Hip Cartilage Defects in Elite Athletes: Their Association with Specific Sports

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Summary:
The purpose of this study was to determine the prevalence of chondral defects among elite athletes and determine if there is an association between types of biomechanical stress in a sport and articular cartilage injury patterns in the hip.

Data:
Chondral defects have been shown to be associated with femoroacetabular impingement (FAI). It is unclear if the type of sport or specific motions are related to the prevalence or severity of chondral defects seen in athletes. The purpose of this study was to determine the prevalence of chondral defects among elite athletes and determine if there is an association between types of biomechanical stress in a sport and articular cartilage injury patterns in the hip. Methods: Elite athletes, 18 years old or greater, who underwent arthroscopy for symptomatic FAI between January 2005 and November 2018 were considered for inclusion. Exclusion criteria consisted of prior ipsilateral hip surgery, presence of osteoarthritis (joint space < 2 mm), history of confounding injury or prior hip conditions. Patients were classified by their sport using a classification system based on ‘at-risk’ hip motions (rotational, repetitive, extreme, contact, and high-speed). Prevalence, size, severity (Outerbridge grade), and location of chondral defects were compared. Results A total of 431 hips (107 female, 324 male, mean age 26.8 +/- 5.1) of elite athletes were included, representing 24 sports at various levels of play. Chondral defects (grade I-IV) were found in 408 (95%) of cases. Severe chondral defects (grade III/IV) were seen in 218 (51%) of cases and most commonly found in football, soccer, and baseball players. Microfracture was performed in 72 (17%) of total cases. There was significantly higher prevalence of acetabular (p<.04), femoral head (p<.04), and combined (p<.04) grade III/IV lesions in the rotational versus non-rotational group and acetabular (p<.001) and combined (p=.02) grade III/IV lesions in the contact group versus non-contact group. Conclusion In elite athletes, the prevalence of chondral defects was high when undergoing hip arthroscopy. The severity, size, and location varied based on type of motion and stress on the hip that was determined by the sport. The more severe (grade III/IV) defects were more common in the rotational and contact athletes according to the motion classification system. The nature of high speed and extreme range of motion sports may be somewhat protective or select-out for athletes with hip chondral defects. This classification system can be used to identify athletes at risk of chondral damage for close monitoring and injury prevention. This information can also be used to pre-operatively counsel these athletes on the likely findings and to set expectations. Keywords hip; cartilage defect; sports; at-risk hip

Assessment of Acetabular Labral Blood Flow Using Laser Doppler Flowmetry Before and After All-Arthroscopic Capsular Autograft Labral Reconstruction

