

# Accelerated Degenerative Joint Disease After Staged Hip Arthroscopy and Periacetabular Osteotomy in a Patient with Hip Dysplasia

Michael S. Guss, M.D., and Thomas Youm, M.D.

## Abstract

*Hip dysplasia, when significant, is effectively treated with periacetabular osteotomy. There have been good results reported with hip arthroscopy when dysplasia is mild. However, when dysplasia is significant, hip arthroscopy with labral repair alone has led to poor results and even rapid decline to end stage arthritis. Staged hip arthroscopy and periacetabular osteotomy would potentially treat the labral lesion and correct the underlying bony abnormality that resulted in the labral pathology. Such a staged treatment plan should help prevent progression to degenerative joint disease. We report a case of a 33-year-old woman who presented with left hip pain and was diagnosed with mild hip dysplasia and a labral tear. She underwent staged hip arthroscopy and labral repair followed by periacetabular osteotomy 2 weeks later. Three and a half months after surgery she developed constant pain and began limping at 5 months. Radiographs showed progression to severe degenerative joint disease. The patient was indicated for total hip arthroplasty.*

Patients with developmental dysplasia of the hip (DDH) have a high incidence of associated intra-articular pathology (labral and cartilage lesions).<sup>1-4</sup> Hip arthroscopy has been described for the treatment of intra-articular lesions in dysplastic hips.<sup>5-8</sup> However, reports of accelerated arthritis and instability postoperatively, likely secondary to the unchanged underlying osseous abnormality, has driven arthroscopic treatment to fall out of favor.<sup>9-12</sup> Periacetabular

osteotomy (PAO) is the preferred treatment in young patients (< 40 years of age) with hip dysplasia without signs of degenerative joint disease.<sup>13-16</sup> When intra-articular lesions are left untreated at the time of osteotomy, poorer outcomes are reported.<sup>13,17,18</sup> Combined arthroscopy and osteotomy is thought to address both the soft tissue lesions and underlying osseous abnormalities, preventing or delaying progression to osteoarthritis (OA).<sup>1</sup>

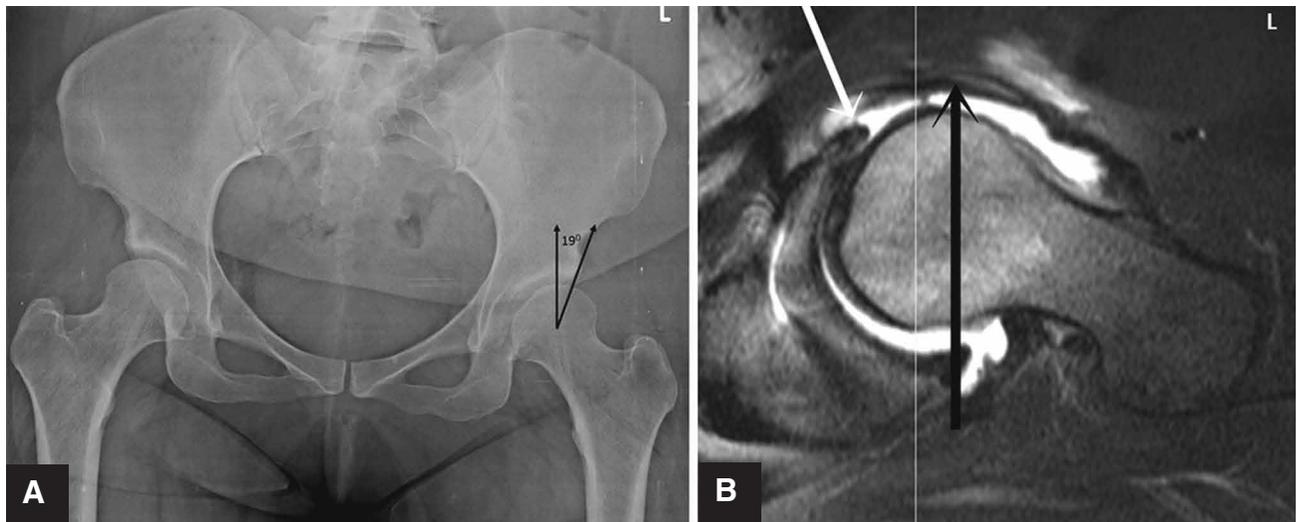
We report a case of a 33-year-old woman with hip dysplasia and concomitant labral tear and impingement, who, despite treatment with arthroscopic labral repair of the hip and staged PAO to address her underlying bony pathology, developed severe degenerative joint disease within 5 months of surgery. The investigators have obtained the patient's informed written consent for print and electronic publication of the case report.

