Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/rk9sen70

FREQUENCY OF LLD IN PATIENTS UNDERGONE TOTAL HIP REPLACEMENT SURGERY BY CLINICAL AND RADIOLOGICAL METHOD

Farman Ullah[1], Muhammad Ibrahim Khan[2], Fareeha Khalid[3], Sohail Rehman[4], Asif Nawaz[5], Murad Ali[6], Baqir Hussain[7*]

[1]Registrar Ortho HMC
[2] Consultant Orthopedic Surgeon
[3]Medical Student
[4]Consultant Paediatric Orthopedic Surgeon
[5]Registrar Ortho HMC
[6]Consultant Orthopedic Surgeon
[7*]Assistant Professor, MTI LRH

***Corresponding Author:** Baqir Hussain
*Email: dr.baqirturi@gmail.com

ABSTRACT
Background: Total hip replacement, also called total hip arthroplasty (THA), is major surgery in orthopedics. It involves the replacement of damaged bone of femur head with prosthesis.
Objective: To determine the frequency of LLD in patient undergone total hip replacement surgery by clinical and radiological method.
Setting: Department of Orthopedics Surgery, MTI-HMC, Peshawar.
Duration of study: 18 March, 2021 to 18 August 2021
Study design: Descriptive Case Study.
Subjects and methods: All patient's limb length was measured by both methods, clinical and radiological. The difference of more than 2 cm as per operational definition was noted as presence of LLD. All the radiograph (AP views) was taken by the same radiologist with the researcher (myself) accompanied.
Results: As per frequencies and percentages for presence of LLD (Clinical Method), 40 (27.8%) patients were recorded with LLD. (Table No. 4). As per frequencies and percentages for presence of LLD (Radiological Method), 58 (40.3%) patients were recorded with LLD.
Conclusion: Based on the findings of this study, it can be concluded that the combined use of clinical and radiological methods provides added advantage and confidence to the surgeon for measuring leg length during THA and it surely helps the surgeon to select appropriate implants and to adjust final leg lengths without compromising the stability of the hip.

Keywords: Total hip arthroplasty, Limb length discrepancy, Intraoperative techniques.

Introduction

Total hip replacement, also called total hip arthroplasty (THA), is major surgery in orthopedics. It involves the replacement of damaged bone of femur head with prosthesis. The data regarding the total

patient with hip replacement surgery is every scanty however in USA about 2.5 million individuals (1.4 million women and 1.1 million men) are with total hip replacement with more patient in older age[1]. However, Secular trends indicated a substantial rise in younger ages[1].

Limb length discrepancy (LLD) is the difference between the lengths of both legs. The greater the difference the more effect on the quality of life and satisfaction after hip arthroplasty[2]. Patients with larger LLD has been showed a slower gait speed ($t = 6.527$; $p < 0.01$), a longer single support time ($t = -2.665$; $p = 0.01$), and shorter foot-off time ($t = -8.502$; $p < 0.01$)[3]. Postoperative leg length discrepancies larger than 5 mm relate to un-physiological gait kinematics within the first year after THA[4]. Furthermore, the LLD of greater than 9mm showed less improvement in WOMAC score, more use of shoe lift, residual hip pain and LLD awareness compared with the those less than 9mm[5].

To properly evaluate and predict the exact value of LLD, methods like clinical and radiological method are used. The clinical method is the distance between the anterior superior iliac spine (ASIS) while the radiological method include the distance between a line passing through the teardrop points medial to the acetabula in anteroposterior (AP) view of pelvis. In total, 329 THR patients (30%) was present an LLD clinically, although radiographic method revealed that only 36% of these patients had anatomical LLD[6]. In a study it was shown that by clinical method there were 21 (22%) lengthening and 16(17%) shortening of operated leg (total 62% LLD) with the radiological method measuring with a difference of 0.03cm from clinical method[7]. This cause the radiological prediction LLD of 36%[6].

