

COMPARISON BETWEEN FUNCTIONAL OUTCOME OF PATIENTS OF DYNAMIC HIP SCREW (DHS) AND BIPOLAR HEMIARTHROPLASTY IN INTERTROCHANTERIC (I/T) FRACTURE OF OSTEOPOROTIC BONES

Dr. Muhammad Waseem^{*1}, Dr. Badaruddin Sahito², Dr. Prem Chand³,
Dr. Waseem Ahmed Memon⁴, Dr. Fayaz Ahmed⁵, Dr. Salim Jan⁶, Dr. Awais Inam Khan⁷

^{*1,3,4,5,6}MBBS, FCPS Trainee, Postgraduate Trainee (FCPS), Dow University of Health Sciences DUHS, Dr. Ruth K. M. Pfau / Civil Hospital, Karachi

²MBBS, FCPS, FRCS, Professor, Dow University of Health Sciences DUHS, Dr. Ruth K. M. Pfau / Civil Hospital, Karachi

⁷Postgraduate Trainee (FCPS), MBBS, FCPS Trainee, Dow University of Health Sciences DUHS, Dr. Ruth K. M. Pfau / Civil Hospital, Karachi

¹waseemraheem42@gmail.com, ²Sahito.badar.duhs.edu.pk, ³premchand728@yahoo.com,
⁴memon4059744@gmail.com, ⁵drfayaz1000@gmail.com, ⁶jakhranisalim@gmail.com, ⁷awais.mhr@gmail.com

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Corresponding Author: *

Dr. Muhammad Waseem

Abstract

OBJECTIVE

To compare the functional outcome of patients of the dynamic hip screw (DHS) and bipolar hemi arthroplasty in unstable intertrochanteric (I/T) fracture of osteoporotic bones.

METHODOLOGY

This randomized controlled trial was conducted at the department of orthopaedics, Dr. Ruth K.M. Pfau Civil hospital, Karachi, and targeted patients aged 50-80 years with unstable intertrochanteric fractures as a result of osteoporosis. The total sample of 169 patients were randomly chosen to be either subjected to Dynamic Hip Screw fixation or Bipolar Hemiarthroplasty. The Modified Harris Hip Score was used to measure functional recovery six months post-surgery. Data analysis was done with the help of SPSS version 26, descriptive statistics were used, and Chi-square tests. The p-value below 0.05 was the statistically significant value.

RESULTS

The study involved 338 patients with 169 participants being in each group. The DHS group had a mean age of 64.12 ± 8.72 years whereas BHA had a mean age of 68.10 ± 7.91 . The proportion of men in DHS group and BHA group was 62.1% and 51.5% respectively. Functional outcomes were better in the BHA group with significantly higher average of Modified Harris Hip Score of 85.99pm 8.02 than the DHS group with an average of 77.32pm 16.73 ($p = 0.0001$).

CONCLUSION

The results of this study demonstrate that bipolar hemiarthroplasty has better functional outcome than the dynamic hip screw fixation in elderly patients with osteoporotic unstable intertrochanteric fractures. Hemiarthroplasty patients had better Modified Harris Hip Scores and no adverse outcomes indicating it is more

capable of delivering superior mechanical stability and early mobility and producing a less problematic and quicker rise to functional autonomy.

INTRODUCTION

The most frequent injury in old people is the femoral intertrochanteric fractures and is normally related to osteoporosis; a condition that reduces the bone strength and capacity to heal. High complication such as long-term immobility, low independence, high morbidity and death are the implications of these fractures [1]. The goal of such patients' treatment is to achieve stable fixation that will allow them to make early contact with the limbs and to be cured without producing excessive postoperative complications [2].

Dynamic Hip Screw (DHS) has never been an unpopular surgery in management of intertrochanteric fractures as it could produce controlled impaction and biological fracture healing through sliding mechanism [3]. However, in more ageing patients who are osteoporotic or fractured patients who have suffered a cut-out, it may not be adequate and may lead to fixation failure by DHS which may cause loss of reduction and fixation breakage [4]. To overcome these inadequacies, the other procedure, the Bipolar Hemiarthroplasty (BHA) has been put forward. It provides early mechanical stability and allows early weight bearing which comes in particularly handy with elderly patients who have poor bone quality [5].

