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LEG LENGTH DISCREPENCY EQUALISATION WITH TOTAL HIP REPLACEMENT IN FRACTURE NECK OF THE FEMUR

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ABSTRACT

Background: The leg length discrepancy in neglected fracture neck of the femur is a vital problem in active patients. The equalization of this discrepancy is important in total hip replacement, so we decide to do our study about such an important subject. **Objectives:** To equalize of the leg length discrepancy with total hip replacement in neglected fracture neck of the femur. **Methods:** This is a prospective observational study of among neglected fracture neck of the femur and leg length discrepancy. The study conducted from October 2024 to December 2025, depending on careful history and physical examination, leg length measurements and radiography of the pelvis at Mosul city, Al Salam Teaching Hospital, Republic of Iraq. The study included traumatized patients who aged 50 years and above, with fracture neck of femur for more than 3 weeks and patients with shortening above greater trochanter, while patients who aged less than 50 years having fracture neck of femur less than 3 weeks, shortening above or below greater trochanter and those with open injuries were excluded from the study. **Results:** The study includes 26 patients who had fracture neck of femur with LLD (shortening) confirmed by clinical and radiographical methods and treated by THA. The number of males was 12 (46.2%) while the number of females was 14 (53.8%). 63.1 years (50-85 years). The medium of fracture duration was 7 month (25 days to 10 years).16 patients (61.5%) had equalization of leg length discrepancy, 8 patients (30.8%) had incomplete correction (shortening), and 2 patients (7.7%) had leg over lengthening in comparison to other side. There is a significant equalization of leg length discrepancy after surgery with the mean of real measurements increase from (83.5± 5cm) before surgery to (85.57±5.2 cm) on last follow up measurements while the difference in mean value between measurements before and after surgery is (2.07 cm) with the corresponding p value (0.021). **Conclusion:** Leg length discrepancy is common in neglected fracture neck of the femur. The equalization of this discrepancy is significantly obtained with total hip replacement using direct clinical method (tape measure) of leg length measurement.

KEYWORDS: Bone, Difference, Equalize, Fracture, Lower limbs, Replace.

1. INTRODUCTION

Fracture of the femoral neck is a serious orthopedic injury, especially in the elderly, and it is linked with considerable morbidity, functional restriction, and increased mortality.[1] Surgical management remains the main approach of treatment, with total hip replacement being widely accepted for active patients and those with displaced intracapsular fractures because it provides better functional outcomes and reduces the need for revision surgery when compared to internal fixation or hemiarthroplasty.[2]

One of the most difficult and clinically important consequences of total hip replacement is postoperative leg length disparity.[3] Even minor limb length differences can cause patient discontent, gait disruption, lower back discomfort, pelvic obliquity, nerve palsy, and an increased chance of dislocation.[4] Accurate leg length restoration is especially challenging in the context of a femoral fracture neck because of the removal of typical anatomical markers, pre-existing limb length discrepancy, muscular spasm, and intraoperative instability.[5]

Equalizing leg length following complete hip replacement necessitates thorough preoperative planning, accurate intraoperative evaluation, and proper implant location.[6] Several approaches have been documented for reducing leg length discrepancy, including templating, intraoperative measuring equipment, reference pins, navigation systems, and meticulous restoration of femoral offset and acetabular center of rotation.[7-8]

The aim of this study is to analyze the clinical and radiological results related with proper limb length restoration in patients receiving total hip replacement for femoral fracture neck, as well as the efficiency of leg length discrepancy equalization.

2. PATIENTS AND METHODS

This is a prospective observational study of among neglected fracture neck of the femur and leg length discrepancy. The study conducted from October 2024 to December 2025, depending on careful history and physical examination, leg length measurements and radiography of the pelvis at Mosul city, Al Salam Teaching Hospital, Republic of Iraq. The study included traumatized patients who aged 50 years and above, with fracture neck of femur for more than 3 weeks and patients with shortening above greater trochanter, while patients who aged less than 50 years having fracture neck of femur less than 3 weeks, shortening above or below greater trochanter and those with open injuries were excluded from the study.

