Functional leg length discrepancy: Chiropractic response

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In addition to the type of service offered, individuals seeking care have essential three wants: 1) to be listened to; 2) a thorough examination/evaluation with a simple explanation; and 3) to be empowered – how you can help them help themselves.

It will be imperative to sit down with Kerry and let him thoroughly vent his feelings, his diagnosis, and his treatment programme. His feelings are the most important and may shed some light on his condition. His diagnosis and the diagnosis of the other health care providers should not be accepted as final. Perform your own thorough examination/evaluation and draw your own conclusion. Providing this patient with specific therapeutic activities will help him actively participate in his treatment programme. He may be helpful in developing this programme; however, the activities must produce specific results based on functional need, the outcomes being progressive and measurable.

It will be important to establish a baseline assessment using a Pain Drawing for location and type of pain, a Visual Analogue Scale for intensity, and the Oswestry Low Back Pain Scale for lifestyle/function limitations. These tools are important not only to monitor progress, but to help Kerry set goals and 'compete' with himself toward their resolution or improvement.

Like all health care specialities, the purpose of chiropractic is to preserve and restore optimal health. Its basic principle, or paradigm, centres around the body's innate recuperative power which is affected by and integrated through the nervous system. Of particular focus is the interrelationship between structural balance and bodily functions.

Doctors of chiropractic thoroughly evaluate the entire individual for biomechanical and neurobiological function and integrity. Chiropractors utilize their knowledge, diagnostic skills, and clinical judgment to determine the necessity for appropriate chiropractic care.

Chiropractic care centres around the correction of the subluxation complex with specific chiropractic

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adjustments. The subluxation is a complex of structural and/or functional and/or pathological articular changes that compromise neural integrity and affect biomechanics, muscle, and organ function (ACC Chiropractic Paradigm 1996, ACC Chiropractic, Scope and Practice 1996, Palmer Educational Principle 1996).

As stated above, there is an interrelationship between structural balance and bodily functions. Standing, sitting, walking and sleeping postures have a profound impact on musculoskeletal function. Therefore, chiropractors evaluate the patient's overall posture. The maintenance of a balanced posture against gravity and the stresses of living is essential for Kerry and dependent on three factors:

1. *Skeletal structure*: posture is determined in part by the shape and size of the underlying bone structure. Problems commonly develop when there is an asymmetry of shape or a difference in size or length of osseous components. Normal joint alignment is also an important factor that not only affects the segmental function, but also the overall posture.
2. *Soft tissue integrity*: the ligaments and muscles play a major role in the juxtaposition of joints as well as overall posture. The ligaments are like strapping tape which hold the joints within their normal range of motion. Ligamentous laxity or shortening will affect joint movement and position. The ability of the muscles to maintain a balanced pull to move and align the structure is an important determinant of posture. Normally, minimal use of energy and muscle contraction is required to maintain upright posture. With optimal posture, the body is considered to be in an 'intrinsic equilibrium', requiring only minimal muscular effort to maintain the erect position (Gatterman 1990). In fact, most electromygraphic studies of healthy individuals find only normal slight 'postural sway' (Steindler 1973). When alignment deviates from the ideal balance, the additional work required of the support muscles increases dramatically (Cailliet 1988, Gatterman 1990). This balanced support between the agonist and antagonist muscle groups can be altered by injury, deconditioning, and/or neurological inhibition affecting muscle contraction capability.
3. *Neurological control*: the strength to hold our structure erect against gravity is dependent on the sensory-motor reflex. The complex interaction of conscious motor control and the many inborn reflexes help to maintain stationary as well as dynamic posture. Habitual faulty posture patterns from work and relaxation, and pain avoidance positions, eventually become learned and are accepted by the body as an abnormal normal.

Many patients/clients presenting with chronic low back pain have a structural picture similar to Kerry. On X-ray examination this typical pelvic distortion features the right femur head lower, the right sacral base also lowered, the right ilium is thinner indicating anterior rotation in the transverse plane, as well as posterior rotation in the saggital plane (Fig. 1).

Usually we measure the discrepancy of the femur head heights to determine the extent of the 'short leg syndrome'. It's an easy and reproducible measurement but it brings up two other questions: What's causing the discrepancy? And of what significance is it?

First determine if the cause is anatomical or functional. An anatomical short leg is an actual shortening of the weight bearing bones of the lower extremity the femur and/or tibia. A functional leg length inequality (LLI) is caused by rotational patterns (usually a medial internal rotation) of the pelvis, knee, and/or foot/ankle complex. Orthopaedic tests and tape measurements help determine gross differences but are not very accurate with discrepancies less than about 20 mm or 1 inch. One reason for • rotational patterns in the joints of the lower extremity will skew the measurement.

