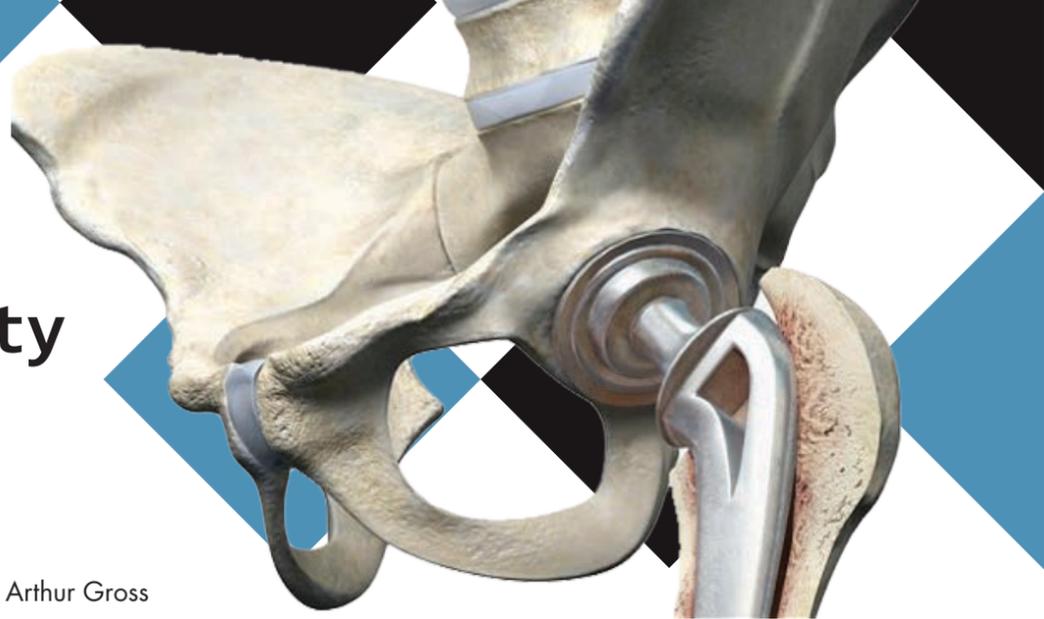


Total Hip Arthroplasty And Leg Deficiency

by Dr. Arthur Gross



In the 1960s, Total Hip Arthroplasty (THA) or Total Hip Replacement (THR) was introduced, and it has been called “the surgery of the 20th century” because it eliminated the pain of patients who were not only crippled with arthritis of the hip joints but also those with fractured hips or those who suffered avascular necrosis of the femoral head, along with a few other maladies which can occur in the hip.

THR is known to be one of the most successful and cost effective surgeries, with over 300,000 performed each year and a prediction that by 2030 the number will double. The overall success rate after ten years is 90 - 95%, but as the numbers grow so do the possibilities of complications such as one leg being longer than the other.

Following hip replacement surgery, some patients may feel like one leg is longer than the other. Usually it's the operated leg, and it is felt within the first week or so that it's noticed. Some of that feeling may be due to pain, muscle contracture or pelvic obliquity, and is usually eliminated during physical therapy sessions over the next 6 - 8 weeks. But if it's still noticed after that period of time, then the patient warrants further examination to rule out an anatomical leg deficiency that is resulting from the hip prosthesis. A brief look at the surgical procedure may shed some light as to the reasons why the leg deficiency occurs.

Why are leg lengths sometimes different after surgery?

Briefly put, when a hip replacement surgery is performed, the hip joint is surgically opened, and damaged

bone is removed. The top of the thigh bone (femur) is removed, and the socket of the pelvis is shaped. A metal cup is placed in the reshaped socket, and a ball is placed on top of the thigh bone. It is important that the new ball and socket are tight and stable, meaning they will not dislocate or come out of position. During surgery, the surgeon has several types of hip prostheses to choose from, based upon what conditions are found during the procedure. For instance, the patient may need a certain type of shaft to improve stability because of the thickness and condition of the femur. Even with all of the pre-examination, X-rays, CTs and MRIs, the final decision on the size and type of prosthesis occurs when the surgeon can actually view what they have to work with. (See Figure 1.)

As a result of the selection, the leg can end up longer on the operated side, or possibly shorter, due to the length of the shaft of the prosthesis. Another point that needs to be considered is that some patients have leg deficiency, acquired or congenital, prior to hip arthroplasty, and the surgery can either aggravate or ameliorate this condition.

