Comparison of Rate of Dislocation after Bipolar Hemiarthroplasty through Hardinge's Versus Moore's Approach in Displaced (Garden's Types III & IV) Neck of Femur Fractures

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ABSTRACT

Background: Hip fractures, constituting 20% of orthopedic trauma workload, often involve displaced Neck of femur (NOF) fractures. Elderly patients typically undergo Bipolar Hemiarthroplasty (BHA) using Hardinge's or Moore's approach. As debate on the preferred approach still persists in literature , this study aims to compare dislocation rates in BHA via Hardinge's vs. Moore's approach for displaced (Garden type III & IV) femur fractures.

Objective: This study aims to compare the rate of dislocation after Bipolar Hemiarthroplasty (BHA) through Hardinge's (Direct lateral) versus Moore's (Posterior) approach.

Methodology: It was randomized Control Trial with 60 patients (30 per group) in the Orthopedics Department, comparing Hardinge's and Moore's approaches for Bipolar Hemiarthroplasty. Follow-up data was analyzed using SPSS. Patient characteristics were expressed in frequencies, and quantitative data presented as mean ± S.D. A p-value ≤ 0.05 indicated significance. Limitations included a small sample size and single-center study.

Results: This study compares Hardinge Bipolar Hemiarthroplasty (HBH) and Moore Bipolar Hemiarthroplasty (MBH) outcomes in terms of patient demographics and dislocation rates. Demography , medication usage, and osteoporosis prevalence vary between groups. Dislocation rates at different time points show significant differences, notably at 6 months. Independent Sample t-test reveals a <0.05 p-value, indicating a significant association between MBH and dislocation at 6 month.

Conclusion: There is a definitive difference in the rate of dislocation after bipolar hemiarthroplasty (BHA) through Hardinge's versus Moore's approach in displaced (Garden type III & IV) neck of femur fractures.

Keywords: Neck of femur , Bipolar Hemiarthroplasty , Dislocation.

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INTRODUCTION

About 20% of the patients seen at an orthopedic-focused trauma center had suffered a hip fracture[1]. One worrisome trend is that these pauses tend to occur more frequently as people age. Hip fractures are more common in young adults because of high-energy injuries, while the elderly have a higher peak because of lower-energy traumas[2].

Bipolar hemiarthroplasty (BHA) is a surgical procedure in which a prosthesis is used to replace both the femoral head and neck[3]. Because extended rehabilitation is linked to increased mortality and impairment in the elderly, as well as higher overall medical costs, early mobility after a head and neck in bipolar hemiarthroplasty (BHA) replacement is advantageous[4]. The best way to do hemiarthroplasty

on elderly patients who have a broken femur neck and are classified as Garden III or IV is a topic of clinical and scientific debate among orthopedists. Misplaced fractures of the neck of the femur (Garden types III and IV) in elderly, low-demand patients are a classic indication for bipolar hemiarthroplasty (BHA)[5].

Moore performs bipolar hemiarthroplasty using the arthroplasty technique. Arthroplasties are the most common surgical technique because they are relatively painless and cause minimal blood and tissue loss. While Harding's method requires a lot of tissue dissection, it better exposes the acetabulum and reduces the risk of infection.

Dislocation is a major complication after bipolar hemiarthroplasty, occurring between 1.5% and 16% of the time[6,7].

When doing hip replacement surgery, an orthopedic surgeon can adopt one of several different approaches to get to the hip joint.