## Case Report

A 33-year-old woman presented with atraumatic left hip pain of 10 years duration that had worsened over the past year. Nine years earlier, she had undergone 6 months of physical therapy without relief. Her pain was localized to the left lateral hip with radiation into the groin and left knee and was aggravated by standing, running, or walking long distances and improved with rest. She reported a limp secondary to pain. Examination revealed a body mass index of 34.0; left hip range of motion revealed flexion, 125°; extension, 15°; internal-external rotation at 90° flexion, 25°/40°; abduction, 35°; and adduction, 20°. There was no leg length discrepancy. The impingement test was positive. There was groin pain with internal rotation but not with axial loading or FABER test. No instability was noted. Straight leg raise and abductor strength were full, and she was neurovascularly intact distally. Radiographs showed mild dysplasia with a well maintained joint space. The lateral center edge angle of Wiberg (CEA) measured 19°, and the degree of osteoar-

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**Figure 1** A, Preoperative anteroposterior pelvic radiograph demonstrating dysplasia with lateral CEA of 19°. B, Axial magnetic resonance arthrogram demonstrating torn acetabular labrum (white arrow) with anterior subluxation of the humeral head (black arrow).

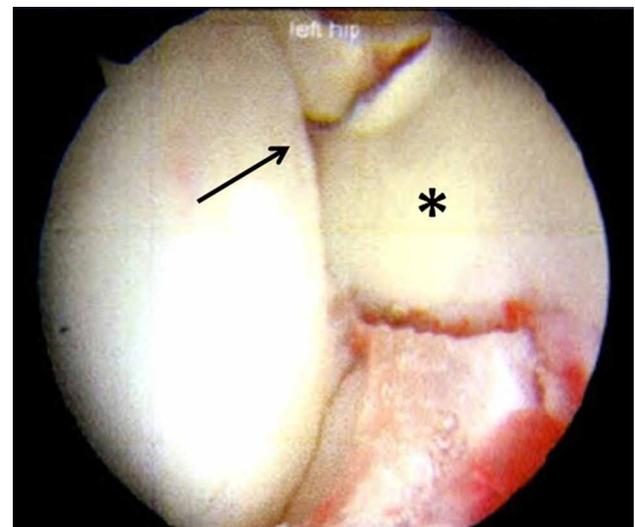
thritus using the Tönnis classification was grade I (Fig. 1). Magnetic resonance arthrogram (MRA) showed a severely degenerated and torn acetabular labrum with paralabral cysts (Fig. 1). Computed tomography with version analysis was consistent with developmental dysplasia of the hip with decreased acetabular femoral head coverage laterally and excessive hip anteversion of 26°. The patient was diagnosed with a left hip labral tear and acetabular dysplasia and was indicated for arthroscopic labral repair followed by a staged periacetabular osteotomy.

Left hip arthroscopy was performed under general anesthesia in the supine position using a hip distractor. Standard anterolateral and mid anterior portals were created under spinal needle localization with fluoroscopic guidance, and two 4.5 mm cannulas were inserted. Capsulotomy was created connecting the two portals. Grade III chondromalacia was identified over the central aspect of the femoral head. The labrum was identified and found to have an anterolateral bucket-handle displaced tear with associated chondral flap (Fig. 2). The labrum was then repaired in a mattress configuration and secured with two suture anchors. Chondroplasty and synovectomy were completed. Traction was released. The capsulotomy was then repaired. The patient tolerated the procedure well and was discharged to home the same day. She was made foot-flat partial weightbearing with two crutches on her left lower extremity and a hinged hip brace.

Fifteen days later, the patient underwent left Ganz periacetabular osteotomy under general endotracheal anesthesia and duramorph spinal block using an ilioinguinal approach. An anterior superior iliac spine (ASIS) osteotomy was performed with subperiosteal dissection of the inner table of the ilium and the quadrilateral plate. The pubis was subperiosteally dissected, and the pubis was osteotomized. The infracotyloid groove was then exposed and underwent incomplete osteotomy. A complex osteotomy was then per-

formed on the quadrilateral plate. This was completed, and a Schanz pin was applied into the inferior spine. Correction of the acetabulum was achieved. The version of the hip was unchanged. The new position was then fixed in place with six 2.5 mm screws, and the ASIS was fixed with 2.5 mm screws (Fig. 3). The patient tolerated the procedure well. She was discharged home on postoperative day 5 and kept partial weightbearing with crutches on her left lower extremity.

