Arthroscopic-assisted PAO

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Problems:

1. Patients want minimally invasive surgery
   a. If rapidly progressive OA occurs after hip arthroscopy → PAO no longer option → THA in young patient
2. Which patients have treatable central compartment pathology?
3. Which patients have XS chondral damage → Abort PAO → THA
4. High prevalence of Cam morphology with DDH
5. Sciatic nerve is at risk
6. Errant intra-articular osteotomy
7. Iatrogenic acetabular retroversion

Solution:

Endoscopic-assisted PAO

   A. Hip arthroscopy for problems 1, 2, 3, 4, 6 and 7
   B. Endoscopy for problem 1, 5 and 6
Surgical Technique

Supine hip arthroscopy under general anesthesia

Central compartment arthroscopy

Peripheral compartment arthroscopic femoroplasty (mid-flexion)

Mini-open PAO

Endoscopic release and retraction of sciatic nerve with 30 degree arthroscope in anterolateral portal

**Ischial osteotomy**

Pubic osteotomy

**Posterior column osteotomy**

Ilium osteotomy

Percutaneous screw fixation

CC hip arthroscopy confirms no intra-articular violation

Arthroscopic dynamic exam + fluoroscopic imaging (or AP pelvis radiograph) confirms no residual FAI from retroverted acetabular fragment.
Is intraarticular pathology common in patients with hip dysplasia undergoing periacetabular osteotomy?

Domb BG, Lareau JM, Baydoun H, Botser I, Millis MB, Yen YM.

BACKGROUND: Periacetabular osteotomy (PAO) enables correction of bony acetabular deficiency in the setting of hip dysplasia. Patients with insufficient acetabular coverage often have intraarticular pathology, but the degree of this pathology has been incompletely characterized. We have used arthroscopy as an adjunct to PAO to further delineate intraarticular pathology in patients with hip dysplasia with mechanical symptoms.

QUESTIONS/PURPOSES: We documented the arthroscopic incidence of (1) femoral and acetabular chondral pathology, (2) femoral neck cam lesions, and (3) internal snapping or ligamentum teres pathology among patients having arthroscopy before PAO.

METHODS: We reviewed all 16 patients (17 hips; mean age at surgery, 21 years; range, 12-33 years) with hip dysplasia who underwent PAOs and concomitant hip arthroscopy at our institutions from October 2010 to March 2012. During this period, 80 patients underwent PAOs, making the arthroscopic cohort 21% of the total cohort. Indications for concomitant hip arthroscopy were mechanical...
symptoms consistent with labral pathology identified on MRI. We documented pathology involving the labrum, chondral surface, ligamentum teres, cam deformity, and psoas tendon.

RESULTS: Arthroscopy revealed significant intraarticular pathology in all patients. Fourteen hips had anterosuperior labral tears, and three hips had preoperative findings of internal snapping hip. Eleven hips had femoral cam-type lesions in addition to dysplasia, and 16 hips had articular chondral injury. Two hips had full-thickness ligamentum tears, and 13 hips had partial-thickness tears.

CONCLUSIONS: Intraarticular pathology at the time of PAO is common. Future studies are needed to rigorously address the use of arthroscopic intervention during PAO and the impact on clinical outcome compared to PAO alone.


Rapidly progressive osteoarthritis after arthroscopic labral repair in patients with hip dysplasia.

Matsuda DK, Khatod M.

Recent reports of poor clinical outcomes after arthroscopic surgery in hips with marked dysplasia have emerged. Arthroscopic resection of the hypertrophic labrum in cases of dysplasia, especially in the absence of periacetabular osteotomy (PAO), has been implicated. Some patients will refuse PAO because it is a major
open procedure, opting for a less invasive arthroscopic procedure. We present the cases of 2 young adults with marked dysplasia who had rapidly progressive osteoarthritis despite arthroscopic labral repair. Though perhaps beneficial as an isolated procedure in borderline or mild dysplasia cases, arthroscopic hip surgery, even labral repair, may best be performed with PAO in cases with more severe dysplasia. Albeit attractive as a less invasive labral-preserving surgery, arthroscopic labral repair not only may fail to provide symptomatic improvement but may compromise or preclude a later PAO if rapidly progressive osteoarthritis ensues. Hip arthroscopy may best be performed concurrently with or after PAO but not proceeding PAO in patients requiring both procedures.


