Dynamic Chiropractic

MUSCULOSKELETAL PAIN

Subluxations: What Role Do the Feet Play?

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The importance of the feet to the normal functioning of the spine is often overlooked. Because the feet are seldom symptomatic, busy chiropractors frequently forget to examine and adjust them. And when a patient doesn't respond as well as expected to chiropractic care, a source of interference is located in the pedal foundation. A recent study concluded that "there are small, but important, intersegmental movements of the spine during gait."[1] An abnormal gait, no matter what the source, will eventually interfere with these important movements, and subluxations may then develop. But why is that?

The Foot/Spine Connection

When we stand, walk, dance, jump, and run, the feet are the foundation for the spine. This foundation must bear the weight of the entire body (and considerably more during running and other sports). If there is insufficient or inadequate support from the pedal foundation, the spine will be exposed to abnormal stresses and strains that eventually cause subluxations and back pain. Recognizing and then responding appropriately to these factors allows doctors of chiropractic to effectively care for spinal subluxations.

Abnormal stresses on the pelvis and spine can be the result of excessive shock transmission, too much rotation, abnormal foot proprioception, or a functional short leg. The cause of all four of these problems is often located in the feet. When some part of the foot is not moving properly (either insufficient or excessive joint motion) the resulting forces produce effects all along the kinetic chain. In fact, investigators have found that "Alteration of normal foot mechanics can adversely influence the normal functions of the ankle, knee, hip, and even the back."[2]

Shock transmission. Whether a foot tends toward hyperpronation or excessive supination, excessive shock is transmitted into the spinal joints. "A high-arched *(cavus)* foot with limited range of motion attenuates shock poorly and a hypermobile flat foot also does poorly on shock attenuation because of its function near the end of the range of motion."[3] In either case, the forces are felt in the joints of the pelvis and spine. Absorbing the shock from the lower extremities may be one of the most significant long-term improvements that will be reported by patients with degenerative discs and spinal joints.

Light and his colleagues studied the "brief but sizeable deceleration transient, which travels up the human skeleton on heel strike during normal walking."[4] In their classic investigation, they found a significant stress that could be reduced by the use of viscoelastic heel pads. Regarding the spine, they warned that "while the transients will load the majority of joints primarily in compression, shear stress will predominate in others, such as the spinal facet and sacroiliac joints."[4] This may explain the rapid response of lumbosacral and sacroiliac subluxations to the use of orthotics that contain shock-absorbing viscoelastic materials.

Rotatory stress. When the foot and ankle stay too long in pronation, the entire lower extremity undergoes excessive medial (internal) rotation. This causes a range of effects in the pelvis, sacroiliac joints, and spine. One doctor of chiropractic has described the numerous consequences as follows: "Based on excessive internal femoral rotation due to hyperpronation, there may develop compensatory shortening of the iliopsoas, which would draw the spinal column downward, forward, and rotate it contralaterally. Unilateral iliopsoas involvement would cause a unilateral anterior pelvic tilt, while bilateral hyperpronation may result in an increased lordosis."[5] All of these changes can trigger the development of subluxations.

Altered proprioception. Proprioceptors are the sensory organs that provide information regarding the status and function of the musculoskeletal system. With many small joints, lots of connective and articular tissues, and intrinsic and extrinsic muscles, the feet are well supplied with proprioceptive nerve endings. When there is a biomechanical dysfunction, it is likely that inaccurate neurological information is sent to the spinal cord, cerebellum, and brain from the feet. This can have a detrimental effect on coordination and balance throughout the spine and pelvis.[6] If inappropriate information is supplied by the position receptors, poor coordination of movement and gait can result in recurrent subluxations.

Dropped pelvis. When there is a discrepancy in the length of the legs (whether anatomical or functional), the pelvis is lower on one side. This asymmetry will cause vertebral rotation and recurrent subluxation (and possibly a functional scoliosis). The most common cause of a functional short leg is a lowered medial arch and excessive pronation. A study by Rothbart and Estabrook found a correlation factor of 0.97 between asymmetrical pronation and a pelvic tilt to the same side.[7] In these cases there is difficulty in eliminating the pelvic and spinal subluxations without treating the feet.

What to Do

Every patient with subluxations should be checked for abnormal foot biomechanics. This evaluation can be quick and easy, and is not painful to the patient. The feet may need to be adjusted, so that numerous joints can move smoothly during each phase of gait. And most patients with biomechanical foot problems will benefit from the long-term support provided by custom-fitted orthotics.

Evaluate. There are five lower extremity "flags" to look for in every patient:

- Watch the patient walk - look for foot flare (toe-out) or toe-in.
- Look at the shoes - check for excessive lateral heel wear.
- Check the kneecap alignment - medial facing ("squinting") *patellae.*
- Look at the Achilles tendons - medial bowing is associated with an everted calcaneus.
- Palpate the medial arches - check for lack of an arch and/or painful *plantar fascia.*

Since excessive collapse of the medial arch is a important component of most foot problems, the navicular drop test is a useful tool. This procedure is objective, quick, and helps in the documentation to patients and insurance companies. The position of the navicular prominence is noted when nonweightbearing, and then compared to its position when bearing the weight of the body. A large difference between the two positions indicates excessive collapse of the medial arch of the foot. Any significant asymmetry provides evidence of loss of symmetrical gait.

Adjust. When the foot is not functioning smoothly, and especially when there is excessive pronation

(the most common biomechanical foot problem), specific adjustments are needed. Table 1 lists the usual foot subluxations seen with excessive pronation. I use standard adjusting methods to adjust whichever areas are found to be misaligned.

Table 1: *Excessive Pronation Subluxation Pattern.*[8]

	Bones	Subluxation Direction
1.	navicular	inferior and medial
2.	cuboid	inferior and lateral or *superior and lateral
3.	cuneiforms	inferior
4.	metatarsals 2-3-4	inferior
5.	metatarsals 1 & 5	superior and lateral
6.	talus	anterior and lateral
7.	calcaneus	everted and plantarflexed
8.	fibular head	posterior and lateral

**Most common direction of subluxation in adults*

Orthotics. When the feet have biomechanical problems, adjustments can be helpful, but orthotics are often necessary for long term support. A properly designed and custom-fitted orthotic will provide the following corrections throughout the day and during all locomotor activities:

- Shock absorption from viscoelastic materials eases the impact at heel strike and reduces the forces on degenerated joints.
- Decreasing the extent and speed of pronation reduces the medial rotation force that is transmitted up the leg into the pelvis and spine.
- Improved alignment and mobility of the arches, with less muscle and connective tissue stretch, provide more accurate proprioception for better balance and alignment.
- Reducing calcaneal eversion with a "pronation wedge" and supporting the medial arch limits the dropping of the pelvis during gait.

Conclusion

When a patient presents with subluxations, especially ones that do not correct rapidly and completely, a search for contributing factors must include examination of the feet. The best way is to screen all new and returning patients for the five lower-extremity "flags." Performing the navicular drop test will provide the necessary documentation for the need for orthotics. Custom-fitted orthotics are needed in most cases for long-term spinal stabilization. Flexible orthotics made from viscoelastic materials are an extremely useful approach for most patients with recurrent spinal subluxations. Even expertly applied spinal corrections will often be only partially successful until the lower extremity problems are uncovered, corrected, and supported for the long haul.

References

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