

Status of Limb-length Discrepancy after Total Hip Arthroplasty in a Tertiary Care Teaching Hospital

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ABSTRACT

Background: Limb-length discrepancy, to one degree or another, is a problem that must be reckoned with after total hip arthroplasty (THA). It must be addressed as both a clinical issue for patients and, unfortunately, a potential medico legal problem. **Methods:** Twenty six Patients of age more than 28 yrs of either sex who have chronic symptoms of degenerative arthritis fitting inclusion criteria. **Results:** In this study, postoperatively after THA, in 34.61% (9/26) of cases, the limb to be operated were longer, in 11.53% (3/26) of cases, the limb to be operated was shorter and in 53.84% (14/21) postoperative limb length was equal as measured with absolute method and trochanteric method. Postoperatively, the mean LLD of lengthen group was 15.93+7.42mm measured with absolute method, 12.89+5.76mm with trochanteric method. **Conclusion:** All the patients have good functional outcome after total hip replacement as functional score increases with time in subsequent follow up, irrespective of limb length discrepancy.

Keywords: Total hip arthroplasty, Limb length discrepancy, Soft tissue tensioning, Hip replacement & Limb length inequality.

INTRODUCTION

Limb-length discrepancy, to one degree or another, is a problem that must be reckoned with after total hip arthroplasty (THA). It must be addressed as both a clinical issue for patients and, unfortunately, a potential medico legal problem. Although a small limb-length discrepancy may cause no symptoms or may not be perceived, a large limb-length discrepancy may cause nerve palsy, low back pain, altered gait, hip instability, and patient dissatisfaction.^[1,2] The incidence of chronic disabling conditions of the hip such as osteoarthritis, inflammatory arthritis, osteonecrosis is on the rise. Status of long term outcomes of an operative procedure is important to determine the durability of the procedures like total hip replacement (THR). Patient derived outcome scales have become increasingly important to surgeons and clinical researchers for measuring improvement in function after surgery. It provides a means for comparison of the results of different clinical interventions which may lead to any

changes in operative technique, implant design, type of joint that occurs over time. LLD after THA can be described as true and apparent or structural and functional respectively. The structural or true leg-length inequality is caused by lengthening of the prosthetic head-neck distance and component malpositioning and is divided into two categories. a) Situations in which Limb-lengthening is direct result of component positioning: Such as when narrow femoral canal or high femoral cut leads to incomplete stem insertion & a stem which sits too proud, or when the acetabular cup is placed too low, b) Situations in which LLD is indirect result of component positioning: Such as when a surgeon increases the neck length to improve soft tissue restraints and to overcome intraoperative instability due to retroverted acetabular component.^[3] The apparent or functional leg-length inequality (FLLI) describes the amount that is attributable to other factors such as degenerative disease with scoliosis of the lumbar spine, causing obliquity of the pelvis and the tightness of the anterolateral soft tissues about the hip (Gluteus medius and minimus, tensor fascia lata, rectus femoris, psoas muscle).^[4] Hip replacement surgery is performed as a treatment for severe arthritis of the hip joint. During a hip replacement surgery, the ball and socket of the joint are replaced with an artificial implant, commonly made of metal and plastic. After hip replacement

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surgery, some patients notice one leg may be longer than the other, most commonly the leg that had surgery. To prevent a post-operative leg length discrepancy, surgeon will template x-rays of your hip with overlay schematics of the hip replacement prosthesis. In addition, some surgeons are now using computer-guided systems to help confirm position and size of the hip replacement implants.^[5] When leg lengths are unequal, patients may experience increased pain and muscle fatigue. When the leg length is increased by more than a few centimeters, the nerves of the leg may become stretched to the point that patients experiences numbness or pain further down the limb. Total hip replacement (THR) relieves the pain and functional disability experienced by patients with moderate to severe arthritis of the hip, improving their quality of life. It is a highly cost-effective procedure generally acknowledged indications for primary THR Include joint pain, functional limitation and some radiographic evidence of joint damage.^[6] Leg length inequality has been described as lengthening or shortening of a limb beyond normal anatomy so that the leg is either longer or shorter than the contra lateral limb. This definition assumes that the contra lateral limb has no pathology and is normal.^[7] This present study was aimed to limb-length discrepancy after total hip arthroplasty in a tertiary care teaching hospital.

