



FUNCTIONAL OUTCOME OF CEMENTED VS UNCEMENTED HEMIARTHROPLASTY IN FRACTURE NECK OF FEMUR

Orthopaedics

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ABSTRACT

Introduction: The purpose of the study is to compare the functional outcome of cemented and uncemented hemiarthroplasty in fracture neck of femur in elderly population. **Method:** Data was collected from 60 patients, who had fracture neck of femur and aged 55 years and above, between the period June 2017 to December 2019, with minimal sample size of 38 in cemented and 22 in uncemented group. It is a prospective observational study. Aim of the study is to compare the functional outcome (HHS score), duration of surgery and blood loss for cemented and uncemented hemiarthroplasty. **Results:** In a total pool of 60 patients, the mean age of patients in cemented group was 76.16 years while that in the uncemented group was 64.82 years. The mean duration of surgery in posterolateral approach the cemented group (13 patients) was 73.85 minutes, while in uncemented group (17 patients) was 64.65 minutes. In the lateral approach mean duration of surgery in cemented group (25 patients) was 73.92 minutes while in uncemented (5 patients) was 65.80 minutes. Average blood loss in cemented group was 258.16ml and uncemented group was 246.41ml. There was no complication of post-operative infection found in either study groups. In our study Harris Hip score in cemented group at 2 weeks, 3 months and 6 months was 29.96, 51.02 and 64.23 while in uncemented group it was 34.5, 60.2 and 78.14. Significant improvement was observed in functional outcome from 2 weeks to 6 months in both the groups. **Conclusion:** Comparison of Harris hip score (functional outcome) between cemented hemiarthroplasty and uncemented hemiarthroplasty at 6 months showed better functional outcome with uncemented group. The advantage of shorter duration of surgery and less blood loss with uncemented prosthesis can be of little importance if weighed against the important finding of equivalent functional results. The increased prosthesis cost can be justified considering the good functional outcome. Our study establishes the fact that HA as an intervention for fracture neck of femur yields satisfactory results and is the treatment of choice. The age of patients with cemented hemiarthroplasty was significantly higher which contributes to the poor functional outcome of the surgery.

KEYWORDS

Cemented Hemiarthroplasty, Uncemented Hemiarthroplasty, Harris Hip Score

INTRODUCTION

Fracture of neck of femur is one of the most common traumatic injuries in elderly, leading to both morbidity and mortality. It is mainly secondary to osteoporosis and falls.¹ India is the second most populated country in the world, with 8.6% of its total population comprising of older adults above the age of 60 years.² Incidence of fracture of neck of femur is rising continuously due to ageing of the population and urbanization.

There has been persistent controversy over whether cemented hemiarthroplasty (CH) or uncemented hemiarthroplasty (UCH) is preferable for the patient population. Cemented hemiarthroplasty may bring low periprosthetic fractures and prosthetic loosening whereas it may lead to embolism and decreased cardiac output with the insertion of bone cement.³ However, there is a higher rate of postoperative prosthesis loosening for uncemented hemiarthroplasty while it may achieve shorter operation time and less intraoperative blood loss.

There is some evidence of inferior short-term results, with decreased mobility and more pain when using an uncemented implant and concerns regarding fixation problems with uncemented stems in osteoporotic bone have been raised. This may be the result of the inferior method of fixation or the design of the prosthesis.³ One randomized comparison of an hydroxyapatite (HA)-coated implant and a conventional uncemented implant showed better functional results with the HA-coated prosthesis.⁴ We are unaware of any randomized trials comparing hemiarthroplasties using uncemented HA-coated implants with cemented implants for treatment of femoral neck fractures. An arthroplasty using a cemented implant may be associated with increased mortality compared with an arthroplasty using an uncemented implant.^{5,6} The mechanisms involved are not fully understood but involve cardiorespiratory disturbances caused by venous and pulmonary embolization of bone marrow contents and methylmethacrylate particles.^{7,8} An uncemented implant may be associated with design-specific complications such as stress shielding, thigh pain, and a higher risk of periprosthetic fracture.⁹

Whether a specific type of hemiarthroplasty using an uncemented implant could yield the same clinical results as a hemiarthroplasty using a cemented implant for treatment of displaced femoral neck fractures is still unclear. It is therefore planned to compare the effectiveness and safety of cemented hemiarthroplasty and uncemented hemiarthroplasty in treating femoral neck fractures in elderly patients.

