patients with persistent hip pain, it is our belief that this relates to the loss of stability normally provided by an intact ligamentum. On occasion, therefore, reconstruction of the ligamentum teres may be indicated.

POSITIONING AND SETUP

A lateral decubitus hip arthroscopic position was used; our detailed technique for hip arthroscopy has already been described.7 The patient was under general anesthesia, and a specialist hip distracter was used (Smith & Nephew, Andover, MA). Intravenous cefuroxime (1.5 g) was used as prophylactic antibiotic cover, followed by a 5-day course of oral erythromycin (500 mg four times daily). Lateral, anterolateral, and posterolateral portals were used throughout the procedure, together with a 70° arthroscope. Normal saline solution (0.9% sodium chloride) containing epinephrine, 1 mg per 3 L, was used for irrigation.

The patient had undergone an arthroscopy of the same hip (right) 6 months earlier, and the current operation was performed because of ongoing symptoms. A complete avulsion of the ligamentum teres from the fovea of the femur was confirmed (Fig 1, Video 1 [available at www.arthroscopyjournal.org]). The remainder of the central compartment was systematically assessed. A small anteroinferior acetabular osteochondral defect was noted; this had failed to heal despite a microfracture being performed at the first arthroscopy.

The posteroinferior portion of the cotyloid fossa was thoroughly debrided with a 90° radiofrequency probe (Video 1). The arthroscope and instruments were freely interchanged between the 3 portals, although the postero-
lateral portal was generally easier for accessing the fovea and the posteroinferior aspect of the cotyloid fossa.

**GRAFT PREPARATION**

To eliminate the risk of donor-site morbidity, an artificial graft made of polyethylene terephthalate (Ligament Augmentation & Reconstruction System [LARS], Arc-sur-Tille, France) was used. Good results have been reported for this material in ACL reconstruction.8,9 A synthetic knee medial collateral ligament graft (MCL 32, LARS) was used because this best suited the proposed procedure. The graft was looped over a 6-mm EndoButton (Smith & Nephew). The final construct comprising LARS ligament and EndoButton was sized at a diameter of 8 mm. Control sutures were applied to the EndoButton, which was then attached to a reversed ACL passing pin (Bearth pin), which acted as an introducer (Fig 2).

**FEMORAL AND ACETABULAR TUNNELS**

The fovea of the femoral head was clearly visualized by use of a combination of hip flexion and inter-

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**TABLE 1. Key Points**

- Cadavers used to trial techniques
- Careful patient selection
- Acetabular safe zones to safeguard against vascular injury
- Synthetic graft to eliminate donor-site morbidity
- Ongoing audit of outcomes

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**Figure 1.** View of right femoral head (FH) showing bare fovea as a result of complete rupture of ligamentum teres (posterolateral viewing portal). (CF, cotyloid fossa.)

**Figure 2.** The graft, here portrayed by a shoelace (G), passed through the EndoButton (EB). The white suture (white arrow) keeps the EndoButton against the side of the ACL passing pin (PP) until the EndoButton “flip” is performed later in the procedure by pulling on the apical suture (black arrow) and releasing the white suture.

**Figure 3.** Intra-articular view of femoral aimer arm (AA) in position in fovea of right femoral head (FH) (posterolateral viewing portal). (CF, cotyloid fossa.)
develop a femoral tunnel, 9 mm in diameter, by use of a cannulated drill. Bleeding from the foveal end of the tunnel was controlled by passing a flexible radiofrequency probe (Dyonics Eflex ligament chisel; Smith & Nephew) down the tunnel and ablating the hemorrhaging tissue.

The femoral head was then rotated within the acetabulum so that when a guidewire was passed up the femoral tunnel, it precisely struck the optimum point of graft insertion in the acetabulum. This position was at the posteroinferior portion of the cotyloid fossa, leaving a bridge of bone measuring approximately 5 mm inferiorly so as not to break into the obturator foramen. The posteroinferior portion of the acetabulum is also known to be a safe point for acetabular penetration at hip arthroplasty surgery. The guidewire was not allowed to penetrate the medial wall of the acetabulum. However, once the precise location for the acetabular hole had been identified, the guidewire was removed from the femoral tunnel and an 8-mm drill was passed down the tunnel to fashion the acetabular tunnel under direct arthroscopic vision and with great care.

