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REVIEW

The need for lumbar–pelvic assessment in the resolution of chronic hamstring strain

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Summary A lumbar–pelvic assessment and treatment model based on a review of clinical and anatomical research is presented for consideration in the treatment of chronic hamstring strain. The origin of the biceps femoris muscle attaches to the pelvis at the ischial tuberosity and to the sacrum via the sacrotuberous ligament. The biomechanics of the sacroiliac joint and hip, along with lumbar–pelvic stability, therefore play a significant role in hamstring function. Pelvic asymmetry and/or excessive anterior tilt can lead to increased tension at the biceps origin and increase functional demands on the hamstring group by inhibiting its synergists. Joint proprioceptive mechanisms may play a significant role in re-establishing balance between agonists and antagonists. An appreciation of neuromuscular connections as well as overall lumbar–pelvic structural assessment is recommended in conjunction with lumbar–pelvic strengthening exercises to help resolve chronic hamstring strain.

Introduction

One of Dr. Ida Rolf's frequent mantras to her students was 'Where the pain is, it ain't!' According to Dr. Rolf, first and foremost in any evaluation of chronic pain is global assessment of structure. Localised evaluation is necessary for acute injury, however a global approach is often appropriate when addressing chronic musculoskeletal pain. While the etiology of hamstring strain is multifactorial and sometimes difficult to define, this article proposes that assessment of lumbar–pelvic biomechanics may play a valuable part in the successful resolution of chronic hamstring strain.

Hamstring injuries are the most prevalent muscle injury in sports involving rapid acceleration and sprinting (Hoskins and Pollard, 2005). At its simplest, treatment of hamstring strain might include stretching and soft-tissue work to increase flexibility and address scar tissue formation. Research into the value of stretching for injury prevention (Herbert and Gabriel, 2002), and the value of massage to effect muscle damage (Tiidus, 1997), does not however show significant effects of these interventions. Research suggests that lumbar–pelvic alignment may play a significant role in hamstring strain (Cibulka et al., 1986; Hennessey and Watson, 1993; Hoskins and Pollard, 2005).

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In the 1970s Dr Vladimir Janda (1978) developed a multifaceted approach to musculoskeletal pain. His treatment protocol included restoring postural alignment, correcting the biomechanics of joints, increasing the proprioceptive input to the central nervous system, and exercise to increase muscular endurance (Janda, 1978). Using Janda's conceptual framework, research relating to assessment and treatment of hamstring strain is presented under the following headings: Posture, Joint Influences, and Lumbar—pelvic Stabilisation Exercises.

Posture

Lumbar hyperlordosis, anterior tilt of the pelvis, and sacroiliac joint (SIJ) dysfunction have all been implicated in chronic hamstring strain (Cibulka et al., 1986; Hennessey and Watson, 1993; Hoskins and Pollard, 2005).

Lumbar hyperlordosis often correlates with anterior pelvic tilt, placing strain on the origin of the hamstrings at the ischial tuberosity, resulting in hamstring tissue pathology (Cibulka et al., 1986). When no tissue pathology is present in the hamstrings, it has also been linked to lumbar—pelvic myofascial pain referral, mimicking hamstring strain (Hoskins and Pollard, 2005). Van Wingerden et al. (1997) suggest that the high correlation between tight hamstrings and lower back pain might reflect a beneficial compensatory mechanism for people with pelvic instability. They point out that, in low back pain patients, bending forward is often painful because of the increase in spinal load during this movement. Increased hamstring tension prevents the pelvis from tilting forward, which diminishes the forward-bent position of the spine, thereby reducing spinal load Van Wingerden et al. (1997).

SIJ dysfunction has been defined as pelvic asymmetry between the left and right innominates (Pool-Goudzwaard et al., 1998). The two innominates join anteriorly at the pubic symphysis, and posteriorly they border the sacrum. Joint play is movement within a synovial joint that is independent of, and cannot be introduced by, voluntary muscle contraction (Greenman, 1996). The amount of joint play at the SIJ is less than 1/8 of an inch in any plane but allows the innominates to rotate anteriorly and posteriorly during ambulation (Figure 1), causing side bending and rotation in the sacrum (Greenman, 1996). These movements are essential for the normal pain-free, non-restricted movement of the joint and significant somatic dysfunction can occur if any of these movements are impeded (Greenman, 1996).

