Concomitant Arthroscopy With Labral Reconstruction and Periacetabular Osteotomy for Hip Dysplasia

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Abstract: In the setting of true hip dysplasia, the high prevalence of intra-articular pathology may lead to recurrent symptoms and failure after periacetabular osteotomy (PAO). Femoral neck osteochondroplasty, microfracture, removal of loose bodies, and labral repair are examples of procedures that are performed with concomitant arthroscopy. When damage to the labrum is too severe to repair, reconstruction instead of extensive debridement before PAO can be more effective in restoring the labral seal to maintain joint lubrication and chondral protection. This Technical Note describes a method for concomitant hip arthroscopy with circumferential labral reconstruction with allograft and PAO.

The addition of hip arthroscopy in conjunction with periacetabular osteotomy (PAO) has expanded the treatment options for dysplasia in the young active adult patient. There is increasing recognition of previously under-reported intra-articular hip pathologies associated with dysplasia and the possibility to treat them through a modern and minimally invasive manner. Previous authors have described residual femoroacetabular impingement, untreated labral tears, and chondral lesions as potential causes of recurrent symptoms and risk factors for revision surgery after PAO procedures. Bony correction with PAO is the fundamental base for the treatment of true hip dysplasia. However, the authors have also advocated concomitant arthroscopy for the treatment of intra-articular derangements.

This Technical Note presents a method for concomitant hip arthroscopy with a circumferential labral reconstruction technique and PAO for the treatment of an irreparable labral tear in the setting of true hip dysplasia (Fig 1).

Surgical Technique

Patient Preparation and Portal Placement

A combination of general anesthesia for skeletal relaxation and epidural analgesia for postoperative pain control is administered. The patient is placed in the modified supine position on a traction table with a well-padded perineal post (Fig 2A). Under fluoroscopy, the joint seal is broken and traction is applied (Fig 2B). Anterolateral, midanterior (MA), distal anterolateral accessory, and posterolateral portals are created (Fig 3A).

Diagnostic Arthroscopy and Labral Assessment

A systematic diagnostic arthroscopy is performed. The ligamentum teres, acetabular notch, iliopsoas impingement sign, labral and chondrolabral junction conditions, and acetabular and femoral head cartilage are assessed. Labral reconstruction is indicated if the labrum is too severely torn or diminutive for repair or is significantly calcified (Fig 4). Indications for reconstruction are listed in Table 1.
Circumferential Labral Reconstruction Technique

A single-strand anterior tibialis tendon allograft is used for the reconstruction (Fig 4 A and B). The following implants are needed: Knotless SutureTak 3.0-mm anchors (Arthrex, Naples, FL) and 1 PushLock 2.9-mm anchor (Arthrex). As previously described and published by the senior author (B.G.D.), an advantage of this technique is that it does not require measurement of the size of the labral defect.15

The labrum to be replaced is debrided, and the acetabular rim is decorticated to ensure healing17 (Video 1). Knotless SutureTak anchors are placed through the distal anterolateral accessory portal with 6 to 8 mm of spacing, which generally amounts to 4 to 6 anchors (Video 1, Fig 3B). Meanwhile, an assistant prepares the allograft by placing a FiberLoop suture (Arthrex) at each end of the graft (Fig 5 A and B). One side is prepared with the PushLock anchor, and the other remains free (Fig 5 C and D).

The free end of the graft is passed into the joint through the MA portal (Fig 3C) and retrieved by pulling the free limb of the FiberLoop from the posterolateral portal (Fig 3D). The graft is fixed to the most anteromedial part of the defect with the PushLock anchor through the modified MA portal, and the sutures of the previously positioned Knotless SutureTak anchors are passed and cinched sequentially (Video 1). Finally, the graft is fixed in the most posteromedial part of the defect also with a Knotless SutureTak anchor, and any excess graft is removed. This allows appropriate...
matching to the size and location of the original defect and essentially circumferential reconstruction (Fig 6). Additional arthroscopic procedures for the treatment of other intra-articular pathologies may then proceed.

**Periacetabular Osteotomy**

After completion of the arthroscopic phase, the patient is transferred to a radiolucent table (Fig 2 C and D). A PAO technique as described by Ganz et al.\(^{18}\) and modified by Murphy and Millis\(^{19}\) with a modified iliofemoral incision is used (Video 1). Superficial dissection is performed with identification of the anterior superior iliac spine (ASIS). The interval between the medial joint capsule and iliopsoas is developed, and ischial osteotomy is performed before pubis osteotomy. The ilium is exposed, with care taken regarding the abductors attached to the lateral iliac wing, and with a sagittal saw, an osteotomy from the ASIS to the pelvic ring is created. The final posterior column osteotomy is connected to the ischial osteotomy, allowing fragment mobilization and correction under fluoroscopy, which

**Table 1. Surgical Indications and Contraindications for Labral Reconstruction With Concomitant PAO**

| Indications                                                                 | Contraindications                |
|----------------------------------------------------------------------------|----------------------------------|
| Intraoperative findings of nonviable and/or irreparable labral tear*       | Reparable tear*                  |
| Frank dysplasia with LCEA < 18°                                           | Advanced osteoarthritis          |
| No evidence of severe chondral damage on dGEMRIC MRA                       | Active infection                 |
| Tönnis grade ≤ 1                                                           | Skeletally immature patient      |
| (age < 12 yr)                                                              | Bipolar and severe chondral damage |

\(^{*}\) Only for labral reconstruction.

dGEMRIC, delayed contrast-enhanced magnetic resonance imaging of cartilage; LCEA, lateral center-edge angle; MRA, magnetic resonance arthrography; PAO, periacetabular osteotomy.
Capsular repair or plication is performed, and the ASIS is repaired. Preoperative and postoperative radiographs show the final construct in Figure 7.