This in-depth evaluation will provide valuable information and more accurate evidences for surgeons in making a clinical decision.

Study Methodology

This study was a prospective observational study, conducted at Father Muller Medical College Hospital, Mangalore, from June 2018 to December 2019. It was conducted on patients above 55 years of age presenting in emergency with fracture neck of femur diagnosed on X-ray, and were planned for HA using bipolar prosthesis. The preference for surgical approach depended upon senior orthopedic surgeon (assistant professor and above). Data was collected for gender, age, surgical approach, type of implant (cemented or uncemented) based on the surgeons preference, postoperative infection (upto 2 weeks), duration of surgery, blood loss. The amount of blood loss was calculated as i) suction collected minus total volume of saline used, ii) the total number of mops used in surgery. Mop used was of size 30*30 and on an average 10 ml of blood loss per mop was taken.¹⁴ Superficial infections were defined as those wound infections requiring treatment with antibiotics or surgical drainage. Deep infections were those around the prosthesis. Functional outcome was assessed by HHS. Patients were followed at 2 weeks, 3 months and 6 months interval.

APPROACH:

Lateral/Hardinge's approach

The patient was positioned either in the supine or lateral position according to the surgeon's choice. A lazy J- incision centering over greater trochanter was made. Fascia lata was divided along skin incision. Tensor fascia lata was retracted anteriorly and gluteus maximus posteriorly. Tendinous junction of gluteus medius and vastuslateralis was exposed. An oblique incision was made over gluteus medius obliquely across the greater trochanter leaving posterior half still attached to the trochanter. This incision was carried proximally over the gluteus medius and distally in line with vastus lateralis. The tendinous insertion of gluteus medius and vastus lateralis was elevated anteriorly. The capsule was visualised and 'T' incision was made. The knee was flexed after the limb was externally rotated and adducted. Femoral head was extracted with a cork-screw extractor, taking care not to damage the articular surface of acetabulum. Acetabulum was inspected and all loose debris and bone fragments were removed, along with the remnants of the ligamentum teres. Next attention was turned to preparing the femoral canal. Reaming of the femoral canal was done by hand. The reamer was used in a position of 5 – 100 anteversion to ensure that the prosthesis, when inserted will lie with this much degree of anteversion. Then the neck was trimmed to the contour of bipolar prosthesis so as to get a close fit

with collar of the prosthesis. Care was taken to maintain correct neck length. Head size of prosthesis was determined by measuring the head of femur, which was removed and measured with a measuring template. A trial reduction with the selected prosthesis was done. Bipolar prosthesis was inserted into the fenestrated canal. Head was manipulated in to acetabulum using standard reduction techniques. Then wound was closed in layers over suction drain.

Posterolateral approach

The patient was placed in lateral decubitus position. Skin incision was started posterior to the lateral side of greater trochanter and carried distally about 6 cm along the femoral axis. Proximally incision was slightly curved towards PSIS (posterior superior iliac spine) to a point 6 cm proximal to greater trochanter. Fascia lata was incised in line with the skin incision. By blunt dissection, the fibres of gluteus maximus were separated, taking care not to disturb superior-gluteal vessels in the proximal part of the exposure. The proximal fibres of gluteus maximus were retracted proximally and the greater trochanter was exposed. A small branch of the sacral plexuses to the quadrates femoris and inferior gamellus, which contains sensory fibers to the joint capsule, was divided. Next, the gamelli and obturator internus (short external rotators) were exposed and divided. The posterior part of the joint capsule was well exposed from distal to proximal along the line of the femoral neck to the rim of the acetabulum. The distal part of the capsule was detached from femur to expose the head of femur. Femoral head was extracted and remaining steps followed in a similar manner as previously described in lateral approach.(short external rotators were repaired)

RESULTS

Out of 60 patients, the mean age of patients in cemented group approach was 76.16 years while that in the uncemented group was 64.82 years. The minimum age found in our study was 55 years and maximum age was 93 years. There is a statistical difference and mean age in cemented group is significantly higher.