At 2-month follow-up the patient's pain had significantly improved. Radiographs showed a healed osteotomy in appropriate position, and she was transitioned to one crutch. At 3-month follow-up she was allowed to start full weightbearing and begin physical therapy. Two weeks after start-



**Figure 2** Arthroscopic image of the left hip joint from an anterolateral portal with 70° arthroscope showing anterolateral labrum (asterisk) and labral tear (arrow). To view this figure in color, see [www.hjdbulletin.org](http://www.hjdbulletin.org).



**Figure 3** Anteroposterior pelvic radiograph status post periacetabular osteotomy shows the left hip with an improved lateral CEA of 40°.

ing therapy, she reported new groin pain after a flexion and internal rotation injury during a stretching exercise, requiring resumption of a crutch for ambulation. Examination at 3.5 months showed left hip flexion of 90°, and at 90° of flexion, the patient had 10° degrees of internal rotation and 40° of external rotation. Impingement and FABER signs were positive. She was unable to straight leg raise and had 4/5 strength on abduction and adduction. Radiographs showed an intact osteotomy site with healing bone. The patient failed a trial of NSAIDs, and a MRA showed typical post-surgical changes. An aspiration was done at the time of MRA. Joint fluid analysis was negative for infection. At 5-month follow-up, the patient reported severe, constant left hip and groin pain with thigh swelling. Radiographs showed development of significant arthritis compared to prior films (Fig. 4). Given the progression to severe degenerative joint disease of the left hip, she was indicated for a total hip arthroplasty.

## Discussion

Developmental dysplasia of the hip is a common underlying diagnosis in young patients presenting with hip pain.<sup>19</sup> Classically, a shallow acetabulum and reduced acetabular coverage of the femoral head leads to abnormal loading of the articular cartilage and subsequent secondary OA.<sup>20-22</sup> The goals of treatment are to delay or prevent the development of OA<sup>16,23</sup> and the need for hip arthroplasty. Periacetabular osteotomy (PAO) is the preferred treatment in young patients (younger than 40 years of age) with hip dysplasia who become symptomatic before developing degenerative joint disease.<sup>13-16,23-26</sup> PAO improves joint congruity leading to reduced joint reaction force.<sup>27</sup>

A high incidence of concomitant intra-articular pathology,<sup>2-4</sup> including labral and cartilage lesions, have been reported in DDH patients at the time of surgery and are associated with worse outcomes if left untreated.<sup>13,17</sup> Even



**Figure 4** Anteroposterior pelvis radiograph 5 months postoperatively demonstrating severe joint space narrowing and extensive sclerosis of the acetabular dome.

if the acetabulum is successfully re-oriented and the high cartilage-loading is decreased, the labral lesion remains and can be a cause of residual symptoms. The majority of these lesions occur in the anterosuperior acetabular region.<sup>21,28</sup> Fujii and colleagues<sup>28</sup> performed an observational study of 121 patients who underwent osteotomy of the acetabulum combined with arthroscopy. They found labral tears were present in 82% of hips, and when separated out into groups based upon severity of radiographic OA, those with no evidence of OA had a 96% rate of labral lesions. Eight of the 121 hips had progression to Kellgren-Lawrence grade 4 changes, and these hips were associated with advanced intraarticular lesions, defined as subchondral bone exposure in the cartilage and full-thickness labral tears.

The role of hip arthroscopy in the management of adult DDH is unclear.<sup>5,7</sup> Limited data has demonstrated improvements in pain after treatment.<sup>6,8</sup> Byrd and Jones<sup>8</sup> reported on a series of 48 patients with dysplasia and borderline dysplasia treated with arthroscopy and found a 27 point average increase in modified Harris hip score at mean 27-month follow-up. However, treatment with arthroscopy alone has fallen out of favor given concerns it may lead to accelerated arthritis and instability.<sup>9-12</sup> Parvizi and coworkers<sup>11</sup> reported on a series of 34 hip arthroscopies in patients with DDH. They found arthroscopy failed to relieve pain in 24 patients. Accelerated arthritis was observed in 14 patients, and 13 had migration of the femoral head signifying instability. They concluded hip arthroscopy may “accelerate the process of arthritis” in patients with “abnormal hip morphologies.” Arthroscopy only addresses the soft tissue pathology, leaving the underlying osseous abnormalities uncorrected, leading to further deterioration of the remaining labrum and articular cartilage. Matsuda and associates<sup>12</sup> reported two cases of arthroscopic labral repair in dysplastic hips with subsequent rapid progression to OA. They recommended hip arthros-

copy not be performed as an isolated procedure but instead combined with PAO in the setting of marked dysplasia.

