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QUALITY OF LIFE AND FUNCTIONAL OUTCOME AFTER UNCEMENTED TOTAL HIP REPLACEMENT- A PROSPECTIVE CLINICAL TRIAL

Dr. Suneet Rajshekhar,[1] Dr. M. Rajasekhar,[2*] Dr. V. S. Baghel,[3] Dr. Abhishek Sachdev,[4] Dr. Priyadershini Rangari[5]

[1,2,3,4]M. S. (Orthopaedics), Consultant, Suraaj Orthopaedic Hospital, Bhilai, Durg (Chhattisgarh)

[5]M.D.S (Oral Medicine and Radiology), Assistant Professor, Department of Dentistry, Sri Shankaracharya Medical College, Bhilai, Durg (Chhattisgarh)

Conflicts of Interest: Nil

Corresponding author: Dr. M. Rajasekhar

Abstract:

Background: Total hip arthroplasty (THA) is a most commonly performed adult reconstructive hip procedure to reduce pain and improve function in patients with different forms of osteoarthritis (OA), trauma, infection and other causes of the hip and almost one million are being implanted annually worldwide, and projected to grow at a faster rate

Objectives: This prospective study was conducted to evaluate the efficacy of uncemented prosthesis for total hip replacement and to study its functional outcome and effects on quality of life.

Methods: This was a prospective clinical trial performed on 20 patients were having femoral neck fracture in either leg of 40-65 year of age range in two years from June 2016 to June 2018. Uncemented Hip Prosthesis was surgically inserted by standard posterior approach to hip. Regular follow-up of all cases was done at 2 weeks, 3 months and 1 year. At each follow-up, patients were evaluated clinically using the Harris hip score and radiologically with appropriate X-rays.

Result: Harris hip score was rated as – excellent: 90-100 in 9 (45%); good: 80-89 in 6 (30%); fair: 70-79 in 3 (15%) and poor: <70 in 2 (10%) patients. All the results showed statistically significant. On average total hospital stay was 5-10 days. Functional outcome found to be statistically significant with very few and manageable complications.

Conclusion: Total hip arthroplasty is a relatively safe and sure procedure in the hands of the experienced surgeon with uncemented hip prosthesis which provided total relief, adequate stability, remarkable range of motion in severely painful, refractory hips, if performed taking into consideration pre-operation selection of patients, intra operative soft tissue balancing, correct alignment of prosthesis and postoperative proper rehabilitation of patients..

Keywords: Functional Outcome, Harris Hip Score, Total Hip Arthroplasty (THA), Uncemented Hip Prosthesis.

Introduction

In humans, the hip has the great responsibility of transmitting the ground reaction against the body weight while at the same time presenting mobility.[1] The number of hip fractures will increase enormously in the decades to come as will the cost of treatment of these patients do. Hip fractures, therefore, represent an enormous socio-economic and medical problem and challenge (orthopaedic) surgeons an anesthetist to find the cheapest and most effective way to treat them. To mechanically accommodate this postural change, the head and neck of femur undergo angulations and rotation at the base. Any affection of the hip is of much concern to the patient since it affects locomotion from the very beginning.[2,3] The patient mostly tries to accommodate the disabilities following such pathology as far as practicable by various compensatory mechanisms. There are various conditions which affect the normal functioning of hip and results in long-term morbidity. So for correction, various treatment modalities have been used. Out of them, here, we focused on total hip replacement (THR).

Hemiarthroplasty has been widely used for the treatment of displaced intracapsular fractures of the femoral neck in elderly patients because of the high incidence of non-union and avascular necrosis following open reduction and internal fixation (ORIF).[4] Inevitably, some hemiarthroplasty fail and require revision for pain, impaired walking ability, leg length discrepancy or a combination of those. The rate of re-operation varies from 5 to 24% among patients treated by hemiarthroplasty.[5,6] Total hip arthroplasty is a surgical procedure performed to reduce pain and improve function in fracture of the femoral neck or hip. However, not all patients achieve the same level of functional improvement

after THA. In the previous decade, many studies have been published investigating the predictors of functional outcome after THA.[7-11]

Robot-assisted THA is further elaborated computer assisted orthopedic surgery where a hip prosthesis is designed to fill the medullary canal is custom-made through three-dimensional visualization of computed tomography-image data, and then the shape of the medullary canal is carved using a high-speed burr or rasp. Subsequently, the designed implant is inserted to accurately fit the medullary canal with a computed tomography-based navigation system. However, this technique is used sparingly because filling the medullary canal to the maximum degree does not guarantee favorable results, and it is still in the trial stage due to the lack of long-term data, cost-related problems and insufficient studies to clarify safety.[12]

The treatment of displaced intracapsular fractures in the patient, who are mobile, socially independent and otherwise fit, is controversial. There are very few cohort studies to depict the functional outcome for total hip replacement by uncemented prosthesis.[13]

We genuinely found better results of function like mobility and pain relief after 2 weeks, 3 months, 6 months and one year follow up.