Report of breakout session: Intraarticular work during periacetabular osteotomy--simultaneous arthrotomy or hip arthroscopy?

Peters CL(1), Sierra RJ; Session Participants.

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Effect of intra-articular lesions on the outcome of periacetabular osteotomy in patients with symptomatic hip dysplasia.

Fujii M, Nakashima Y, Noguchi Y, Yamamoto T, Mawatari T, Motomura G, Iwamoto Y.

In order to clarify how intra-articular lesions influence the survival of a periacetabular osteotomy in patients with dysplasia of the hip, we performed an observational study of 121 patients (121 hips) who underwent a transposition osteotomy of the acetabulum combined with an arthroscopy. Their mean age was 40.2 years (13 to 64) and the mean follow-up was 9.9 years (2 to 18). Labral and cartilage degeneration tended to originate from the anterosuperior part of the acetabulum, followed by the femoral side. In all, eight hips (6.6%) had post-operative progression to Kellgren-Lawrence grade 4 changes, and these hips were associated with the following factors: moderate osteoarthritis, decreased width of the joint space, joint incongruity, and advanced intra-articular lesions (subchondral bone exposure in the cartilage and a full-thickness labral tear). Multivariate analysis indicated subchondral bone exposure on the femoral head as an independent risk factor for progression of osteoarthritis ($p = 0.003$). In hips with early stage osteoarthritis, femoral subchondral bone exposure was a risk factor for progression of the grade of osteoarthritis. Although the outcome of transposition osteotomy of the acetabulum was satisfactory, post-operative progression of osteoarthritis occurred at a high rate in hips with advanced intra-articular lesions, particularly in those where the degenerative process had
reached the point of femoral subchondral bone exposure.


Arthroscopic disease classification and interventions as an adjunct in the treatment of acetabular dysplasia.

Ross JR, Zaltz I, Nepple JJ, Schoenecker PL, Clohisy JC.

BACKGROUND: Treatment of hip dysplasia has focused on corrective osteotomy surgery, while hip arthroscopy remains controversial. Improved understanding of intra-articular disease patterns associated with hip dysplasia will help delineate the role of arthroscopy as an adjunct to osteotomy surgery for dysplastic hips.

PURPOSE: The authors set out to describe the intra-articular disease patterns of patients undergoing combined hip arthroscopy and periacetabular osteotomy for the treatment of symptomatic acetabular dysplasia with associated mechanical symptoms. Secondly, they wanted to identify the potential role for arthroscopy in treating intra-articular problems as an adjunct to acetabular reorientation surgery.

METHODS: Seventy-three hips in 71 patients undergoing arthroscopy for mechanical symptoms before a redirectional osteotomy of the acetabulum were reviewed. Radiographic findings of acetabular dysplasia were compared with intraoperative labral and chondral disease patterns. Arthroscopic interventions were recorded.
RESULTS: Labral tears and acetabular cartilage lesions were present in 65.8% and 68.5% of hips, respectively. Combined acetabular articular cartilage lesions and labral disease were observed in 58.9% of hips. When disease was present, acetabular labrum and chondral lesions were primarily located at the anterior (81.0%, 76.0%) and superolateral (66.7%, 84.0%) labrochondral junctions. A lateral center-edge angle <15° was associated with an increased likelihood of acetabular chondromalacia, as well as moderate to severe acetabular cartilage disease. An acetabular inclination of >20° was associated with an increased risk of larger labral tears (>2 cm). Sixty-three percent had at least 1 arthroscopic treatment of central compartment disease, most commonly acetabular chondroplasty (30.1%), partial labral resection (26.0%), and labral repair (16.4%).

CONCLUSION: Acetabular rim disease is common in symptomatic acetabular dysplasia, and 63% of cases have a central compartment abnormality amenable to arthroscopic treatment. Lateral center-edge angle <15° and acetabular inclination >20° are associated with more severe labrochondral disease.