**Graft Positioning**

The femoral and acetabular tunnels were then complete and suitably aligned. The EndoButton/ligament/reversed ACL passing pin complex was passed down the femoral tunnel under image intensifier control. Direct vision was used to guide the EndoButton into the acetabular tunnel (Fig 4, Video 1). Image intensifier views (Fig 5) were used to confirm exit from the acetabular tunnel on the inner lamina of the pelvis before the EndoButton was flipped (Fig 6). The introducer and all sutures were then removed, although tension was maintained on the LARS ligament throughout (Fig 7) to ensure that the EndoButton remained securely apposed to the inner lamina of the pelvis.

The limb was then rotated into 60° of external rotation, and traction on the right lower limb was slowly released. The ligament, which remained under tension throughout, was then fixed securely within the femoral tunnel by a graft fixation screw (9 × 30-mm Softsilk 1.5 screw; Smith & Nephew). The excess ligament was cut flush with the greater trochanter.

Twenty milliliters of 0.25% bupivacaine was placed into the hip joint before skin closure, with all the incisions being closed with interrupted No. 3/0 nylon sutures. Formal check radiographs (anteroposterior and lateral views) were performed before the patient returned to the ward (Fig 8).

**Rehabilitation and Recovery**

The patient was discharged home the day after surgery and was restricted to touch weight bearing for 4 weeks. She was also asked to avoid any active external rotation of the hip but was permitted active...
hip flexion to a maximum of 60° for the same period. An intensive physiotherapy rehabilitation program was commenced a week postoperatively.

Ten weeks after her operation, the patient reported that she was no longer aware of the “knocking” feeling that had been present before surgery. She had regained normal hip flexion, but external rotation remained restricted to 50% of the contralateral hip. Her Non-Arthritic Hip Score on the day of surgery was 42. These same scores at 6 weeks and 6 months after surgery were 72 and 86, respectively.

The patient’s latest clinical review, 8 months after reconstruction, showed continued improvement in both her confidence and muscle control around the hip. Her Non-Arthritic Hip Score was 89. The rehabilitation program is now focused on returning her muscular control, strength, and stamina to the extreme levels required in professional dance.

**DISCUSSION**

The breadth of procedures available to the arthroscopic hip surgeon continues to grow, although clearly,
arthroscopic reconstruction of the ligamentum teres is in its infancy. However, it has been established that a rupture of the ligamentum teres can be a source of pain⁴ and that the ligamentum does impart some stability to the hip joint.¹ We believe that to arthroscopically reconstruct this structure is a reasoned and justifiable response in carefully selected individuals. The technique we describe is based on similar ligament reconstruction procedures elsewhere in the musculoskeletal system, in addition to being simple and reproducible.

Transacetabular holes have been used by hip arthroplasty surgeons successfully for many years.¹¹ The concept of safe zones for transacetabular drill holes was developed by Wasielewski et al.¹⁰ for use by hip arthroplasty surgeons seeking to use screws to provide initial stability for uncemented acetabular components. The recommended acetabular entry point was selected with reference to these zones (Fig 9). The posteroinferior and posterosuperior quadrants are considered safe, whereas the anterior quadrants are to be avoided because of the closely opposed major vascular structures.¹²,¹³ The exit point lies safely inferior with reference to the neighboring vascular structures in the female pelvis (Fig 10). In the male pelvis the obturator vein more closely follows the artery and is therefore even further away from the acetabular entry point than in the female pelvis.

The indications for ligamentum teres reconstruction remain to be fully defined. Currently, this is only offered to patients in whom arthroscopic surgery has failed and where the symptoms are consistent with instability of the hip. As clinical experience with this procedure grows, the selection criteria will change. It is important that these initial patients undergo detailed follow-up and have their outcomes recorded within the orthopaedic literature.

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**REFERENCES**