BMI was 24.5 ± 4.7, and mean follow-up time was 52.0 ± 34.3 months. Half of the cohort reported moderate or high concern that hip pain would worsen during future pregnancy, while a slight majority felt that hip surgery would not raise their risk of pregnancy complications (56.0%) or impair hip function after pregnancy (51.2%). 27 patients (31.4%) had become pregnant after hip surgery at an average of 6.3 ± 1.4 months postoperative, of whom 13 (48.2%) cited hip pain as a factor in getting surgery before pregnancy and 9 (33.3%) reported delaying a planned pregnancy to undergo surgery. Patients who became pregnant after surgery experienced a significant increase in VAS pain during pregnancy (p = 0.02), though pain resolved after pregnancy in most (19 of 27, 70.4%). Of the 39 nulligravid patients, 28 (71.2%) were considering future pregnancy and 32 (84.2%) did not consider hip pain to be a factor in their nulligravid status. No significant difference in mHHS was found at latest follow-up between nulligravid patients, patients who had not been pregnant since hip surgery, and patients who got pregnant after hip surgery (mean 79.6 vs 80.0 vs 79.6, p = 0.94). Conclusions: Most female hip arthroscopy patients were not concerned that their surgery would have a negative impact on their pregnancy outcomes or hip function after pregnancy. Although hip pain was exacerbated during pregnancy, most patients experienced a resolution of pain following delivery. Pregnancy-related complications did not occur more frequently in the hip arthroscopy cohort compared to the wider U.S. population. Outcomes were comparable between nulligravid women and those who had only been pregnant prior to surgery.

Category: Hip/Groin/Thigh

Comparison of Anterior Inferior Iliac Spine Morphology Between Femoroacetabular Impingement and Developmental Dysplasia of the Hip: A Cohort Study in Symptomatic Patients

Abstract ID# 23531
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Summary:
Comparison of AIIS between FAI and DDH

Data:
Background: Anterior inferior iliac spine (AIIS) morphology has been defined as one of the common causes of extra-articular hip impingement and failed hip arthroscopy for femoroacetabular impingement (FAI). Thus, the AIIS classification by Hetsroni is popular in clinical practice, and surgeons should pay attention to extra-articular hip impingement in cases of type 3. Many previous studies have shown the AIIS morphology in patients with FAI, patients with labral tears or asymptomatic populations. However, there are a few studies about AIIS morphology in developmental dysplasia of the hip (DDH). Purpose: The purpose of this study was to compare the AIIS morphology between FAI and DDH. Methods: Four hundred twenty-three hips of 374 patients who underwent primary hip arthroscopic surgery from January 2015 to March 2019 were retrospectively reviewed. The inclusion criteria in this study were labral tears with FAI or DDH. Finally, 359 hips of 310 patients were included in this study. Preoperative demographics and imaging variables of patients in the FAI and DDH groups were compared. For demographic evaluation, age at surgery, sex, and body mass index (BMI) were assessed. For imaging evaluation, LCE angle, sharp angle, vertical center anterior (VCA) angle, alpha angle, Tonnis angle and AIIS were assessed. AIIS morphology was classified according to the Hetsroni’s classification. Statistical analysis was performed to compare the AIIS morphology between the FAI and DDH groups. Results: Of 359 hips in 310 patients, FAI cases involved 241 hips (148 males, 93 females), and DDH cases involved 118 hips (34 males, 84 females) in this study. In FAI group, AIIS type 1 included 45 hips (16.7%), type 2 included 286 hips (77.2%), and type 3 included 10 hips (4.1%). In the DDH group, AIIS type 1 included 4 hips (3.4%), type 2 included 93 hips (78.8%), and type 3 included 21 hips (17.8%). The proportion of AIIS type 3 in the DDH group was significantly higher than that in the FAI group (chi-squared test, p = 0.001). In the FAI group, there were no significant differences in demographic and radiographic parameters between AIIS type 1 or 2 and type 3. In the DDH group, there were significant differences in LCE, VCA and Tonnis angle between AIIS type 1 or 2 and type 3. The LCE angle was 19.0 ± 4.0 in type 1 or 2 and 13.0 ± 6.0 in type 3 (Mann-Whitney U test, p = 0.003). The VCA angle was 11.8 ± 3.2 in type 1 or 2 and 13.1 ± 10.0 in type 3 (Mann-Whitney U test, p = 0.011). The Tonnis angle was 12.5 ± 5.1 in type 1 or 2 and 16.8 ± 6.3 in type 3 (Mann-Whitney U test, p = 0.014). These results indicated that DDH with AIIS type 3 tends to be more severe dysplasia than that with type 1 or 2. Conclusions: AIIS type 3 was more common in DDH than FAI. In DDH, AIIS type 3 tends to be more severe dysplasia than AIIS type 1 or 2.