Postoperative Course

An epidural catheter is used for 48 hours for pain control. A continuous passive motion machine is used for 4 weeks beginning on postoperative day 1.
Postoperative Rehabilitation

The patient is placed in a brace (Donjoy X-Act ROM Hip Brace; DJO Global, Vista, CA) for 6 weeks to protect the hip and limit abduction and rotation. Use of crutches is encouraged for 8 weeks with weight-bearing restriction of up to 20% of body weight. Gentle passive range-of-motion exercise is initiated during the first week, under the supervision of a physiotherapist. Active hip flexion is not allowed until week 8.

Discussion

The purpose of this technique is to restore normal hip biomechanics to a patient with an irreparable labral tear in the setting of true dysplasia by correcting bony abnormalities through PAO, reconstructing a functional labrum, and addressing other associated intra-articular pathologies. Hip dysplasia is well recognized as a leading cause of secondary osteoarthritis in the active young adult. In fact, 20% to 40% of patients with osteoarthritic hips have a history of dysplasia. Female sex and familial antecedents are known risk factors. The necessity for total hip arthroplasty at a relatively young age is a concern in terms of implant durability and stability, and the likelihood of a more difficult and unpredictable revision surgical procedure may be as much as 25% higher compared with the general population. Bony correction and reorientation in dysplastic sockets through rotational osteotomies have proved to be a good hip-preservation option. The Bernese PAO has been shown to be an efficacious procedure in experienced hands, yielding good results even in the long term, with survivorship of over 60% at 20 years. Tables 2 and 3 review the advantages and disadvantages of arthroscopic procedures concomitant with PAO, and Table 4 presents pearls and pitfalls.

The use of isolated hip arthroscopy in the setting of hip dysplasia remains controversial. Results and outcomes vary greatly between true hip dysplasia and “borderline dysplasia,” as well as capsular

Table 2. Advantages and Disadvantages of Concomitant Arthroscopy With PAO

| Advantages | Disadvantages |
|-----------|---------------|
| Intra-articular arthroscopic visualization | Steep learning curve |
| Arthroscopic treatment of concomitant pathologies such as labral tears, FAI, SSI, and IPI | Meticulous technique |
| Hip traction | Fluid extravasation, which may make open approach more difficult |
| Lack of long-term follow-up |

FAI, femoroacetabular impingement; IPI, iliopsoas impingement; PAO, periacetabular osteotomy; SSI, subspine impingement.
management. 29-32 Authors have published good results in patients with borderline hip dysplasia with appropriate patient selection criteria and appropriate capsular and labral management. 32,33 Lodhia et al. 18 pointed out in a systematic review that arthroscopy alone with capsular plication improved outcomes at short-term and midterm follow-up in borderline hip dysplastic cases. Discounting results with isolated hip arthroscopy for true dysplasia have been reported. 34-36 Uchida et al. 30 concluded that patients with a lateral center-edge angle below 19° were at risk of failure after hip arthroscopic surgery even with adequate capsular management. In a recent systematic review, Yeung et al. 37 concluded that hip arthroscopy alone leads to a high rate of reoperation and conversion to total hip arthroplasty in true hip dysplasia cases.

Arthroscopy may be more effective than arthroscopy in the recognition of associated intra-articular hip pathologies in patients with hip dysplasia undergoing PAO. 5 Redmond et al. 13 established this difference between hip arthroscopy and hip arthroscopic in patients who underwent PAO. They found statistically significant differences: Labral tears were found in 21% of arthroscopy cases versus 84% of arthroscopy cases. It is interesting that only arthroscopic evaluation studies reported acetabular and femoral chondral damage, with rates of 73% and 27%, respectively. 13

Risk factors that accompany arthroscopic labral reconstruction and PAO along with limitations of the procedure are listed in Table 5. Concomitant hip arthroscopy with labral reconstruction and PAO offers a feasible alternative for the management of young active adult patients with true acetabular dysplasia and irreparable labral tears; however, midterm and long-term follow-up is still needed. 38

Table 3. Advantages and Disadvantages of Concomitant Arthroscopic Labral Reconstruction With PAO

| Advantages | Disadvantages |
|------------|---------------|
| Restoration of labral suction-seal effect | Technically demanding procedure |
| Restoration of labral function | Longer OR time |
| Preservation of capsule for minimal to no acetabular morbidity and complications | Possible increase in inherent potential arthroscopic complications |

Table 4. Pearls and Pitfalls

| Pearls | Pitfalls |
|--------|---------|
| Minimal to no acetabular trimming | Not addressing associated intra-articular pathologies such as FAI, SSI, loose bodies, and IPI |
| Use knotless anchor technology to decrease surgical time | Minimal experience in advanced arthroscopic techniques may result in nonreproducible procedure |
| Use allograft to reduce donor-site morbidity and complications | Preservation of capsule for further capsular plication |
| Ideally, 2 different lead surgeons, one for each surgical phase (arthroscopy and open) | |

Table 5. Risks and Limitations

| Risks | Limitations |
|-------|-------------|
| Abdominal extravasation | Trained surgical team and staff |
| Abdominal compartment syndrome | 2 surgical teams |
| Tight compartment syndrome | Available allograft |
| Increased neurologic lesion risk | Challenging and demanding procedures |

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