

Original Research Article

Prospective study comparing early functional outcome and gait analysis in femoral neck fracture treated by cemented hemiarthroplasty using modified Hardinge approach and conventional posterior approach

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ABSTRACT

Background: A prospective study was done to compare the outcomes of management of fracture neck of femur by cemented hemiarthroplasty using modified Hardinge approach and conventional posterior approach

Methods: The 2019 to 2022 50 patients underwent bipolar hemiarthroplasty for femoral neck fracture. Group A (Femoral neck fracture treated using conventional posterior approach) and group B (Femoral neck fracture treated using modified Hardinge approach) with 25 patients in each group. Outcomes were evaluated based on mean surgical time and Harris hip score and SF-36.

Results: Mean duration of surgery in minutes was more for modified Hardinge approach. Harris hip score with standard deviation for modified Hardinge Approach for follow-ups was better and statistically significant than posterior approach. Similarly, quality of life after surgery, in terms of mean SF-36 score with standard deviation for modified Hardinge approach was better and statistically significant than posterior approach. Modified Hardinge approach has fewer complications in comparison to the posterior approach. With the advantages comes a longer learning curve to operate without complications. Hence, with proper surgical technique, and proper tight closure, we prefer the modified Hardinge approach over other approaches as it had nil dislocations and abductor lurch.

Conclusions: Modified Hardinge approach for hip arthroplasty in elderly people with femoral neck fracture provide significant benefit in the early post operative period when compared to conventional posterior approach in terms of post operative pain, time of recovery, dislocation rate and quality of life.

Keywords: Femoral neck fracture, Cemented hemiarthroplasty, Hardinge approach, Posterior approach

INTRODUCTION

Hip fracture are commonly seen in the elderly population after a trivial fall and this represents a major public health issue. In the past few decades, the incidence has been steadily increasing.¹ About 1.6 million people worldwide sustain a hip fracture every year and due to increase life expectancy, the incidence is expected to rise.² The estimated mortality rate of 5% in acute phase and of 15-25% within first year surgical treatment.³⁻⁴

For displaced fragility hip fractures, hemiarthroplasty (HA) is a popular therapeutic option.⁵ Hemiarthroplasty is economical affordable to bring back a near normal hip joint. Various approaches have been explained in accessing the hip joint namely Kocher-Langenback (dorsal), Moore (posterior), Watson Jones (anterolateral) and modified by Hardinge and Smith Peterson (anterior). Posterior approach is the go-to surgery at present mostly.⁶

The anterolateral approach (Watson-Jones) utilizes the intermuscular plane between the tensor fasciae latae and

gluteus medius.⁷ The lateral approach includes separating the vastus lateralis and gluteus medius insertions, which are attached after prosthesis implantation into their original position. All modifications of the lateral approach involve the division and later repair of the gluteus medius. The posterior approach includes separating the gluteus maximus muscle following the release of external rotators from the femoral insertion.⁸ Each approach has its advantages and complications. Previously conducted studies of hip fracture patients treated with hemiarthroplasty indicate that the risk of hip dislocation and reoperation increase with posterior approach compared to the lateral approach.⁸⁻¹⁰ The lateral approach, however, may predispose to hematoma. Rates of infection, seroma, and perioperative fractures are similar after both approaches.¹¹ Some surgeons use the modified Hardinge procedure routinely for their primary total hip arthroplasty in cases of high risk of posterior dislocation postoperatively.¹²

This study compared hemiarthroplasty using anterolateral (Modified Hardinge) and posterior approaches among fragility hip fracture patients and evaluated early functional outcome and gait analysis postoperatively.

METHODS

Material and methods source of data

The present study had been carried out in the hospital settings of department of orthopedics in tertiary care centre and government medical college.

Study design

This was an interventional prospective randomized control trial study.

Period of study

The study was carried out over 3 years from 2019 to 2022.

Study place

Tertiary care centre and government medical college.

Software used

Software used was SPSS (Statistical package for social sciences).

Ethics committee

The study was approved by institutional ethics committee.

Sample size

Patients were randomly divided into two groups with the help of computer-generated coded envelopes; group A

(Femoral neck fracture patients treated by cemented hemiarthroplasty using conventional posterior approach) and group B (Femoral neck fracture patients treated by cemented hemiarthroplasty using modified Hardinge Approach) with 25 patients in each group.

