



Patient and Disease Characteristics Associated with Hip Arthroscopy Failure in Acetabular Dysplasia



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ABSTRACT

The purpose of this study was to define the clinical and disease characteristics in patients who fail hip arthroscopy and require periacetabular osteotomy. Thirty patients (30 hips) who underwent a PAO, following a failed hip arthroscopy were identified from a multicenter database. Eighty-seven percent were female and the average age was 27.3 years. The average LCE angle was 14.7°, acetabular inclination 16.3°, and ACE angle 16.8°. Labral abnormalities and acetabular chondral disease were noted at PAO surgery in 60 and 56%, respectively. The average clinical scores prior to the PAO were mHHS 53.5, WOMAC 56.9, and UCLA 5.4. Failed hip arthroscopy and the need for PAO are most commonly observed in young female patients with mild to moderate dysplasia, major functional limitations and associated intra-articular abnormalities.

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Acetabular dysplasia is well recognized as a common cause of hip pain, dysfunction and eventual secondary osteoarthritis. This disorder commonly presents in young, healthy patients and markedly impacts function and activity level [1–3]. In the setting of untreated acetabular dysplasia, the insufficient coverage of the femoral head results in mechanical overload of the acetabular rim, which may lead to acetabular labral hypertrophy and disease, chondral degeneration, and progression to secondary osteoarthritis [4]. Treatment of symptomatic acetabular dysplasia has traditionally focused on corrective osteotomy surgery, however with the evolution and popularity of hip arthroscopic procedures, some surgeons have performed labral debridement and repairs in the setting of acetabular dysplasia [5]. Hip arthroscopy alone in the setting of acetabular dysplasia remains controversial given the concern for failure to address abnormal pathomechanics of this structural disorder. Additionally, the specific characteristics of the dysplastic hip that indicate a need for osteotomy correction have not been defined in detail [6,7]. Furthermore, many patients with hip dysplasia have femoral

deformities consistent with femoroacetabular impingement [8] making the diagnosis of the dominant pathomechanics challenging. In a recent prospective database search of hip arthroscopy failures, 24% of the patients were diagnosed with acetabular dysplasia and underwent a periacetabular osteotomy (PAO) [9] for definitive treatment. These data suggest that failure of hip arthroscopy in the setting of acetabular dysplasia is becoming more common.

The periacetabular osteotomy (PAO) is currently the preferred osteotomy for symptomatic acetabular dysplasia in North America, and many reports have demonstrated favorable outcomes with this procedure [10–14]. An improved understanding of the patient population with acetabular dysplasia that fails to improve with hip arthroscopy alone may help to guide future surgical decision-making and enable the development of improved treatment algorithms. Therefore, the purpose of this study was to define the clinical and disease characteristics in patients who fail hip arthroscopy, and require periacetabular osteotomy (PAO) for the treatment of symptomatic acetabular dysplasia.

Methods

The Academic Network for Conservational Hip Outcomes Research (ANCHOR) Study Group is a multi-center research network that has collected prospective longitudinal data for hip preservation surgical procedures. The ANCHOR database was searched to identify all patients who underwent a PAO after prior hip arthroscopy between May 2007 and April 2012. The database consisted of 2628 procedures, and 742 hips were identified that underwent a PAO during this time

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period. Patients underwent the PAO at the discretion of the operating surgeon. All patients were reported to have symptoms that were refractory to non-operative treatment that typically included physical therapy and a period of activity modification as well as physical examination and radiographic findings consistent with acetabular dysplasia. The specific radiographic criteria used to define acetabular dysplasia are discussed below. This study was performed under an institutional review board-approved protocol obtained at all participating sites. The inclusion criteria for the study required documentation of a complete data set [15] including: age at the time of surgery, BMI, operative side, diagnosis, description of the “failed” index procedure, lateral center edge angle, acetabular inclination, anterior center edge angle, presence/absence of the cross-over sign, presence/absence of posterior wall sign, minimum joint space, maximum alpha angle, Tönnis grade, complete intra-operative classification of labral and chondral status, complete description of the procedures performed, pre-operative range of motion, and pre-operative clinical scores.

Thirty patients (4% of all PAO's during the time period) were identified who underwent a PAO after being treated with a prior hip arthroscopy. There were 26 females (87%) and 4 males (13%), with a mean age of 27.3 years (range, 13 to 44 years), and mean BMI of 24.1 kg/m² (range, 18.0 to 34.6 kg/m²). Sixty-three percent of the hips were right-sided and 37% were left-sided. In addition, all 30 patients (100%) had acetabular dysplasia, 4 patients (13%) were also diagnosed with concurrent femoroacetabular impingement, and 1 patient (3%) also had a diagnosis of Perthes disease. This cohort of patients that failed hip arthroscopy was compared to a group of PAO patients who did not have a previous hip arthroscopy (comparison group). This comparison group was also analyzed. For these two groups, the demographics were not significantly different with respect to gender (77% females; $P = 0.21$), side (54% right-sided hips; $P = 0.32$), or mean BMI (24.7 kg/m²; $P = 0.46$). The PAO comparison group (no previous arthroscopy), however, was significantly younger (mean age of 24.3 years; $P = 0.03$).

