Gait Related Lower Back Pain

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As described in previous articles in this series, chronic lower back pain (CLBP) can have its origin within the gait cycle and lower extremity (LE) function in particular. Considering that individuals will take between 5-10,000 steps/side/day on average, having dysfunction within the lower extremity can produce a repetitive strain injury (RSI) on par with any other repetitious activity known to cause symptoms. While impact shock has been theorized as the traumatic event during gait, other factors may be far more important when considering how the lumbar spine can be stressed during walking. 1

There are three basic factors present during the various phases of any step that can be repetitively stressful to the lower back. These including flexion of the lumbar spine during mid single support phase and iliopsoas activity and lateral trunk bending at toe off.

While each of these mechanical dysfunctions can exist as individual entities, it is best to view the events present during walking as a continuum, with one aspect either leading to or perpetuating the other(s). 2

During the earlier articles of this series, the mechanics of swing phase was described as the “pull” to create the power for any step. 3 For this to occur normally, as the swing limb extends in front of the body, the trailing (weight bearing) limb moves rearward into its maximum extended position. Extension of the trailing limb occurs during single support phase, and terminates immediately with the onset of double support phase.

The iliopsoas takes its origin from the lumbar spine, its disks, vertebra and innerosseous septa. During the time of psoas firing, the vertebra column should normally be extended into lordosis. This permits the facets to articulate in a manner that restricts rotation of the lumbar column. Since the intervertebral disks are very strong to vertical load, yet weak to rotational or axial loading, this stabilization effect becomes essential in maintaining a healthy lumbar spine. Failing to stabilize against rotation, particularly at the time the iliopsoas is firing, produces an environment that is unable to guard against the repetitive stress of thousands of swing phase initiations that occur on a daily basis.

When the foot fails to provide normal pivotal mechanics, lower extremity extension is limited and adjusted for by flexion of the torso. Failing to extend the thigh from beneath the hip, results in a loss of pre-load mechanics. The weight bearing limb is for all intents and purposes “stuck”, and the body is now assigned the task of “dragging” this limb into motion. It is this overall process that can either cause or perpetuate a state of lower back pain. 5

The iliopsoas (hip flexors) will act on a limb already in motion. Considering that an average hip, thigh and lower leg/foot weigh 15% of body weight, this efficiency is essential to prevent muscular overuse and tissue strain. 4

The concept of sagittal plane restriction has been the basis of this series of articles. For the LE to extend normally over the weight bearing foot, the weight bearing foot must permit this motion to occur above it. Failure of this sagittal plane pivot can therefore prevent normal extension at the hip joint, and it often replaced by a subtle but repeatable flexion of the torso. It is these two, mechanically linked processes, which form the basis of understanding how gait mechanics and lower back pain are linked. 5

Motions of the hip, knee, and ankle/MTP joints act in the opposite direction from the one directly above or below it. For example, when an individual squats, the ankle and hip flex in the reverse direction of the knee. This is analogous to the motions of a scissor jack. Each of the hinges flex in opposite direction to one another. Should one of these hinges be fused, then motion within the entire jack will cease. This is because these motions are interdependent. Considering that the linkage of the LE is identical to the scissor jack, then loss of motion in one joint will have to negatively impact the others.

In order to address these issues, careful
biomechanical evaluation of the lower extremity is essential. Motion of the pivotal segments of the ankle and MTP joint must be assessed so as to determine the impact any restriction may have on lower back mechanics. Should Fhl be detected, then, appropriate modification of foot orthoses is critical to re-establish proper MTP joint mechanics. This is the entire purpose of the Vasyli-Dananberg orthotic device. By utilizing a multi stage removable plug on the plantar surface of the 1st metatarsal head, adequate plantarflexion can be restored and Fhl and its sequelae prevented.

The device is designed so that different levels of functional locking can be addressed, but simply removing additional material from under the device. Care should also be taken to address any leg length difference that may exist, and heel lifts are available for this very purpose.

**Figure 4 - Left to right - Plugs in situ, Proximal plug removed, distal plug removed, both plugs removed.**

**Figure 5 - Heel Raise**

**Conclusion**

Previous studies have shown that 84% of patients considered at or near medical endpoint for chronic lower back pain can have major improvements in symptoms via the foot orthotic approach. Care in assessment and proper orthotic prescribing is essential to achieve this very positive outcome.

REFERENCES:


Howard Dananberg, renowned worldwide for development of the concepts of Functional Hallux Limitus and the relationship of gait style to Chronic Lower Back Pain...