The purpose of surgery for individuals with displaced fractures of the femoral neck should be to improve function while decreasing the likelihood of complications[8]. The Hardinge approach and the Moore approach are often used in a number of nations around the world, as shown by the limited number of national registers that track BHA surgical techniques[9]. Though less common, frontal and lateral techniques also exist. It appears that in many parts of the world, the surgeon's level of education and experience has a larger role in determining the course of treatment than does strict adherence to standards or evidence-based medicine[9]. It's important to keep in mind that each strategy has benefits and cons. Moore's (posterior) method has been shown to cause more dislocations, as stated by Sveny et al. (2017).[10]

Several investigations found that the posterior (Moore's) approach to bipolar hemiarthroplasty increased the incidence of dislocation and, consequently, the need for revision surgery. The risk of dislocation was decreased with the lateral (Hardinge's) technique[11]. According to Mukkaet al. (2016), the dislocation rate was 10.7 percent[7]. Most dislocations following bipolar hemiarthroplasty happen in the first six months after surgery. In one study, 5% of patients who underwent surgery using the posterior (Moore's) technique experienced dislocation, while in another study, no patients experienced dislocation after surgery utilizing the lateral (Hardinge's) approach. For example: (Aparajit et al., 2017). Another study found that dislocation occurred in 8% of patients who underwent surgery using Moore's (posterior) method and in 6% of patients who underwent surgery using Hardinge's (lateral) approach[12]. Other research found that although 2.9% of patients who received the lateral (Hardinge's) approach experienced dislocation, 8.4% of patients who underwent the posterior (Moore's) approach experienced dislocation[7]. Recent observational studies have showed a risk of dislocation after surgery with the posterior (Moore's) technique, prompting some to suggest it not be used for hemiarthroplasty. Incontestably, hemiarthroplasty carries this danger[9].

According to the results of a randomized controlled trial (RCT) comparing the two BHA surgical approaches, there was no significant difference in the incidence of complications or the efficacy of the procedures. Dislocations occurred in 2% of individuals in the lateral group and 1% of those in the back group. According to a study[13].

Most people believe the Moore's (back) approach is easy to perform and has fewer incisions, which means less blood is wasted and the surgery can be done more quickly. Advantages of the lateral technique, commonly known as Hardinge's procedure, include making it easier to achieve the ideal cup positioning by giving the acetabulum more room to move. Getting the cup in the right spot could help cut down on hip dislocations.

The goal of this research is to compare the dislocation rates between the two most common surgical procedures used at our center (Hardinge's and Moore's). The choice to undertake this study was motivated by the dearth of evidence suggesting a particular approach is superior to others.

There is not yet consensus among medical experts regarding the best way to treat displaced fractures of the thigh bone's neck. The primary goal of this study is to compare the dislocation rates between the two techniques in a population of elderly people. Many studies have compared the two approaches, but the results have not always been clear. This study aims to compare two techniques for preventing dislocation after bipolar hemiarthroplasty: Hardinge's (lateral) and Moore's (posterior). The lateral and posterior methods of treatment will be contrasted in detail.

MATERIALS AND METHODS

All Patients presenting in Emergency department or OPD of Sheikh Zayed Hospital Rahim yar khan, of both genders, aged 60-80 years, undergoing Bipolar hemiarthroplasty for displaced (Garden types III &

IV) neck of femur fracture were included in this study.

Bed ridden patients for more than 2 months, patients with pathological fractures, known malignancy, neurologically impaired patients, and patients with impaired cognitive function were excluded from this study.

Study design was Randomized Controlled Trial

Sampling technique was Non-Probability Convenient Sampling

The sample size was calculated as 60 (30 in each group on the availability of cases and time constraints) was estimated using 90 % confidence level and 80% power of the test (Subawa *et al*. 2020).

$$n = \frac{2\sigma^2(z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

Z1-α/2 = 90% = 1.64

Z1-β = 80% = 0.80

μ1 = Mean of population 1 = 70.21

μ2 = Mean of population 2 = 67.71

$2\sigma^2$

We used a lottery system to choose which patients would be placed in Group A and which would be placed in Group B. Group A was treated using Hardinge's approach, whereas Group B was given Moore's. Every procedure was performed by the same team of surgeons in a completely sterile operating room, with patients receiving either epidural or spinal anaesthetic.