Rationale: Restoring the hip biomechanics is the key goal of hip surgery. Also it is the important examination in musculoskeletal examination, but which method is best of the measurement of this discrepancy. Also there is less studies in available on comparison of the clinical and radiological measurement of LLD. There is no study in our hospital in last 5 years. Result of this study can be used to adopt one technique, which proves better, (clinical or radiological) of measurement of LLD to avoid miscalculation and to predict the exact difference between the length of two legs after total hip replacement surgery and LLD. Also the clinician will be able to use the accurate method of these in clinic for measurement of LLD in out department patient who present for any related symptoms.

Materials and Methods

Study design: Case descriptive study.

Setting: Department of Orthopedics, Hayatabad Medical Complex, Peshawar

Duration of study: 18 March 2021 to 18 August 2021

Sample size: By the radiological method the frequency of LLD is 36% and 30% by clinical method, so taking the 30% of clinical method[1], with 95% confidence interval and 7.5% margin of error the sample size was 144 patients of THA.

.Sampling technique: Non-probability consecutive sampling

Inclusion Criteria

- Those patients who undergoes total hip replacement surgery in our orthopedic department in which femoral head is removed and replace it with artificial one, obvious on X-ray.
- THA done at least 2 weeks before.
- Age 30 to 65 years.
- Both gender.
- ASA status I or II
- Welling for consent and follow-up.

Exclusion Criteria

- All patient who have congenital limb related disorder which effect the length of the limb including those effected by polio.
- All those who have previous any type of orthopedic surgery in legs.
- Previous known fractures of the lower limb

The above exclusion criteria were followed to avoid bias in the study.

Data Collection Procedure: Permission from the hospital ethical committee was taken. Patient presented to orthopedic department for follow up after THA in our unit was evaluated. Patients were included in the study according to inclusion and exclusion criteria. Informed consent (Annexure I) was taken for each participant after explaining all the benefits and harms related with the study. Confidentiality was maintained throughout the study. Patient data like age, sex duration since surgery, occupations (labor, jobless) was noted. All patient's limb length was measure by both methods, clinical and radiological. The difference of more than 2 cm as per operational definition was noted as presence of LLD. All the radiograph (AP views) was taken by the same radiologist with the researcher (myself) accompany. Data was collected by the by the researcher himself and was noted in questionnaire attached (Proforma-1).

Data Analysis: Data was analysis with the help of statistical software name (IBM-SPSS.Version.23). Descriptive statistics was used to present the mean and standard deviation of continuous variables like age, duration since surgery, operated limb length (both clinical and radiological) and non-operated limb length (both clinical and radiological). Frequency and percentage were used to present the categorical variables like gender presence of LLD and lengthen operated leg (when measurement of operated leg > non-operated leg) and shortened operated leg (when measurement of operated leg < non-operated leg). Both the method (clinical and radiological) was compared for frequency of LLD (yes/no). After comparison chi square test was applied.

Results

This study was carried out on 144 patients at the Department of Orthopedic Surgery, MTI-HMC, Peshawar. Following are the results of this study: -Mean and SDs for age was 45.36+9.033. Mean and SDs for duration since surgery was 2.58+0.621. Mean and SDs for operated limb length (clinical method) was 80.167+4.690. Mean and SDs for non-operated limb length was 79.22+4.94. Mean and SDs for operated limb length (radiological method) was 80.15+4.700. Mean and SDs for non-operated limb length (radiological method) was 78.73+5.107. (Table No. 1). 28 (19.4%) patients were below thirty-five years age, while 116 (80.6%) patients were having above thirty-five years age. (Table No. 2). 85 (59.0%) patients were male while 59 (41.0%) patients were female. (Table No. 3). As per frequencies and percentages for presence of LLD (Clinical Method), 40 (27.8%) patients were recorded with LLD. (Table No. 4). As per frequencies and percentages for presence of LLD (Radiological Method), 58 (40.3%) patients were recorded with LLD. (Table No. 5).