Inclusion criteria

Patients with age >60, traumatic fracture neck femur with indication for bipolar hemiarthroplasty, ability to walk before trauma as well as both genders were included in the study.

Exclusion criteria

Patients with pathological fracture secondary to neoplasia or infection, indication for total hip replacement, concomitant neuromuscular pathologies and associated with any other ipsilateral or contralateral lower limb fractures were excluded from the study.

Management protocol

Operative management

Cemented bipolar hemiarthroplasty either by posterior or modified Hardinge approach.

Conventional posterior approach

Begin the incision 4.5 cm distal and lateral to the posterior superior iliac spine continue it laterally and distally, remaining parallel with the fibers of the gluteus maximus muscle, to the postero-superior angle of the greater trochanter, and distally along the posterior border of the trochanter for 5 cm.¹³

Separate the fibers of the gluteus maximus parallel with the line of incision, no more than 7 cm to protect the branches of the inferior gluteal artery as well as the nerves.¹⁴

Divide the insertion of the gluteus maximus into the fascia lata for 5 cm, corresponding to longitudinal limb of incision.¹⁵

Rotate the thigh internally, detach the tendons of the piriformis and the gemellus muscles near their insertion into the trochanter, and retract the muscle medially. The gemelli protect the sciatic nerve.¹⁶

The capsule is incised longitudinally to expose the posterior surface of the femoral neck and posterior border of the acetabulum, further exposure may be obtained by retracting the gluteus medius muscle proximally and the quadratus femoris muscle distally.¹⁶

After fracture and head is exposed head is dislocated posteriorly.

Modified hardinges approach

Place the patient lateral on the O.T table. Make a 15 cm straight longitudinal incision centered over tip of greater trochanter. Divide the fascia lata in the line with the skin incision. Retract the tensor fasciae latae anteriorly the gluteus maximus posteriorly, exposing the origin of the vastus lateralis and the insertion gluteus medius.¹⁷ Incise tension of gluteus medius obliquely leaving the posterior half attached to the trochanter, before incising the Gluteus Medius about 5 cm proximal to greater trochanter by suture in suture technique a bite in taken in anterior one third and posterior two third followed by incising proximally in the with the fibres of gluteus medius. this spilt should not be farther than 4-5 cm from the tip of greater trochanter to avoid damage to superior gluteal artery and nerve distally carry the incision anteriorly.¹⁸ Elevate the tendinous insertion of the anterior portion of the gluteus minimus and vastus lateralis, abduction of thigh exposes the anterior capsule. Incise the capsule. Head is dislocated anteriorly.

Post-op rehabilitation program

Hip positioned in approximately 15° abductions. Avoid internal rotation of lower extremity. Avoid crossing midline of body. Triangular pillow to maintain abduction and prevent extreme flexion for posterior approach. For anterolateral approach patient is advised abductor strengthening exercises. After 2 weeks patient is called for follow up, if surgery uncomplicated walker can be discontinued and to use crutches when strength and balance allow. Cane allowed until pain and limp is resolve.

RESULTS

This was an interventional prospective randomized control trial study carried out over 3 years from 2019 to 2022 in a tertiary care centre and government medical college. Patients were randomly divided into two group A (Femoral neck fracture patients treated by cemented hemi-arthroplasty using conventional posterior approach) and group B (Femoral neck fracture patients treated by cemented hemi-arthroplasty using modified Hardinge Approach) with 25 patients in each group.

Table 1: Age distribution in both groups.

Age (Years)	Group A, n (%)	Group B, n (%)
61-65	05 (20)	07 (28)
66-70	08 (32)	08 (32)
71-75	06 (24)	05 (20)
76-80	04 (16)	02 (08)
>80	02 (08)	03 (12)

Table 2: Gender distribution.

Gender	Group A, n (%)	Group B, n (%)
M	15 (60)	13 (52)
F	10 (40)	12 (48)

Table 3: Duration of surgery.

Duration of surgery (minutes)	Group A	Group B
	74.61±10.37	86.11±9.47

Table 4: Harris hip score group A.

Harris hip score	1 month	3 months	6 months
Group A	71.42±4.93	77.19±3.79	81.97±5.12

Based on mean Harris hip score with standard deviation for group A the values were 71.42±4.93, 77.19±3.79 and 81.97±5.12 after surgery 1 month, 3 months and 6 months respectively.

Table 5: Harris hip score group B.

