

# *Education* Resource Center

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*Hip Pain and Orthotic Support*



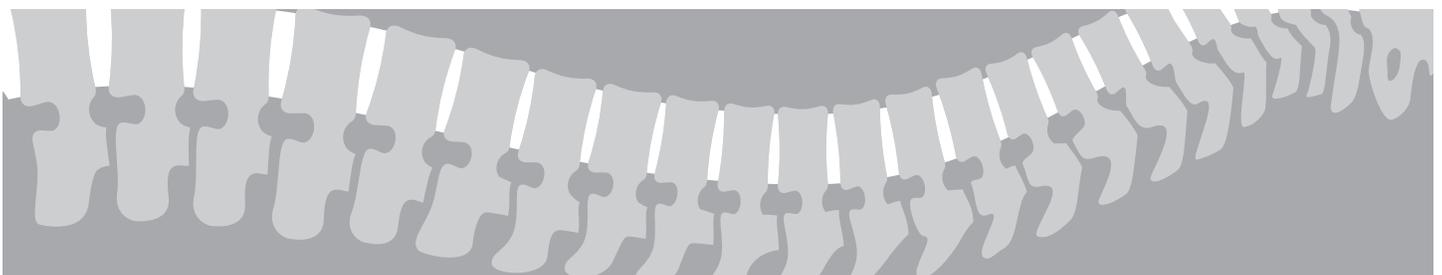
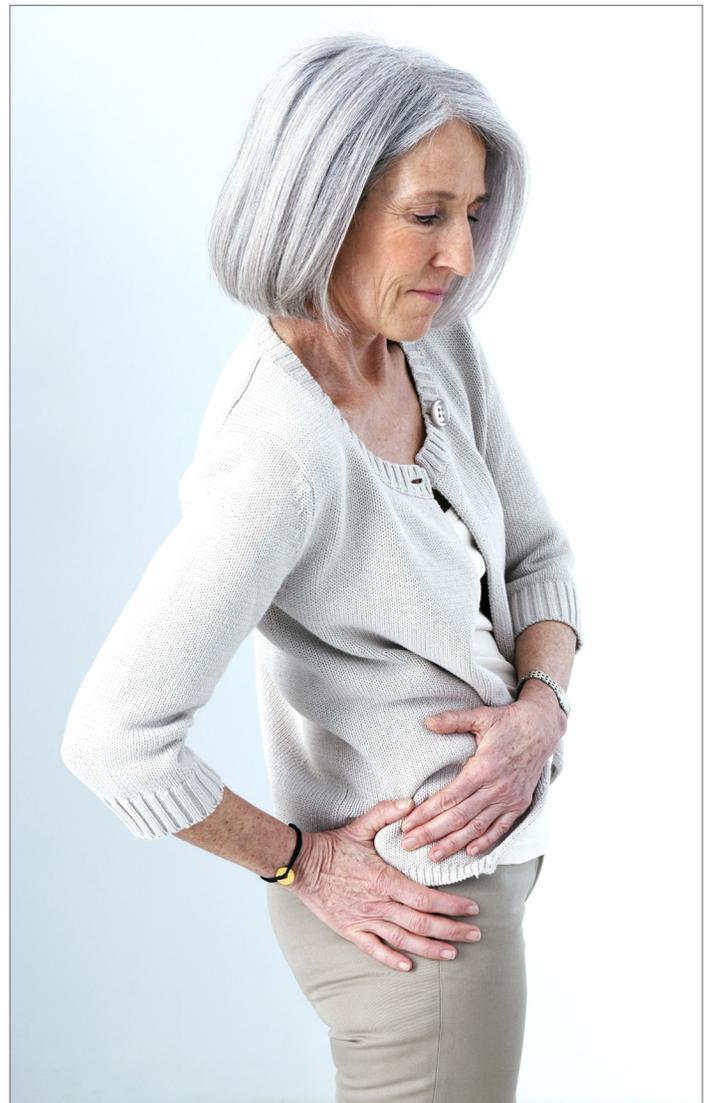
## Hip Pain and Orthotic Support

Most hip problems seen by Chiropractors have developed gradually, over a period of weeks, months or even years. There is usually an underlying biomechanical imbalance, or possibly some type of overuse syndrome. Common examples include trochanteric bursitis, recurrent muscle strains (hamstrings, adductors), piriformis syndrome and snapping hip. By far the most frequently seen forms of hip dysfunction are due to chronic degenerative changes (hip joint DJD). Successful treatment often requires the use of custom-made and shock-absorbing flexible orthotics.