Domb and colleagues<sup>29</sup> recently reported their results with hip arthroscopy in 26 patients who underwent labral repair with mild dysplasia and concurrent capsular repair. They showed favorable results at 2-year follow-up. The patient in this case study underwent capsular repair at the time of labral repair. Therefore, accelerated arthritis as a result of iatrogenic instability is unlikely in this case.

Given poorer outcomes in patients with labral lesions left untreated at time of osteotomy, there appears to be a role for concomitant or staged hip arthroscopy and osteotomy.<sup>1,18,28,30</sup> Combined treatment corrects both the soft tissue and bony pathology and may better protect against progression to OA compared to osteotomy alone.<sup>1</sup> Data describing outcomes of a combined approach are limited. Kim and coworkers<sup>1</sup> prospectively evaluated 43 dysplastic hips (CEA < 20°) treated with combined arthroscopy and acetabular osteotomy in the same setting. Labral lesions were identified in 38 hips, and 41 were Tönnis grade 0 to II. The investigators reported good medium-term results. At a mean follow-up of 74 months, the mean Harris hip score improved 22 points ( $p < 0.001$ ) as did all radiological parameters ( $p < 0.001$ ). No patients in their cohort developed accelerated OA. Jackson and associates<sup>31</sup> recently published a case report of one patient with dysplasia who underwent failed hip arthroscopy with exacerbation of symptoms. The patient subsequently underwent arthroscopic labral repair and PAO with good results at 2-year follow-up.<sup>31</sup> This again shows the importance of addressing the underlying bony pathology.

We report, to our knowledge, the first case in the literature of a patient with hip dysplasia and intraarticular labral tear progressing to catastrophic arthritis following combined but staged hip arthroscopy and PAO. Based upon Tönnis grade and lateral CEA, this patient would have been included in the study by Kim and coworkers<sup>1</sup> discussed above. Unlike that study, our patient's operations were staged 2 weeks apart. However, this is unlikely to impact the outcome of the osteotomy as the patient was kept partial weightbearing to prevent any joint trauma. Combining arthroscopy with osteotomy was thought to prevent development of arthritis by addressing intraarticular pathology and off-loading the cartilage. However, despite repairing her torn labrum and solving her underlying bony problem with an osteotomy, she went on to develop severe debilitating arthritis within 5 months of surgery.

It is not certain what caused this accelerated arthritis. Intraarticular lidocaine was not used, so it is unlikely a result of chondrolysis. Capsular repair was performed, so it is unlikely that the patient developed instability in the 2 weeks between procedures. Femoral anteversion was elevated but unlikely to require derotational osteotomy in the setting of a PAO. The most likely scenario is the patient had been slowly progressing with disease over the last 10 years. Her degenerative changes were subclinical. She had Tönnis 1

changes on radiographs. Her MRI demonstrated mild cartilage thinning and irregularity in the joint consistent with early arthritis changes. There was also some irregularity and sclerosis over the anterior roof of the acetabulum on the MRI. At the time of arthroscopic surgery, grade III chondromalacia changes were found diffusely over the femoral head. The labrum was significantly torn and displaced. In retrospect, this is a patient who may have progressed rapidly toward end stage arthritis even without a combined arthroscopic and open osteotomy approach.

This case highlights the importance of advanced imaging techniques, such as delayed gadolinium-enhanced MRI of cartilage (dGEMRIC), to detect at risk hips and hips likely to further deteriorate.<sup>32</sup> dGEMRIC detects early cartilage damage by recognizing the charge density of cartilage contributed by glycosaminoglycans, which are lost early in the process of OA.<sup>32,33</sup> This information can be valuable for preoperative planning and patient education. Even with the knowledge that her hip may have been further advanced in degeneration than what her films indicated, our patient may still have elected to proceed with this combined procedure to salvage her hip. However, with more knowledge and accurate detection of cartilage damage, we could have better prepared her for potential failure and conversion to total hip arthroplasty.

Surgeons should be aware that even with a combined approach there exists a risk of progression to severe arthritis in patients with hip dysplasia. This treatment method needs to be further investigated, and future studies with a larger number of patients and longer follow-up should be performed to develop a better understanding of the associated risks and complications of this technique.

#### *Disclosure Statement*

Dr. Thomas Youm, M.D., is a paid consultant for Arthrex Inc. and Smith & Nephew. Michael S. Guss, M.D., has no financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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