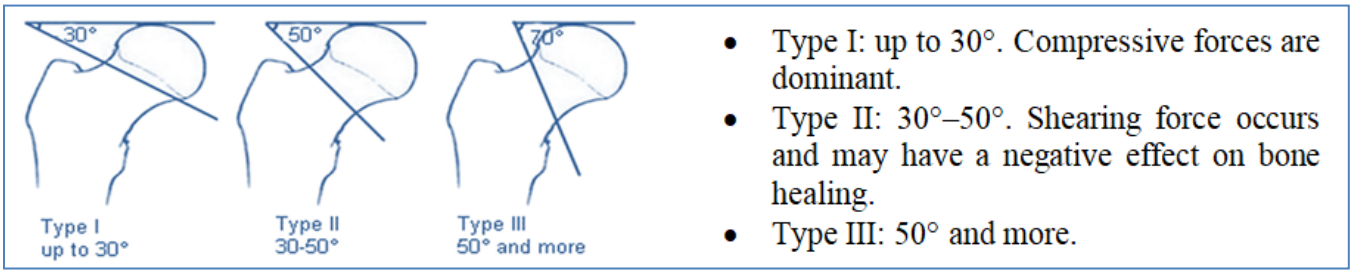
This prospective study was conducted to evaluate the efficacy of uncemented prosthesis for total hip replacement and to study its functional outcome and effects on quality of life.

MATERIAL AND METHODS

This was a prospective clinical trial performed on 20 patients of 40-65 year of age range in two years from June 2016 to June 2018 in Suraaj Orthopaedic Hospital, Bhilai, Chhattisgarh. All the patients visited to our OPD were having femoral neck fracture in either leg, were taken into urgent consideration. Patients were admitted and consent was taken from each before initiation of the treatment.

Patients with dementia, non ambulatory, rheumatoid arthritis, osteoporosis, pathologic fracture, and additional acute lower extremity fractures were excluded from the study.

Pouwels Classification (Shen 2016)[20]



- Type I: up to 30°. Compressive forces are dominant.
- Type II: 30°–50°. Shearing force occurs and may have a negative effect on bone healing.
- Type III: 50° and more.

Surgical procedures and Prosthesis:

- Antibiotic prophylaxis against infection was given to all patients (Ceftriaoxone sulbactum 1.5gm 12 hourly intravenously before and after surgery for 3-5 days).

- A direct standard posterior approach to the hip was used under Spinal anesthesia for all of the patients.

Femoral Neck Resection:

- The angle of resection should be 45°. The neck resection guide should be used to determine the level of the femoral neck resection in conjunction with pre-operative templating. If the resection is too high, it may result in a varus positioned stem.

Proximal Cancellous Bone Compaction:

- It is important to select a point of entry posterolaterally to the Piriformis Fossa to avoid varus positioning. To prevent under-sizing or varus positioning, the greater trochanter may be prepared with an osteotome to allow better insertion of the broaches. Curette to indicate the direction of the canal and the bone tamp to compact the cancellous bone were used proximally, which helps in the bone preservation.

Femoral Canal Preparation

- Ensure that broaching is started postero-laterally. The broach should run parallel to the posterior cortex following the natural anatomy of the femur. Begin with the smallest broach attached to the broach handle and increase the size of broach sequentially until longitudinal and rotational stability is achieved, broaching should then be stopped. The

version will be determined by the natural version of the femur.

- Calcar Reaming was obtained by broaching by postero-laterally with increasing in size following the natural anatomy of the femur. Broaching was stopped when longitudinal and rotational stability was achieved.

- Trial reduction was done by last broach in place till the calcar mill to achieve a flat resection surface which allows an optimized fit of the collar on the calcar.

Femoral Component Insertion:

- After reducing the hip by assessing adjustments, femoral component was inserted with stability through a full range of motion.

Femoral Head Impaction:

- Once the uncemented prosthetic stem is fully seated, cancellous bone from the resected femoral head was added around the proximal part of the stem using the bone tamp to seal the femoral canal and to reduce the time for osteointegration which provides definitive stability. A final trial reduction was carried out to confirm joint stability and range of motion. Prosthesis 12/14 head was used by lightly tapping it using the head impactor.