MATERIALS AND METHODS

Study location: Department of Orthopedics, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar.

Study design: Prospective observational study

Ethics approval: Study was approved by the Institution-al ethics committee and informed consent was taken from the participants or from the blood relatives.

Study period: October, 2017 to December,2018.

Sample size and Methodology: Twenty six Patients of age more than 28 yrs of either sex who have chronic symptoms of degenerative arthritis fitting inclusion criteria after excluding those who meet exclusion criteria are chosen among the outpatients at the Orthopaedic Department of NMCH, Jamuhar fulfilling the inclusion criteria. We evaluated all cases undergoing THR for degenerative arthritis. Leg length was calculated using digital x-rays by 2 examiners (who were blinded) preoperatively and postoperatively. Leg length: On digital X-ray a line was drawn at the level of & parallel to inter teardrop area and intersecting the lesser trochanter on each side. Compare 2 points of intersection & measure difference to determine the amount of limb discrepancy 10. We also manually measured the limb length from anterior superior iliac spine to medial malleolus pre and post operatively. We

asked patient perceivngness of limb length pre and post operatively. We evaluated twenty six cases undergoing THR for degenerative arthritis at NMCH, Jamuhar for functional outcome using Harris hip score and LLD using digital x-rays by 2 different examiners. Postoperative patients are evaluated for radiological outcome. The results were expressed as mean \pm standard deviation (SD) values. Data analysis was performed with Microsoft Excel. The p-value<0.05 was considered significant. All the analysis was carried out on IBM SPSS -18.0 version.

RESULTS

This present study was carried out in the department of Orthopedics, Narayan Medical College and Hospital, Jamuhar. In this study, postoperatively after THA, in 34.61% (9/26) of cases, the limb to be operated were longer, in 11.53% (3/26) of cases, the limb to be operated was shorter and in 53.84% (14/21) postoperative limb length was equal as measured with absolute method and trochanteric method. Postoperatively, the mean LLD of lengthen group was 15.93+7.42mm measured with absolute method, 12.89+5.76mm with trochanteric method. Postoperatively, the mean shortening of shorten group was 13.61+6.83mm measured with absolute method. To assess functional outcome after THR in our study, we have used the Oxford hip score(OHS)54and Harris hip score (HHS)55 preoperatively and postoperatively follow up at 1 month, 3 months, and 12 months.

Table 1: Shows the no. of cases in pre-operative and post-operative THA.

Limb length discrepancy	No. Of Cases N=26 (%)	
	Pre-operative	Post-operative
Shorter	26 (100%)	3 (11.53%)
Equal	-	14 (53.84%)
Longer	-	9 (34.61%)

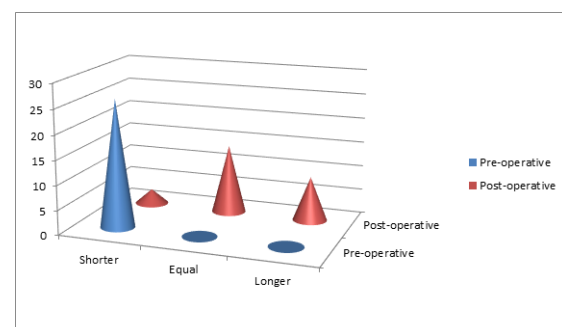


Figure 1: Shows the no. of cases in pre-operative and post-operative THA

Harris hip score was 27.21 \pm 12.54 at pre-operative which increased postoperatively to 37.52 \pm 14.24 at 1 month, 73.6 \pm 17.21 at 3 months and 89.37 \pm 18.81 at 12 months in the present study. In this study,

there was significant ($p=0.02$) mean increase in Harris hip score from pre-operative to subsequent time periods postoperatively. We found that Oxford hip score was 7.14 ± 2.52 at pre-operative which increased to 16.23 ± 6.21 at 1 month, 29.54 ± 8.36 at 3 months and 42.5 ± 11.74 at 12 months. There was significant ($p=0.03$) mean increase in Oxford hip score from pre-operative to subsequent time periods postoperatively.

