Orthotic therapy represents an integrated approach to chiropractic case management. Effectively addressing problems of the spine requires considering the musculoskeletal structure as a series of interrelated components, with the feet as its foundation.

In seven out of ten cases of back pain, postural fatigue and spinal strain are frequent causes of discomfort (1). The stress can often be traced to altered foot biomechanics that lead to pelvic and spinal distortion (2). Flexible, custom-made orthotics are useful in correcting abnormal biomechanics in the lower extremities and enhancing the effectiveness of chiropractic care.

**Biokinetic Interaction**

The spine is one link in a biomechanical kinetic chain, where movement at one joint influences movement at other joints in the chain (3), extending from the feet to the spine. Locomotion demonstrates the complexities of biokinetic interaction and the risk of imbalance or structural deficiency that leaves the spine vulnerable to destructive torque – bending and shearing stresses (4 - 6).

Locomotion is comprised of two phases: stance, when the foot bears weight; and swing, when no weight is borne. When the foot hits the ground, changes occur that can have detrimental effects if pedal imbalance is present.

The stance phase is divided into three subphases:

1. **Contact.** A natural inward rotation of the subtalar joint produces pronation. The tibia rotates internally, with the femur moving slightly.
2. **Midstance.** Forefoot loading occurs as the foot supinates, accompanied by external rotation of the tibia and femur while the knee unflexes.
3. **Propulsion.** For toeing off, the foot remains in supination and leg bones rotate externally.

**Clinical Implications**

If pronation is maintained into the midstance phase of gait, the tibia and femur will remain in the inward rotational configuration. This places the patello-femoral complex, the structure that is the most frequent source of knee disorders, in immediate jeopardy (7).

Rotation of the lower extremity transmits to the pelvis, causing an inward hip rotation commonly associated with myofascial back pain (8). Inward rotation of the femur brings the greater trochanter forward and outward, stretching the piriformis muscle. The sacrum may be pulled into a subluxated anterior and inferior position (2).

The gluteus maximus muscle contracts to compensate for the downward and forward pelvic tilt. The innominate at its iliac portion rotates to the posterior, producing a typical pelvic distortion. The sacrum’s anteroinferior position causes the L5 vertebral body to gravitate and rotate toward the low side, initiating structural scoliosis (2).

Excessive pronation results in abnormal firing of muscles and inaccurate proprioceptive nerve impulses. This also interferes with the toe-off phase, resulting in less-efficient propulsion.

**Correcting Postural Imbalance**

When the gait is affected by excessive pronation, the pelvis and spine must compensate. The specific way in which each patient adapts to abnormal support from the lower limbs is very individualized. This
explains why patients often notice so many areas of improvement when their pronation is corrected with orthotics.

Flexible, custom-made orthotics help enhance biomechanics of the lower extremity and modify minor deficits that inhibit the integrity of the pedal foundation (9). Orthotic therapy seeks to control – not restrict – motion within the pedal structure, particularly of the subtalar joint (10). Restricted subtalar joint pronation affects the knees, hips, and back (11). Custom-made orthotics can also improve back pain caused by walking with an abnormal gait and poor toe-off (12).

Summary
Postural instability is a direct result of imbalance in the pedal foundation. As the arch rolls inward, the tibia twists, the knee strains, the femur rotates, and spinal curves are affected.

Custom-made, flexible orthotics address problems of pedal imbalance and related postural instability. When used as an adjunct to chiropractic care, orthotics enhance postural stability and protect the integrity of musculoskeletal structures.

References

About the Author
Dr. Mark N. Charrette is a 1980 *summa cum laude* graduate of Palmer College of Chiropractic. He is a world-renowned expert in extremity adjusting. Over the past 15 years, Dr. Charrette has lectured extensively on spinal and extremity adjusting throughout the United States, Europe, the Far East, and Australia – performing over 1,000 seminars. Dr. Charrette is a featured speaker in Foot Levelers’ 2007 Seminar Series.