BIOMECHANICAL ASSESSMENT & MANAGEMENT OF HIP IMPINGEMENT

Overview
Acetabular-femoral (AF) and femoral-acetabular (FA) movement is dependent on cooperation and control of six joints in the lumbo-pelvic-femoral complex and twenty-two pairs of muscles that cross the AF / FA joints.

Acetabular movement on the femur (AF) and femoral movement on the acetabulum (FA) occurs with rotation in all three planes of sagittal, transverse and coronal direction. At foot strike the acetabulum adducts on the femur and then abducts from midstance until terminal swing. At foot stance the femur is externally rotated on the acetabulum and then internally rotates during midstance. Regardless of what phase of gait, or what position one is in when sitting or standing, inability to decrease load of the cotyloid rim on the femur or the femoral head on the cotyloid rim results in stimulation of the nociceptors in the labrum or impingement and possible damage to the rim itself, or labral fraying resulting in subluxation or labral tears. This lack of congruent rotation and stability of AF / FA movement secondary to asynchronous AF activity and dyssynchronous FA activity can lead to undesirable force-coupling and contact during adduction and internal rotation and abduction and external rotation, regardless if in a state of loaded or un-loaded kinetic chain. Compensatory motor control strategies, poor footwear and weak knee and ankle anti-gravitational muscle only complicates assessment and management of hip impingement.

Three most common impingement syndromes seen in the clinic:

1. Anterosuperior acetabular femoral impingement (ASAF)
2. Anteromedial femoral acetabular impingement (AMFA)
3. Laterosuperior femoral acetabular impingement (LSFA)

Anterosuperior Acetabular-Femoral Impingement

Experienced most often on the left side when the patient attempts to ‘shift’ or pull his or her femur into the acetabulum with the ischiocondylar adductor.

Contributing Factors:
Anteriorly rotated, forward positioned innominate with accompanying lax iliofemoral, pubofemoral ligament, restricted ischiofemoral ligament, long and weak adductors, overactive FA external rotators and abductors, weak AF extensors and overactive FA hip flexors as FA IR’s (TFL).
Test Results:
1. Positive ipsilateral Adduction Drop Test
2. Positive or negative ipsilateral Extension Drop Test
3. Positive ipsilateral FABER (flexion + abduction + external rotation with + Thomas)
4. Increased ipsilateral seated FA ER
5. Increased or decreased ipsilateral FA flexion

Management:
1. Increased activity of ipsilateral adductor for AF IR and concomitant FA IR and FA adduction
2. Increased activity of ipsilateral FA IR and concomitant contralateral FA ER
3. Increased activity of ipsilateral FA IR and abduction with contralateral AF ER
4. Increased dynamic ipsilateral AF IR and AF extension
Anteromedial Femoral Acetabular Impingement

Experienced most often on the right side when the patient attempts to internally rotate femur in the second half of seated FA internal rotation or with posterior translation of the femoral head in flexion.

Contributing Factors:
Posterior capsular instability, weak inferior gluteus maximus fiber, lax ischiofemoral ligament, restricted iliofemoral and pubofemoral ligament, short pectineus, adductor magnus and brevis.

Test Results:
1. Decreased ipsilateral seated FA ER
2. Increased ipsilateral seated FA IR
3. Possible posterior hip subluxation (snapping hip)
4. Positive and painful Step Down Test
5. Positive and painful Hip Lift Test

Management:
1. Increase activity of ipsilateral FA ER with concomitant contralateral AF IR
2. Increase activity of ipsilateral FA abduction with concomitant contralateral FA adduction
3. Increase activity of contralateral adductors with ipsilateral abdominals
4. Increase dynamic ipsilateral FA ER and extension with concomitant contralateral AF IR
Laterosuperior Femoral Acetabular Impingement

Experienced most often on the right side when the patient attempts to lift or abduct right leg and fails to properly seat femoral head into acetabulum.

Contributing Factors:
Poor contralateral pube control, overactive ipsilateral back lateral flexors and extensors, tight contralateral posterior hip capsule, restricted, tight, short and overactive ipsilateral adductors, and weak long ipsilateral abductors and contralateral adductors.

Test Results:
1. Level 2 or lower on Hruska Abduction Lift Test
2. Level 2 or lower on contralateral Hruska Adduction Lift Test

Management:
1. Contralateral posterior capsule stretch
2. Active contralateral adduction in an AF IR position
3. Active ipsilateral abduction with FA IR and concomitant contralateral AF IR and adduction
4. Dynamic ipsilateral active adduction and abduction in contralateral AF IR static position with trunk stabilization.
References:

Femoral Acetabular Impingement

Anatomy

Adductors as Internal Rotators