All patients in both groups had a complete blood count, urinalysis, liver function tests, serum electrolyte and electrocardiogram levels, electrocardiogram, chest X-ray, and AP and lateral hip X-rays. Before the operation, the patient was given enough anesthetics, painkillers, antibiotics, tetanus toxoids, and blood transfusions to keep them comfortable. Aspirin, blood thinners, and other anti-inflammatory medications should be stopped 7–10 days before surgery.

At the end of the second, sixth, and twelfth weeks and the end of the sixth month after surgery, patients were examined for follow-up exams. The patient was given a thorough clinical examination during the follow-up visit. Both a physical examination and, if necessary, an x-ray were performed to rule out dislocation.

Data Analysis

The clinical proforma (annexure-I) will be used for data collection. Information will be evaluated and analyzed when it has been entered into SPSS 22. As this case, the categorical variables will be presented in a frequency distribution. We will use both numerical and percentage examples to show the data. In this paper, we will use mean values and standard deviations to talk about certain numerical data. Quantitative information will be transformed into usable percentages and frequencies. The help looked at how different students conducted their t-tests and compared the results. The p-value needs to be less than 0.05 to be considered significant statistically.

RESULTS

Mean & Standard Deviation:

The mean age of the patients in HBH is 70.06 with 6.98 SD but the mean age of the patient in MBH is 72.03 with 6.08 SD. The mean weight of the patient in HBH is 71.16 with 6.34 SD but the mean weight of the patients in MBH is 85.06 with 2.36 SD.

Table 1:

	Hardinge's Bipolar Hemiarthroplasty		Moore's Bipolar Hemiarthroplasty	
	Mean	Standard Deviation	Mean	Standard Deviation
Age	70.06	6.98	72.03	6.08
Weight	71.16	6.34	85.06	2.36

Frequency & Percentages:

In HBH, males were 40% and female were 60% but in MBH, males were 46.7% and female were 53.3%. In HBH, patients who take anti-glycemic drug were 33.3% and patients who didn't take anti-glycemic drug were 66.7% but in MBH, patients who take anti-glycemic drug were 50% and patients who didn't take anti-glycemic drug were 50%. In HBH, patients who take anti-hypertensive drug were 40% and patients who didn't take anti-hypertensive drug were 60% but in MBH, patients who take anti-hypertensive drug were 33.3% and patients who didn't take anti-

hypertensive drug were 66.7%. In HBH, patients who were taking NSAID drug were 46.7% and patients who were not taking NSAID 53.3% but in MBH, patients who were taking NSAID drug were 53.3% and patients who were not taking NSAID drug were 46.7%.

Table 2:

	Hardinge's Bipolar Hemiarthroplasty		**Moore's Bipolar Hemiarthroplasty**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Gender				
Male	12	40	14	46.7
Female	18	60	16	53.3
Anti-glycemic				
Yes	10	33.3	15	50
No	20	66.7	15	50
Anti-Hypertensive Drugs				
Yes	12	40	10	33.3
No	18	60	20	66.7
Chronic Use of NSAIDS				
Yes	14	46.7	16	53.3
No	16	53.3	14	46.7
Osteoporosis				
Yes	12	40	14	46.7
No	18	60	16	53.3
Pre-operative X ray Findings				
Garden Type 3	17	56.7	18	60
Garden Type 4	13	43.3	12	40
Dislocation at 2nd week				
Yes	5	16.7	8	26.7
No	25	83.3	22	73.3
Dislocation at 6th week				
Yes	4	13.3	8	26.7
No	26	86.7	22	73.3
Dislocation at 12th week				
Yes	3	10.0	7	23.3
No	27	90.0	23	76.7
Dislocation at 6th month				
Yes	2	6.7	9	30.0
No	28	93.3	21	70.0

In HBH, patients with osteoporosis were 40% and patients without osteoporosis were 60% but in MBH, patients with osteoporosis were 46.7% and patients without osteoporosis were 53.3%. In HBH, patients with pre-operative X ray finding of Garden Type 3 were 56.7% and patients with pre-operative X ray finding of Garden Type 4 were 43.3% but in MBH, patients with pre-operative X ray finding of Garden Type 3 were 60% and patients with pre-operative X ray finding of Garden Type 4 were 40%.