Our current understanding of hip joint function, along with the effects of orthotics on gait, aid us in helping our patients with chronic hip complaints.

### **Hip Joint Anatomy**

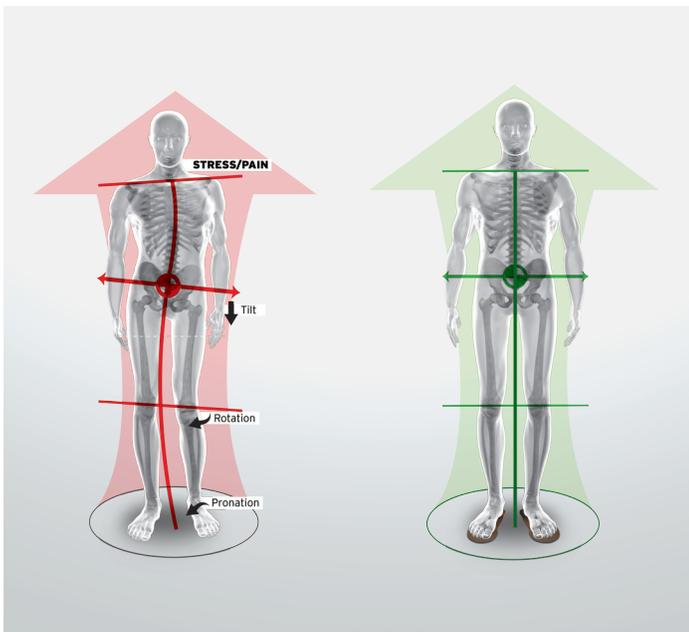
By virtue of its deep-socketed bony anatomy, the hip is a very stable joint. It has a very thick joint capsule reinforced by strong spiral ligaments, and several powerful groups of muscles enhance its intrinsic stability.<sup>1</sup> It is injured much less commonly than joints such as the shoulder, knee and ankle.<sup>2</sup> In fact, most hip problems develop secondary to biomechanical dysfunctions, which can still be very disabling. When the hip joint does not function properly, simple daily activities are difficult, and often painful. This is because the hip forms a vital link in the lower extremity Kinetic Chain, transferring groundreaction forces from the legs to the trunk during gait. While some hip problems are due to trauma, the vast majority are chronic in nature. Osteoarthritis of the hip joint is often an end result, following years of improper biomechanics and dysfunction.



## Orthotic Support

Since the hip joints are so intimately involved in gait, it's not surprising that orthotic support for the feet is often a necessary treatment component in hip joint dysfunction. There are 3 distinct (but overlapping) effects of orthotics on the hip joints:

- A. Support for low arches and calcaneal eversion will reduce pronation at the foot and ankle. This decreases the medial rotational stress on the legs and the hip joints, and prevents excessive joint movement during gait.
- B. Correction of a functional or an anatomical leg length discrepancy diminishes the ground reaction forces being sent through the joint on the side of the longer leg. This can prevent the development of degenerative changes.
- C. Shock absorption from viscoelastic materials in the orthotic can ease the musculoskeletal impact at heel strike. The additional padding is particularly necessary when there is instability, chronic degeneration, or even an inflammatory arthritis in the hip joints.



**A. Pronation Control.** The most common problem that interferes with effective foot and leg biomechanics is excessive foot pronation. This condition occurs as a result of several factors, including loss of the medial longitudinal arch, eversion (tilting) of the calcaneus, or excessive dropping of the talus and/or navicular bones.

In addition to interfering with gait and decreasing athletic performance, excessive pronation is important for two reasons. There is the likelihood of developing painful foot and ankle disability over time, but also (and especially important for doctors of Chiropractic) the probability of transferring abnormal stresses up the lower extremity and into the pelvis and spine. Athletes often suffer from “overuse

injuries” to areas including the hip joints, many of which are due to excessive pronation.<sup>3</sup> These problems often go unnoticed for months or years, and symptoms arise only when a new walking or recreational program is begun. Other times it is the painful end stage of abnormal biomechanics that brings a patient in for care.

**B. Leg Length Asymmetry.** Several studies have found a correlation of hip symptoms and joint arthritis with leg length inequality.<sup>5-6</sup> In a study of patients with leg length discrepancy, Friberg reported that chronic hip pain symptoms were located on the long leg side in 88.9% of his patients, and of 27 patients with asymmetrical hip degeneration, 24 had their unilateral arthrosis in the hip joint of the longer leg. He hypothesized that the greater pressure on the articulation of the longer leg produced chondral damage and the ensuing unilateral arthrosis.<sup>7</sup>

The most important condition for doctors of Chiropractic is the functional short leg created by the combination of arch collapse and medial rotation of the ankle and leg. This results in a pelvic tilt to the shorter side, and is usually accompanied by a spinal rotoconvexity (scoliosis). This is sometimes known as a “functional short leg,” since there is no measurable difference in the anatomical structures of the leg. In this case, the underlying cause of leg length discrepancy is an asymmetry of alignment which is correctable with proper orthotic support.

