Arthroscopic Treatment of Hip Pain in Adolescent Patients With Borderline Dysplasia of the Hip: Minimum 2-Year Follow-Up

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Purpose: To examine arthroscopic treatment of hip pain in patients with borderline hip dysplasia (lateral center edge angle [LCEA] between 20° and 25°). **Methods:** From 2008 to 2013, patients below 18 years of age who underwent arthroscopic hip surgery with an LCEA between 20° and 25° were retrospectively matched 1:1 to a control group without dysplasia (LCEA $\geq$25°) based on age, gender, femoroplasty, labral treatment, and capsular plication. Indications for surgery included failure to improve with nonoperative treatments and anti-inflammatory medications after 3 months. Patient-reported outcome data were collected using modified Harris hip score, hip outcome score—activities of daily living subscale, hip outcome score—sports-specific subscale, nonarthritic athletic hip score, and visual analog scale. **Results:** From 2008 to 2013, 168 patients below the age of 18 underwent arthroscopic hip surgery. Twenty-one patients met inclusion criteria and were matched 1:1 to a control group. Follow-up was achieved for 17 patients in both groups (81%). Mean follow-up time, age, and LCEA were 2.19 years, 15.5 years, and 22.3° for the dysplastic group and 2.16 years, 16.0 years, and 31.2° for the control group, respectively. Preoperative patient-reported outcomes between groups were not statistically different. At the latest follow-up, both groups showed statistically significant improvement over baseline in modified Harris hip score, hip outcome score—activities of daily living subscale, hip outcome score—sports-specific subscale, nonarthritic athletic hip score, and visual analog scale ($P < .001$). Latest follow-up scores were not statistically different between groups. **Conclusions:** This study shows favorable 2-year outcomes in adolescent patients with borderline dysplasia undergoing labral treatment and capsular plication. Outcomes in the borderline dysplastic patients were as good as those of a control group. Although adolescents with borderline dysplasia have traditionally been a challenging group of patients to treat, these results suggest that an arthroscopic approach that addresses both labral pathology and instability may be beneficial. **Level of Evidence:** Level IV, therapeutic case series.

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Borderline dysplasia of the hip joint may be a source of functional impairment in the pediatric and adolescent population. Mild dysplasia has been reported to result in ligament strain, plastic deformity, and capsular redundancy, increasing the risk of capsular and labral injury.[1-4] In the case of adolescent hip dysplasia, a common cause of early chondrolabral dysfunction, patients present with prearthritic symptoms associated with decreased bony coverage and acetabular rim overload.[5,6] In addition, it is likely that in borderline dysplasia, the hip capsule and ligaments play an increased role in stabilizing the hip.[7]

Hip arthroscopy has been increasingly well characterized, and is indicated for the treatment of labral tears, loose bodies, and femoroacetabular impingement (FAI).[8-10] The literature has increasingly suggested similar positive outcomes for arthroscopy in the pediatric and adolescent population with FAI.[11] However,

the role of hip arthroscopy in the management of instability caused by borderline dysplasia is debated. Despite a wide range of outcomes in hip arthroscopy in the context of dysplasia, a recent study by Domb et al. suggested that capsular plication in the context of borderline dysplasia, defined as a lateral center edge angle (LCEA) between 20° and 25°, is a potential treatment option.[12-17]

The purpose of this study was to examine the arthroscopic treatment of hip pain in patients with borderline hip dysplasia (LCEA between 20° and 25°). We hypothesized that adolescents with hip pain and borderline dysplasia would show satisfactory outcome after arthroscopic capsular plication and concomitant treatment of additional pathology.

Methods

Between 2008 and 2013, data were prospectively collected and retrospectively reviewed for patients who underwent hip arthroscopy for symptomatic intra-articular hip disorders. Inclusion criteria for the study group included patients younger than 18 years of age who underwent capsular plication, labral treatment, had an LCEA between 20° and 25°, completed preoperative patient-reported outcome (PRO) scores at the time of surgery, and had a minimum follow-up time of 2 years. Patients were excluded if they had previous ipsilateral hip surgeries, acetabuloplasty, previous hip conditions (such as Legg-Calve-Perthes disease, slipped capital femoral epiphysis), capsular release, or Tönnis grade $\geq$2. Patient demographics such as gender, age, height, weight, body mass index, and length of symptoms before surgery were recorded, as were revisions. The study group was then matched-paired on a 1:1 basis to a control group with an LCEA $\geq$25°. The matching was completed based on age below 18 years, gender, femoroplasty, capsular plication, and labral treatment. Indications for surgery included failure to improve with nonoperative treatments and anti-inflammatory medications after 3 months. Capsular plication was performed in all patients with borderline hip dysplasia, and in patients with normal acetabular coverage who had examination findings consistent with ligamentous laxity. Institutional review board approval was obtained for this study.

Evaluation

Evaluation included patient history, physical examination findings, radiographs, and magnetic resonance arthrogram (MRA). Physical examination findings included routine range of motion (ROM), strength testing, provocation maneuvers, apprehension signs, and evaluation of ligamentous laxity. Radiographs included anteroposterior pelvis (AP), false profile, modified Dunn, and cross-table later views. The LCEA was measured on the AP and the alpha angle was measured on the 45° Dunn view.[18] The AP was used to assess the presence of an epiphyseal growth plate. MRA was examined for ligamentum teres (LT) tears, and labral tears. Radiographic data were measured by orthopedic surgeons completing a hip preservation fellowship.

Indications for Surgery

Indications for surgery included failure to improve with nonoperative treatments (minimum 3 months) including physical therapy and anti-inflammatory medications. Patients with gradual onset of pain as well as those experiencing pathology from a definitive acute incident were treated. Radiographic analysis was used to measure the degree of dysplasia and MRA to confirm the possible presence of a labral tear. Cam lesion of the femur was evaluated by cross-table lateral radiograph examining the alpha angle; if the alpha angle is >50°, CAM impingement was considered probable.[18] At our institution, patients with an LCEA between 20° and 25° are typically treated with arthroscopic surgery rather than periacetabular osteotomy (PAO). Patients with an LCEA less than 18° are encouraged to consider PAO. There was no minimum age limit for surgery. However, if symptoms are tolerable, hip arthroscopy is avoided until after the physis closes.

Surgical Technique

All surgical procedures were performed in the same position with the patient supine on a hip traction table. As described by Domb et al.,[15] the patient was secured, traction was applied, and the operative extremity was placed with 15° of internal rotation of the foot. After prepping and draping in a usual sterile fashion, access to the hip joint was obtained with a standard anterolateral portal, modified anterior portal, and distal lateral accessory portal (DLAP). A capsulotomy was made with an arthroscopic knife, incising the capsule parallel to the acetabular rim to connect the anterolateral and anterior portals. Routine diagnostic arthroscopy was performed to assess the entire labrum, cartilaginous surfaces, and the LT. If indicated, intra-articular procedures were performed to treat FAI and labral tears, and also included LT debridement in case of LT tear, chondroplasty for loose, unstable cartilage, iliopsoas fractional lengthening in cases of painful internal snapping, or impingement lesion on the labrum. The acetabular rim was decorticated to create a surface for labral healing.

After addressing intra-articular and peripheral compartment pathology, we performed the capsular plication. This procedure has previously been described by Domb et al.[15,19] and Chandrasekaran et al.[17] (Fig 1). We used 3 portals during the capsular plication: anterolateral, anterior, and a DLAP. The camera was placed in the anterolateral portal. The hip was flexed to approximately 45° and abducted 30°. A suction shaver