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Comparison of functional outcome in uncemented and cemented bipolar hemiarthroplasty in displaced fracture neck of femur in elderly age group

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Abstract

Some studies recommends uncemented prosthesis in treating femoral neck fractures as the blood loss, operative time, and incidence of embolism are lower. On the other hand, others recommend using a cemented prosthesis for fracture neck of femur treatment as there is reduced thigh pain, facilitates early mobilization and a decreased incidence of prosthetic loosening. Uncertainty exists regarding whether a uncemented bipolar hemiarthroplasty for the treatment of displaced femoral neck fractures could have the same clinical outcomes as a cemented bipolar hemiarthroplasty. This study compared a using uncemented and cemented bipolar prosthesis in the treatment of fracture neck of femur

Keywords: Prosthesis; Hip Arthroplasty; Femur Fracture; Pain

1. Introduction

A femoral neck fracture is a common and serious medical condition. These fractures are becoming more common as the population increases and the average life expectancy rises. The average age at which a femoral neck fracture manifests itself is 81 years old. Femoral neck fracture risk is 13-22% for men and 40–50% for women.¹ Numerous risk factors for femoral neck fracture have been identified by epidemiologic research, insufficient sunlight, inadequate physical activity, smoking, and corticosteroid use.²⁻⁵

The prevalence of this type of fracture has significantly increased in recent years as a result of better health care and a longer life expectancy.⁽⁶⁻⁹⁾

According to the level of activity prior to the fracture, either a hemiarthroplasty or a total hip arthroplasty is used to treat a displaced femoral neck fracture in patients over 60.

Some studies recommends uncemented prosthesis in treating femoral neck fractures as the blood loss, operative time, and incidence of embolism are lower¹⁰. On the other hand, others recommend using a cemented prosthesis for fracture neck of femur treatment as there is reduced thigh pain, facilitates early mobilization and a decreased incidence of prosthetic loosening. (11-13) Uncertainty exists regarding whether a uncemented bipolar hemiarthroplasty for the treatment of displaced femoral neck fractures could have the same clinical outcomes as a cemented bipolar hemiarthroplasty. (14-17) This study compared a using uncemented and cemented bipolar prosthesis in the treatment of fracture neck of femur. (Fig.1). (Fig. 2)

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Figure 1 Cemented bipolar hemiarthroplasty



Figure 2 Uncemented bipolar hemiarthroplasty

2. Material and method

This was a Longitudinal Ambispective observational study which included patients aged more than 60 years admitted with displaced fracture neck of femur admitted. These patients were subsequently treated with uncemented or cemented bipolar hemiarthroplasty for displaced fracture neck of femur since 2019, and then followed up for one year.

Those patients aged less than 60 years, with history of polytrauma, pathological fracture, compound fracture were excluded from the study.

2.1. Follow up

The follow-up was performed at the end of 6 months and 12 months. X-rays was taken to monitor whether the implant was displaced or not. At the 1 year follow up, Harris hip score was calculated and functional outcome was measured.

In all The patients were admitted with displaced fracture neck of femur, a thorough medical history focusing on mode of injury, grade of living before the fall and co morbidities was obtained, and thorough clinical examination and appropriate radiographs were done. Buck’s traction was applied to the affected limb with adequate weight to all patients to ease the discomfort, minimising the limb shortening, and NSAIDs were given for pain relief.

X-rays include the following: Pelvis with both hips in the AP view, AP view with the injured limb in internal rotation, Lateral view of the injured hip.

Based on radiographs the fracture was classified,also osteoporosis graded and femur canal diameter was noted.Patients were evaluated with investigations to look for any potential medical problems which could be aggravated if cementing was to be advocated during the surgery.

Prior to the surgery, a written consent was sought from the patients and attendees after they had been told of the procedure's hazards.

An hour prior to surgery, antibiotics were intravenously administered. The affected limb was prepared.

All of the surgeries were carried out in the operating room and adhered to standard aseptic practises. Anesthesia was either spinal or general. Either lateral or posterior approach was advocated based on surgeon’s choice.Either cemented or uncemented bipolar hemiarthroplasty was done based on surgeons preference and also patient factors such as diameter of femur canal,any contraindication for use of cement etc.

Intraoperatively we checked for amount of blood loss and any variation in oxygen pulseoximeter reading and ECG during femur canal preparation.

Every six weeks, three months, six months, and every twelve months, patients were checked in. The clinical follow-up was directed by the Harris Hip Score and radiographs at each followup.

Follow-up radiological examinations were performed to look for signs of implant loosening, protrusion, dislocation.103-104

3. Results

The study included a total of 50 study participants, which was divided into two groups; group A is cemented and group B is uncemented. The mean age was found to be higher in group B than in group A. However, there was no statistically significant difference.

In this study, there were 17 males and 33 females overall, and there was no statistically significant difference between the two groups.