Several studies have compared the results of the two methods of surgery. A study conducted by Emami et al. discovered that DHS is effective in stable fractures, though BHA yields better results in unstable cases of osteoporosis due to the reduction in mechanical failure and rehabilitation at an earlier age [1]. Chua et. al. also had noted that sliding hip screw fixation might not offer sufficient stability in highly comminuted fractures and it may be better to place such patients on arthroplasty [2]. Pal et al. emphasize that hemiarthroplasty also enables patients to walk sooner with reduced complications than when using internal fixation [4].

In a prospective study, Pangavane et al. found patients receiving BHA had better short-term functioning and reduced complication rates

compared to patients receiving DHS [3]. Similarly, it was observed that BHA resulted in better early functional recovery and reduced reoperations, in comparison with DHS [7]. In a meta-analysis, Tu et al. also reported that hemiarthroplasty performs fewer mechanical failures and easier mobilization than internal fixation in elderly patients with unstable fractures [8]. Huang and Wu pointed out the importance of the correct selection of the surgical procedure highlighting that, with unstable trends, the appropriate fixation technique is paramount to favourable recovery outcomes [6].

This evidence is further reinforced by more recent studies. Arya et al. have emphasized that early stability and rehabilitation are the main elements affecting the postoperative outcomes [9]. Shri Vishnu et al. reported a much higher Modified Harris Hip Scores in patients who were treated by BHA than by DHS [10], and the same tendency was reported in other comparative studies reporting the superiority of hemiarthroplasty treatment on stability and recovery [11]. Recent studies have gone further to indicate that hemiarthroplasty has lower incidences of implant related complications, earlier recovery and better overall functionality compared to internal fixation in osteoporotic elderly patients [12,14].

Regardless of these advances, the discussion is still on which method is best in the overall result because the decision may be determined by the patient status, type of fracture, and preference of the surgeon. Based on the significance of functional recovery and the existing knowledge, the proposed study will compare the functional results of Dynamic Hip Screw versus Bipolar Hemiarthroplasty in the treatment of unstable intertrochanteric fractures in osteoporotic bones using the Modified Harris Hip Score as a standard outcome measure of functional recovery.

METHODOLOGY

This study was carried out at the Department of Orthopaedics, Dr. Ruth K.M. Pfau Civil Hospital, Karachi, using a randomized controlled trial design. After receiving ethical clearance from the

institutional review board and research department, we screened all admitted patients with intertrochanteric fractures for eligibility based on our inclusion criteria.

The study included patients aged between 50 and 80 years of any sex having suffered unstable intertrochanteric fractures that were comorbid with osteoporosis. The diagnosis and classification of the fractures were proven with the help of Evans classification system. These patients usually had severe hip pain or failed to support weight on their admission. The exclusion criteria included bilateral/pathological fractures, previous history of hip surgery/trauma, and the absence of informed consent to participate.

Non-probability consecutive sampling methodology was employed, leading to the recruitment of a sample comprising 169 patients distributed across two distinct treatment groups. Following comprehensive disclosure regarding the study's objectives and protocols, each patient duly provided written informed consent prior to their participation. Baseline data such as age, gender, residential location, medical history (including diabetes, hypertension, and smoking habits), ASA classification, type of fracture, duration of ASA were systematically noted on a standardized form.

The patients were randomly selected to undergo either Dynamic Hip Screw or Bipolar Hemiarthroplasty. Randomization was achieved using computer-generated numbers that were placed in opaque envelopes to have fairness and avoid biases during group assignment.

Patients had undergone the relevant lab tests and had radiographic images of their affected femur before surgery. Templates were used to assist in the planning of the implant size and verifying limb length to enhance accurate surgery. All surgeries were done using a standard lateral approach.

The intensity of pain, term of stay, and total recovery progression were monitored in patients

after surgery. All the participants were treated using the same rehabilitation plan to ensure management consistency. Follow-up measurements were done on the 7th, 15th and 30th postoperative days and six months. The Modified Harris Hip Score was used to assess improvement during every follow-up, and the results were categorized as excellent, good, fair or poor.

