LIMB LENGTH DISCREPANCY AFTER THR DR Vasu Pai

Limb-length discrepancy is the second most common cause of litigation in adult reconstruction surgery behind nerve injury, and 7.9% of orthopaedic surgeons have been named as defendants.

As many as one-third of healthy asymptomatic individuals have 5 mm to 2 cm of limb-length discrepancy [1,2,3].

Leg-length discrepancy after total hip arthroplasty can pose a substantial problem for the orthopaedic surgeon. Such discrepancy has been associated with complications including nerve palsy, low back pain, and abnormal gait. Careful preoperative measurement and assessment, as well as preoperative and postoperative patient education, are important factors in achieving an acceptable result. However, after total hip arthroplasty, equal leg length should not be guaranteed. Rather, the patient should be given a realistic assessment of what can reasonably be expected.

1.Many patients are annoyed by leg- length discrepancy; patient education is important in preventing dissatisfaction. Patient dissatisfaction with leg-length

2. traction injury to peroneal or sciatic nerve 2.7 cm lengthening range: 2-4 cm

3. **When LLD is significan**t: Garney [J Bone Joint Surg Am 2001;83:907-915] found that with 2 to 4 cm of limb-length discrepancy, there was a significant increase in oxygen consumption. With 3 and 4 cmof limb-length discrepancy, there was a significant increase in heart rate and significant
quadriceps activity in the longer limb. With a 4-cm limb-length discrepancy, there was a significant increase in plantar flexor activity in the shorter limb. The authors concluded that in older adults, limb-length discrepancy of between **2 and 3 cm is the critical point with regard to the effects on most physiologic parameters.**
Vink [Acta Morphol Neerl Scand 1987;25:261-27] and Huson21 reported a notable increase in the electromyographic activity of the erector spinae muscles only when the leg-length discrepancy was !3 cm.

4. Of particular concern is the patient who presents with a leg-length discrepancy in which one leg is perceived to be longer than the other although the actual leg lengths are equal. Common causes of such a perceived “long leg” include scoliosis, fixed pelvic tilt, and

contralateral leg deformity.

5. Occasionally, physical therapists or chiropractors may draw attention to a limb-length discrepancy, which is usually functional, causing the patient to perseverate over whether something is wrong with the total hip replacement [6]. 100 patients reviewed by Ranawat had pelvic obliquity 1 month after surgery, but by 6 months postoperatively, all of these symptoms had subsided with the use of physical therapy.

INCIDENCE

14% following THR >1 cm

CLINICAL

Perceived Inequality of Leg Lengths

Pain, low back pain, impaired abductor function and possibly hip dislocation may occur with shortening

Often a patient's legs were of unequal length before the surgery, and it is important to document this baseline measurement preoperatively.

preexisting degenerative process in the lumbar spine that is producing scoliosis and pelvic obliquity.

Postoperative Assessment

HOW TO AVOID LLD DURING THR

1. Good informed consent

   Determine pre op patients perceive leg discrepancy. This is common as muscle contracture can cause apparent discrepancy. Although many patients may not perceive a preexisting limb-length discrepancy, it is important to evaluate and document any structural and apparent limb-length discrepancy before total hip arthroplasty for later comparison.

2. Clinically assess: abduction, adduction and flexion contracture.
3. **Measure true and apparent lengthening.**

   Most discrepancies are a combination of true and apparent differences. Because functional limb length is the result of a complex interaction of the lengths of bones, implants, soft tissue contractures, and pelvic obliquities, no single measure adequately conveys all of this information. A flexion contracture of the knee produces functional shortening of the affected side. Tightness of the anterior structures spanning the hip, such as the capsule, the iliopsoas muscle, and the rectus femoris muscle, can induce a flexion contracture of the hip.

Measurement of **Apparent or functional length**: The apparent leg length can be measured from the umbilicus to the medial malleolus. [using blocks]. resulting from soft-tissue contractures or pelvic obliquity.