In our study we concluded that most of the patients were males in both the groups with the mean average age of 68-70 years. Majority of the patients had grade 5 and 6 of living. Patients treated with uncemented prosthesis showed better Harris hip score with lesser blood loss, while other parameters including, hemodynamics, operative time, complications were incomparable.

Table 1 Blood loss in the present study

Variables	Cemented group		Un-cemented group		t-value	p-value
	Mean	Std.Dev.	Mean	Std.Dev.		
Blood loss (in ml) present study	416.40	84.96	372.08	64.02	2.0832	0.0426*

*p<0.05

In the present study, mean time required for cemented prosthesis was 1.6 hrs while that for uncemented prosthesis was 1.3 hrs. although the time taken for uncemented prosthesis was slightly less than cemented prosthesis, it was not found to be statistically significant.

Table 2 Harris Hip score at 6 months and 12 months

HarrisHIP scores	Cemented group	%	Un-cemented group	%	Total	%	Chi-square	p-value
6 months								
Poor	5	20.00	3	12.00	8	16.00	17.75	0.0001*
Fair	15	60.00	10	40.00	25	50.00		
Good	3	12.00	8	32.00	11	22.00		
Excellent	2	8.00	4	16.00	6	12.00		
12 months								
Poor	4	16.00	2	8.00	6	12.00	22.87	0.0001*
Fair	16	64.00	10	40.00	26	52.00		
Good	3	12.00	9	36.00	12	24.00		
Excellent	2	8.00	4	16.00	6	12.00		

In our study we did not encounter any complication related to prosthesis or in general complications. The hemodynamic parameters including blood pressure was statistically indifferent between two groups. While maximum number of patients in both the groups belonged to grade 5 and grade 6 of living.

Mean Post operative day in patients with cemented prosthesis was 3 days while in uncemented prosthesis was 4 days, with no significant statistical difference. We found that by 6 months, 10 patients in cemented group while 15 patients in uncemented group showed good results, while at the end of 12 months 4 patients in cemented and 6 patients in uncemented group showed good results. Overall, better HHS scores were found in patients with uncemented group, although not statistically significant.

4. Discussion

The choice of which technique of hemi-arthroplasty with which to treat intracapsular fracture is uncertain and the literature is confusing. Our study was aimed at classifying this issue with comparison of cemented and uncemented prosthesis for fixation. Cemented fixation is a well-known treatment for the mobility-impaired elderly. Cement pressurisation, on the other hand, boosts intramedullary pressure and may result in fat embolism and severe bone cement implantation syndrome, particularly in individuals with multiple comorbidities. Lower intramedullary pressures, less embolization, and less hemodynamic imbalance result from cementless implantation. This may reduce mortality, but it is technically challenging and requires careful planning and implementation.¹¹³⁻¹¹⁴

Our prospective study focused on comparing the two treatment modalities based on certain study variables including, blood loss, blood pressure, grade of living of patients, Harris hip scores, day of ambulation, treatment time and complications. We found significant difference in blood loss with less blood loss in patients operated with uncemented implant prosthesis. The results were similar to that found in a retrospective study by Grosso et al. They retrospectively reviewed 309 uncemented and 377 cemented hemiarthroplasty procedures for the treatment of displaced femoral neck fractures. The minimum follow-up Grosso et al. retrospectively reviewed 309 uncemented and 377 cemented hemiarthroplasty procedures for the treatment of displaced femoral neck fractures. The minimum follow-up duration was 2 years, and the mean patient age was 81 years. There was a significantly higher volume of blood loss in the cemented group (325 mL) compared with the uncemented group (255 mL) (p = 0.02). This study also examined the associated complications and they found that, periprosthetic femoral fractures occurred at a significantly higher rate compared to the cemented group (0.4%) in the uncemented group (2.5%) (p = 0.03). The uncemented and cemented groups did not differ significantly with respect to conversion to total hip arthroplasty, dislocation rate, aseptic loosening, acetabular wear, or perioperative mortality rate. In the present study we did not encounter any such complications in both the study groups. In the present study, there was no difference between the groups in the mean operating time. Figved et al. evaluated hemiarthroplasty procedures performed using 112 cemented (Spectron; Smith & Nephew) compared with 108 uncemented tapered-wedge implants (Corail; DePuy) in patients with a mean age of 83 years followed for a minimum of 1 year. Operative times and blood loss volume were significantly less in the uncemented group. Complication rates did not differ. One patient who had a cemented implant experienced a significant

intraoperative drop in blood pressure during the cementing procedure. Within 24 hours following the surgery, this patient died. Another patient in the cemented group died within 72 hours of the operation after sustaining cardiac failure during wound closure. There were no significant differences in periprosthetic femoral fracture rate or functional outcomes at 3 and 12 months. However, at 5 years of follow-up, the uncemented group (7.4%) had considerably greater incidence of periprosthetic femoral fractures than the cemented group (0.9%). There were no significant differences in functional outcomes (Barthel Index and EuroQol-5 Dimensions [EQ-5D]) or mortality rate at 5 years of follow-up.