The best information always comes from the patient. Try to correlate one of the five main categories of causes for anatomical LLI with their health history. The five main categories are: 1) trauma – fracture or surgery; 2) congential; 3) degenerative joint disease; 4) infections; and 5) neoplasms (Freberg 1983, Beal 1950). If you cannot establish a relationship in one or more of these categories, it is probably a functional LLI. In my estimation, a functional short leg accounts for 90% of our patients with a short leg syndrome. Also keep in mind that an anatomical short leg will usually have an associated functional component with it.

Whether it's anatomical or functional, if the discrepancy is 9–10 mm or greater, it is clinically

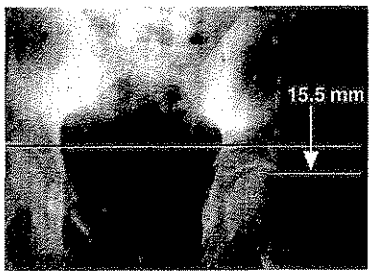

Fig.1 X-ray of an unlevel pelvis with typical rotation patterns.

significant for degenerative joint disease (Giles & Taylor 1982), suggesting that this individual would be more susceptible to developing degenerative joint disease in the lower extremity and lumbosacral regions secondary to focal weight bearing stress than another individual without this discrepancy.

If the discrepancy is 5 mm or greater, it may be clinically significant for pain. Dr Ora Freberg evaluated over 1000 young healthy army recruits by looking at femur head height discrepancies and a history of low back pain, hip pain, and/or sciatica (Freberg 1982, 1983). He found that almost two-thirds of the recruits with a leg length inequality of 5 mm or more had a history of low back pain, hip pain, and sciatica.

Interestingly, in that same study, if the individual complained of hip pain, 89% involved the long leg side. If the individual complained of sciatica, 79% also involved the long leg side. Kerry's pain appears to be on the right or long leg side.

One of the most common biomechanical faults is asymmetrical bilateral pronation (Fig. 2), which contributes to serial distortions up through the kinetic chain, pelvis and spine. Bates (1979) demonstrated that an asymmetry difference of 3% or greater in the pedal foundation contributed to LLI and pelvic unleveling (Blake & Ferguson 1992).

Along with specific chiropractic adjustments, custom-made flexible orthotics can be used to stabilize the foot/ankle complex in a better position of biomechanical function. Based on the chiropractic paradigm of structure affects function, the primary goals of orthotic therapy are to:

1. Inhibit serial biomechanical stress up the kinematic chain – The inward rotation of the foot/ankle complex, tibia and fibula is a contributing factor in frequent ankle sprains, lower leg compartment syndromes, patello-femoral dysfunction, medial knee degenerative joint disease, stress fractures, ilio-tibial band inflammation, and pelvic unleveling (Fig. 3). Foot mechanics affect all joint complexes above, including the sacroiliac joints, up to the occiput (Dahle, 1991, Harries 1994).
2. Create a symmetrical foundation by blocking pronation or supporting supination – an asymmetrical pedal foundation is a contributing factor in pelvic unleveling and flexible scoliosis (Fig. 4) (Riegler 1987, Smith 1992, Carpintero 1994).
3. Provide heel strike shock absorption – The natural shock absorption capacity of the foot/ankle complex is reduced with either pronation or supination (Bates et al. 1979, McPoil & Cornwall 1991). Pronated feet are more susceptible to metatarsal stress fractures, whereas the tibia is more susceptible with supination.
4. Enhance neuromuscular re-education – The sensory information from the mechanoreceptors of the foot play a major role in balance, gait, reciprocal inhibition, and innervation of muscles, and posture (Guyton 1981, Bennett et al. 1993, Lennon et al. 1994). Orthopedic manual muscle

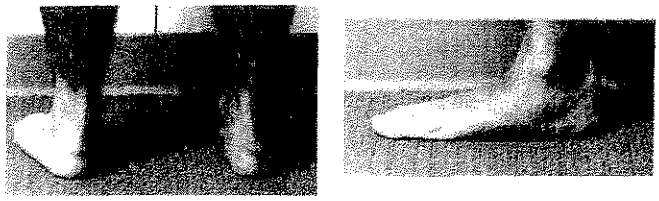

Fig. 2 Asymmetrical bilateral pronation.

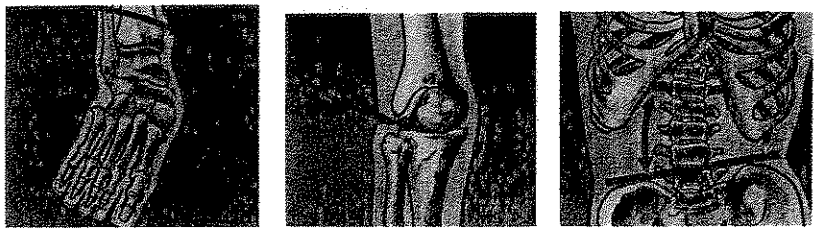

Fig. 3 Excessive pronation.