Detailed history and clinical examination were taken and done, leg length discrepancy proved by clinical and radiographic methods (pain x-ray of pelvis). Preoperative measurement of the length of the lower extremities was calculated by tape measure including real and apparent length as standardized as possible. As a part of preoperative evaluation patients were examined with plain Radiography of the pelvis and hip joints. 23 cases of 26 operated upon in one stage with or without adductor tenotomy, and the remaining 3 cases operated on in two stage procedure (including adductor tenotomy and skeletal traction at distal femur for a period of 2-6 weeks with gradual increasing in the weight that may reach up to 15-16 Kg, checking clinically and by X-ray, then followed by total hip replacement procedure). The adductor tenotomy may lengthen the leg up to 2 cm. All patients operated upon under general anesthesia or spinal anesthesia with highly aseptic technique through the posterior approach (Moore's approach). After reduction the stability was assessed the LLD was assessed with flexion of both hips and knees with the leveling the feet. LLD equalization, shortening and lengthening will be obtained by total hip replacement through measurement of postoperative real and apparent lengthening. All patients were followed up by X-ray of the pelvis at day 1 of operation, received antibiotic, analgesia, low molecular weight heparin.

Physical therapy was initiated on the first postoperative day, then allowing partial weight bearing as tolerated. Patients were discharged from the hospital when they are independent and safe.

The information gathered was processed, categorized, and evaluated using relevant statistical significance tests. Statistical analysis was conducted using SPSS version 30.0 (SPSS Inc., Chicago, USA). Quantitative data were presented as mean ± standard deviation and medium (interquartile range). Qualitative data were presented as frequency and percentages. Chi square test was used for statistical testing of frequencies and percentages. Paired student t test was used to assess the significance of difference between pre and postoperative measurements (real and apparent measurements). A p value of <0.05 was considered statistically significant.

3. RESULTS

The study includes 26 patients who had fracture neck of femur with LLD (shortening) confirmed by clinical and radiographical methods and treated by THA. Among them 12 (46.2%) were males and 14 (53.8%) were females. As shown in (figure 1).

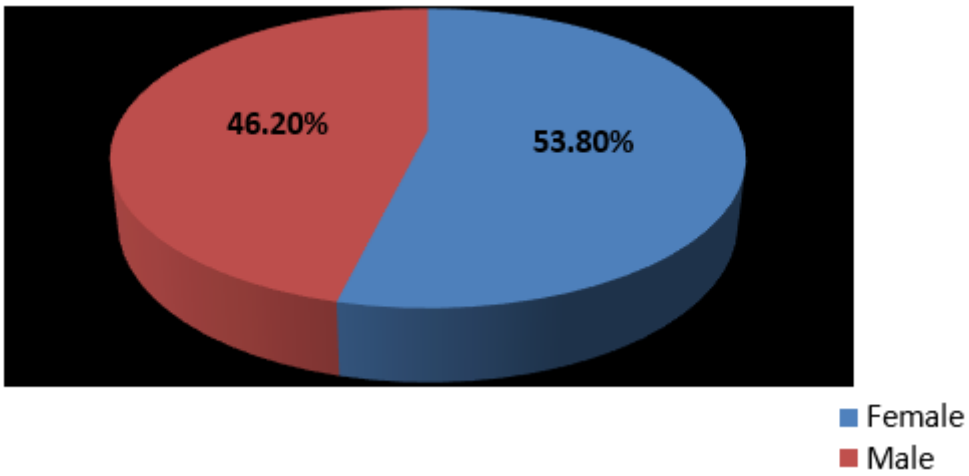

Figure 1: Male: Female ratio.

The age range of patients at the time of the operation is (50-85) years with mean age (63.1 years ±10.9). Table 1 shows the mean ages of the study patients according to their gender.