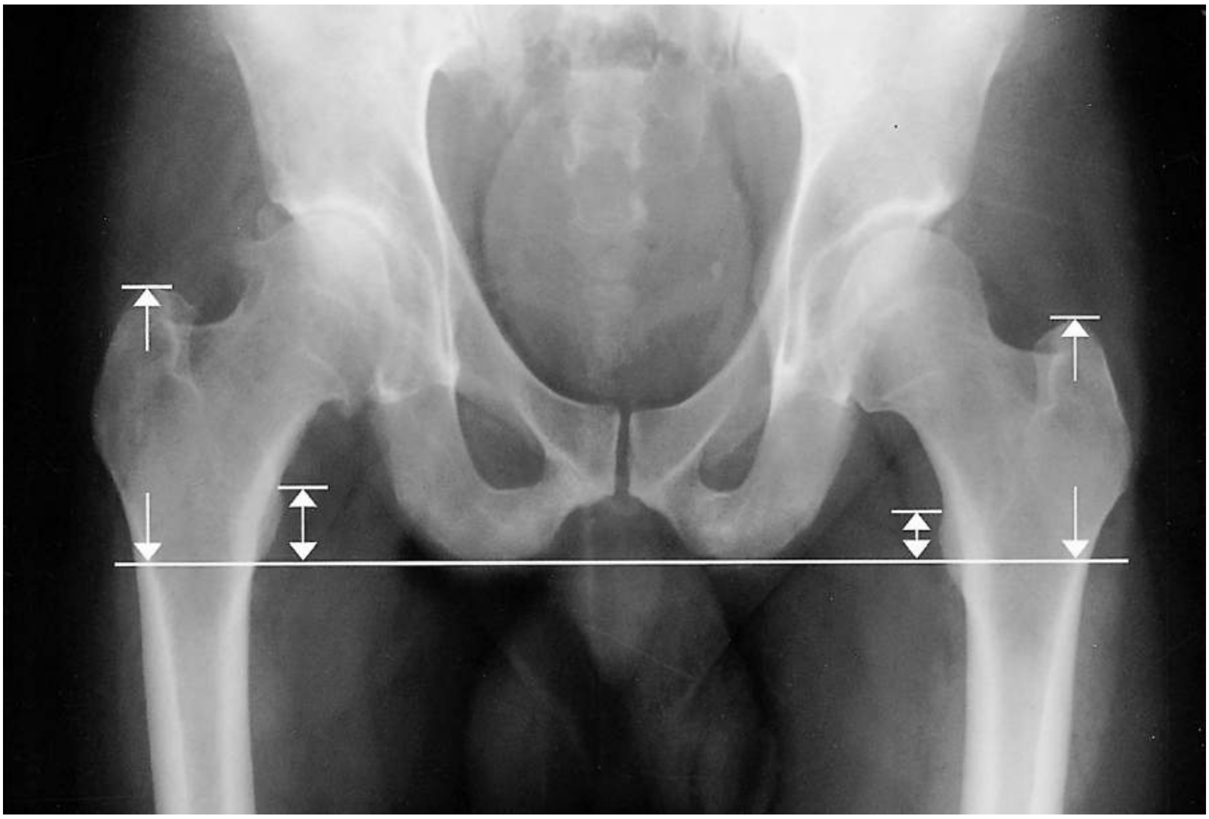
The true leg length is measured from the anterior superior iliac spine to the medial malleolus. This is arguably the most reliable clinical measure of limb length; however, the technique requires precise identification of landmarks, which may be difficult, particularly in obese individuals. True leg-length measurement also is subject to variation because of changes in the position of limbs and is required to measure limbs in identical position after squaring pelvis.

Structural (true) limb-length discrepancy is attributable to actual differences in the cumulative length of osseous structures and the thickness of cartilaginous surfaces of the lower limb. Structural limb-length discrepancy may be due to developmental dysplasia of the hip, and previous osteotomies for the treatment of developmental dysplasia of the hip can produce asymmetric acetabular, and femoral anatomy.

4. Preperative Templating.
5. Intraoperative leg length:
    a. the center of the femoral head coincide with the superior tip of the greater trochanter.
    b. Reference pins: a zig or measuring caliper
    c. Compare knees
    d. Following reduction of trial implants, the so-called "shuck" test, described by Charnley

HOW TO ASSESS LLD

X ray: AP pelvis with both femurs internally rotated approximately 20°



As an estimate of leg-length discrepancy an X ray: a reference line is drawn through the bottom of the obturator foramina. On each side, the distance from the lesser trochanter landmark to the reference line is measured. The difference between the two is the radiographic leg-length discrepancy.