Ideally, when standing or seated, the innominates do not differ in terms of anterior or posterior rotation. However, it is not uncommon for pelvic obliquity to develop, involving an anterior tilt on one side and a posterior tilt on the contralateral side. Rotation of the innominates and torsion of the sacrum can result from forces being transmitted to these bones from the spine, pelvic floor or lower extremities (Schamberger, 2002). In athletes, training error, or overtraining with unilateral loading, as in kicking or throwing, can exaggerate the normal sacroiliac movements (Ross, 2000). Over time, unilateral muscle tightness or contracture can produce a rotational force on the innominates. For example, a tight rectus femoris muscle could

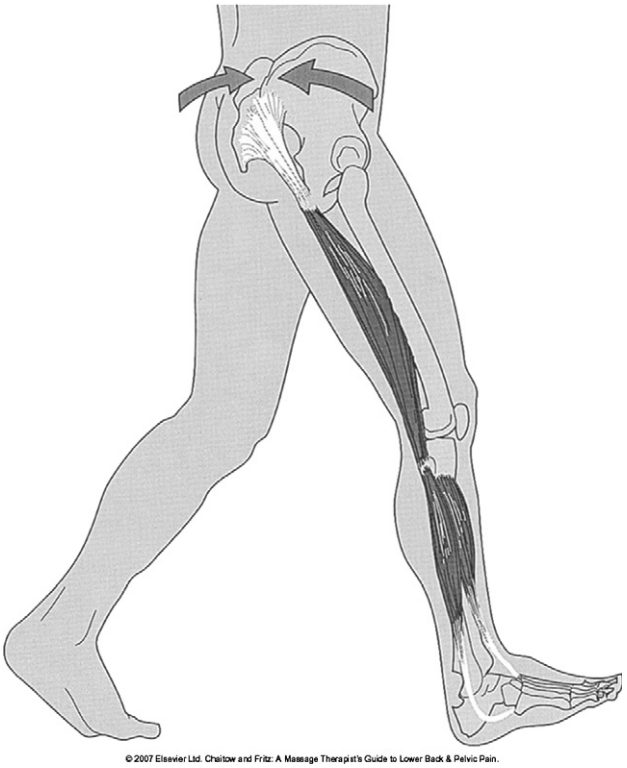

Figure 1 When walking, as the right leg swings forward the right ilium rotates backward in relation to the sacrum. Simultaneously, the sacrotuberous and interosseous ligamentous tension increases to brace the sacroiliac joint (SIJ) in preparation for heel strike. Just before heel strike, the ipsilateral hamstrings are activated, thereby tightening the sacrotuberous ligament (into which they merge) to further stabilize the SI joint. Figure. 1 is figure 5.15 from *A Massage Therapist's Guide to Low Back and Pelvic Pain* Chaitow L., Fritz S. 2007 Elsevier/Churchill Livingstone, Edinburgh Redrawn from Vleeming et al. 1997 Movement, Stability and low back pain. 1st Edition Churchill Livingstone, Edinburgh.

produce anterior—inferior rotation force on the anterior superior iliac spine, while a tight biceps femoris muscle could produce posterior—inferior rotational force at the ischial tuberosity (Schamberger, 2002).

Cibulka et al. (1986) investigated the role of SIJ dysfunction in hamstring strain. Results showed a significant increase in hamstring strength immediately following SIJ mobilisation. The researchers had noted a high correlation between hamstring muscle strains and an anterior tilt of the innominate bones, associated with sacroiliac dysfunctions. They concluded that mobilising the SIJ reduced the tilts of the innominates, releasing undue stress on the previously elongated biceps femoris. More recent research has also found SIJ mobilisation to increase hamstring flexibility (Fox, 2006). Hoskins and Pollard, (2005), found that improving lumbar—pelvic biomechanics, including SIJ mobilisation, played a role in treatment and prevention of hamstring injury in Australian Rules footballers.

Apart from producing a static stretch of the biceps femoris muscle, fixations of the SIJ can exacerbate pain upon ambulation. Ideally, during hip flexion the innominate on the same side rotates in a posterior and inferior