- Subcutaneous low molecular weight heparin (40 mg once daily) starting on the day of surgery was given to all patients for 14 days in addition to antiembolism stockings as prophylaxis against deep vein thrombosis (DVT).

- Early mobilization was used both to prevent DVT and to hasten the functional recovery. Full weight-bearing was allowed from the day after surgery with walker onwards in all cases. They used walker for first three weeks and physiotherapy was performed in first week.

Regular follow-up of all cases was done at 2 weeks, 3 months and 1 year. At each follow-up, patients were evaluated clinically using the Harris hip score and radiologically with appropriate X-rays. Harris hip score was used to evaluate the functional outcome in the present study. Results were rated as– excellent: 90-100; good: 80-89; fair: 70-79; and poor: < 70. Data was analyzed at the end of study.

All the data were analyzed using descriptive statistics. The statistical software used was SPSS 20.0. The results were considered significant at a two-tailed level of 0.05.

RESULTS

This was a prospective study performed on 20 patients of femoral neck or hip fracture. In this context age range was 40-65 years and the average age of the patients was 56.06 years. Patients were divided into two age groups i.e. Majority of the patients were between 51-65 years. Male preponderance was found to be higher i.e. 12(60%) in our study as shown in Table 1.

According to Table 2, the right sided hip was fractured in 11(55%) patients and left sided hip fracture was seen in 9(45%) patients of our series. Right side femoral fracture was most prevalent. Depending on the anteroposterior and lateral oblique radiographic view available they were grouped into Type I, II and III based on Pouwels Classification[20] of femoral neck or hip fracture. In our series 7(35%) patients had Type I fracture, 8(40%) patient had Type II fracture and 5(25%) patients had Type III fracture. Most of the femoral fracture were caused by road traffic accident 10 (50%), trivial fall 6 (30%) and 4 (20%) patients had fall from height.

Associated injuries were observed with the femoral neck or hip fracture. 2 (10%) patients had Colle's fracture, 6 (30%) patients had abrasion, 11 (55%) patients had lacerated wound and 5 (25%) patients were having old fracture on opposite hip. Some surgical or medical conditions were associated with some patients. Hypertension in 6 (30%) patients, diabetes mellitus in 7 (35%) patients, chronic obstructive pulmonary disorder (COPD) as seen in 3 (15%) patients, Cerebro-vascular accident (CVA) was seen in one patients, anaemia in 3 patients and ischemic heart disease (IHD) in one patient. Hypertension and diabetes mellitus were found to be most prevalent systemic disease associated with the femoral fracture patients. All above findings were described in Table 3.

In our study hospital stay ranges from 1-10 days with a mean average of 6.2 days. We operated all patients within three days. Those patients who had no operative or post operative complications were discharged after reduction of pain and swelling within a week. Other patients were discharged till 10th day. On average total hospital stay was 5-10 days. All these findings were described in Table 4.

2 patients had peri prosthetic fracture after one year, 2 patients had malalignment after 3 months and one year, 1 patients had superficial wound infection in second week which resolved afterwards, 2 patients had shortening of leg (1.5 cm) after a year, 2 patients had stiffness of hip after 15 days and continued only one patient till 3 months, 4 patients were suffering from bed sores, which were healed afterwards. Out of 20 patients 10 patients does not show any complication after 2 weeks and 15 patients were showed total healing till one year. According to Table 5, only one patient was died after 3 months by other complication. All the findings were statistically significant ($p<0.05$).

Table 6 describes functional outcome. 75% patients had varying degree of pain. Limping was absent in 8 patients and mild to moderate in 12 i.e. 60 % patients. Use of support was not needed in 6 patients, canes for long walk were used by 5 patients, One crutch was used by 9 patients and two canes were used by 5 patients.

14 patients could walk unlimitedly and 6 patients could walk only in their residence. 12 (60%) patients could sit comfortably in ordinary chair, 8 patients were unable to sit on chair. 12 patients could climb stairs without use of railing. 4 patients were able to climb stairs with the use of railing and 4 patients were unable to climb by any manner.

Harris hip score was used to evaluate the functional outcome in the present study. Results were rated as – excellent: 90-100 in 9 (45%); good: 80-89 in 6 (30%); fair: 70-79 in 3 (15%) and poor: <70 in 2 (10%) patients. All above findings were described in Table 7. All the results showed statistically significant.

Table 1: Demographic characteristics.