The SPSS 26 was used to analyse the data. The demographic and clinical characteristics of the participants were provided using descriptive statistics, the Chi-square test was used to compare the functional outcomes between the groups in the study. A P- value less than equal to 0.05 was considered to be statistically significant.

RESULTS

Table I presents the baseline characteristics of the patients (n=338). The mean age was 64.12 ± 8.72 years in the dynamic hip screw (DHS) group and 68.10 ± 7.91 years in the bipolar hemiarthroplasty (BHA) group. The mean duration of fracture was 37.34 ± 18.21 hours and 36.85 ± 17.95 hours, respectively, while the mean duration of surgery was 96.59 ± 31.13 minutes and 96.43 ± 29.73 minutes, showing no notable difference between the groups. Males were more frequent in the DHS group (62.1%) compared to the BHA group (51.5%), whereas females were slightly more in the BHA group (48.5%). Most patients in both groups resided in urban areas (68.6% vs. 70.4%). The majority of patients were classified as ASA II (48.5% in DHS and 53.3% in BHA). The prevalence of diabetes mellitus was 42.0% in DHS and 39.1% in BHA, while hypertension was more common in BHA (53.3%) than DHS (44.4%). The proportion of smokers was similar in both groups (26.0% vs. 27.2%).

Table I: Baseline Characteristics of the Patients (n=338)

Characteristics of Participants	Groups	
	DHS (n=169)	BHA (n=169)

Age in years, Mean $\pm$ SD		64.12 $\pm$ 8.72	68.10 $\pm$ 7.91
Duration of Fracture in hrs, Mean $\pm$ SD		37.34 $\pm$ 18.21	36.85 $\pm$ 17.95
Duration of Surgery in mins, Mean $\pm$ SD		96.59 $\pm$ 31.13	96.43 $\pm$ 29.73
Gender	Male, n (%)	105 (62.1)	87 (51.5)
	Female, n (%)	64 (37.9)	82 (48.5)
Residential Status	Urban, n (%)	116 (68.6)	119 (70.4)
	Rural, n (%)	53 (31.4)	50 (29.6)
ASA Status	I, n (%)	47 (27.8)	43 (25.4)
	II, n (%)	82 (48.5)	90 (53.3)
	III, n (%)	40 (23.7)	36 (21.3)
Diabetes Mellitus		71 (42.0)	66 (39.1)
Hypertension		75 (44.4)	90 (53.3)
Smoking Status		44 (26.0)	46 (27.2)

Table II shows the comparison of functional outcomes based on the Harris Hip Score between patients treated with Dynamic Hip Screw (DHS) and those treated with Bipolar Hemiarthroplasty (BHA) for unstable intertrochanteric fractures. Among the DHS group (n=169), 25.4% of patients achieved excellent outcomes, 35.5% had good outcomes, 14.8% had fair outcomes, and 24.3% had poor outcomes. In contrast, in the BHA group (n=169), 37.9% of patients achieved excellent

results, 37.3% had good outcomes, 24.9% had fair outcomes, and none had poor outcomes. The mean Harris Hip Score was significantly higher in the BHA group (85.99 $\pm$ 8.02) compared to the DHS group (77.32 $\pm$ 16.73). This difference was statistically significant (p = 0.0001), with a 95% confidence interval ranging from (-11.477 to -5.862), indicating that patients treated with BHA demonstrated superior functional outcomes compared to those treated with DHS.

Table II: Comparison of Functional Outcomes Based on Harris Hip Score Between DHS and BHA in Unstable Intertrochanteric Fractures (n=338)

Harris Hip Score	Groups	
	DHS (n=169)	BHA (n=169)
Excellent (90–100)	43 (25.4)	64 (37.9)
Good (80–89)	60 (35.5)	63 (37.3)
Fair (70–79)	25 (14.8)	42 (24.9)

Poor (< 70)	41 (24.3)	0 (0.0)
Mean $\pm$ SD	77.32 $\pm$ 16.73	85.99 $\pm$ 8.02
P-Value (95% Confidence Interval)	0.0001 (-11.477~ -5.862)	

DISCUSSION

This current randomized controlled trial was comparing the functional recovery of patients receiving Dynamic Hip Screw (DHS) fixation and Bipolar Hemiarthroplasty (BHA) to unstable intertrochanteric fractures in osteoporotic bone. We have found out that the postoperative functioning of patients at six months with BHA was significantly better than with DHS fixation, evidenced by a greater mean Modified Harris Hip Score (85.99 $\pm$ 8.02) in the former than in the latter (p = 0.0001). Besides, the BHA patients did not show poor functional outcomes, whereas nearly a quarter of the DHS group did. These results effectively substantiate the aim of the study since they indicate the functional superiority of BHA in elderly osteoporotic patients with unstable fracture patterns.