Tables No. 1: Descriptive Statistics

Numerical Values	Minimum	Maximum	Mean	Std. Deviation
Age (Years)	30	60	45.36	9.033
Duration since surgery (Weeks)	2	4	2.58	.621
Operated Limb Length (Clinical)	74.0	89.0	80.167	4.6904
Non-Operated Limb Length (Clinical)	70.0	89.0	79.222	4.9493
Operated Limb Length (Rad)	73.00	89.00	80.1597	4.70034
Non-Operated Limb Length (Rad)	70.0	89.0	78.736	5.1072

Table No. 2: Age Wise Distribution

Age Groups	Frequency	Percent
< 35 Years	28	19.4
> 35 Years	116	80.6
Total	144	100.0

Table No. 3: Gender Wise Distribution

Gender Groups	Frequency	Percent
Male	85	59.0
Female	59	41.0
Total	144	100.0

Table No. 4: Frequencies and Percentages for Presence of LLD (Clinical Method)

Presence of LLD	Frequency	Percent
Yes	40	27.8
No	104	72.2
Total	144	100.0

Table No. 5: Frequencies and Percentages for Presence of LLD (Radiological Method)

Presence of LLD	Frequency	Percent
Yes	58	40.3
No	86	59.7
Total	144	100.0

Discussion

Total hip replacement, also called total hip arthroplasty (THA), is major surgery in orthopedics. It involves the replacement of damaged bone of femur head with prosthesis. The data regarding the total patient with hip replacement surgery is every scanty however in USA about 2.5 million individuals (1.4 million women and 1.1 million men) are with total hip replacement with more patient in older age[1]. However, Secular trends indicated a substantial rise in younger ages[1].

Limb length discrepancy (LLD) is the difference between the lengths of both legs. The greater the difference the more effect on the quality of life and satisfaction after hip arthroplasty[2]. Patients with larger LLD has been showed a slower gait speed ($t = 6.527$; $p < 0.01$), a longer single support time ($t = -2.665$; $p = 0.01$), and shorter foot-off time ($t = -8.502$; $p < 0.01$)[3]. Postoperative leg length discrepancies larger than 5 mm relate to un-physiological gait kinematics within the first year after THA[4]. Furthermore, the LLD of greater than 9mm showed less improvement in WOMAC score, more use of shoe lift, residual hip pain and LLD awareness compared with the those less than 9mm[5].
Findings of this study suggest, mean and SDs for age was 45.36+9.033. Mean and SDs for duration since surgery was 2.58+0.621. Mean and SDs for operated limb length (clinical method) was 80.167+4.690. Mean and SDs for non-operated limb length was 79.22+4.94. Mean and SDs for operated limb length (radiological method) was 80.15+4.700. Mean and SDs for non-operated limb length (radiological method) was 78.73+5.107. (Table No. 1). 28 (19.4%) patients were below thirty-five years age, while 116 (80.6%) patients were having above thirty-five years age. (Table No. 2). 85 (59.0%) patients were male while 59 (41.0%) patients were female. (Table No. 3). As per frequencies and percentages for presence of LLD (Clinical Method), 40 (27.8%) patients were recorded with LLD. (Table No. 4). As per frequencies and percentages for presence of LLD (Radiological Method), 58 (40.3%) patients were recorded with LLD. (Table No. 5).

To properly evaluate and predict the exact value of LLD, methods like clinical and radiological method are used. The clinical method is the distance between the anterior superior iliac spine (ASIS) while the radiological method includes the distance between a line passing through the teardrop points medial to the acetabula in anteroposterior (AP) view of pelvis. In total, 329 THR patients (30%) was present an LLD clinically, although radiographic method revealed that only 36% of these patients had anatomical LLD[6]. In a study it was shown that by clinical method there were 21 (22%) lengthening and 16(17%) shortening of operated leg (total 62% LLD) with the radiological method measuring with a difference of 0.03cm from clinical method[7]. This cause the radiological prediction LLD of

36%[6] which is almost in agreement to the findings of this study where, as per frequencies and percentages for presence of LLD (Clinical Method), 40 (27.8%) patients were recorded with LLD. (Table No. 4). As per frequencies and percentages for presence of LLD (Radiological Method), 58 (40.3%) patients were recorded with LLD. (Table No. 5).

