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Original Research Article

Evaluating functional outcome of patients with limb length discrepancy after total hip replacement: a clinical prospective study

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ABSTRACT

Background: Total hip arthroplasty is a reliable procedure for relief of pain in patients with avascular necrosis of head of femur and osteoarthritis of hip joint. In order to optimize function, hip mechanics should be restored to as near normal as possible. This includes restoration of limb length as well as femoral offset after total hip arthoplasty. There are two types of limb length discrepancies-apparent and true. Apparent Limb length discrepancy is due to pelvic obliquity. True limb length discrepancy is actual discrepancy caused due to under or oversized implants or due to contracture of tissues not allowing bones to achieve their anatomical position.
Methods: Surgeries were performed at Dayanand medical hospital. Preoperative templating was performed in all cases. Patients were examined before surgery and six months after surgery. In order to compare the outcomes of patients with different degrees of leg length discrepancy, patients were divided into four groups. The limb length discrepancy was measured both clinically and radiologically.
Results: Leg length discrepancies were there in postoperative patients. 3 have shortening of more than 5 mm, 8 have lengthening between 5-10 mm, 7 patients have lengthening more than 10 mm, 28 have discrepancy within 5mm. Functional outcome of patients was measured by using Harris hip score at a follow up of six months. In our series mean preoperative Harris hip score was 45.59 and mean Harris hip score at follow up was 89.70 (97–84), of which 52.2% graded as excellent and 47.8% as good.
Conclusions: In our study we found no correlation between leg length discrepancy and functional outcome following total hip arthroplasty was found.

Keywords: Functional outcome, Limb length discrepancy, Total hip replacement

INTRODUCTION

Total hip arthroplasty is a reliable procedure for relief of pain. In order to optimize function, hip mechanics should be restored to as near normal as possible. This includes restoration of limb length as well as femoral offset. There are two types of imb length discrepancies-apparent and true. Apparent Limb length discrepancy is due to pelvic obliquity. It occurs due to tight hip abductors and usually resolves within six months with abductor stretching. True limb length discrepancy reflects unequal bone length (e.g. due to bone loss, growth alteration, subsidence).[1] Discrepancy of leg length is common after arthroplasty of the hip, with lengthening being more noticeable to patients than shortening. Most patients with minor leg-length discrepancy after THA have few symptoms and the majority of patients with moderate leg-length discrepancy have readily manageable symptoms. However, a minority of patients, mostly those with marked Limb length discrepancy, may have substantial disability as a result of pain or functional impairment.[2] The incidence of LLD after primary total hip arthroplasty

has been reported to range from 1% to 27% and in the literature the LLD is reported to vary from 3 to 70 mm with a mean from 3 to 17 mm.[2] Discrepancies in limb leg have also been associated with alterations in gait, chronic low back pain and chronic hip pain.[1] Although leg length inequality after total hip arthroplasty cannot be eliminated, the problem can be minimized. There are a variety of important steps in the process, including physical examination, radiographic evaluation, preoperative templating and intraoperative confirmation of the preoperative plan. In this study, we addressed possible correlation between clinical and radiological leg-length assessment and the effect of postoperative Limb length discrepancy on walking ability, limping, pain and Harris Hip Score.

To assess the effects of limb length discrepancy on functional outcome of patients after total hip replacement.

METHODS

After taking permission from institutional ethical committee, this prospective study was conducted for a period of one and a half year from December 2015 to march 2017, on patients undergoing primary total hip arthroplasty at Dayanand Medical College and Hospital Ludhiana. Surgeries were performed by multiple surgeons at Dayanand medical college and hospital.

Preoperative templating was performed in all cases. Dedicated content report forms were used to collect preoperative information about patient history, clinical examination and surgical intervention. Harris hip score was calculated preoperatively for each patient. In order to compare the outcomes of patients with different degrees of leg length discrepancy, patients were divided into four groups; those with a LLD of -5 mm, those with LLD within -5 mm to +5 mm, those with LLD between +5 mm and +10 mm, those with an LLD greater than +10 mm.

In addition to clinical measurements of movement of the hip, the patient's perceptions of their comfort, mobility and quality of life were assessed by Harris hip score (HHS).[3] The limb length discrepancy was measured both clinically and radiologically. The data was collected in MS world excel and by using appropriate statistical test(chi-square) valid conclusion was drawn.

Inclusion criteria

Patients undergoing primary unilateral total hip arthroplasty

Exclusion criteria

Patients undergoing revision replacement, patients undergoing bilateral hip replacement, patients who had undergone Previous hip surgery. The patients who met the above-mentioned criteria were selected and their consent was taken for being a part of study. Functional outcome was evaluated according to Harris hip score which gives points to pain, support for walking, distance walked, limp, activities like wearing shoes and using stairs, public transportation, sitting, absence of deformities and range of motion.

