



THE DOCTOR IS IN

with Dr. Richard Beauchamp, M.D., FRCS C

LEG LENGTH DISCREPANCY

One of the most common misconceptions I see in my orthopedic practice is the notion that a mild (less than 2 cm) leg length discrepancy (LLD) can directly cause symptoms or lead to problems such as back pain, arthritis, or gait abnormalities. The effect of a LLD on running and walking as well as the magnitude of the discrepancy causing the effect have been the subject of controversy in Orthopedics and Physical Therapy for some time. LLD also serves as fodder for legal claims, particularly those arising following motor vehicle accidents and other libelous events. The truth is, very little scientific information is available to substantiate any of those claims.

What is LLD?

Leg length inequality refers to the condition in which the legs are different lengths. First, one must consider the accuracy in determining what constitutes the true length of the leg.¹ From the hip joint to the floor might seem like a reliable way of measuring, but how do you determine exactly where the hip joint begins? Unless there is completely full and symmetrical movement at all of the joints in the leg, there will be some asymmetry of measurement and the resulting difference will be what is referred to as an “apparent” discrepancy. In these cases, the legs are in fact equal lengths but because of some restricted movement in one or more leg joints, the person may be perceived to have one leg shorter than the other.

Measurement

Measuring leg lengths with a tape measure from the pelvis to the ankle is a time-honoured approach; however, there has been reported up to 1 cm measurement error as well as poor reproducibility using this technique. Other methods include the “block test” where a small raise is placed under the supposed short leg and added to until the standing patient’s pelvis is clinically level on a physical exam. Again, this is a highly imprecise method, which does not take into account possible apparent leg length differences. A classic method of assessing a LLD involves moderate radiation exposure but is effective (Fig. 1). The new “gold standard” for measuring leg length differences involves a Computerized Axial Tomography (CAT) scan², although there is still some room for error as the person interpreting the results can

erroneously misread the x-ray films.

Historically, up to 1 cm has been the accuracy measurement error accepted for clinical leg length assessment. It has been quoted that a LLD of less than 2 cm can be seen in 40 to 70% of the general population. If we accept measurement error as being 1 cm, then a LLD in the general population can vary from 2 cm plus-or-minus 1 cm, for a total of 1 to 3 cm.

Causes

LLD can occur due to congenital reasons (at birth) or from other acquired conditions such as infections or trauma (e.g. a bone fracture). For instance, if a broken leg is not set properly during initial treatment, it can heal in a shortened position. Sometimes in children, even though the broken leg is set perfectly, the bones can “over grow” and heal in a lengthened position.

A study by Song et al. concluded that absolute LLD (e.g. 2 cm) affects individuals differently depending on their height.³ For example, a discrepancy of 3 cm would affect a five-foot-two runner differently than a six-foot-four runner. The researchers proposed describing the discrepancy in terms of percent difference between the two legs and found that gait mechanics were altered with more than 5.5% discrepancy.

In summary, mild leg lengths are very common and rarely produce any significant disability. Some mild gait asymmetry may be cosmetically balanced with a small shoe raise. More significant discrepancies may require more aggressive experimentation with different orthotic inserts and possibly even surgery. **RR**

References:

1. Sabbarwal, S, Kumar, J. “Method for Assessing Leg Length Discrepancy” *Clin Orthop Relat Res* 466 (2008): 2910-2922.
2. Gurney, B. “Leg length discrepancy – Review” *Gait & Post* 15 (2002): 195-206.
3. Song, K.M. et al. “The Effect of Limb-Length Discrepancy on Gait” *J Bone Joint Surg* 79-A, No.11 (1997): 1690-1697.



Figure 1: An X-ray of the legs in an individual with a 4 cm Leg Length Discrepancy (LLD).

LLD CLASSIFICATION

Absolute LLD can be classified according to the magnitude:

Mild (<2cm)

Mild (less than 2 cm) discrepancies are generally thought not to produce any proven clinical disability. If subjective concern requires treatment, then a simple foot orthotic can serve to “equalize” the real or perceived discrepancy.

Moderate (2-4cm)

Moderate (2 to 4 cm) discrepancies are probably more likely to contribute to the production of symptoms, which can include back pain, hip pain, altered balance and sway. Scoliosis (curvature of the spine) can also be a sequel of moderate LLD.

Severe (>4cm)

Severe (greater than 4 cm) discrepancies are definitely known to cause significant disability and may require surgical management to either shorten the longer leg or lengthen the shorter leg. These are both very complicated surgeries.

Dr. Richard Beauchamp is a runner as well as an orthopedic surgeon. His running career has spanned more than 15 years and involved seven marathons. His orthopedic surgery career extends over 35 years. He is the medical director of the Shriner’s Gait Lab at Sunny Hill Health Centre in Vancouver and a clinical professor in the Department of Orthopedics at the University of British Columbia. He walks out of the West 4th store with his wife Dorothy.