tients were treated with combination of surgical reconstruction of the external oblique muscle aponeurosis followed with hip arthroscopy, FAI decompression and labrum reconstruction/debridement. All 25 patients returned to preoperative level of athletic activities with no residual pain.

We postulate that a direct positive correlation exists between the Gilmore's groin and Femoro-acetabular impingement. It is thus imperative to have a high index of suspicion for a condition of the Gilmore's groin in all patients presenting with FAI.

Paper 6: The Effect of Capsulotomy on Hip Stability

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SUMMARY

The presence of transverse capsulotomy appears to permit increased rotation in maximum flexion compared to hips with intact capsules.

DATA

Methods: 13 fresh frozen cadaveric hip specimens were mounted in a custom testing apparatus and an external rotation torque of 0.588 Nm was applied under static load. A motion tracking system (Eagle4 cameras and EVaRT imaging software program, Analysis Corp., Santa Rosa CA) was used to record the experimental kinematics, post-process translation, and rotation data for each specimen under 4 conditions: (1) Neutral flexion with capsule intact. (2) Neutral flexion with transverse capsulotomy. (3) Maximum flexion with capsule intact. (4) Maximum flexion with transverse capsulotomy. Each specimen underwent CT scanning prior to testing. DICOM images were imported into Mimics (Materialze, Luven, Belgium) and the femoral head centroid was calculated based on segmented 3D model of the femur.
Results: We compared femoral-acetabular motion caused by an applied external rotation torque for each testing condition in terms of translation and rotation in the x, y and z planes. We analyzed the data using both analysis of variance (ANOVA) and nonparametric analysis. After evaluation of rotation in the z plane in maximum flexion, the intact hip rotated less than hips with transverse capsulotomy (p-value=.0362).
Conclusion: The presence of transverse capsulotomy appears to permit increased rotation in maximum flexion compared to hips with intact capsules. We believe that larger studies are warranted to further examine how capsular integrity affects hip stability

Paper 7: Effect of Cam-Type Femoroacetabular Impingement on Hip Joint Kinematics

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SUMMARY

Changes to motion patterns and kinematics occur as a result of CAM-type femoroacetabular impingement, which increases with larger sized impinging lesions.

DATA

Introduction: CAM-type femoroacetabular impingement is caused by a morphologic abnormality at the femoral head-neck junction. Gait analysis has shown that CAM deformities cause changes to coupled motions in vivo, though it is unclear whether these changes are due to soft tissue structures or due to direct bony contact. The objective of this study was to determine how structural CAM deformities and surgical resection affect patterns of hip rotation, translation of the center of rotation, and force required to flex and abduct the hip.
Materials and Methods: Six cadaveric hip (hemipelvis/proximal femur) specimens were used in this study. Specimens with a history of hip surgery were excluded. Three CAM lesions of varying severity were simulated for each specimen using polymethyl-methacrylate (PMMA) with added barium sulphate to increase radiodensity. A metal plug was inserted into the femoral neck to allow a bolt to hold each deformity in place.

We measured the kinematics and applied tendon force in each hip during flexion and abduction with simulated muscle loads in five states: underformed, small deformity, medium deformity, large deformity, and post-osteochondroplasty. We assessed the relationship between deformity and coupled motions, translations of center of femoral rotation, and force required to create active unconstrained flexion and abduction ex vivo. Four muscles were simulated by cables drawn from the distal tendon to the location of proximal attachment. Motion was created by actively shortening one of these cables while statically loading the others. Markers on the femur and pelvis were tracked, allowing for calculation of joint rotations and translations. A load cell on the active cable allowed for measure-

ment of the applied force. Statistical differences were assessed using linear mixed models.
Results: CAM deformities were associated with an increased external rotation, adduction and translation during flexion and increased internal rotation, extension and decreased translation during abduction ($p < 0.05$). An increasing severity of CAM deformity significantly increased the muscle force required to flex the hip. In the hip with no deformity, a force of approximately 100N was required to flex the hip to 70°. This force requirement more than doubled with a severe deformity, and the difference increased with flexion angle. Further, CAM resection resulted in increased internal rotation and translation during flexion and decreased internal rotation during abduction ($p < 0.05$). Less force was required to create flexion and abduction following resection.
Conclusions: Changes to motion patterns and kinematics occur as a result of CAM-type FAI lesions, and were greater for larger lesions. As coupled motions were observed within ranges of flexion and abduction required for daily living, it is recommended that resection be performed in an attempt to slow the progression of osteoarthritis by limiting contact between the femoral head-neck and the acetabulum.

Paper 8: Prevalence of Radiographic Hip Pathomorphology in Patients Presenting to an Orthopaedic Clinic with "Hip" Pain *Christopher Michael Larson, MD, USA, Presenting Author*
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SUMMARY

FAI is highly prevalent (94%) and frequently bilateral (81%) in patients presenting to an orthopaedic clinic with "hip" pain, while increasing alpha angle is highly predictive of "hip-related" symptoms.

DATA

Introduction: There is limited data with regards to the prevalence of radiographic hip pathomorphology in patients presenting with "hip" related complaints.
Methods: 498 consecutive patients (996 hips) presented to two orthopaedic surgeons at two centers with "hip" related symptoms. There were 227 males and 271 females with a mean age of 38 years (range, 10 – 81 years). An anteroposterior (AP) radiograph of both hips and a lateral radiograph of the hip was obtained for all patients. A detailed radiographic evaluation including lateral center edge angle (LCE), neck-shaft angle, alpha angles on AP and lateral radiographs, cross-over sign, ischial spine sign, posterior wall sign, and Tonnis grading was performed on all radiographs. The presence of dysplasia, cam and or pincer-type femoroacetabular impingement (FAI), and a classification for pincer-type FAI (retroversion, focal anterior overcoverage, profunda, protrusio) was determined for all hips. The above named parameters were also evaluated with respect to symptoms, gender, age, and bilaterality.
Results: The presence of at least one finding consistent with FAI was noted in 94.4% of patients and was bilateral in 81%. The prevalence of dysplasia was 10.4% and was bilateral in 3.6%. The prevalence of isolated cam-type FAI was 18.5%, isolated pincer-type FAI was 21.3% and combined-type FAI was 54.6%. Symptoms were more prevalent in the presence of cam ($p<0.001$), pincer ($p=0.042$), and combined-type FAI ($p<0.001$). In addition, increasing alpha angle was highly predictive of "hip-related" symptom ($p<0.001$). Pincer-type FAI had a greater prevalence with increasing age ($p<0.001$). Cam and combined-type FAI were seen more frequently in males ($p<0.001$), whereas coxa profunda was seen more frequently in females ($p<0.001$).
Conclusions: FAI is highly prevalent (94%) and frequently bilateral (81%) in patients presenting to an orthopaedic clinic with "hip" pain. Increasing alpha angle was highly predictive of "hip-related" symptoms. This study also confirmed that pincer-type FAI was more prevalent with increasing age, cam and combined-type FAI were more prevalent in males, whereas coxa profunda was more prevalent in females.

Paper 9: The Effect of Femoroacetabular Impingement on Sacroiliac Joint Motion *Patrick Michael Birmingham, MD, USA, Presenting Author*
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SUMMARY

Hip internal rotation causes motion of the contralateral Sacroiliac Joint with realtively more motion with a decreased head neck offset

DATA

Background: A causative link between femoroacetabular impingement and increased motion of the other pelvic joints could give one possible explanation for the clinical