Dynamic Chiropractic

DIAGNOSIS & DIAGNOSTIC EQUIP

Functional Evaluation of the Hips, Part 2

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In my experience, I have found it useful to measure internal and external hip rotation in a prone rather than a supine position. I was taught this technique by Mark Comerford in 2006 and use it on a daily basis. In the prone position with the client on the table or floor, grasp the foot gently, maintain the knee at 90 degrees, and slowly rotate the hip internal and external until you feel resistance. Make sure you are isolating the hip and not allowing pelvic rotation to occur. Take measurement of either excessive or decreased motion. (In Part 1 of this article (Jan. 15, 2009 issue), you will find the description and interpretation of the tests for medial and lateral hip rotation.)

If you find an asymmetry in internal hip rotation in the prone position, you can demonstrate the asymmetry in internal rotation by having the patient perform the "windshield-wiper position" in the supine position. Patient is supine lying in the 90/90 pose with both fists together (thumbs touching each other) between the knees. Slowly move the feet outward while maintaining pressure between the knees. Compare left and right internal rotation. This method should confirm what you find in the prone position, and allows the patient to see and feel any discrepancy.

The importance of proper hip range of motion and motor control is that the hip muscles either stabilize or produce power. During gait, the glutes and hamstrings produce hip extension. When the hamstring muscle is more dominant than the glutes during hip extension, the proximal femur / greater trochanter can create stress on the anterior joint capsule by anteriorly gliding during the hip extension movement. Ideally, the greater trochanter is maintained in the acetabulum by coordination and fine control of the surrounding muscles. Anterior gliding of the proximal femur / greater trochanter is a form of "uncontrolled translation" that can create a friction rub or repetitive microtrauma.

Many structures pass over the anterior femur head, such as the labrum, capsular fibers, bursa and soft tissues. It is reasonable to imagine that dysfunctional muscle control at the hip can cause synovitis, bursitis and soft-tissue contracture. If the iliopsoas is stretched or weak, and is not providing normal restraint on the femur head, the anterior gliding will be worse.

Reviewing the anatomical attachments of the hamstrings provides a plausible reason why hip joint motion becomes altered. The hamstring muscles, with the exception of the short head, do not attach into the femur. They attach to the ischial tuberosity. Because the hamstrings do not attach directly into the proximal femur, they cannot provide precise control of the movement of the proximal end of the femur during hip extension.

The short head of the biceps femoris starts at about the mid femur. It has a continuous origin from the lateral lip of the linea aspera on the posterior surface of the femoral shaft, the upper half of the lateral supracondylar line and from the lateral intermuscular septum. Distally, the long and short head of the biceps femoris give rise to a tendon that inserts into the lateral surface of the fibular head. In my experience, the short head of the biceps femoris is consistently one of the most overactive muscles in the body. The hamstrings simply cannot provide local fine motor control of the femur head.

There is another side to this whole hip movement pattern story. When the gluteus max and piriformis muscles are the prime movers for hip extension, the greater trochanter will either maintain a constant position or move slightly posteriorly.

If your patients experience cramps in the hamstrings during the bridge maneuver, they are overutilizing the hamstring muscle and not firing the glutes properly. If the patient has anterior hip pain while performing the bridge exercise up and down, they may not be controlling the proximal femur / greater trochanter.

Hip/pelvic complex dysfunction, especially the gluteal/hamstring relationship, can further impact the kinetic chain distally, such as excessive femoral medial rotation with respect to the tibia. The knee often gets caught between a dysfunctional hip and/or a dysfunctional ankle. The knee can easily become the site of greater flexibility between the ankle, hip and knee joints. Excessive uncontrolled motion is instability. The ankle has a tendency to lose dorsiflexion, while the hip loses extension.