These new achievements in the use of BHA are mostly justified by its mechanical and biological benefits. The trabecular structure of the proximal femur in osteoporotic bone is usually not strong enough to hold a screw which put the patient at risk of implant cut-out, varus collapse and fixation failure that are commonly related to DHS [4]. By comparison, hemiarthroplasty involves the replacement of the damaged neck and head of the femur and offers immediate stability, which makes it possible to mobilize and start bearing weight early. This prompt regaining of ambulation in the elderly is vital because it avoids complications related with extended immobilization and enhances the recovery of functions more swiftly. The fact that the BHA patients do not have poor outcomes in the current study highlights the role of stable fixation in enhancing rehabilitation and independency.

Our findings are consistent with earlier research comparing these two surgical options. Emami et al. concluded that DHS is suitable for stable

intertrochanteric fractures, but that BHA offers superior outcomes in unstable osteoporotic cases due to fewer mechanical failures and earlier rehabilitation [1]. Similarly, Chua et al. observed that sliding hip screw fixation may be insufficient for highly comminuted or unstable fractures, recommending alternative approaches that ensure mechanical stability [2]. Pangavane et al. and Pal et al. also reported that patients treated with BHA recovered faster and had better early hip function than those managed with DHS fixation [3,4]. These findings are similar to the current findings in which BHA resulted in increased functional scores and elimination of poor outcomes. These results were further supported by a meta-analysis done by Tu et al., which revealed that hemiarthroplasty is associated with lower mechanical failure rates and earlier mobilization in the elderly than internal fixation [8]. Other comparative studies like Shri Vishnu et al. have reported much higher Harris Hip Scores and the postoperative functionality in patients who have been handled with BHA which has proven the consistency of our results in various environments [10-14].

What sets this study apart is its randomized design and balanced baseline characteristics, which minimize bias and enhance the reliability of the comparison. Both groups were managed under a standardized rehabilitation protocol, allowing functional differences to be attributed confidently to the surgical method itself. The findings carry important clinical implications: early mobilization after hemiarthroplasty not only enhances hip function but also reduces secondary complications such as chest infections, thromboembolic events, and pressure ulcers—conditions that commonly increase morbidity and mortality in this population. While DHS fixation remains less invasive and is generally more cost-effective, its

dependence on bone quality makes it less ideal for patients with severe osteoporosis.

There are also limitations associated with this study. It was carried out in one tertiary care centre, which can be a weakness of the study in terms of external validity. The follow-up did not extend beyond six months, which is not enough to determine the long-term functionalities of the implants but enough to determine the short-term functionality of the implants i.e. acetabular erosion, loosening, or infection. Also, there was no blinding of outcome assessors, and this could bring slight observer bias. Regardless of these limitations, the research possesses the randomized nature, sufficient sample size, and standardized rehabilitation plan that provide the study with the high internal validity of its conclusions. Prosthetic multicentre studies over a longer period are encouraged in the future in order to estimate long-term prosthetic survival, patient satisfaction, and cost-effectiveness.

This study indicated that bipolar hemiarthroplasty is better in early functional performance and quicker recovery than dynamic hip screw fixation in old osteoporotic patients with unstable intertrochanteric fractures. BHA provides better stability and allows early mobilization to enable a patient in a vulnerable group to be discharged faster, which is why it is a more credible and efficient surgical method.

CONCLUSION

The results of this study demonstrate that bipolar hemiarthroplasty has better functional outcome than the dynamic hip screw fixation in elderly patients with osteoporotic unstable intertrochanteric fractures. Hemiarthroplasty patients had better Modified Harris Hip Scores and no adverse outcomes indicating it is more capable of delivering superior mechanical stability and early mobility and producing a less problematic and quicker rise to functional autonomy.

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