Dynamic Chiropractic

ORTHOTICS & ORTHOPEADICS

Foot Pronation and Posture

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Excessive foot pronation, whether in one foot or bilaterally, interferes with the carefully coordinated movements during gait and causes problems throughout the musculoskeletal system. The effects of excessive pronation on the function of the spine are of particular interest to doctors of chiropractic.

Neurological Factors

With many interconnected joints, lots of connective and articular tissues, and both intrinsic and extrinsic muscles, the lower extremities are very well-supplied with proprioceptive nerve endings. Mechanoreceptors in the feet and ankle joints, along with the muscle spindles of the foot and lower leg muscles, are responsible for the positive support reflexes and a variety of automatic reflexive reactions.[1]

The position receptors in the lower extremities, pelvis and spine (and especially the neck/head-righting reflexes) must coordinate smoothly in order to maintain postural equilibrium. Difficulty in achieving or keeping optimal postural alignment, or problems with excessive postural sway, are frequently caused by inaccurate information sent by spindle sensors in chronically strained muscles or aberrant joint mechanoreceptors in the feet.[2]

In addition, much of the neurological coordination of the body is based on a balanced, rhythmic lower extremity movement and gait. The "cross crawl" pattern organizes many fundamental musculoskeletal functions at the spinal cord level, permitting smooth performance of daily physical activities without the need for conscious thinking about posture or planning out movements. This includes factors such as balance, stability, and center of gravity.[3]

When one or both feet spend too much time in pronation, many muscles throughout the body (and around the spine) don't turn on and shut off in proper sequence. This affects posture, raises the work effort for all activities, and even increases the amount of oxygen consumed during normal walking.[4]

Structural Support

The foot provides structural support for the body during the stance phase of gait - from heel strike through foot flat to toe-off. The foot and leg must bear the full weight of the body and maintain the pelvis and spine in normal alignment. The stance portion of the gait cycle is therefore the most critical for posture, and it is also the longest (60 percent of each step).[5]

If one or more of the foot's arches is not able to provide the necessary support, or if there has been a breakdown of the plantar fascia, abnormal postural adaptations are created. Additional stress is then placed on the many joints, ligaments and muscles involved in helping to maintain upright posture. Whenever there is an unequal amount of support from each leg during weight-bearing stance (due to either an anatomical or a functional shortening), posture will definitely suffer. This

results in an uneven foundation for the pelvis and the spine, causing various postural shifts in response.

Functional Factors

In the pelvis: When a foot pronates during the stance phase of gait, there is a normal inward (medial) rotation of the entire limb and pelvis. In individuals who have excessive or prolonged pronation, this twisting movement is accentuated. The increased rotational forces are transmitted into the pelvis and especially the sacroiliac joint.[6]

In response, various compensatory pelvic subluxation complexes develop. These include pelvic tilts (usually anterior or to one side), innominate rotations (usually postero-inferior), and other complicated adaptations. Until other complicated adaptations. Until the excessive pronation is corrected with flexible, custom-made orthotic stabilizers, only short-term relief can be achieved with chiropractic adjustments.

In the spine: The loss of arch height that occurs with excessive pronation allows the pelvis to drop to the more pronated side during stance and gait.[7] The resulting pelvic tilt lowers the sacral base and drops the lowest freely moveable vertebra. A lateral curvature develops in response to the lack of solid support for the base of the spine. This "functional" scoliosis starts in the lumbar region, but can affect the entire spine. In young patients, this type of curvature disappears when sitting or lying on the exam table. As patients age, the spine becomes less flexible, and functional curves become more fixed.

The whole body: Many chronic myofascial problems can begin with excessive pronation. The gait abnormalities, neurological incoordination, and asymmetrical structural stresses are often compensated by contracting the large stabilizing muscles of the spine. This results in habit patterns with detrimental effects on movement and eventual perpetuation of symptoms. Myofascial trigger points, chronically contracted muscles, and even thoracic outlet syndrome[8] can develop when gait abnormalities continue.

Conclusion

Your patients' feet are intimately connected in several ways to the pelvis and spine above. Neurological, structural and functional factors clearly reveal this interrelated and integrated system. Posture, balance, coordination, and efficient musculoskeletal function all depend on the smooth functioning of the foot and ankle complex. Researchers are now beginning to understand the intricate relationships that many doctors of chiropractic have treated empirically (and successfully) for decades. Whenever a patient demonstrates a postural imbalance, we must always consider the importance of the lower extremities, particularly the feet.

References

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