

**Paper #57****THE BIOMECHANICAL EFFECT OF ISCHIOFEMORAL IMPINGEMENT AND FEMORAL VERSION ON LUMBAR FACET LOADS DURING HIP EXTENSION**

Juan Gómez-Hoyos<sup>1</sup>, Anthony Khoury<sup>2</sup>, Ricardo Goncalves Schroder<sup>2</sup>, William Márquez-Arabia<sup>3</sup>, Asadullah Helal<sup>2</sup>, Ian James Palmer<sup>4</sup>, Hal David Martin<sup>2</sup>

<sup>1</sup>Medellín (Colombia), Dallas (Usa), COLOMBIA, <sup>2</sup>Hip Preservation Center at Baylor University Medical Center at Dallas, Dallas, TX, UNITED STATES, <sup>3</sup>Medellín, COLOMBIA, <sup>4</sup>Oklahoma City, OK, USA

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**Summary:** The biomechanical effect of ischiofemoral impingement and femoral version on lumbar facet loads during hip extension.

**Purpose.** The purpose of this study was to assess the effect of ischiofemoral impingement, abnormal femoral version, and the iliofemoral ligament on lumbar facet joint loads during hip extension.

**Methods.** Twenty-five hips from fresh frozen T1-to-toes cadaveric specimens were tested. A complete pre-testing imaging evaluation was performed using CT scan. Through a posterior lumbar spine approach L3-4 and L4-5 facet joints were dissected. Ultrasensitive, and previously validated, piezoresistive force sensors were placed in lumbar facet joints of L3-4 and L4-5. Lumbar facet loads during hip extension (from zero to 10 and 20 degrees) were measured in native hip conditions and after three different conditions in two separate cohorts. Cohort1 (n = 12): condition 1) simulated ischiofemoral impingement by performing lesser trochanteric osteotomy and lengthening. Cohort 2 (n = 13): condition 2) Native versus increased (+30 degrees) and decreased (-10 degrees) femoral version by performing a femoral osteotomy, and condition 3) native versus decreased femoral version after release of the iliofemoral ligament. Paired t-tests were performed comparing normal versus simulated ischiofemoral impingement on the L3-L4 and L4-L5 facet joint loads. Repeated measures ANOVA with post hoc paired t-tests were performed to compare the native versus abnormal femoral neck version and the native versus retroverted femur with iliofemoral ligament release on the L3-4 and L4-5 facet joint loads.

**Results.** Cohort 1: After simulating IFI, mean absolute differences of facet joint load were 10.8 N (SEM±4.53, p = 0.036) for L3-4 at 10 degrees of hip extension, 13.71 N (SEM±4.53, p = 0.012) for L3-4 at 20 degrees of hip extension, 11.49 N (SEM±4.33, p = 0.024) for L4-5 at 10 degrees of hip extension, and 6.67 N (SEM±5.43, p = 0.245) for L4-5 at 20 degrees of hip extension. And a statistically significant increase in L3-4 and L4-5 lumbar facet joint loads of 30.81% was found on average.

Cohort 2: After simulating increased and decreased femoral neck version, mean absolute differences of L3-4 facet joint load at 10 degrees of hip extension were 24.8 N (SEM±8.3, p = 0.013) between native and -10 femoral version and 39.6 N (SEM±14.4, p = 0.020) between 30 degrees and -10 degrees femoral version. Mean absolute differences of L3-4 facet joint load at 20 degrees of hip extension were 56.9 N (SEM±22.9, p = 0.030) between 30 degrees and -10 degrees femoral version. Trends for a femoral version effect were found in L4-5 facet loads at 10 degrees (p = 0.088) and 20 degrees (0.063) of hip extension. After releasing the iliofemoral ligament in a retroverted condition (-10 degrees) a statistically significant decrease in L3-4 and L4-5 lumbar facet joint loads of 186.84% was found on average.

**Conclusion.** Ischiofemoral impingement (cohort 1) significantly increased L3-4 and L4-5 lumbar facet joint load when compared to non-ischiofemoral impingement native hips. Decreased femoral version (cohort 2) decreased L3-4 and L4-5 facet loads. Release of the iliofemoral ligament decreased the facet loads in all specimens of femoral retroversion.