Difficulty: in revision hips when land marks may be deficient.

TREATMENT

1. Shoe lift for the leg that seems to be shorter

Edeen [Am J Orthop 1995;24:347-351.] 24% of patients required a shoe lift after THA.

Similarly, in most cases, it is desirable to delay the use of a lift for approximately 6 months postoperatively to determine whether the perceived leg-length discrepancy will resolve. Equally important is the perspective assumed by the physical therapist.

According to a survey of Hip Society members [6], functional limb-length discrepancy persists in 0.5% to 7% of patients. The majority of cases can be treated with a shoe lift and additional physical therapy such as stretching of the involved muscles, manual massage, and soft-tissue mobilization techniques. Shoe inserts can provide as much as 9.5 mm of height without requiring shoe modification

2. Assurance from the therapist that the leg will work well with adequate stretching and manipulation may affect eventual outcome. 100 patients reviewed by Ranawat had pelvic obliquity 1 month after surgery, but by 6 months postoperatively, all of these symptoms had subsided with the use of physical therapy.

3. Revision THR: change with modular head. If shortening >2 cm,, revision to a femoral stem. [8]. 19/21 better with revision performed at 8 month for LLD 2-7 cm average 4 cm

4. **When shortening** is required: change femoral stem with high offset.

5. Correct any prosthetic malalignment

2 types of LLD due to malpositioning of the cup:

1. When an acetabular component is placed inferior to the tear drop or when a femoral component is placed with the centre of the femoral head substantially proximal to the tip of the greater trochanter.
2. Retroverted acetabular which causes instability. Surgeon trying to compensate by increasing the neck leading LLD

SUMMARY

Restoration of hip biomechanics, including femoral offset and leg length are desired goals in performing total hip arthroplasty. Minor leg length discrepancies, less than a centimeter, are common after total hip arthroplasty and usually well tolerated. **However, in some patients, even these small discrepancies are a source of dissatisfaction[1].** LLD following HR is a disturbing problem for both the surgeon and the patient. Perception of a leg length discrepancy[13] post total hip arthroplasty (THA) is one of the most common sources of patient dissatisfaction and can have a direct influence on the considered success of the operation.

The functional LLD resolves with time but the true LLD does occur related to malpositioning which may cause LLD.

The role of leg length discrepancy (LLD) both as a biomechanical impediment and n predisposing factor for musculoskeletal disorders has been a source of controversy. The causes these problems, and what magnitude of LLD is necessary to generate these problems have been over exaggerated.

Although evaluating asymmetry in lower extremity dynamics in the presence of LLD would increase our understanding of the biomechanical implications of LLD, there has been a paucity of research in this area. Reviews the biomechanical implications of leg length inequality as related to the development of stress fractures, low back pain and osteoarthritis are contentious at moment.

Comparison of limb-length discrepancy after THA: with and without computer navigation [12]. This study demonstrated that computer-navigated THA resulted in improved restoration of normal limb length and limited significant outliers but did not show improvement in Harris Hip Scores or patient's perception of limb-length equality.

REFERENCES

1. Hellsing. A prospective study of young men during their military service. Ups J Med Sci. 1988;93(3):245-53.
2. Gross Am J Sports Med. 1983 May-Jun;11(3):121-4.
3. Soukka Spine (Phila Pa 1976). 1991 Apr;16(4):429-31.
4. Clark. J Am Acad Orthop Surg 2006;14:38-45
5. Edeen Am J Orthop 1995;24:347-351.
6. Ranawat CS, Rodriguez JA: Functional leg-length inequality following total hip arthroplasty. J Arthroplasty 1997;12:359-364.
7. The J bone joint surg 95-A, 1426, 2013
8. Surgical treatment Parvizi J Bone J Surg 2003:85A; 2310
9. Gourney. Gait Posture. 2002 Apr;15(2):195-206.
10. Biomechanical implications. Br J Sp Med 1991:25(1)
11. Maloneyl J Arthroplasty. 2004 Jun;19(4 Suppl 1):108-10.
12. **12.** Orthopedics. 2013 May;36(5):e543-7
13. Hip Int. 2015 Sep-Oct;25(5):452-6