

## **The Biomechanical Link between Low Back Pain and Golf** ***Allen Gruver, PT, ATC, PRC, CSCS***

The golf swing is a highly integrated sport requiring tri-planar mobility and strength especially across the hips and pelvis. There are approximately 23 ranges of motion in the body that are essential for an efficient swing and none more important than the acetabular-femoral (AF) joint, also known as the hip joint. Rotation of the pelvis during the golf swing is one of the key movements, promoting stability and the transfer of power during both phases of the swing. When rotation of the acetabular-femoral joint is limited in one joint or both, rotational demands are transferred proximally to the lumbar spine and SI joints. This compensation affects the biomechanics of the swing and leads to mechanical breakdown in the lumbar spine region.

Research has shown a positive correlation between decreased lead hip rotation and lumbar range of motion with a prior history of low back pain in professional golfers. A study performed in 2004 by Dr. James Andrews and various authors showed that range of motion deficits in the lead hip rotation and lumbar spine extension correlated with a history of low back pain in golfers. It was the author's hypothesis that capsular tightening occurred due to lead hip external rotator hyper tonicity and inhibition of the corresponding internal rotators.<sup>3</sup>

Ron Hruska MPT, PT of the Postural Restoration Institute™ (PRI) in Lincoln, NE describes a pattern of asymmetry across the lower extremity known as the Anterior Interior Chain (AIC). Hruska believes that the asymmetrical postural pattern occurs in some degree with all humans and the specific muscular imbalances occur on the left side. This is largely due to anatomical differences and a dominant right side motor pattern that we develop through our life. The left Anterior Interior muscle chain consists of the diaphragm, psoas major, tensor fascia latae, vastus lateralis, and the biceps femoris. When this muscle chain becomes unopposed and malpositioned a predictable pattern evolves causing structural compensations throughout our entire body.<sup>2</sup>

The left anterior interior chain primarily affects the pelvic girdle and its corresponding joints. The left pelvic innominate is anteriorly tilted and forwardly rotated in relationship to the right innominate. The left femur is internally oriented within the acetabular-femoral joint (AF), promoting compensatory femoral-acetabular (FA) external rotation to reposition the left femur in a relative neutral state. This pelvic positional state produces hypertonicity of the left external rotators and posterior capsule tightening.

During the downswing, AF internal rotation is key for transfer of energy and acceleration through the impact of the golf ball. As weight is being transferred to the lead hip, the pelvis rotates over the femur producing AF internal rotation. This generation of torque is created in the lower body and transferred up through the body and through the club. According to Fleisig, the majority of torque in the swing is generated by the lower body muscle groups of the glutes, hamstrings, quads, and core region (low back, abdominal, obliques).<sup>1</sup>

When a golfer presents with a Left AIC pattern and hip external rotator hypertonicity and/or posterior capsular restriction is accompanied, the internal rotators of the hip and concomitant obliques are positionally weak and cannot properly achieve adequate internal rotation during the downswing phase. The inability to rotate the acetabulum over the femur creates compensatory shearing forces in the SI joints and lumbar spine, where anatomical rotation is very minimal and not desired. This rotational compensation will eventually lead to torque of SIJ and lumbar spine causing SIJ dysfunction/instability and mechanical low back pain.

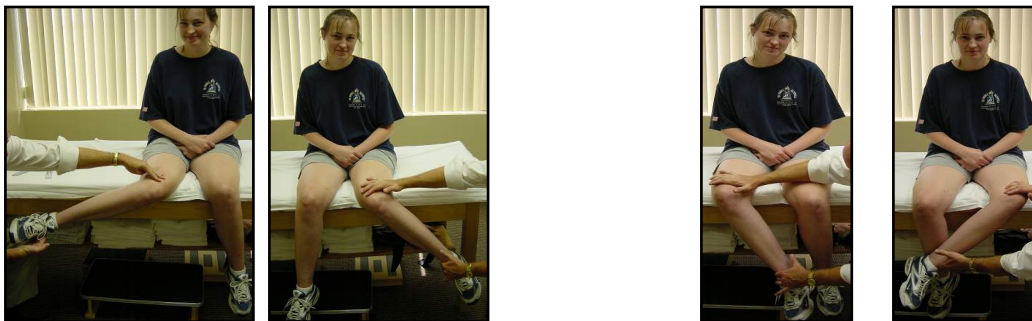
### Clinical Assessment Considerations

The Postural Restoration Institute™ has identified tests and measures to determine if a Left AIC Pattern exists. If the following tests are positively recognized, this demonstrates the common pattern of an asymmetrical pelvis with compensatory muscle dysfunction.

### Seated FA IR/FA ER

The patient is seated at the edge of table or plinth with hips positioned on the table and feet hanging freely off the floor. Examiner passively rotates the leg into internal/external rotation while maintaining the patient's thigh firmly on the table. The examiner stops the test when an end-feel is reached and or pelvic rotation is observed.

Each side is measured and comparison is noted for any asymmetry. Decreased left FA IR and right FA ER is usually observed with a non pathological Left AIC pattern.<sup>2</sup>



### Extension Drop Test (Modified Thomas Test)

The patient is positioned in supine with both thighs on the table. Both hips and knees are flexed to the chest. Passively lower one leg over the edge of the table while helping the patient hold the untested knee close enough to the chest to maintain the low back against the table. Do not allow hip abduction to occur past zero on the tested extremity while passively dropping the FA joint into extension.

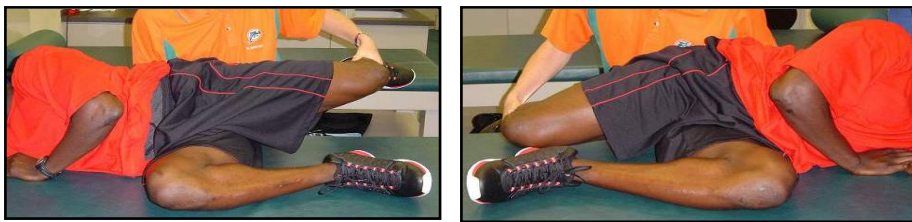
A positive test is indicated when the tested lower extremity (usually the left) is restricted in hip extension because of the forward oriented of the tested side compared to the other.<sup>2</sup>



### Adduction Drop Test (Ober Test)

The patient lies on their side with the lower leg and hip flexed to 90 degrees. Stand behind the patient and passively flex, abduct and extend the hip to neutral while maintaining 90 degrees of knee flexion. Passively stabilize the pelvis from falling backward and allowing femoral internal rotation to occur

A positive test is indicated by a restriction from the anterior-inferior acetabular labral rim, transverse ligament and piriformis muscle or impact of the posterior inferior femoral neck on posterior inferior rim of the acetabulum that does not allow the femur to adduct, possibly secondary to an anteriorly rotated forward hemipelvis. Usually observed on the left side.<sup>2</sup>



### References:

1. Fleisig, Glenn MS: "The Biomechanics of Golf"
2. Hruska, RJ. Myokinematic Restoration- An Integrated Approach to Treatment of Lower Half Musculoskeletal Dysfunction. Postural Restoration Institute Course Manual. 2008.
3. Vad, V., Atul B., Basrai, D., Gebeh, A., Aspergren, D., Andrews, J. Low Back Pain in Professional Golfers. The Role of Associated Hip and Low Back Range of Motion Deficits. The American Journal of Sports Medicine 32: 494-497 (2004)