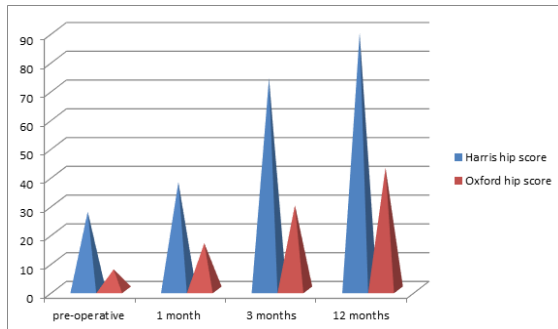


Figure 2: Shows the Mean Hip Score.

DISCUSSION

In THA preoperative templating should be used to predict the necessary length correction and plan femoral neck osteotomy level and combined with the techniques to reproduce it intraoperatively and accurate-positioning of the leg during measurements to ensure minimal LLD after THA.^[8] The leg length equality is an important functional parameter that is strongly related to the success in THA. The LLD can contribute to hip instability, ipsilateral knee pain, low back pain, sciatic nerve palsy, and aseptic prosthesis loosening. These problems can lead to revision surgeries and may even be the sources of litigation. Ranawat et al.^[9] wrote that the leg-length difference must be 10 mm or less, in order for a patient to have a good quality of life. In spite of the careful attention, an unexpected difference of 10-16 mm can sometimes occur. The possible reasons are the excessive acetabular reaming during the surgery, sinking of the collarless stem, flexion contracture of the hip joint before the surgery, inaccurate preoperative planning based on the radiographs at several different magnifications, and an inexperienced surgeon. The minor discrepancies of up to 1cm are usually asymptomatic, but in some patients even a small discrepancy may be a source of dissatisfaction. Avoiding postoperative LLD remains an important focus for all surgeons performing THR. To this end, a number of techniques have been proposed to assess leg length intraoperatively, which can produce varying results. Pelvic radiographs are helpful in assessing limb-length discrepancy (LLD) before and after THA but are subject to variation. Different methods are used to determine LLDs. As a pelvic reference,

both ischial tuberosities and the teardrops are used, and as a femoral reference, the lesser trochanter and center of the femoral head are used.^[10] There is no universal agreement as to what reference points should be taken for accurate measurements of limb lengths. Various authors have pointed out that the linear measurements and calculations from plain X-rays are susceptible to error, due to variations in positioning of the pelvis relative to the plane of the film and the divergence of the X-ray beams. The inaccurate abduction/adduction repositioning of the femur with respect to the pelvis also can cause substantial error in the measurement of the length and can offset changes. These points should be improved in order to achieve more accurate measurements. Affatato et al examined the validity of determining leg length differences using an ultrasound system.^[11] They measured the distance between three points, in millimetres, and the difference between preoperative and postoperative measurements represented change in the leg length. The method is non-invasive, not limited by radiation, easy, quick to use, and can be used for standard clinical screening. Studies are still in progress to resolve difficulties concerning the device sterilisation and the positioning of the entire set-up in a surgical unit.^[12] LLD can be quantified clinically and radiologically. Radiographic measurement is expected to be more accurate than clinical measurement in determining leg length discrepancy.^[13] The method is non-invasive, not limited by radiation, easy, quick to use, and can be used for standard clinical screening. Studies are still in progress to resolve difficulties concerning the device sterilisation and the positioning of the entire set-up in a surgical unit.^[14]

CONCLUSION

These findings suggest that, All the patients have good functional outcome after total hip replacement as functional score increases with time in subsequent follow up, irrespective of limb length discrepancy. In our study, there was excellent interobserver agreement for radiological measurements and moderate agreement for manual measurements, suggesting that radiological measurement is more accurate than the manual measurements. A comprehensive analysis of risk factors, preoperative extent of LLD and combined use of preoperative and intraoperative techniques may help to select appropriate implants and to adjust final leg lengths and minimise postoperative LLD.

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