Another study comparing operative time, blood loss and complications was carried out by Kumar et al. In a meta-analysis of 6 randomized controlled trials comparing cemented (n 5 500) with uncemented hemiarthroplasty (n 5 471) for femoral neck fractures, Kumar and colleagues reported a significantly shorter mean operative time and significantly less estimated blood loss (EBL) in uncemented cases. The authors found significantly more prosthesis-related complications (periprosthetic fractures, dislocation, or subsidence) in the uncemented group. Despite higher prosthesis-related complications, there were no differences in reoperation rates. At 1-year follow-up, they found a significantly shorter time to mobility in the cemented group.

Functional outcome after peritrochanteric hip fracture and intracapsular fracture neck of femur can be analyzed with Harris hip score. The Harris hip score (HHS) is a joint specific score that is completed by both the clinician and the patient and consists of 10 items covering domains of pain, function, functional activities, deformity and hip range of motion. The HHS was initially described for assessment of functional outcome after total arthroplasty for posttraumatic arthritis.

In our study, the functioning of the joint was assessed depending on post operative ambulatory movement and HHS. Similarly, a study by Merli et al found no statistical difference in Harris hip score and VAS score between the two groups. A significant statistical difference was seen in terms of surgical time (97.63 minutes versus 60.83 minutes) and blood loss (298.67 ml versus 181.83 ml) for the cemented cohort than the uncemented. Another study, conducted by Wender Figved et al, found that the findings for Harris hip score were identical, with no variations in mobility, usage of painkillers, or place of residence. In another study done by Jaimo Ahn, Li-Xing Man et al, Surgical mortality, total morbidity, and pain levels were comparable between the two cohorts. There was no significant difference between the 2 groups of patients regarding most variables. S. Santini, et al, Hansen et al compared complications, reoperations and mortality and they did not find any statistically significant difference between the groups. Deangelis JP et colleagues discovered that the use of cemented and uncemented femoral components in the treatment of non pathologic displaced femoral neck fractures is linked with identical functional outcome at 6 months. 60 There were no clinically or statistically significant differences in mortality, disposition, or requirement for ambulation assistance at the 30-day, 60-day, or 1-year follow-ups. 126-130

Taylor et al. performed a prospective randomized controlled trial comparing 80 cemented hemiarthroplasty procedures (Exeter; Stryker) and 80 tapered-wedge uncemented hemiarthroplasty procedures (Alloclassic Zweymüller; Zimmer), with a mean patient age of 85 years. They found no significant differences in pain and function via Oxford Hip Scores at 6 weeks postoperatively. There were 18 (22.5%) postoperative periprosthetic femoral fractures in the uncemented group and 1 femoral fracture (1.3%) in the cemented group (p, 0.05). There was a subsidence rate of 22% in the uncemented group and 1.3% in the cemented group (p, 0.05). 19.131

In two valuable review studies, cemented group's patients had less pain at three months after surgery and better mobility after six months. The incidence of residual pain at 6 months after surgery were 23.6% and 34.4% in cemented, uncemented groups respectively, which was statistically significant (Relative risk 0.69, 95% CI 0.53- 0.90:0.007). However, in some studies, although complications, intraoperative and postoperative fractures and subsidence in considerably more common in uncemented group, but the mean of visual analog scale was noted significantly different between the two groups.

Jameson et al reported that the uncemented group had more intraoperative and postoperative prosthesis loosening, periprosthetic fractures, and dislocation. Previous studies also concluded that cemented stems have fewer implant-related complications than cementless stems. Therefore, surgeons should pay attention to these possible implant-related complications before surgery. We also found no significant difference between the cemented group and the uncemented group in term of local complications and general complications. This suggests that cement has little, if not no, effect on local complications and general complications. It is worth considering that there is no difference in the rate of cardiovascular complications between the 2 groups. Some previous studies reported that the cement prosthesis may increase the risk of hypoxemia and transient hypotension, cardiovascular accidents, and pulmonary embolism.

5. Conclusion

The present study was conducted to compare the functional outcome between the two modalities as cemented and uncemented bipolar hemiarthroplasty in patients with displaced femur neck fracture.

- We had no statistical significant difference in patient demographics amongst both the groups including age, gender.
- The grade of living prior to the fracture in both the groups was grade 5 and 6.
- Though the mean operating time for cemented hemiarthroplasty was more than uncemented hemiarthroplasty, even though it was statistically insignificant between the groups.
- Mean time required for full weight bearing mobilisation found between both the groups was insignificant.
- Blood loss observed was more in patients with cemented prosthesis as compared to uncemented group and was statistically significant.
- The Harris hip score at the end of 6 and 12 months was observed better in patients with uncemented prosthesis. With overall 56% patients showing fair results. Which was statistically significant.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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