In HBH, patients with dislocation at 2nd week were 16.7% and patients without dislocation at 2nd week were 83.3% but in MBH, patients with dislocation at 2nd week were 26.7% and patients without dislocation at 2nd week were 73.3%. In HBH, patients with dislocation at 6th week were 13.3% and patients without dislocation at 6th week were 86.7% but in MBH, patients with dislocation at 6th week were 26.7% and patients without dislocation at 2nd week were 73.3%.

In HBH, patients with dislocation at 12th week were 1o% and patients without dislocation at 12th week were 90% but in MBH, patients with dislocation at 12th week were 23.3% and patients without dislocation at 12th week were 76.7%. In HBH, patients with dislocation at 6th month were 6.7% and patients without dislocation at 6th month were 93.3% but in MBH, patients with dislocation at 6th month were 30% and patients without dislocation at 12th week were 70%.

Independent Sample t-test:

The value of <0.05 shows that there is a significant association between HBH and dislocation at 6th month.

Table 3:

	df	Sig. (2-tailed)	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Dislocation_2ndweek	58	.356	.10739	-.11496	.31496
	56.381	.356	.10739	-.11510	.31510
Dislocation_6thweek	58	.203	.10358	-.07400	.34066
	54.403	.203	.10358	-.07429	.34096
Dislocation_12thweek	58	.171	.09629	-.05941	.32608
	52.286	.172	.09629	-.05986	.32653
Dislocation_6thmonth	58	.019	.09689	.03939	.42727
	44.798	.020	.09689	.03817	.42850

DISCUSSION

The mean age of the patients in HBH is 70.06 with 6.98 SD but the mean age of the patient in MBH is 72.03 with 6.08 SD. The mean weight of the patient in HBH is 71.16 with 6.34 SD but the mean weight of the patients in MBH is 85.06 with 2.36 SD. In HBH, males were 40% and female were 60% but in MBH, males were 46.7% and female were 53.3%. In HBH, patients who take anti-glycemic drug were 33.3% and patients who didn't take anti-glycemic drug were 66.7% but in MBH, patients who take anti-glycemic drug were 50% and patients who didn't take anti-glycemic drug were 50%. In HBH, patients who take anti-hypertensive drug were 40% and patients who didn't take anti-hypertensive drug were 60% but in MBH, patients who take anti-hypertensive drug were 33.3% and patients who didn't take anti-hypertensive drug were 66.7%. In HBH, patients who were taking NSAID drug were 46.7% and patients who were not taking NSAID 53.3% but in MBH, patients who were taking NSAID drug were 53.3% and patients who were not taking NSAID drug were 46.7%

In HBH, patients with osteoporosis were 40% and patients without osteoporosis were 60% but in MBH, patients with osteoporosis were 46.7% and patients without osteoporosis were 53.3%. In HBH, patients with pre-operative X ray finding of Garden Type 3 were 56.7% and patients with pre-operative X ray finding of Garden Type 4 were 43.3% but in MBH, patients with pre-operative X ray finding of Garden Type 3 were 60% and patients with pre-operative X ray finding of Garden Type 4 were 40%. In HBH, patients with dislocation at 2nd week were 16.7% and patients without dislocation at 2nd week were 83.3% but in MBH, patients with dislocation at 2nd week were 26.7% and patients without dislocation at 2nd week were 73.3%. In HBH, patients with dislocation at 6th week were 13.3% and patients without dislocation at 6th week were 86.7% but in MBH, patients with dislocation at 6th week were 26.7% and patients without dislocation at 2nd week were 73.3%.