Harris hip score section

Pain

None or ignores it (44), alight, occasional, no compromise in activity (40). Mild pain, no effect on average activities, rarely moderate pain with unusual activity, may take aspirin (30). Moderate pain, tolerable but makes concessions to pain. Some limitations of ordinary activity or work. May require occasional pain medication stronger than aspirin (20). Marked pain, serious limitation of activities (10). Totally disabled, crippled, pain in bed, bedridden (0).

Support

None (11), cane/Walking stick for long walks (7). Cane/Walking stick most of the time (5). one crutch (3), two Canes (2), two crutches or not able to walk (0).

Distance walked

Unlimited (11), six blocks (30 minutes) (8), two or three blocks (10 - 15 minutes) (5). Indoors only (2), bed and chair only (0).

Limp

None (11), slight (8), moderate (5), severe or unable to walk (0). Activities-shoes, socks Stairs, with ease (4), with difficulty (2), Unable to fit or tie in any manner (0)

Stairs

Normally without using a railing (4). Normally using a railing (2). In any manner (1). Unable to do stairs (0). Public transportation. Able to use transportation (bus) (1). Unable to use public transportation (bus) (0)

Sitting

Comfortably, ordinary chair for one hour (5). On a high chair for 30 minutes (3). Unable to sit comfortably on any chair (0)

Section 2

Absence of Deformity (All yes=4, Less than 4=0). Less than 30 degrees of fixed flexion I) Yes II) No. Less than 10 degrees of fixed internal rotation in extension I) Yes II) No. Less than 10 degrees of fixed adduction I) Yes II) No. Limb length discrepancy less than 3.2 cm (1.5 inches) I) Yes II) No.

Section 3

Range of Motion (*indicates normal) Flexion (*140°) _____ Abduction (*40°) _____ Adduction (*40°) _____ External Rotation (*40°) _____ Internal Rotation (*40°) _____

Range of motion scale

211°-300° (5), 1610-2100(4), 101°-160° (3), 61°-100° (2), 31°-60° (1), 0°-30° (0). Range of Motion Score _____, Total Harris Hip Score _____, Grading for the Harris Hip Score.

RESULTS

Total of 49 hips were operated, two patients were lost to follow up, one patient had revision surgery, therefore was excluded from study. Table 1 shows that total 46 patients, with age ranging from 23 years to 74 years. Mean age of patients operated was 48 years. Table 2 out of 46 patients, on radiological measurement 28 patients (60.9%) had operated leg within 5 mm of neutral. 7 patients (15.2%) had limb lengthening of more than 10 mm. 8 patients (17.4%) had lengthening between 5 mm to 10 mm. 3 patients (6.5%) had shortening of more than 5 mm. Mean limb length discrepancy with radiological measurement was 3.1 mm (standard deviation 6.6).

Table 3, In this series of 46 patients, the mean walking capacity after total hip arthroplasty was 39.02 minutes (15-60). We found that limb length discrepancy had no effect on walking capacity of patients. Table 4 shows out of 46 patients, 56.55% patients (n=26) reported no pain at follow up, 39.1 % (n=18) had slight pain and 2 patients (4.3%) had mild pain (p=0.365) Result is statistically insignificant. We observed that there was no correlation between limb length discrepancy and residual hip pain. Table 5, In 46 patients, at a follow up of six months, mean Harris hip score was 89.70 (84-97) with standard deviation of 3.1. Hence, patients had significant improvement in functional outcome after total hip arthroplasty. No correlation was found between postoperative limb length discrepancy and harris hip score.

Table 6 out of 46 patients, at follow up of six months, 52.2 % patients (n=24) reported excellent result. 47.8% patients (n=22) reported good result. No association was found between limb length discrepancy and final result of total hip. Table 7 out of 46 patients, 95.7 % patients (n=44) were satisfied with the results of surgery. 4.3% (n=2) reported fair satisfaction. None of the patients reported poor satisfaction. No correlation was found between limb length discrepancy and satisfaction of patients after six months of surgery (p=0.719). Result is statistically insignificant.

Table 1: Distribution of cases according to age.

Age group (in years)	No. of patients	%
18-30	7	15.2
30-40	9	19.6
41-50	11	23.9
51-60	7	15.2
More than 60	12	26.1
Total	46	100.0

Table 2: Distribution according to limb length discrepancy.

Follow-up- radiologically (mm)	No. of patients	%
Less than -5	3	6.5
(-5)-(+5)	28	60.9
5-10.0	8	17.4
>10	7	15.2
Total	46	100.0

Table 3: Distribution according to walking with support.

		Support				Total
		Cane	Cane	None	None	
Radiologic LLD	Less than-5	1	33.3%	2	66.7%	3
	(-5)-(+5)	2	7.1%	26	92.9%	28
	5-10.0	1	12.5%	7	87.5%	8
	>10	2	28.6%	5	71.4%	7
Total		6	13.0%	40	87.0%	46

Table 4: Distribution of patients according to pain.