**C. Skeletal Shock Wave.** Scientists have accurately recorded a peak impact force of 5 Gs (5 times body weight) on the lower leg during walking on the laboratory floor in normal shoes.<sup>8</sup> They also documented that a shock wave (a “transient”) travels very rapidly up the leg, into the hip joints, pelvis and along the spine. Within 10 milliseconds of heel strike (faster than the muscles can consciously respond), a .5 G impact was recorded at the skull. With a viscoelastic support inserted into the heel of a shoe, the peak of the shock wave was cut in half. Without good shock absorption, a 160-pound runner can expect impact forces up to 2400 pounds on the knee and hip joints (and 240 pounds at the head and neck).<sup>9</sup>

Many hip dysfunctions are caused by, or are compounded by, this repetitive shock wave that travels through the body during normal activities. The additional strain placed on the tissues of the lower limbs and pelvis during gait can interfere with the healing of sports traumas; and repetitive shock to weightbearing joints, such as the hips, has been shown to cause degenerative changes.

## Shock Absorption Mechanisms

Our bodies handle the force and the kinetic energy that is developed during gait in several ways. The shock force is dissipated both actively (using the biomechanical interactions of the neuromuscular system), and passively

(due to the elasticity of bone, cartilage and soft tissues). When one (or more than one) of these strategies becomes less competent, increased stress is placed on the other mechanisms. When forces continue and are repetitive, a symptomatic breakdown can occur in the hip joints.

**Joint Degeneration.** Repetitive impact loading can have a detrimental effect on joints, especially when shock absorption is poor. Mechanical stress can cause degenerative arthritis in both the weightbearing joints,<sup>10</sup> and those that sustain frequent movement, such as the patellofemoral joint.<sup>11</sup> The knee joints of sheep that walked on concrete underwent rapid degeneration compared to controls that walked on natural surfaces.<sup>12</sup> The researchers described the bone's attempt to strengthen in response to the shock stress, which resulted in a thicker cortex and a stiffer, less elastic bone. With less "give" in the bone, the cartilage was subjected to even greater shock and microtrauma, leading to knee joint osteoarthritis. The same phenomena have been hypothesized to occur in the hip joints.

**Shock Absorption.** Several studies have found that the use of a viscoelastic polymer heel cup to reduce heel strike shock will significantly decrease both foot and back symptoms, and prevent lower extremity overuse conditions.<sup>13-14</sup> One researcher who used a tibial accelerometer measured the "shock factor" of nine different insoles in four types of shoes.<sup>15</sup> He found a significant reduction in impact loading with the use of the viscoelastic insoles. This means that we can reduce the effect of the shock wave on our patients by recommending inserts made with advanced technologies such as the Extreme Gait Cycle System®, and DRS-Extreme™.

### Functional Orthotic Benefits

A properly designed and custom-made functional orthotics can significantly reduce the exposure of

the hip joint to overuse biomechanics and repetitive shock waves throughout the day and during all athletic activities. Here are some important factors:

- Decreasing the extent and speed of pronation with a "pronation wedge" reduces the medial rotation forces that are transmitted into the hip joints and pelvis.
- Improved alignment and symmetry of the arches, and better balance between the legs results in a smoother gait and less chance of degenerative changes in the hip joints.
- Shock absorption from viscoelastic materials eases the impact at heel strike and reduces the forces on all weightbearing joints, from the legs, into the hips and spine.

### Conclusion

Since biomechanical alignment problems are frequently found in association with chronic hip complaints, patients must be screened for excessive pronation and/or leg length discrepancies. Failure to recognize these complicating factors will result in patients with recurring hip complaints, or symptoms that vary in location due to the effects of the underlying biomechanical stress. Shock-absorbing functional orthotics can significantly decrease many chronic hip conditions.

With custom-made orthotics we can help our patients deal with the effects of musculoskeletal shock and prevent many of the muscle and joint degenerative problems that are improperly called "normal aging." Once their lower extremities are properly aligned, their muscles are strengthened and lengthened, and their hip joints work smoothly, our patients will be able to enjoy the benefits of independent mobility well into their elder years.

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