Out of the 60 participants, 25 were male patients while 35 female patients. The mean duration of surgery in posterolateral approach in the cemented group (13 patients) was 73.85 minutes, while in uncemented group (17 patients) was 64.65 minutes. In lateral approach, mean duration of surgery in cemented group (25 patients) was 73.92 minutes while in uncemented group (5 patients) was 65.80 minutes. Comparison of duration of surgery between the two groups shows that duration of surgery is higher in cemented group with a t value of 7.297 and is statistically significant with a p value of <.001. The average blood loss in cemented group was 258.16 ml and that in the uncemented group was 246.41 ml. Comparison of the blood loss between the two groups shows that blood loss is higher in cemented group with a t value of 0.833 and is statistically non- significant with a p value of 0.405. There was no complication of post-operative infection found in either study groups. **Functional outcome:** The mean **HHS at 2 weeks** in cemented group was 29.96. The mean HHS in the uncemented group at 2 weeks was 34.51. Comparison of the HHS at 2 weeks between the two groups shows that HHS at 2 weeks is higher in uncemented group with a t value of 1.971 and is statistically non-significant with a p value of 0.053. The mean **HHS at 3 months** in cemented group was 51.02 . The mean HHS at 3 months in the uncemented group was 60.2. Comparison of the HHS at 3 months between the two groups shows that HHS at 3 months is higher in uncemented group with a t value of 3.018 and is statistically significant with a p value of 0.004. The mean **HHS at 6 months** in cemented group was 64.23. The mean HHS at 6 months in the uncemented group was 78.14 .Comparison of the HHS at 6 months between the two groups shows that HHS at 6 months is higher in uncemented group with a t value of -3.8 and is statistically significant with a p value of <.001.

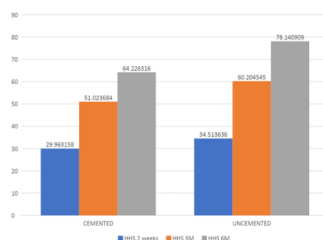


Figure 1: HHS in cemented and uncemented hemiarthroplasty HHS at 2 weeks, 3 months and 6 months

INDEPENDENT T TEST

	Cemented (n=38) Mean ± sd	Uncemented (n=22) Mean ± sd	t	P Value
age	76.16±9.39	64.82±10.55	4.307	<0.001
Duration of surgery	73.89±5.03	64.91±3.72	7.297	<0.001
Blood loss	258.16±40.33	246.41±68.39	0.839	0.405
HHS 2 weeks	29.96±8.44	34.51±8.92	-1.971	0.053
HHS 3M	51.02±10.6	60.2±12.57	-3.018	0.004
HHS 6M	64.23±13.1	78.14±14.61	-3.8	<0.001
3M TO 2 W DIFFERENCE	21.07±6.53	25.69±6.31	-2.672	0.01
6M TO 2W DIFFERENCE	34.28±7.97	43.63±8.49	-4.278	<0.001
6M TO 3M DIFFERENCE	13.2±4.86	17.94±5	-3.595	0.001

Comparison of mean value of HHS at 2 weeks, 3 months and 6 months (within the 2 groups)

Comparison of the HHS at 2 weeks to 3 months difference between the two groups shows that HHS is higher in uncemented group with a t value of -2.672 and is statistically significant with a p value of 0.01. Comparison of the HHS at 2 weeks to 6 months difference between the two groups shows that HHS is higher in uncemented group with a t value of 4.278 and is statistically significant with a p value of >0.001. On Comparison of the HHS at 3 months and 6 months, HHS between the two groups is higher in uncemented group with a t value of -3.595 and is statistically significant with a p value of .001.

DISCUSSION

Our study included 60 elderly patients diagnosed with non-pathological fracture of femoral neck, operated via cemented and uncemented hemiarthroplasty. We collected clinical profile of patients and followed them up until 6 months, with regular assessment of functional outcome at 2 weeks, 3 months and 6 months.

The highest number of patients was in the age group of 65-74 years.. Hip fractures are more common among females, irrespective of age due to the prevalence of osteoporosis. In a 16 year longitudinal study by Elena Lobo et al.¹⁰ in southern Europe, the incidence rate of hip fracture was found to be three times higher in women than in men.¹¹

The mean duration of surgery in cemented group was 73.85 minutes and 73.92 minutes in posterolateral and lateral approach groups respectively. In the uncemented group, the mean duration of surgery was 64.65 and 65.80 minutes in the posterolateral and the lateral approach groups respectively. However, the duration of surgery was higher in cemented HA as compared to uncemented group and was statistically significant.