Harris hip score	1 month	3 months	6 months
Group B	82.56±3.96	87.23±6.12	89.02±5.06

Based on mean Harris hip score with standard deviation for group B the values were 82.56±3.96, 87.23±6.12 and 89.02±5.06 after surgery 1 month, 3 months and 6 months respectively

Table 6: SF 36 score group A.

SF 36 score	1 month	3 months	6 months
Group A	81.12±5.14	85.19±6.17	86.98±4.88

Based on mean SF-36 score with standard deviation for group A the values were 81.12±5.14, 85.19±6.17 and 86.98±4.88 after surgery 1 month, 3 months and 6 months respectively.

Table 7: SF 36 score group B.

SF 36 score	1 month	3 months	6 months
Group B	84.66±4.19	89.09±5.17	92.11±6.84

Based on mean SF-36 score with standard deviation for group B the values were 84.66±4.19, 89.09±5.17 and 92.11±6.84 for 1 month, 3 months and 6 months respectively.

DISCUSSION

This was an interventional prospective randomized control trial study carried out over 3 years from 2019 to 2022 in a tertiary care centre and government medical college. Patients were randomly divided into two group A (Femoral neck fracture patients treated by cemented hemi-arthroplasty using conventional posterior approach) and group B (Femoral neck fracture patients treated by cemented hemi-arthroplasty using modified Hardinge Approach) with 25 patients in each group.

Surgical exposure is fundamental to the end result in hip arthroplasty. Two of the most popular are the posterior and the modified Hardinge type approaches.

The relative merits of these approaches are debated, although no study has conclusively demonstrated an advantage of one over the other. The issues involved in selecting a surgical approach are addressed in this study.

The posterior approach is generally considered to be easy to perform, using less extensive tissue dissection, which gives shorter operation times, and less blood loss. It allows a good exposure of the femur that may reduce the risk of femoral fracture during the procedure. It is considered to be associated with less problems with gait since the abductor muscles are not dissected. However, it is often more difficult to see the acetabulum and increased rates of dislocation have been reported (Paterno et al).¹⁷ It also has higher incidences of sciatic nerve injury and femoral stem loosening as seen by Roberts et al study.¹⁹

The advantages proposed for the modified Hardinge Approach are that it allows good exposure of the acetabulum, facilitating cup positioning which may decrease rates of hip dislocation. It also diminishes the risk of injury to the sciatic nerve, which is not close to the operative field. However, there is an increased risk of damage (as seen by Baker et al study) to the superior gluteal nerve as well as to the gluteus medius muscle resulting in delay in recovery of abductor strength and late Trendelenburg gait.²⁰ Furthermore, the capsule of the hip joint is preserved. Though not confirmed statistically, there is a likelihood of heterotropic ossification with this approach.

The primary goal of total hip arthroplasty is to improve pain and function. Barber et al study compared 28, hip arthroplasty operated on using the posterior approach versus 21 hips using the modified Hardinge approach.²⁰ At 2 years follow-up, no dislocations were recorded in either group. A Trendelenburg test score as well as a limp score and an abductor power score were recorded without significant differences between groups. This is the only study, which assessed Harris hip score and found both groups improved their postoperative score to obtain the same mean score of 94 at the end of 2 years and found it is not significant.

In this study, we used Harris hip score to evaluate the postoperative outcome. We assessed at the end of 1, 3 and 6 months for comparing the early functional outcome between the modified Hardinge type and posterior approaches. However, there is a significant improvement in the overall score as well as individual pain and functional score. Same response came for Lusty et al study also with significant statistical findings.¹²

Limitations

There are a few limitations in our study. Firstly, it is not randomized and not double blinded. Secondly, power of the study is inadequate. Thirdly, selection bias-patients in both groups are not matched. Fourthly, short-term follow up. Fifth, implant used were the same in all patients.

CONCLUSION

Mean duration of surgery in minutes was more for modified Hardinge approach. Harris hip score with standard deviation for modified Hardinge approach for follow-ups was better and statistically significant than posterior approach. Similarly, quality of life after surgery, in terms of mean SF-36 Score with standard deviation for modified Hardinge Approach was better and statistically significant than posterior approach. Modified Hardinge approach has fewer complications in comparison to the posterior approach. With the advantages comes a longer learning curve to operate without complications. Hence, with proper surgical technique, and proper tight closure, we prefer the modified Hardinge approach over other approaches as it had nil dislocations and abductor lurch.

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Conflict of interest: None declared

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