Acetabular osteochondroplasty and simultaneous reorientation: background and validation of concept.

Anderson LA, Crofoot CD, Erickson J, Morton DA, Peters CL.

Most hips with femoroacetabular impingement (FAI) have combinations of femoral
and acetabular abnormalities, including acetabular deficiency in some cases. Other impinging hips have large acetabular hyaline cartilage lesions that, when treated by resection, lead to acetabular deficiency and the need for a subsequent reorientation to improve coverage. Ideally, large cartilage lesions could be identified preoperatively and treated with 1 procedure. Therefore, a single operative approach that allows for both femoral and acetabular osteochondroplasty where needed, as well as simultaneous acetabular reorientation, is advantageous. We hypothesized that the addition of traction and dry arthroscopy via the Smith-Petersen approach at the time of periacetabular osteotomy could allow for the diagnosis and treatment of intra-articular labral and hyaline cartilage lesions and simultaneous acetabular reorientation. To validate this concept, we performed the procedure on cadaveric hips and subsequently treated a series of patients successfully (4 hips with limited anterior debridement and dry arthroscopy and 1 hip with a simultaneous periacetabular osteotomy). There were no intra- or postoperative complications in the series of 5 hips. The addition of traction and dry arthroscopy can permit the diagnosis and treatment of intra-articular lesions in reorienting periacetabular osteotomy. This enables the surgeon to address both acetabular cartilage and labral lesions, as well as idealizing acetabular orientation and coverage in 1 setting with less morbidity.


Arthroscopy for labral tears in patients with developmental dysplasia of the hip: a cautionary note.
Patients with developmental dysplasia of the hip may present with acetabular rim overloading, labral hypertrophy, and tear. Our hypothesis was that isolated arthroscopic treatment of labral tear is likely to fail in most patients. We investigated 34 patients who underwent at least one arthroscopy of the hip for labral tear. Developmental hip dysplasia or other morphologic abnormalities of the hip were confirmed in all patients. Arthroscopy failed to relieve pain in 24 patients. We observed accelerated arthritis in 14 patients and migration of the femoral head in 13 patients. Sixteen patients underwent further surgery (further surgeries included periacetabular osteotomy [6 patients], femoroacetabular osteoplasty [7 patients], and total hip arthroplasty [3 patients]). At the latest follow-up, all patients but one were pain-free. Patients with evidence of abnormal hip morphologies may not benefit from hip arthroscopy and isolated treatment of the labrum; in fact, the latter may accelerate the process of arthritis in some patients.


Endoscopy-assisted periacetabular osteotomy: a preliminary cadaveric study.

Inan M, Gokce A, Ustunkan F.
Periacetabular osteotomy has been recommended for reconstructing symptomatic dysplastic hips in adolescents and young adults, but requires substantial incisions and exposure. To minimize large incisions, we asked whether periacetabular osteotomy could be performed with a mini-incision under direct endoscopic control. We used five fresh-frozen cadaver pelves and developed curved guides and osteotomes for the osteotomy. We were able to perform a periacetabular osteotomy under endoscopic and image intensifier control and to fix the osteotomy with two cannulated screws. We identified no damage to vital structures or intraarticular fracture in any of the five cadavers we subsequently dissected. We believe periacetabular osteotomy may be performed with a mini-incision under direct endoscopic control. Our preliminary observations suggest the approach might be explored in limited prospective clinical trials by experienced individuals.


Endoscopic pelvic osteotomy for the treatment of hip dysplasia.

Wall EJ, Kolata R, Roy DR, Mehlman CT, Crawford AH.

Adolescent and adult hip dysplasia can be surgically treated by rotating the acetabulum into a better weight-supporting position; however, open pelvic osteotomies are among the most invasive of all pediatric orthopaedic procedures.
Endoscopic pelvic osteotomy offers the theoretical advantages of magnified visualization of the bone cuts, minimized surgical dissection, and rapid postoperative recovery. The technique of endoscopically assisted triple innominate osteotomy requires the combination of endoscopic skills and facility with more standard surgical approaches.