Category: Hip/Groin/Thigh

Hip Arthroscopy: Trends in Immediate Procedure Reimbursement, Patient Out-of-Pocket Expenditure, and Surgeon Reimbursement

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Summary:
Patient out-of-pocket expenditures for hip arthroscopy have been increasing at a higher rate than immediate procedure reimbursement, placing a larger economic burden for the surgery on the patient.

Data:
Introduction: Hip arthroscopy (HA) is a minimally invasive surgical treatment option ideal for patients presenting with symptomatic labral tears and femoroacetabular impingement (FAI). Incidence of FAI has consistently increased over the past two decades and is often observed in athletic patients who engage in high levels of physical activity at a younger age. The procedure’s high rate of return to sports among athletes, superior patient-reported outcome scores relative to that of traditional open surgical hip dislocation, and higher cost-effectiveness when compared with non-operative treatment options have contributed to its significant growth. However, the immediate procedure reimbursement (IPR), expected patient out-of-pocket expenditure (POPE), and surgeon reimbursement (SR) for HA have not yet been characterized in the literature. The purpose of this study is to report on trends in IPR, POPE, and SR for HA. Methods: Adult Patients undergoing outpatient HA were identified using Current Procedural Terminology codes from the 2013-2017 IBM MarketScan Commercial Claims Encounter database. Median IPR, POPE, and SR were calculated for each cohort: femoroacetabular impingement (FAI) surgery, isolated debridement, and isolated labral repair. A multivariable model was utilized to determine trends over time for IPR, POPE, and SR while controlling for network status of the surgeon and facility, presence of peripheral nerve block, and region of the U.S. that the patient is from. A generalized linear mixed model with a gamma distribution and a log link function was chosen because the outcome variables were skewed. Statistical significance was set at p < 0.05. All values were inflation-adjusted to 2017 dollars. Results: A total of 20,335 patients were identified with 3,739 in the debridement cohort, 14,583 in the FAI cohort, and 2,013 in the labral repair cohort. Multivariable analysis for FAI revealed an increasing trend for IPR and POPE while no significant trend was observed for SR. Median IPR increased 4.2% from $12,316 in 2013 to $12,823 in 2017 (p < 0.01) while POPE increased 24.3% from $712 to $885 (p < 0.01). No significant trend was observed for SR. For isolated debridement, there was a decreasing trend for IPR, but no significant trend for POPE or SR. Median IPR decreased 13.5% from $7,938 in 2013 to $6,867 in 2017 (p = 0.01). For isolated labral repair, no significant trend was observed for IPR, POPE, or SR. Conclusion: From 2013-2017, IPR and POPE significantly increased for FAI surgery, the largest HA cohort. However, no significant trend was observed for SR. The increase in POPE may be related to growth in high deductible health plans and the overall trend of patients bearing a higher share of procedural costs. In conclusion, this study shows that patients are faced with covering a larger proportion of their HA procedure, adding to the burden of healthcare expenditures on patients. This study also allows for surgeons to better counsel patients on their expected out-of-pocket costs for HA as this is the first study in the literature to evaluate POPE for HA.