Techniques are being developed in digital templating and image guided surgery that may provide better accuracy and improved outcomes concerning leg deficiency, but for now what is needed to keep leg length inequality to a minimum is a

good pre-operative plan; attention to detail; intra-operative measurements referencing “the well leg” after the components are implanted; and then post-operative measurements some weeks following the surgery. Even with these measures there will be cases of significant leg length inequality, but the post-op measurement will discern the amount, and simple procedures such as the addition of shoe lifts or heel lifts can reduce or eliminate the leg deficiency before related problems occur.

What are the goals of total hip arthroplasty?

The major goal of this surgery is to improve the patients' quality of life; improve their ability to walk; get them active again; and eliminate their pain. Total Hip Arthroplasty has a very good result on the majority of patients, but the remainder who end up with a leg deficiency can experience some of the following symptoms. (See Figure 2.)

- Significant Limp
- Leg Pain
- Hip Pain
- Back Pain
- Hip Joint Instability
- Numbness In The Lower Extremity
- Disc Problems
- Osteoarthritis Of The Knees
- Poor Oxygen Intake During Activity
- Muscle Fatigue
- Vertigo
- Foot Pain
- Scoliosis
- Headaches

How do we evaluate patients who are having problems?

A leg deficiency of just 5 mm is considered significant to the point of creating some of the above-mentioned symptoms; these are the patients who will enter your office after six months, a year, or perhaps even 2 years after their surgery. While taking their history always ask if they have had any surgery to the lower extremities; if they have, then they definitely need to be evaluated to determine leg deficiency.



Figure 3

Your standing postural examination should be performed with the feet 8 inches apart and knees extended. Here is what to look for from head down to feet: head tilt, shoulder tilt, prominent scapula, spinal curvature, unlevel iliac crest, unlevel sacral dimples, or tendency to want to flex an extended knee.

Keep in mind that a leg deficiency of 5 - 7 mm will not be easily seen in the standing postural exam, but the patient is there, with symptoms, and has had a hip replacement or other surgery which could have affected his leg length.

How do we determine the exact amount of leg deficiency?

The only way to determine true leg deficiency and the effect it has on the pelvis and spine is by a standing X-ray evaluation, with feet 8 inches apart and knees extended. The X-ray needs to be a fully collimated 14 x 17 view, with the primary ray centered on the umbilicus. This view will enable you to do line drawings to determine the leg deficiency, the level of the 5th lumbar, and the spinal angle...all factors that are needed to make an accurate decision on the amount of lift that needs to be under the short leg. (See Figures 3 and 4.)

We need to remember that the legs are the foundation for the pelvis. If there is a pelvic tilt it is either from leg deficiency or extreme pelvic obliquity as a result of contracture. The X-ray makes the differentiation. Also, the sacrum and 5th lumbar are the foundations for the spine, so it is important that your X-ray evaluation takes into consideration the leg deficiency as well as the level of the



Figure 4

5th lumbar, and you should consider heel lift or shoe lift heights that will level the 5th lumbar. You may have a 15 mm leg deficiency but only need a 10 mm lift to level the 5th lumbar.

Leg length discrepancies of 2 - 4 cm require a full foot lift built onto the sole of the shoe. In discrepancies of 4-plus cm surgery may be considered to resize the implants, remove additional bone from the femur, or shorten the opposite leg, but that is usually undertaken only in individuals severely affected.

In summary, the goal of Total Hip Arthroplasty is to improve the patients' quality of life but there are a large number of those patients who do not achieve that goal due to a resultant leg deficiency, i.e. they are not walking better; they are not as active as they want to be; and they still experience pain. We can help these patients, if given the opportunity, because we know the importance of good body mechanics. X-rays reveal those altered body mechanics, and X-rays also reveal what needs to be done to improve them. Basically it shows us that we need to reduce the deficiencies, treat the patient, and then watch their health and quality of life improve.

About The Author: Dr. Arthur B. Gross, co-founder and CEO of G&W Heel Lift, is a recognized authority on the biomechanical effects of leg length differences and how it relates to human biomechanics. He also teaches at Logan University, and has published articles and training materials on the biomechanics of leg deficiencies and other topics. He can be reached at admin@gwheellift.com.



Figure 1



Figure 2