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INTRODUCTION: All-arthroscopic capsular autograft labral reconstruction has been proposed to repair complex or irreparable tears. Cadaveric studies have suggested that the acetabular labrum receives its blood supply from branches of the periacetabular periosteal vascular ring, with perfusion remaining intact in most hips exhibiting labral tears. Despite this, little is known about the exact course of blood flow to labral tissue or how surgical reconstruction affects microvasculature during hip arthroscopy. The purpose of this study was to examine the effects of all-arthroscopic capsular autograft labral reconstruction on labral blood flow in vivo using laser doppler flowmetry (LDF) to measure microvascular perfusion. METHODS: Patients =18 years old undergoing arthroscopic repair of the acetabular labrum by a single surgeon. Labral repair was performed via a previously published capsular autograft labral reconstruc- tion technique. A LDF probe (Moor Instruments) measured microvascular blood flow flux (perfusion units [PU]) within 1mm3 of surrounding labral tissue. LDF measurements were taken medial and lateral to the region of the tear before/after labral reconstruction and before/after labral elevation from the acetabular rim. The mean of flux measurements was expressed as a percent change from each patient’s baseline measurements. The change in labral perfusion was analyzed using student t-tests, one-way ANOVA using Tukey’s method for multiple comparisons, and multiple regression analyses. Lending from previous literature, flux decreases <50% were considered clinically significant. RESULTS: This study included 41 patients (24 males (58.5%);17 females (41.5%)) undergoing arthroscopic labral repair with capsular autograft reconstruction with mean [SD] age 31.3 [8.4] years, BMI 24.8 [3.3] kg/m2, lateral center edge angle (LCEA) 35.3 [4.9] degrees, Tonnis angle 5.8 [5.8] degrees, and mean arterial pressure 96.0 [10.9] mmHg. The mean [95% CI] percent change in blood flow following labral elevation was -9.24% [-0.04] to (-18.1)). Following labral reconstruction, the mean [95% CI] percent change in blood flow medially was -22.3% [-1.19] to (-32.7) and laterally -32.5% [-23.6] to (-41.5). There was no significant difference between medial versus lateral perfusion (p=0.136) following repair. Unadjusted analyses stratifying for age, BMI, sex, type of impingement, Tonnis/Outerbridge class, amount of capsule used for augmentation, and suture technique were not found to be correlated with differences in labral perfusion medially (p<0.05) or laterally (p>0.05). Multiple regression analyses controlling for BMI, LCEA, suture technique, age, mean arterial pressure 96.0 [10.9] mmHg. The mean [95% CI] percent change in blood flow following labral elevation was -9.24% [-0.04] to (-18.1)). Following labral reconstruction, the mean [95% CI] percent change in blood flow medially was -22.3% [-1.19] to (-32.7) and laterally -32.5% [-23.6] to (-41.5). There was no significant difference between medial versus lateral perfusion (p=0.136) following repair. Unadjusted analyses stratifying for age, BMI, sex, type of impingement, Tonnis/Outerbridge class, amount of capsule used for augmentation, and suture technique were not found to be correlated with differences in labral perfusion medially (p<0.05) or laterally (p>0.05). Multiple regression analyses controlling for BMI, LCEA, suture technique, age, mean arterial pressure were not found to be associated with changes in medial (p>0.05) or lateral (p>0.05) labral perfusion. Finally, all changes in flux were found to be signifi- cantly less than the 50% threshold, when comparing decreases following labral elevation (p<0.001) and labral reconstruction medically (p<0.001) and laterally (p<0.001). DISCUSSION: While the vascular nature of the acetabular labrum has been described in literature, preservation of labral blood flow following arthroscopic labral repair has not yet been objectively reported. This study found that techniques to preserve native hip anatomy and vascular supply may adequately maintain perfusion to labral tissue and promote healing. Although this study cannot be generalized to all variations of labral repair/reconstruction, these re- sults suggest that surgeons can employ techniques that preserve microvascular tissue perfusion. ACKNOWLEDGEMENTS: Conine Family Foundation for Joint Preservation; Mark Cote DPT, MS from MGB for assistance with statistical
Risk Factors for Athletic Pubalgia Development in Collegiate Football Student-Athletes: A Retrospective Cohort Study

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Summary:
Olympic weightlifting and playing a skilled position are strongly associated with the development of athletic pubalgia in collegiate football players.

Data:
Background: Athletic pubalgia is a common injury among student-athletes. The cause of this injury is multifactorial and poorly understood and has been associated with repetitive explosive movements that cumulatively injure the groin and surrounding tissues. Therefore, the aim of this study was to evaluate the effect of Olympic weightlifting, body mass index and position type (skilled vs non-skilled) in collegiate football players with respect to development of athletic pubalgia. Hypothesis: The introduction of Olympic weightlifting and playing a skilled position will significantly increase a student-athlete’s risk of developing athletic pubalgia. METHODS: Football student-athletes at a single college institution from January 2010 to December 2019 were included in the study. The primary outcome measure was athletic pubalgia surgery confirmed with magnetic resonance imaging. Odds of athletic pubalgia was determined using logistic regression with the dependent variable being whether or not the student-athlete received athletic pubalgia surgery. Independent variables included Olympic weightlifting exposure, skilled vs. non-skilled position and body mass index. Skilled positions were defined as quarterbacks, wide receivers, running backs, tight ends, linebackers, cornerbacks, and safeties, with these positions being subject to a high volume of running, cutting, and rapid change of direction. Non-skilled positions were defined as offensive linemen, defensive linemen, and specialists (punters, kickers, and long snappers), with these positions being subject to a low volume of running, cutting, and rapid change of direction. Olympic weightlifting exposure occurred suddenly in January of 2015 when Olympic weightlifting was implemented in the weight training regimen where it was not previously present, therefore all student-athletes on the 2015 roster and later were deemed positive exposures. Previous core muscle injury or athletic pubalgia surgery excluded student-athletes from the study. RESULTS: A total of 1,154 student-athlete exposures met inclusion criteria, defined as any male football student-athlete who was listed on the active program roster and participated in football team activities from the 2010 through 2019 seasons. Of the 576 student-athlete exposures to Olympic weightlifting, 20 developed athletic pubalgia, whereas 7 student-athletes not exposed to Olympic weightlifting developed athletic pubalgia. Student-athletes exposed to Olympic weightlifting had a 2.86 (95% CI, 1.25-7.35; p=0.014) times higher odds of being diagnosed with athletic pubalgia compared to those not exposed. Skilled position players had a 9.32 (95% CI, 1.71-63.96; p=0.031) times higher odds of developing athletic pubalgia as compared to those not exposed. Skilled position players may benefit from modified training regimens to decrease this risk.