Preoperative radiographs included an antero-posterior (AP) pelvis, [16,17] a false profile view, [18] and either a frog-lateral, [19] 45° or 90° Dunn lateral, [20,21], or cross-table lateral radiograph [22]. Osteoarthritis was classified on plain radiographs using the Tönnis classification system as previously described [23]. The final grade was based on the greatest degree of osteoarthritic change on any view. The minimum joint-space thickness was also determined on the AP view, in addition to the presence or absence of a “cross-over-sign” as previously described [16]. The alpha angle was measured on all available lateral radiographs [24]. Each of these radiographic measurements and classifications were performed by the individual surgeons and the data were then submitted to the coordinating center.

Operative findings were prospectively recorded by the treating surgeon. Labral tears were classified using the Beck classification system, [25] where grade 1 = normal (macroscopically sound), grade 2 = degeneration (thinning or localized hypertrophy, fraying, discoloration), grade 3 = full-thickness tear (complete avulsion from the acetabular rim), grade 4 = detachment (separation between the acetabular and labral cartilage, preserved attachment to bone), and grade 5 = ossification (osseous metaplasia, localized or circumferential). Acetabular and femoral head chondral injury was determined using the Beck classification, [25] where grade 1 = normal cartilage (macroscopically sound cartilage), grade 2 = malacia (roughening of surface, fibrillation), grade 3 = debonding (loss of fixation to the subchondral bone, macroscopically sound cartilage; carpet phenomenon), grade 4 = cleavage (loss of fixation to the subchondral bone; frayed edges, thinning of the cartilage, flap), and grade 5 = defect (full-thickness defect, complete loss of cartilage).

Range of motion was recorded pre-operatively by the treating surgeons and included terminal flexion, internal and external rotation

in 90° of flexion (IRF, ERF), internal and external rotation in extension (IRE, ERE), and abduction. Pre-operative clinical outcome scores were prospectively collected using the modified Harris Hip Score, SF-12 score, Western Ontario and McMaster University Arthritis Index (WOMAC) and UCLA activity scoring systems.

Results

The thirty patients underwent a PAO on average 22 months (range, 9 to 57 months) after the failed index arthroscopy. Twenty-three percent of the patients underwent 2 arthroscopies prior to PAO. The most common procedures that were performed at the initial arthroscopy included a femoral head/neck osteochondroplasty (43%), labral repair (30%), and labral debridement (27%) (Table 1).

Radiographic evaluation demonstrated a mean LCEA of 14.7° (range, −4° to 37°) (Table 2). Twenty patients (67%) had radiographic evidence of acetabular dysplasia via the LCEA measurement <20°. Another 8 patients (27%) were classified as borderline dysplasia with the LCEA between 20 and 25°. The mean acetabular inclination was 16.3° (range, 0° to 31°). Twenty-eight patients (93%) had an acetabular inclination >10° and were thus classified as dysplastic. The mean ACEA was 16.8° (range, −4 to 34°) with 70% of patients having an ACEA <20°. All patients (100%) had at least one radiographic measurement indicative of acetabular dysplasia. A cross-over sign and posterior wall sign were present in 43 and 67% of hips, respectively. The Tönnis grades of osteoarthritis ranged from 0 to 2, with 16 hips (53%) with grade 0 and 13 hips (43%) with grade 1, and 1 hip (3%) with grade 2 osteoarthritis. The mean minimum joint space was 4.3 mm (range, 2.0 to 7.5 mm). The PAO alone control group had more severe acetabular dysplasia deformities as measured by the LCEA, ACEA, and acetabular inclination (Table 2).

Seventy-three percent (22/30) of the hips were treated with either an anterior arthrotomy (16 hips) or an arthroscopy (6 hips) at the time of their PAO. Sixty percent (13 hips) were noted to have labral damage in the form of degeneration (36%), detachment (18%), or full-thickness tear (5%) at the time of the PAO (Table 3). The acetabulum was visualized in 9 hips, of which chondral disease was noted in 56% in the form of malacia (3 hips), debonding (1 hip), and cleavage (1 hip). Chondral disease of the femoral head was noted in only one hip (5%), which was in the form of malacia.

A femoral osteoplasty was performed in 18 hips (82%) that had either an anterior arthrotomy or arthroscopy at the same setting as the PAO (22 hips). Labral treatment was performed in 27% (6/22), in either the form of resection (4 hips) and repair (2 hips), while another 14% (3 hips) underwent chondroplasty. Other associated procedures include 1 hip with lysis of adhesions, 1 hip with capsular plication, and 1 hip with anterior inferior iliac spine (AIIS) decompression (Table 4).

The mean range of motion included 106.2° (range, 50 to 135°) of terminal flexion, internal rotation in flexion of 26.2° (range, 0 to 45°), external rotation in flexion of 40.5° (range, 20 to 70°), and abduction of 39.1° (range, 15 to 50°). Internal and external rotation in extension

Table 1

The Procedures That Were Performed at the Index Arthroscopy Prior to Presentation and PAO.

“Failed” Index Procedure	N	% Total (N = 30)
Hip arthroscopy	30	100
Femoral head/neck osteoplasty	13	43
Labral repair	9	30
Labral debridement	8	27
Synovectomy	4	13
Psoas lengthening	3	10
Capsular plication	3	10
Chondroplasty	3	10
Acetabular rim resection	2	7
Ligamentum teres debridement	2	7
Thermal capsulorrhaphy	1	3

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