In HBH, patients with dislocation at 12th week were 1o% and patients without dislocation at 12th week were 90% but in MBH, patients with dislocation at 12th week were 23.3% and patients without dislocation at 12th week were 76.7%. In HBH, patients with dislocation at 6th month were 6.7% and patients without dislocation at 6th month were 93.3% but in MBH, patients with dislocation at 6th month

were 30% and patients without dislocation at 12th week were 70%.

According to Independent Sample t-test the value of <0.05 shows that there is a significant association between HBH and dislocation at 6th month.

The procedure known as hemiarthroplasty, which is a form of hip replacement surgery, is usually performed on elderly patients who have damaged femoral necks. When there is a risk of dislocation, there is a lot of back and forth over whether method of surgery is the safest. In a recent study, the surgical procedure of hemiarthroplasty served as the primary focus, with the overarching goal of determining which aspects influence the implant's long-term stability. Between the years 1996 and 2003, a total of 739 hemiarthroplasties were performed on 720 patients as primary procedures for displaced femoral neck fractures or as revisional procedures following failed internal fixation of femoral neck fractures. These procedures were either primary or revisional in nature. Logistic regression was used to investigate the characteristics that, when combined, increase the likelihood of a prosthesis becoming dislodged. The results of a multivariate regression analysis found that the posterolateral approach was the only predictor of a significantly increased risk of dislocation (odds ratio [OR], 3.9 [95% confidence interval [CI], 1.6–10) for posterolateral repair and OR, 6.9 [95% confidence interval [CI], 2.6–19%] for posterolateral repair alone). This was the case regardless of whether the repair was performed with or without the use of a posterior approach. The dislocation rate was the same regardless of the patient's age, gender, the reason for the surgery, the amount of experience of the surgeon, or the type of HA used. The posterolateral approach was linked with a significantly increased risk of dislocation compared to the anterolateral approach among patients who were treated with HA for femoral neck fractures. When compared to the anterolateral approach, it appears that the dislocation rate is lower when a posterior repair is performed on the joint. (Barney J et al., 2022)

As a result of femoral neck fractures, hip replacement surgery is becoming increasingly popular among senior citizens who are both healthy and physically active. The most effective surgical method and how it effects prosthesis stability is a topic of continuous discussion. This topic is crucial since dislocation of the prosthesis is a serious issue. Because it was determined that the surgical process was the single most critical factor in determining the long-term stability of a full hip replacement, special emphasis was paid to this aspect of the surgery. They examined 713 hips from 698 patients, 573 of whom were female, who had either a primary total hip replacement (n = 311) for a non-pathological, displaced femoral neck fracture (Garden III or IV) or a secondary total hip replacement (n = 402) due to a problem with how a femoral fracture healed. The patients had either a primary total hip replacement (n = 311) for a non-pathological, displaced femoral neck They were able to discover the elements that contribute to post-operative prosthesis movement by using a technique called Cox regression. In the model, variables such as patient age and gender, the reason for the surgery, the level of experience of the surgeon, the size of the femoral head, and the surgical technique were investigated. Overall, the migration rate was 6% of the population. When compared to the posterolateral approach, whether or not a posterior repair was performed, the anterolateral surgical technique resulted in a lower chance of dislocation (2.5%, 12.5%, and 14.5%, respectively) (p 0.001). The risk of dislocation was only significantly increased by the posterolateral approach, with a hazard ratio (HR) of 6 (2-14) for posterior repair and 6 (2-16) for no repair at all. The risk of dislocation was only significantly increased by the posterolateral approach. When doing a total hip replacement on a patient who has a fracture of the femoral neck, the anterolateral technique is the one that is most commonly used. This decreases the likelihood of something becoming dislodged. (Varacallo M et al., 2022)