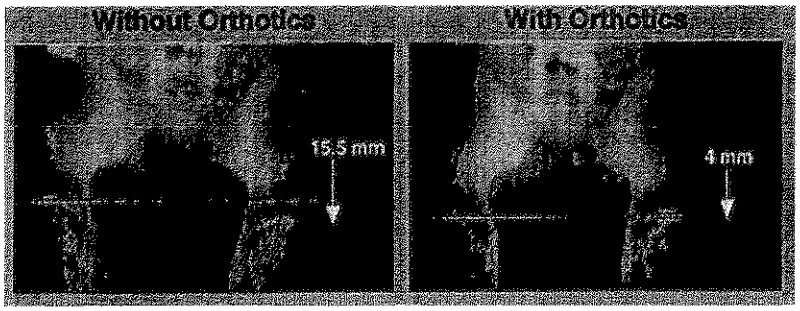

Fig. 4 Before and after X-rays (A) with orthotics and (B) without orthotics.

testing may be used as an indicator of neuromuscular function.

Even though Kerry is physically active, he does not appear to be sensible. A specific exercise programme must be developed so that he can 'work out' yet not injure himself. He will need to embrace the concept of 'no pain for maximum gain' versus 'no pain no gain'. The overall strength of his muscles may be adequate; however, the neurological coordination needs improvement. By performing specific exercises within a pain-free range of motion, he can facilitate neurological firing into both the back extensors – the multifidi and the erector spinae – and the deep hip flexors, the iliopsoas muscle. Because there is pelvic unleveling, lateral bending into the side of convexity or low sacral base side, the left, will be needed. This exercise will improve neurological coordination of the iliopsoas, the quadratus lumborum, and abdominal obliques.

Trigger point therapy and myofascial release techniques are also essential in restoring balance and function to the involved musculature. This should be performed by a trained massage therapist.

Initially, this treatment regime would be scheduled for three times per week for 4 weeks. At that time, a reexamination with assessment tools would be completed to assess progress and to determine the frequency of future care. If progress is being made, I would anticipate at least 3 months of care with decreasing office visits and an increase of home/gym participation centering on restoration of optimal biomechanics.

REFERENCES

ACC Chiropractic Paradigm 1996 The Association of Chiropractic Colleges, Position Paper, July

ACC Chiropractic, Scope and Practice 1996. The Association of Chiropractic Colleges, Position Paper, December

Bates BT et al. 1979 Foot orthotic devices to modify selected aspects of lower extremity mechanics. American Journal of Sports Medicine, 7

Beal MC 1950 Review of short leg problem. Journal of American Osteopathic Association 50: 109–121

Bennett P et al. 1993 Pressure Distribution beneath the Human Foot. Journal of American Podiatric Association 83(12): 674–678

Blake RL, Ferguson H 1992 Limb length discrepancies. Journal of American Podiatric Medical Association 82(1): 33–38

Cailleit R 1988 Soft tissue pain and disability, 2nd edn. FA Davis, Philadelphia, 154

Carpintero P et al. 1994 The relationship between pes cavus (supination) and idiopathic scoliosis. Spine 19(11): 1260–1263

Dahle SAA et al. 1991 Visual assessment of foot type and relationship of foot type to lower extremity injury. Journal of Orthopedics and Sports Physical Therapy 14(2):

Freberg O 1982 Leg length in asymmetry in stress fractures: a clinical and radiological study. Journal of Sports Medicine 22: 485–488

Freberg O 1983 Clinical symptoms and biomechanics of lumbar spine and hip joint in leg length inequality 8: 643–651

Gatterman MI 1990 Chiropractic management of spine related disorders. Williams & Wilkins, Baltimore 28, 31

Giles LGF, Taylor JR 1982 Lumbar spine structural changes associated with leg length inequality. Spine 7:

Guyton AC 1981 A textbook of medical physiology. WB Saunders Philadelphia

Harries RI et al. 1994 Oxford textbook of sports medicine. Oxford University Press, Oxford

Lennon J et al. 1994 Postural and respiratory modulation of autonomic function pain and health. American Journal of Pain Management 4(1): 36–39

McPoil T, Cornwall M 1991 Use of soft orthotics in prevention of injuries Journal of American Podiatric Medical Association 81(12)8

Palmer Educational Principles. 1996 Palmer Chiropractic University System

Riegler HF 1987 Orthotic devices for the foot. Orthopaedic Review 16(5): 293–303

Smith RL 1992 Pronation syndrome and global spinal posture, biomechanics, physiology, and applications to chiropractic. Chiropractic Biophysics

Steindler A 1973 Kinesiology of the human body under normal and pathological conditions. Charles C Thomas, Springfield 141–142