Restoration of LLD is an important goal of any hip arthroplasty procedure as it affects functional outcome. According to Jasty et al [7] preoperative LLD of more than 2 cm presents social problems. They also allude that if shortening occurred in adult life, lengthening of more than 2 cm may be attempted. LLD has been perceived by 6 %–32 % [8] of patients and universally perceived when shortening exceeds 10 mm and lengthening 6 mm [9]. Edeen et al [10] allude that 32 % of patients in their series were aware of LLD with an average LLD of 15 mm which as compared to the findings of this study where, mean and SDs for duration since surgery was 2.58+0.621. Mean and SDs for operated limb length (clinical method) was 80.167+4.690. Mean and SDs for non-operated limb length was 79.22+4.94. Mean and SDs for operated limb length (radiological method) was 80.15+4.700. Mean and SDs for non-operated limb length (radiological method) was 78.73+5.107. (Table No. 1).

In another study by Knoyves and Bannister [11], 33 % of patients perceived lengthening and 18 % of patients had worst Oxford Hip Score (OHS) who perceived true lengthening at the end of 12 months after THA. Wylde et al [12] also concluded that patients with LLD had significantly poorer OHS and limped more frequently. In contrast to all these studies, Clark [13], concluded that radiological lengthening up to 35 mm and shortening up to 21 mm during THA do not correlate with functional outcome of the patients (the authors used OHS and Harris Hip Scoring outcomes). However, the lack of correlation between LLD and functional outcome by using such surgeon based and generic tool, which lacks sensitivity and specificity of other disease-specific or joint-specific questionnaires has been well criticized [14]. However, in this study, mean and SDs for age was 45.36+9.033. Mean and SDs for duration since surgery was 2.58+0.621.

Mean and SDs for operated limb length (clinical method) was 80.167+4.690. Mean and SDs for non-operated limb length was 79.22+4.94. Mean and SDs for operated limb length (radiological method) was 80.15+4.700. Mean and SDs for non-operated limb length (radiological method) was 78.73+5.107. (Table No. 1). 28 (19.4%) patients were below thirty-five years age, while 116 (80.6%) patients were having above thirty-five years age. (Table No. 2). 85 (59.0%) patients were male while 59 (41.0%) patients were female. (Table No. 3). As per frequencies and percentages for presence of LLD (Clinical Method), 40 (27.8%) patients were recorded with LLD. (Table No. 4). As per frequencies and percentages for presence of LLD (Radiological Method), 58 (40.3%) patients were recorded with LLD. (Table No. 5).

Various techniques have been described in the literature, which aims to avoid any LLD following THA. Preoperative templating seems an unreliable option as a study by Woolson et al [15] after reviewing 408 THA cases done by using templating and a calliper device to overcome LLD, concluded that their technique is more accurate for patients with small preoperative LLD.

In the literature, the mean postoperative LLD varies from 1 to 17 mm [16, 17]. Love and Wright [7] reported 18 % incidence of LLD of greater than 15 mm after THA. Turula et al [18] found a mean LLD of 8.7 mm in unilateral and 11.5 mm in bilateral THA. In prior reports, in which no intraoperative measurements were performed by using any technique, the mean clinical and radiological LLD after THA was more than 5 mm [8, 18]. These findings are somehow in agreement to the results of this study where, mean and SDs for operated limb length (clinical method) was 80.167+4.690. Mean and SDs for non-operated limb length was 79.22+4.94. Mean and SDs for operated limb length (radiological method) was 80.15+4.700. Mean and SDs for non-operated limb length (radiological method) was 78.73+5.107.

Conclusion

Based on the findings of this study, it can be concluded that the combined use of clinical and radiological methods provides added advantage and confidence to the surgeon for measuring leg length during THA and it surely helps the surgeon to select appropriate implants and to adjust final leg lengths without compromising the stability of the hip.

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