It used to be the case that the only treatment options for elderly patients who had displaced femoral neck fractures (FNFs) were hemiarthroplasty (HA) or total hip arthroplasty (THA), regardless of whether or not they were in otherwise good health (THA). Research indicates that THA may be the best choice, despite the fact that this has not yet been demonstrated conclusively. Although THA has been the gold standard, it has been proposed that bipolar HA, also known as BHA, is equally as effective; however, it is not yet clear which one is superior. This study's objectives were to[1] investigate the efficacy of BHA and THA in treating FNF in healthy older persons and[2] compare the RCT outcomes of both treatments. There were a total of eight randomized controlled trials that were carried out (total 1,014 patients; 523 had BHA and 491 had THA). The data from the included randomized controlled trials were analyzed and then separated

into four groups, with each group being assigned a different amount of time to be followed up on. Following either BHA or THA, there was no discernible change in any of the subgroups' Harris Hip Scores. After 4 years, there was a connection between BHA and a higher rate of acetabular erosion and the need for reoperation. THA, on the other hand, had a higher rate of dislocation during the first four years. THA performed better in terms of the EQindex-5D, mobility, and pain, but BHA performed better in terms of the amount of time it took to perform the surgery. There were no statistically significant differences found in postoperative infection rates, general complications, mortality rates at one year, blood loss, or hospital stays. When it came to older patients who were otherwise healthy and had displaced FNFs, BHA performed better in terms of the rate of dislocation, while THA performed better in terms of the rate of acetabular erosion and the rate of reoperation. In terms of other key parameters, such as the Harris Hip Score, infection rate, general problems, or death at one year, the BHA and THA did not differ significantly from one another in any discernible ways. It is necessary to conduct additional RCTs that are of a high quality in order to assess the available therapy options and provide solid evidence for them[16].

The purpose of this study is to evaluate the early complications of hemiarthroplasty for the treatment of displaced fractures of the femoral neck in elderly patients utilizing either the posterior or direct lateral (transgluteal) approach. This evaluation will be done using either the posterior or direct lateral (transgluteal) approach. In a prospective clinical investigation that was carried out in Norway over the course of a year by researchers at four different hospitals, there were a total of 583 patients who were observed. In every single one of the locations, the uncemented femoral stems and the bipolar heads were the two most common implant options. Mortality rates after 30 days and after 1 year were recorded, as well as sex, age, surgical method, prosthetic dislocation, postoperative infection, perioperative fracture, ASA score, diabetes, alcoholism, cognitive impairment, body mass index, and ASA status. Also recorded were mortality rates after 30 days and after 1 year. The standard deviation was 7.8, and 434 out of 583 (or 74%) of the participants were female. There was no discernible difference between the groups in any significant way. Recurrent prosthetic dislocations were more common in the posterior group than in the lateral group (9/186 (5%) vs. 2/395 (0.5%); RR = 9.6, 95% CI 2.1-44.0, p 0.001), as were first-time dislocations (15/186 (8%) vs. 4/397 (1%); RR = 8.0, 95% CI 2.7-23.8, p 0.001). Nineteen percent of those who had a dislocation also had a recurrence of the condition. There were 10 patients who needed extra open surgery because they had numerous dislocations. It was necessary to do more than one open surgery on sixty percent of the patients. One patient who had dislocation developed a persistent infection, and three others had to undergo resection arthroplasty. Aside from surgical intervention, there were no other known risk factors for dislocation that were found. There was no discernible difference between the groups in any of the other challenges that they faced. When compared to a lateral approach, the likelihood of a prosthesis becoming dislodged was eight times higher when the procedure was performed using a posterior approach. The probability of the prosthesis becoming dislodged from its original position is multiplied several times over, which may result in the need for additional treatments and poor outcomes. After a fracture of the femoral neck, the posterior technique is not one that we recommend because the potential benefits of this method have not been established[17].

CONCLUSION

There is a definitive difference in the rate of dislocation after bipolar hemiarthroplasty (BHA) through Hardinge's versus Moore's approach in displaced (Garden type III & IV) neck of femur fractures.

Conflict of Interest: None

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