In a meta-analysis performed by Lin FF et al., shorter operation time was achieved in uncemented HA than that in cemented HA¹², which was same as our study. Santini S, conducted a prospective randomized study to evaluate the clinical and functional outcomes at 12 months of follow up in two groups of patients affected by femoral neck fractures and treated with cemented or cementless bipolar HA. There was no significant difference between the 2 groups of patients regarding most variables, except for duration of operation (75.00±22.43 minutes in cemented group and 56.98±55.00 minutes in cementless group, p<0.001).¹³

The mean intraoperative blood loss was calculated as by number of mops used and blood collected in suction minus the total volume of saline used. In cemented group was 258.16 ml and that in the uncemented group was 246.41 ml and was statistically insignificant. Very few studies have mentioned intraoperative blood loss.^{14,15}

There was no post-operative infection and posterior dislocation found in any of the patients in either approach groups in our study. Biber et al. conducted a retrospective study on 704 patients and concluded that there was no difference between the cemented and uncemented group in both posterior approach and the direct lateral approach regarding early surgical complications.¹⁶

In both the groups, the comparison of mean values of HHS at 2 weeks and 3 months, 2 weeks and 6 months, 3 months and 6 months, a higher HHS value was observed at 3 months and 6 months respectively and

these were statistically significant with p value of <0.001. It is also observed that HHS tends to improve with duration of follow-up in the study. At 2 weeks, the score was comparable with 26.96 and 34.51 in cemented and uncemented groups, which improved to 64.23 and 78.14 at 6 months in cemented and uncemented groups respectively. Thus, it was observed that final functional outcome (i.e. 6 months) was better in the uncemented group as compared to the cemented group. In comparison of the difference of HHS between 2 weeks to 3 months, the difference is higher in the uncemented group and is statistically significant. Similarly, the comparison of difference of HHS from 2 weeks to 6 months shows that the difference is higher in the uncemented group and is statistically significant. In our extensive literature research we did not come across any study comparing these outcomes. Due to limited studies, the importance or clinical value of this statistical significance in our study could not be established. In our study at 6 months, satisfactory (excellent + good) results were found. We did not notice any major complications like intra op or immediate post op death, cardio pulmonary embolism, in cases of cemented hemiarthroplasty, as described in most of the literatures. We also did not notice complications like persistent thigh pain, subsidence of prosthesis, stress shielding and implant loosening in uncemented hemiarthroplasty cases. This is probably because of the standard press fit modular femoral stems which is otherwise used in THAs. This finding correlates with the randomized controlled trial done by Wender Figved et.al.¹⁷

Strength in our study was that it was a prospective study with a reasonably good patient size making it likely that results are generalisable. Patient selection for cemented and uncemented hemiarthroplasties were randomly assigned. All the surgeries were done with posterolateral and lateral approach depending on the surgeons preference.

There were drawbacks in our study as the pre operative functional status was not assessed and we noticed that the post surgical functional outcome depended on comorbidities and age of the patient.

The difference in HHS may be due to higher mean age and poor functional status of the patients prior to the injury in cemented group as no other significant complications were observed in our study.

CONCLUSION:

In our study it is concluded that the cemented hemiarthroplasty is preferred in patients with osteoporotic bone which is seen in the increased mean age of patients. The stability and functional outcome of uncemented hemiarthroplasty can be comparable to cemented hemiarthroplasty. The advantage of shorter duration of surgery and less blood loss with uncemented prosthesis can be of little importance if weighed against the important finding of equivalent functional results. The increased prosthesis cost can be justified considering the good functional outcome. Our study establishes the fact that HA as an intervention for fracture neck of femur yields satisfactory results and is the treatment of choice. Harris Hip score does not take age and pre-injury functional status of the patient into account. The poor functional outcome in our study was related to increased age and may be related with poor pre injury functional status. The limitations of present study are small sample size and short duration of follow up. There is a better scope for improvement in results with a longer duration of follow up. A larger randomized trial or may be a multicentre trial can improve the interpretation of the results further. We suggest a modified HHS which takes the functional status of the patient prior to the injury into account and comparison of the patients with similar age with a larger sample size to establish HA as a treatment of choice for fracture neck of femur.

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