Category: Hip/Groin/Thigh

A Unique Cartilage Morphology of the Femoral Head-Neck Junction in Patients with Femoroacetabular Impingement

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Summary:
To investigate the clinical, histological, and genetic phenotype of superficially fissured cartilage on the femoral head-neck junction at the impingement site in patients with femoroacetabular impingement.

Data:
Purpose: While an association between femoroacetabular impingement (FAI) and osteoarthritis (OA) has been reported, the mechanistic differences and transition between the two conditions is not fully understood. In FAI cartilage lesions at the femoral head-neck junction can sometimes be visualized during hip arthroscopy. In this study, we evaluated a unique cartilage pattern in FAI patients that we hypothesized may indicate risk for, or predict occurrence of, osteoarthritis. The purpose of this study was to describe a unique dimpled pattern of superficial fissured cartilage lesions on the femoral head-neck junction at impingement site in patients with FAI and to evaluate the clinical, histological and genetic phenotype of this cartilage. Methods: Six hips (six patients) with dimpled or fissured cartilage were included among patients who underwent hip arthroscopy for treatment of symptomatic FAI from October 2020 through December 2021. This injured cartilage (dimple-pattern group) and normal cartilage (control group) on the femoral head-neck junction were collected from the same patients and evaluated for histological quantification by Mankin score and expression of proteins related to cartilage degeneration, such as matrix metalloproteinases (MMP)-1,2,3,10, and 12, tissue inhibitor of metalloproteinases (TIMP)-1 and 2, aggrecan neoepitope CS846, and hyaluronic acid, by Milliplex Multiplex Assays. Results: The mean age of the six hips included was 34.2±12.9 years (range, 19-54), and all FAI subtypes were mixed. Mankin scores for the normal cartilage group and the dimple-pattern group were 0.67 ± 0.82 and 3.3 ± 0.82, respectively. Dimple pattern fissured cartilage showed a significant increase in Mankin score (p=0.031) and a significant increase in protein expression of CS846 (p=0.031) compared to normal cartilage. There were no significant differences in MMPs, TIMPs, or HA levels between the two groups. Conclusion: The dimple pattern fissured cartilage, compared to normal cartilage, showed histologically significant cartilage degeneration and a significant increase in protein expression of CS846, a biomarker for early OA. This lesion serves as a helpful visual indicator of extremely early degeneration of the cartilage of femoral head-neck junction caused by FAI. Keywords: cartilage defect; femoral head; femoroacetabular impingement; hip arthroscopy

Category: Hip/Groin/Thigh

Ten-Year Outcomes Following Endoscopic Gluteus Medius Repair With Concomitant Hip Arthroscopy

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Summary:
This study evaluates 10-year patient-reported outcome (PRO) scores following endoscopic surgery for gluteus medius partial and full-thickness tears with concomitant hip arthroscopy for labral tears and/or femoroacetabular impingement syndrome (FAIS).

Data:
The purpose is to evaluate 10-year patient-reported outcome (PRO) scores following endoscopic surgery for gluteus medius partial and full-thickness tears with concomitant hip arthroscopy for labral tears and/or femoroacetabular impingement syndrome (FAIS). Methods: Prospectively collected data on patients followed for a minimum of 10 years after endoscopic gluteus medius repair with concomitant hip arthroscopy performed by a single surgeon were retrospectively analyzed. Patients with preoperative and 10-year follow-up for the following PROs were included: modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), Hip Outcome Score-Sports Specific Subscale (HOS-SSS), and Visual Analog Scale (VAS) score for pain. Results: There were 13 patients eligible for inclusion, 11 (84.6%) of whom had 10-year follow up, with a mean of 127.6 months (range, 120.0-140.2 months). The group consisted of 10 females (90.9%) and one male (9.1%) with a mean age at surgery of 60.1 years (range, 46.2-74.8 years). PRO scores improved from preoperative to 10-year follow-up as follows: mHHS from 60.4 to 88.0 (p=0.011); NAHS from 50.1 to 90.6 (p<0.001); HOS-SS from 37.5 to 85.1 (p<0.001); and VAS from 4.8 to 1.2 (p=0.006). Mean patient satisfaction rating was 8.3. Patients achieved PASS and MCID for mHHS and HOS-SSS at a rate of 81.8%. There was no significant decline in PROs or