A likely source of muscle impairment is the concept of relative stiffness/flexibility. One structure increases its flexibility to accommodate the relatively stiffer structure. We don't always know how the muscular impairment begins, but compensation is normal. The nature of our society forces long-term habitual use patterns. A common muscular impairment starts with recruitment issues of the hip lateral rotators. A weakness or recruitment problem of the hip lateral rotators can lead to the short head of the biceps femoris becoming overactive.

Here is how you check the length of the short head of the biceps femoris: Visual postural analysis will reveal a prominence of the biceps femoris muscle. It will simply look bulged behind the knee. To check the length of the right short head of the biceps femoris muscle, put the client's right leg in the supine 90/90 position. The left leg is held straight and resting on the table. Try to straighten the right leg. Normal for women is a "straight" raised leg (no bend at the knee). Normal length for men is within 10 degrees of a raised straight leg (10 degrees at the knee). If it is short, they may be using the biceps femoris as the primary lateral rotator of the hip instead of the intrinsic hip lateral rotators - the gemelli, obturators, piriformis and quadratus femoris.

The obvious problem with the biceps femoris muscle becoming the dominant muscle is that it attaches to the mid femur proximally and to the fibula distally, allowing the femur to rotate inward and the tibia/fibula to rotate outward. By eccentrically controlling femoral internal rotation, the hip abductors and external rotators are maintaining stability not only at the hip, but also at the patellofemoral region. Weakness of the hip abductors and external rotators may allow increased femoral medial rotation and valgus knee moments, putting excessive compressive forces on the patellofemoral joint and leading to a diagnosis of patellofemoral pain syndrome.

How many of your patients have had knee surgery without any trauma to the knee? Can you see how this knee problem began from the hip and caused a repetitive microtrauma to the knee? Hip abduction strength is key to movement control.

In order to activate the key stabilizers and prime movers of the hip (glute max, posterior glute med, deep-six rotators), I recommend you train your clients in both low-load exercises and high-load exercises. This will improve the performance of the glute medius and maximus, piriformis, obturator externus and internus, gemellus and quadratus femoris. Here is an example of a hip stability exercise prescription progression:

Side-lying clam progressing to side-lying straight-leg hip abduction (going from short- to long-lever exercises). The hip and knee of the bottom leg should be flexed. The top leg should be in the same

alignment, supported on a pillow placed between the knees. The patient slowly rotates the hip of the top leg laterally, being sure not to allow the pelvis to rotate, holds this position for 10 seconds and then returns to the starting position. Repeat for 10 reps. Once the exercise looks and feels easy, progress to the long-lever exercise and repeat the same 10-second holds for 10 reps.

*Glute max bridge*s. Starting with double-feet-on-floor glute raises, progressing to one-leg-at-a-time bridges. For single-leg raises, assume the bridge position, lock the right hip into flexion (knee-chest position, holding the knee inward with both hands); this makes it hard for the patient to hyperextend the lumbar spine, so they use the glutes. Bridge up and down 20 times per side. Keep the hips level and isolate the glutes.

Band walk. Begin with tubing at knees, progress to tubing at ankles. Wrap a band around both knees, slightly externally rotate the hip and walk sideways one leg at a time. Walk six steps left and six steps right. Perform as many sets of six reps per side until the patient feels the targeted glute muscle fatigue.

Single-leg bend-over. This is a deadlift hinging at the hip. Begin with hands on hips, progress to a reach with the hand opposite of stance leg. Progress further to use a dowel or a bar across the shoulders or held horizontal along the spine. Perform 10 reps per side.

Resources

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4. Cesarelli M, Bifulco P, Bracale M. Study of the control strategy of the quadriceps muscles in anterior knee pain. IEEE Trans Rehabil Eng, 2000;8:330-41.
5. Fredericson M, Cookingham CL, Chaudhari AM, et al. Hip abductor weakness in distance runners with iliotibial band syndrome. Clin J Sport Med, 2000;10:169-75.
6. Comerford M. Lumbo-Pelvic Stability. Course notes.
7. NASM Corrective Exercise Specialist (CES) course notes.

JUNE 2009