Table 1: Mean age of the study group distributed by gender.

Gender	Number (NO.%)	Age (year) Mean ± SD
Male	12 (46.2%)	56.8±5.7
Female	14 (53.8%)	68.4±11.4
Total	26 (100%)	63.1±10.9

Table 2 shows distribution of the study patients according to their type of fracture. It's evident that 11 (42.3%) patients had transcervical fracture followed by basal fracture and subcapital in 9 (34.6%) and 6 (23.1%) respectively.

Table 2: Types of fracture neck of femur.

Types of fracture	NO.	%
Transcervical	11	42.3%
Basal	9	34.6%
Subcapital	6	23.1%
Total	26	100%

Table 3 shows trivial injury of the hip was commonest cause of fracture neck of the femur included in this study. And the most common cause of fracture neck in our patients 17 (65.4%) was fall on the ground, 13 of them was female and 4 was male.

Table 3: Pattern of injury of fracture neck of femur.

Pattern of injury	Number	Percentage
Fall on the ground	17	65.4%
Road traffic accident RTA	6	23.1%
Fall from height FFH	3	11.5%
Total	26	100%

The study depended only on the real length measurement using tape measure to obtain the results, of 26 patients, 17 had preoperative shortening in the left side and 9 patients in the right side as shown in table 4.

Table 4: Preoperative shortening in the left and right side.

Case	Right real length (cm)	Left real length (cm)	Shortening (cm)
1	88	85	3
2	91	88.5	2.5
3	96	93	3
4	82	79	3
5	78	77	1
6	83	81	2
7	82	80	2
8	83	80	3
9	82	81	1
10	78	76	2
11	88	85	3
12	90	87	3
13	82	80	2
14	83	81	2
15	86	84	2
16	83	82.5	2
17	83	81	2
18	93	96	3
19	92	95	3
20	90	91	1
21	82	85	3

22	84	87	3
23	77	79	2
24	80	81	1
25	83	86	3
26	91	92	1

Preoperative radiological finding at presentation in our study show either non united fracture neck of femur with LLD (12 patients), or associated with avascular necrosis of the femoral head (13 patients), or with other events as shown with table 5.

Table 5: Preoperative radiological finding at presentation.

Radiological finding	Number	%
Fracture NF+AVN	13	50%
Fracture NF+(non-union)	12	46.2%
Fracture NF+ Austin Moore	1	3.8%
Total	26	100%

The preoperative management of the real length and postoperative evaluation of correction of LLD with postoperative incomplete correction (shortening) and lengthening of each case on either side will be shown on table 6.

Table 6: Preoperative LLD and postoperative evaluation.

Case	Side	Preoperative shortening	Correction	Postoperative shortening	Postoperative lengthening
1	LT	3	2cm	1cm	
2	LT	2.5	2cm	0.5cm	
3	LT	3	2cm	1cm	
4	LT	3	2cm	1cm	
5	LT	1	1cm		
6	LT	2	2cm		
7	LT	2	2cm		
8	LT	3	2.5cm	0.5cm	
9	LT	1	1cm		
10	LT	2	2cm		
11	LT	3	3cm		
12	LT	3	3cm		
13	LT	2	2cm		
14	LT	2	3cm		1cm
15	LT	2	2cm		
16	LT	2	2cm		
17	LT	2	2cm		
18	RT	3	3cm		
19	RT	3	2cm	1cm	
20	RT	1	1cm		
21	RT	3	2cm	1cm	
22	RT	3	2cm	1cm	
23	RT	2	2cm		
24	RT	1	1cm		
25	RT	3	3cm		
26	RT	1	2cm		1cm

Among 26 patients have fracture neck of femur with LLD (shortening) treated with either cemented or cementless total hip replacement by measuring the pre and postoperative real length using tape measure as follow and shown in table 7.

Table 7: Pre &post operative discrepancy for study population.