Age group in years	Gender		Total n(%)
	Male (n)	Female (n)	
40-50	5	3	8(40)
51-65	7	5	12(60)
Total	12	8	300(100)

Table 2: Details of fracture

Variable	Group	Frequency	%
Side of fracture	Right	11	55
	Left	9	45
Mode of injury	Trivial fall	6	30
	RTA	10	50
	Fall from height	4	20
Type of Fracture (Pouwels Classification)	Type I	7	35
	Type II	8	40
	Type III	5	25

Table 3: Associated injuries and other medical problems

Problem		Frequency	%
Associated injuries	NIL	8	40
	Colle's fracture	2	10
	Abrasion	6	30
	Lacerated wound	11	55
	Old fracture on opposite hip	5	25
Associated medical/ surgical problems	HTN	6	30
	DM	7	35
	COPD	3	15
	CVA	1	5
	Anaemia	3	15
	IHD	1	5

Table 4: Hospital stay

Hospital stay	Days	Frequency	%
Pre operative	1-2	16	80
	2-3	4	20
Post operative	1- 3	11	55
	4-7	6	2
Total	<5	8	40
	5-10	12	60

Table 5: Post operative complications

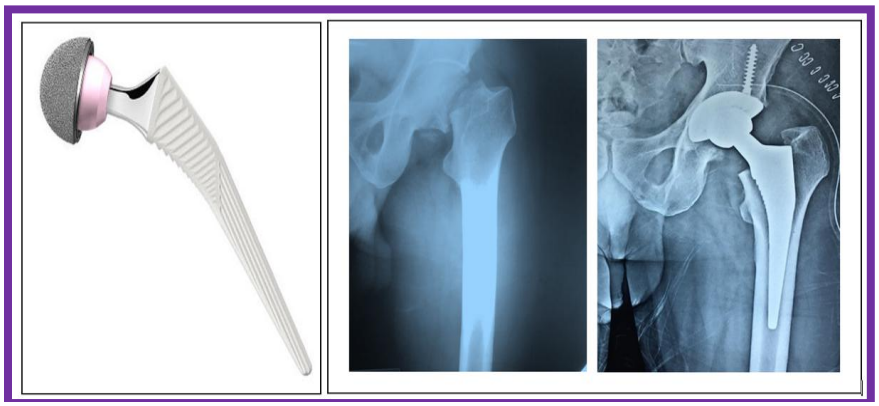
Complications	Follow up			p-value
	15 days N (%)	3 months N(%)	1 year N(%)	
Death	-	1	1	0.05
Peri prosthetic fracture	-	-	1	0.001
Malalignment	1	1	1	0.01
Superficial infection	1	-	-	0.02
Shortening	2	2	2	0.05
Stiffness of hip	2	1	-	0.04
Bed sore	4	-	-	0.002
Nil	10	15	15	0.001

Table 6: Functional outcome

Function	Criteria	Frequency	%	p-value
Pain	None	5	25	0.02
	Mild	6	30	
	Moderate	4	20	
	Marked	5	25	
Limping	None	8	40	0.01
	Slight	6	30	
	Moderate	6	30	
Use of support	None	6	30	0.02
	Cane for long walks	5	25	
	One crutch	9	45	
	Two crutch	5	25	
Walking distance	Unlimited	14	70	0.002
	Indoor only	6	30	
Sitting	Comfortable in ordinary chair	12	60	0.02
	Unable to sit	8	40	
Staire climbing	Without using railing	12	60	0.05
	Use of railing	4	20	
	Unable	4	20	
Harris hip score	Excellent	9	45	0.005
	Good	6	30	
	Fair	3	15	
	Poor	2	10	

ATLAS

(a) Uncemented prosthesis (b) Preoperative AP view (c) Postoperative AP view



DISCUSSION

Total hip replacement is a frequently performed procedure in orthopaedic surgery. In the current prospective study, we aimed to evaluate the efficacy of uncemented prosthesis for total hip replacement and to study its functional outcome and effects on quality of life. The average age of the patient was 56.06 years. Patients were divided into two age groups i.e. majority of the patients were between 51-65 years. Male preponderance was found to be higher in our study. Salaffi F et al[6] in 2005, Mangione CM et al[7] in 1997, Rat AC et al[9] in 2010 and Kadam R et al[18] in 2016 in their study on outcome after total hip replacement found similar results as our study.

We evaluated all patients clinically and radiologically with serial follow-ups to obtain the complications. We monitored the functional outcome data such as: hospital stay length; operative time; preoperative and postoperative stay; limping, use of support, walking distance, sitting, stair climbing and other intraoperative and postoperative complications. We used data forms to record the details of the procedure including estimated blood loss, duration of the procedure, and other information. Recording and analysis of perioperative medical and surgical complications were performed. All complications during the hospital stay were evaluated, and patients were followed closely for a period of one year.

