

Can You Define Leg Length Inequality?

by Dr. Arthur B. Gross



Leg deficiency is a basic cause of many biomechanical problems, sometimes so basic that it is overlooked or not even considered. The mere thought of examining for it gets lost with the advances in skeletal imaging, but if you are going to be treating biomechanical problems you always need to properly evaluate the patient to rule out leg deficiency. You can do it quickly and efficiently during a clinical examination. If a leg deficiency is found, an indirect method of measuring or a standing x-ray (postural x-ray) will determine how much deficiency there is.

If you cannot define a simple deformity such as leg length inequality then you are simply not prepared when it comes to the assessment of more complex deformities or biomechanical problems. Examining for leg length inequality is the starting point for evaluating patients with biomechanical disorders, ranging from a headache to foot, leg, lower back, upper back or arm pain to anything in between.

There are three types of leg deficiency:

1. Functional Leg Deficiency:

The difference in alignment of the lower extremity. Correction: Stabilize by using orthotics.

2. Anatomical Or Structural Leg

Deficiency: The difference in length of the lower extremity. Correction: Stabilize by using heel or full foot lifts. (Various heights are available to suit the individual needs of your patients.)

3. Dual Component Leg Deficiency:

This is a combined difference due to a difference in leg length, as well as alignment of the lower extremity. Correction: Stabilize by using orthotics with a heel lift.

To begin, are you able to determine the following?

- Is leg length inequality present or not?
- If yes, is the shortening anatomical or functional, and how are you going to differentiate it?
- If functional, what are your options?
- If anatomical, what are your options?
- Is the shortening a dual component leg deficiency, i.e. both anatomical and functional?
- If anatomical, how are you going to measure it?
- When you determine the amount of leg deficiency, what are you going to do to stabilize or correct it?

Now let us discuss how to make the determinations listed above.

Is leg length inequality present or not? See Figure 1. Have the gowned patient stand with their back to you,

with their heels 8 inches apart and knees locked in extension. Place your hands on the iliac crest with palms down and observe if one of your hands is higher than the other. If so, there is apparent leg deficiency on the lower side, but look a little further. Are the sacral dimples uneven? Is there a flank fold? If the answer is yes, then it further confirms a leg deficiency.



Figure 1

So let us assume that we have determined there is a leg deficiency. What is next?

- Is the shortening anatomical or is it functional?
- How are you going to differentiate it?

With the clinical exam this is easy. You are standing behind the patient with your hand on the iliac crest with your palms facing down. As you are looking at the level of your hands, have the patient roll up on the outside of their feet. (Supinate the feet.) **Here is what to look for:**

1. Did the pelvis and sacral dimples level when the feet were supinated? If so, you are dealing with a functional leg deficiency.

2. Did the level of the pelvis and sacral dimples remain the same when the patient went into supination? If this is the case, your patient has an anatomical leg deficiency.

3. Did the pelvis and sacral dimples attempt to level but not at 100 percent? If that is the case, you have what I call a dual component deficiency, i.e. part anatomical and part functional leg deficiency.

Now that we have determined what type of leg deficiency the patient has, we need to consider the following:

If functional, what are your options?

If the Supination Exam showed a functional leg discrepancy, then an orthotic of your choice should be used as an adjunct to your treatment. There is no need to measure leg deficiency in this particular instance.

If anatomical, what are the options?

If the Supination Exam showed an anatomical leg deficiency, then heel lifts or full foot lifts are your options, but at this point you have no idea how much anatomical leg deficiency is present. (We'll discuss determining this deficiency a little later on.)

Is the shortening a dual component deficiency (both anatomical and functional)?

If the Supination Exam revealed a dual component deficiency, then an orthotic plus a heel lift are your options to help in the treatment of your patient. Some research has shown that no more than 5mm of leg deficiency is the result of a unilateral pronated foot. When you determine the amount of deficiency, for example, let's say the deficiency is 10mm, then the use of an orthotic along with a 5mm heel lift under it should eliminate the 10mm of leg deficiency.

If it is anatomical, how are you going to measure it? There are two ways of determining the amount of leg

deficiency in the clinic:

1. Indirect Method Using A Leg Inequality Measuring Pad (LIMP)

This is a device which has eight 3mm layers. Each layer can be added or removed and placed under the patient's short leg until you determine the pelvis is level, as you check with your hands resting on the iliac crests.

It should be noted that this method is not as accurate as a standing postural x-ray but it is much better than the Deerfield Leg or Tape Measure Test. The Tape Measure Test is not reliable, i.e. in research studies this test has proven to be 25mm off on the opposite side. The Deerfield Leg Test will offer you a clue as to possible tibial shortening but it is not a reliable test for these particular purposes.

2. Standing Postural Radiograph

A simple, standing A-P and Lateral Lumbo-Pelvic view (which includes the femoral heads, the pelvis, and the 5 lumbar vertebrae) will provide you with a wealth of information as to the biomechanics of the foundation of the spine, as well as reasons why those biomechanics are altered. Proper positioning is critical because you want to rule out as much distortion as you possibly can. Also, you will want to do comparative films at a later time; therefore, it is essential that the positioning be consistent.

Note the following:

- The A-P view requires that your patient stand with their heels 8 inches apart and with their knees locked in extension.
- The primary ray is centered on the umbilicus in the 14x7-inch view, and on the xyphoid in the 14x36-inch view. Focal Film Distance is 40 inches on the 14x17 view, and 72 or 84 inches on the 14x36 view.
- Do not obstruct sacral base or femoral heads with shield.
- Lateral view is taken with primary ray 1 inch above the iliac crest and centered on the crest of the ilium. Focal

Film Distance is 40 inches.

- Make sure that you use the L or R marker on the appropriate side.

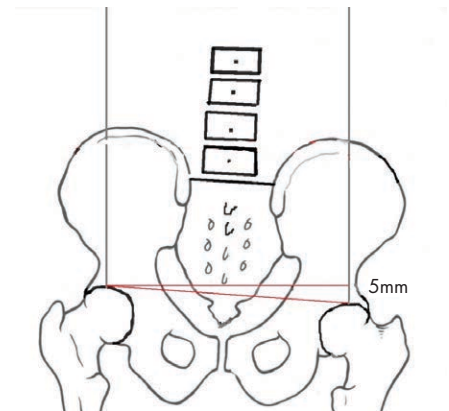


Figure 2

- Place a dot on the most superior point of each femur head.
- Using the ruler, draw a line vertical to the top of the film from those points on the femur head.
- Next, using the ruler, draw a line parallel to the bottom of the film from those points on the femur head.
- Determine the deficiency of the short leg by measuring up from the point of the shorter leg femur head point.

Based on the information provided in this article you should be able to define a simple deformity such as leg length inequality. You know how to differentiate functional versus anatomical leg deficiency. You have the knowledge of what your options are for an adjunct treatment in each of the three types. And you know how to measure for leg deficiency in a clinical setting.

About The Author: Arthur B. Gross, DC is a graduate of Logan Chiropractic College, a past diplomate of the American Board of Chiropractic Orthopedists, and a past Logan University faculty member. Co-founder and CEO of G&W Heel Lift, Dr. Gross is a recognized authority on the biomechanical effects of leg length differences and how it relates to human biomechanics. He has maintained a private practice in Cuba, MO for 36 years. He can be reached at 573-528-1360 or you can email at AGross1087@aol.com.