	Shortening		Lengthening		Equalization
	Pre-operative	Post – operative	Pre – operative	Post – operative	
Total	26	8	0	2	16
	100%	30.8%	0.0%	7.7%	61.5%

Table 8 shows significant equalization of LLD after surgery. The mean of real measurement increases from (83±5cm) before surgery to (85.57±5.2cm) on last follow up measurements, and the aim in our study to reach the mean of the normal side (85.78±5.3cm), while the difference in mean value between measurement before and after surgery are (2.07 cm) with the corresponding p value.

Table 8: Pre and post operative mean measurement and difference among study group (Number=26).

Type of measurement	Measurement (mean ±SD)			P .value
	Preoperative	Postoperative	Difference	
Real/right side No.=9	85.78±5.8	87.78±6	2	0.0365
Real/left side No.=17	82.32±4.3	84.41±4.5	2.1	0.001
Total No.=26	83.5±5	85.57±5.2	2.07	0.020

Table 3.9 shows postoperative complications of the study patients. Posterior dislocation was occurred in one patient the same for foot drop (sciatic nerve injury), both occur due to leg lengthening for more than 2cm length.

Table 9: Postoperative complications.

Postoperative Complications	No.	%
Dislocation	1	3.8%
Sciatic nerve injury	1	3.8%

4. DISCUSSION

The study found females were more likely to do total hip replacement. Moreover, the study found male having lower mean of ages than females. Maradit et al[9] and Patel et al[10] showed similar findings. This might due to the fact that females have a higher prevalence of hip arthritis, osteoarthritis-related disability, osteoporosis, and potentially different activity levels or biological factors, leading to more women needing the hip replacement surgery at an advanced age.

The study found patients with transcervical fracture are the commonest cause for THR followed by basal fracture and subcapital. As THR is generally indicated for displaced intracapsular fractures to avoid high rates of non-union and avascular necrosis (AVN) associated with internal fixation.[11] As Transcervical Fractures occur across the middle part of the femoral neck associated with high risk of vascular compromise leading to AVN. This runs with Szymski et al[12] and Ohana et al studies' results.

Fall on the ground was commonest cause of fracture according to the study results, which usually predisposed by osteoarthritis, which parallel to Kumar et al study results.[13]

Among patients who underwent total hip replacement, the majority (61.5%) achieved postoperative correction of leg length discrepancy (LLD) with successful equalization. The remaining patients had incomplete correction, resulting in either residual shortening or over-lengthening compared with the contralateral side. The mean postoperative lengthening was 2.07 cm. Rasheed et al[15] found that the mean postoperative LLD was 7.25 mm (±9.46 mm), and ~88.6% of patients had LLD within ±10 mm. Furthermore, El Bitar et al found that mean postoperative LLDs of 1.8 to 2.7 mm.[16]

In the current study, one patient (3.8%) sustained postoperative posterior hip dislocation, and one developed foot drop. In published meta-analyses of primary total hip arthroplasty show hip dislocation rates of roughly 2.1-2.6%.[17] Indicating that the observed dislocation rate falls within the stated range. Additionally, foot drop caused by sciatic nerve damage is a particularly uncommon complication after THA, with documented rates of ~0.3-0.44% in major cohort studies.[18-19] Our small sample size suggests that its prevalence may be greater than average, but should be considered cautiously.

The limitations of the current study. First, the results might not be as applicable to other groups because of the limited sample size. Second, the study was conducted in a single hospital setting, which would have affected the results' external validity.

5. CONCLUSIONS AND RECOMMENDATIONS

Leg length discrepancy is common in neglected fracture neck of the femur. Equalization of the leg length discrepancy (shortening) is significantly obtained with total hip replacement using direct clinical method (tape measure) as screening tool for measurement of leg length discrepancy. Postoperative foot drop (sciatic nerve injury) may result from leg lengthening for more than 2 cm length. The study recommend follow up the guidelines for early treatment of the fracture neck of the femur as early as possible to decrease LLD.

Conflict of intertest

The authors of this study report no conflicts of interest.

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