Category: Hip/Groin/Thigh

Primary Hip Arthroscopy For Femoroacetabular Impingement Syndrome In Adolescents Improves Outcomes And Clinical Benefit Achievement Rates At Short-Term Follow-Up. A Multi-Center Analysis

Abstract ID# 23565
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The purpose of this study is to report minimum 2-year follow-up patient-reported outcome scores (PROs) and rates of achieving the minimal clinically important difference (MCID), the patient acceptable symptomatic state (PASS), and the maximal outcome improvement (MOI) on adolescents following primary hip arthroscopy for femoroacetabular impingement syndrome (FAIS).

### Data

**Purpose:**
To report minimum 2-year follow-up patient-reported outcome scores (PROs) and rates of achieving the minimal clinically important difference (MCID), the patient acceptable symptomatic state (PASS), and the maximal outcome improvement (MOI) on adolescents following primary hip arthroscopy for femoroacetabular impingement syndrome (FAIS).

**Methods:**
Prospectively collected data from two high-volume hip arthroscopy centers were retrospectively reviewed on adolescents (<19 years old) who underwent primary hip arthroscopy between November 2008 and February 2019. Adolescents with a minimum 2-year follow-up for the modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score-Sports Specific Subscale (HOS-SSS), International Hip Outcome Tool-12 (iHOT-12), and visual analog scale (VAS) for pain were included regardless of their growth plate status. Exclusion criteria were: female age >18, prior ipsilateral hip surgery or conditions. Pre- and postoperative radiographic data, MCID, PASS, MOI, secondary surgeries, and complications were reported. A multivariable survival analysis for risk factors for secondary surgery was conducted. Results: A total of 287 hips (249 patients) were included (74.9% females). The mean values for age, body mass index, and follow-up were 16.3±1.3 years, 22.3±3.5, and 26.6±9.4 months respectively. Further, 88.9% underwent labral repair, 81.5% femoroplasty, and 85.4% capsular closure. Improvement for all PROs was reported (P < 0.001) with high patient satisfaction (8.8 ± 1.5). Achievement for the MCID was 71.7%, 83.0%, 68.1%, and 79.5% for the mHHS, NAHS, HOS-SSS, and iHOT-12 respectively. Achievement for the PASS was 68.3% for the mHHS and 73.2% for the NAHS. The MOI for hHHS, NAHS, and VAS was 58.3%, 77.0%, and 59.6% respectively. Rates of revision hip arthroscopy, cam recurrence and heterotopic ossification were 5.8%, 1.7%, and 5.5% respectively. Acetabular retroversion was found to be a risk factor for revision surgery (P = 0.03). Conclusion: The results of this multi-center study demonstrated that adolescents who underwent primary hip arthroscopy for FAIS reported significant improvement in all PROs, with satisfactory achievement rates for the MCID, PASS, MOI, and high patient satisfaction at a minimum 2-year follow-up. Level of Evidence: IV; Retrospective Multi-center Study.

### Summary

High-level athletes with borderline hip dysplasia achieve favorable outcomes and return to sport rates following primary hip arthroscopy: minimum 5-year outcomes comparison to a propensity-matched control group.

### Abstract

**Title:** High-Level Athletes With Borderline Hip Dysplasia Achieve Favorable Outcomes and Return to Sport Rates Following Primary Hip Arthroscopy: Minimum 5-Year Outcomes Comparison to a Propensity-Matched Control Group

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**Summary:**
This study reports on minimum 5-year patient-reported outcomes (PROs) and return to sport (RTS) rates in high-level athletes with borderline hip dysplasia (BHD) following primary hip arthroscopy for labral pathology and femoroacetabular impingement syndrome (FAIS).

**Data:**
The purpose is to report minimum 5-year patient-reported outcomes (PROs) and return to sport (RTS) rates in high-level athletes with borderline hip dysplasia (BHD) following primary hip arthroscopy for labral pathology and femoroacetabular impingement syndrome (FAIS) and to compare results to a propensity-matched control group of athletes with normal acetabular coverage.