		Pain						Total	Chi-square value	P value
		Mild pain		Slight pain		No pain				
LLD	Less than-5	0	0.0%	1	33.3%	2	66.7%	3	6.546	0.365
	(-5)-(+5)	1	3.6%	8	28.6%	19	67.9%	28		
	5-10.0	1	12.5%	5	62.5%	2	25.0%	8		
	>10	0	0.0%	4	57.1%	3	42.9%	7		
Total		2	4.3%	18	39.1%	26	56.5%	46		

Table 5: Distribution according to follow up Harris hip score.

		N	Mean	Std. deviation	95% Confidence interval for mean		Min.	Max.
					Lower bound	Upper bound		
follow up-								
Harris	Less than							
		3	87.3	3.1	79.7	94.9	84.0	90.0
Hip	-5							
Score								
	(-5)-(+5)	28	90.3	2.9	89.2	91.4	84.0	97.0
	+5-10.0	8	90.6	3.3	87.9	93.4	86.0	95.0
	>10	7	88.1	3.1	85.2	91.0	86.0	95.0
	Total	46	89.8	3.1	88.9	90.7	84.0	97.0

Table 6: Distribution according to result.

		Results				Total
		Excellent	Excellent	Good	Good	
Radiologic LLD	Less than-5	1	33.3%	2	66.7%	3
	(-5) -(+5)	18	64.3%	10	35.7%	28
	5-10.0	4	50.0%	4	50.0%	8
	>10	1	14.3%	6	85.7%	7
Total		24	52.2%	22	47.8%	46

Table 7: Distribution according to satisfaction of patients.

		Satisfaction				Total	Chi-square value	P value
		Fair		Satisfied				
Radiologic LLD	Less than 5	0	0.0%	3	100.0%	3	1.344	0.719
	(-5) –(-5)	2	7.1%	26	92.9%	28		
	5-10.0	0	0.0%	8	100.0%	8		
	>10	0	0.0%	7	100.0%	7		
Total		2	4.3%	44	95.7%	46		

DISCUSSION

In this study, 46 patients with age ranging from 23 years to 78 years with a mean age of 48 years were analysed. Whitehouse et al, in their study of 191 patients reported mean age of 72 years.[4] Plaass et al, in their series of 94 patients reported mean age of 68.5 years.[5] In our study, mean radiological limb length discrepancy was 3.1 mm ranging from -12 mm to +22 mm. 28 patients (60.9%) were restored within 5 mm of neutral. Two patients had shortening between 5 mm to 10 mm and only one patient had shortening of more than 10 mm. Seven cases (15.2%) were lengthened by more than 10 mm and 8 cases (17.4%) were lengthened by between 5 and 10 mm. In our study incidence of having a limb length discrepancy of more than 10 mm was 17.3 % compared to 21.5 % in a study conducted by whitehouse et al, Turula et al, in their study had limb length discrepancy of −20 to +15mm with a mean of 2.8 mm.[4,7] Ranawat in a series of 100 patients demonstrated a mean LLD of 3.4 mm (range −10 to 18 mm).[8] Konyves et al, in a study of 90 patients reported a mean lengthening of 3.5 mm (range -22 to +27).[9] In study conducted by Renkawitz et al, 23.5% patients had

lengthening of more than 10 mm and 18.5% patients had shortening of more than 5 mm.[10] Hence in our study mean limb length discrepancy was comparable to other studies.

In our study of 46 patients, 56.55% patients (n=26) reported no pain at follow up, 39.1% (n=18) had slight pain (no compromise in activities) and 2 patients (4.3%) had mild pain (may require aspirin). In literature there are various causes of pain after total hip arthroplasty like iliopsoas tendinitis, impingment, synovitis etc. In our study, we compared presence of limb length discrepancy with pain and found that there was no correlation between limb length discrepancy and residual pain.

Similarly, Beard et al, in their study used pain component of Harris hip score and found no correlation between limb length discrepancy and pain.[11] Functional outcome of patients was measured by using Harris hip score at a follow up of six months. In our series mean preoperative harris hip score was 45.59 and mean Harris hip score at follow up was 89.70 (97–84), of which 52.2% graded as excellent and 47.8 % as good.

In a similar study, chiu et al, observed a mean Harris hip score of 88.9 at a follow up of six months after total hip arthroplasty.[12] In our study we found no correlation between leg length discrepancy and functional outcome following total hip arthroplasty.

Similarly, white and Dougall et al and Fujimaki et al, in their studies found no correlation between radiological limb length discrepancy and functional outcome in terms of Harris hip score.[13,14] In our study, 95.7% patients were satisfied with total hip replacement upon evaluation after a follow up of six months.

None of our patients reported poor satisfaction. No correlation was found between limb length discrepancy and satisfaction of patients. In a similar study White and dougall found that limb length discrepancy has no effect on satisfaction of patients.[12]

Pain assessment is subjective. Limited range of activities assessed.

CONCLUSION

Limb length discrepancy is one of the important parameters in assessment of results after total hip arthroplasty. In our study, we have concluded that patients who had limb length discrepancy of more than 10 mm perceived inequality in their legs but statistically it had no influence on Harris hip score and satisfaction of patients at a follow up of six months. Therefore, Patients should be counseled pre-operatively about possible leg length differences and associated symptoms.

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