Complications local to each joint including fracture, Peri prosthetic fracture, Malalignment, superficial wound infection, shortening of leg, deep wound infection around the prosthesis, stiffness of hip and bed sore. Salaffi F et al[6] in 2005, Mangione CM et al[7] in 1997 and Rat AC et al[9] in 2010 on outcome after total hip replacement also showed same results.

Out of 20 patients 10 patients does not show any complication after 2 weeks and 15 patients were showed total healing till one year. According to Table 5, only one patient was died after 3 months by other complication. All the findings were statistically significant ($p<0.05$). Kadam R et al[18] in 2016 on outcome after total hip replacement also showed same results.

Osboren RP et al[13] in 1930, Harris WH et al[14] in 1973 about hip joint revealed many post operative complications. But we experienced positive results. Functional outcome were evaluated in our study, 75% patients had varying degree of pain. Limping was absent in 8 patients and mild to moderate in 12 i.e. 60 % patients. Use of support was not needed in 6 patients, canes for long walk were used by 5 patient, one crutch was used by 9 patients and two canes were used by 5 patients. 14 patients could walk unlimitedly and 6 patients could walk only in their residence. 12 (60%) patients could sit comfortably in ordinary chair, 8 patients were unable to sit on chair. 12 patients could climb stairs without use of railing. 4 patients were able to climb stairs with the use of railing and 4 patients were unable to climb by any manner.

Pivec R et al[1] in 2013, Hernigou P et al[2] in 1958, in their study on Hip arthroplasty stated that the mortality rate within 90 days after THR is about 1% and cardiovascular disease is generally the leading cause of death. Only one death was reported in our literature that also because of other systemic complication.

A group of independent examiners conducted the clinical and functional assessment for this study. Harris hip score was used to evaluate the functional outcome in our study. Results were rated as – excellent: 90-100 in 9 (45%); good: 80-89 in 6 (30%); fair: 70-79 in 3 (15%) and poor: <70 in 2 (10%) patients. All the results showed statistically significant. We asked the patients, whether they would go for the same surgery procedure and if they would recommend it to others. Patients' satisfaction evaluation was used as a good factor, distinguish the procedure from others.

No patient required reoperation. All the complications occurred during the stay at hospital. There were no patients showed deep vein thrombosis and no pulmonary embolism. These findings were similar to the results revealed by Pivec R et al[1] in 2013, Hernigou P et al[2] in 1958, in their study on Hip arthroplasty.

The mean range of flexion was improved from 65º (range, 40º- 85º) to 115 º (range, 90º to 121º) after operation. Postoperatively, all patients (100%) reported satisfaction with the surgery, increased function and reported either no pain or a small amount of pain but no compromise in activities and all of them (100%) would recommend the surgery procedure to others with similar problems.

Our results are similar to the report by Pivec R et al[1] in 2013, Hernigou P et al[2] in 1958, in their study on Hip arthroplasty found suboptimal gain in the range of movement and improvement in gait in patients undergoing THA. Although it has been reported that there is an increased rate of heterotopic ossification

in patients who underwent one stage procedure, in this survey, we did not reported any such complication.

Gruen TA et al[15] in 1979, in his study on failure of cemented stem type femoral components stated about the disadvantages of bone cement over uncemented prosthesis were the potential risk of cardiopulmonary disturbance, called bone cement implantation syndrome.[16,17] In our study we found that uncemented hip prosthesis was easy to insert, less complicated, with few side effects and lead to a pain-free and better functionally acceptable life style functional outcome in all patients.

Katz JN et al in 2001, Berend ME et al in 2003 in their study of total hip replacement, despite of arguments about the pulmonary embolism rate and risk of death, we didn't found any significant increase in the risk of major complications associated with the surgery procedure. We reported neither vein thrombosis nor pulmonary embolism in our study, as they are the most common complications of THA procedures in previous evaluations.

CONCLUSION

Despite of the small sample size and absence of a control group and cost evaluations, Hip replacement is a remarkable medical innovation that allows humans to walk without pain by reconstructing badly damaged hip joints. Today, hip replacement procedures have advanced dramatically through failures and successes over many years. The best professional approach for surgeons will be performing surgery using standard hip replacement prostheses when fully understanding the concepts, principles, benefits and risks of currently established approaches.

With these excellent results we conclude that total hip arthroplasty provided total relief, adequate stability, remarkable range of motion in severely painful, refractory hips, if performed taking into consideration pre-operation selection of patients, intra operative soft tissue balancing, correct overall alignment of prosthesis and postoperative proper rehabilitation of patients. Total hip arthroplasty is a relatively safe and sure procedure in the hands of the experienced surgeon with uncemented hip prosthesis.

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