**Methods:**
Data were reviewed for surgeries performed between February 2009 and February 2016. Patients were eligible if they underwent primary hip arthroscopy in the setting of BHD [LCEA 18-25] and completed in professional, collegiate, or high school sports. Inclusion criteria were preoperatively and minimum 5-year follow-up scores for the modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score-Sport Specific Subscale (HOS-SSS), and Visual Analog Scale (VAS) for pain. Rates of achieving the minimal clinically important difference (MCID), patient acceptable symptomatic state (PASS), and maximum outcome improvement satisfaction threshold (MOISST) were recorded in addition to RTS. BHD athletes were matched by age at the time of surgery, sex, BMI, Tonnis grade, follow-up time, sport type, and competition level to a control group of 58 athletes with normal acetabular coverage (LCEA 25-40). Results: A total of 34 BHD athletes were included with a mean follow-up of 73.6 ± 10.7 months. BHD athletes showed significant improvements in all PROs, demonstrated high RTS rates (90.0%), and achieved PASS/MCID/MOIST for mHHS (MCID: 80.0%, PASS: 93.3%, MOIST: 80.0%) and HOS-SSS (MCID: 76.7%, PASS: 73.3%) at high rates. When compared to a propensity-matched group with normal acetabular coverage, BHD athletes demonstrated similar postoperative PROs, rates of achieving psychometric thresholds, and RTS rates (P > 0.05). Conclusion: High-level athletes with BHD undergoing primary hip arthroscopy for labral pathology and femoroacetabular impingement syndrome may expect favorable midterm outcomes and high RTS rates. These results were comparable to a control group of athletes with normal coverage.

**Category:** Hip/Groin/Thigh

**Return To Performance In Elite Athletes With Proximal Hamstring Tendon Avulsion Following Operative And Non-Operative Treatment**

**Abstract ID:** 21978

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**Summary:**
This pilot case series indicates that both operative and non-operative treatment for proximal hamstring tendon avulsions can result in return to play and return to performance in elite athletes following shared decision-making.

**Background:**
Proximal hamstring tendon avulsions are rare but severe hamstring injuries, that have the potential to end an athlete’s career. Operative treatment is the most described choice of treatment for these injuries in current literature. Non-operative outcome is scarcely reported, even more so in elite athletes. Therefore, the objective of this case series was to describe the outcome of both operative and non-operative treatment in terms of return to play and return to performance in sports for elite athletes. Methods: we included elite athletes with MRI-confirmed proximal hamstring tendon avulsions of the conjoint tendon and/or the semimembranosus tendon. Operative or non-operative treatment was selected by shared decision-making. For operative treatment reattachment with suture anchors was performed followed by a phased criteria-based rehabilitation program. Non-operative treatment consisted of a phased criteria-based rehabilitation program. The primary outcome was time to return to performance (in days). Secondary outcomes were time to and rate of return to play, return to performance rate, and recurrence rate. Results: In total we have included nine proximal hamstring tendon avulsions in eight elite athletes with a median age of 27 years (IQR: 23–29 years). Five athletes were treated operatively and three athletes were treated non-operatively. One non-operatively treated athlete sustained a proximal hamstring tendon avulsion in different legs on different occasions. Operative patients included three full-thickness avulsions of both conjoint and semimembranosus tendon and two full-thickness avulsions of the conjoint tendon. In the non-operatively treated cases there were two full-thickness avulsions of both conjoint and semimembranosus tendon and two full-thickness avulsions of the conjoint tendon. The median retraction of the affected tendons in the operative group was 51 mm (IQR: 24–78 mm) and the median retraction in of the affected tendons in the non-operative group was 39 mm (IQR: 25–46 mm). The median return to performance in days of the operative group was 395 days (IQR: 240–472 days) and in the non-operative group 120 days (IQR: 74–235 days). The median return to play time in days of the operative group was 304 days (IQR: 159–351 days) and in the non-operative group 63 days (IQR: 50–95 days). Both groups had a return to play and return to