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Comparative study on functional outcome of unstable intertrochanteric fractures treated with bipolar hemiarthroplasty and dynamic hip screw fixation in elderly population

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Abstract
Introduction: The surgical stabilisation of elderly proximal femur fractures has improved thanks to recent developments. In many circumstances, the internal fixation fails. Inadequate fixing of the fracture, fracture pattern, and poor quality of the bone are all contributing causes of internal fixation failures. Elderly patients who have Bipolar Hemiarthroplasty (BHA) for unstable inter trochanteric fractures are compared to those who undergo Dynamic Hip Screw (DHS) fixation.
Methods: Department of Orthopaedics conducted a study on this topic. 30 Patients with Unstable Intertrochanteric Fractures were divided into two groups for a 12-month period of time: group A (Bipolar Prosthesis) in 16 cases, while group B (DHS) in 14 cases.
Results: "Evaluation of the patients was done using the Harris hip score during their follow up period. In group A, the Harris hip score at three, six, twelve months were 81.9, 76.7, 83.4 respectively. Similarly, in group B, the Harris hip score at three, six, twelve months were 72.80, 67.03, 73.71 respectively.
Conclusions: Bipolar Hemiarthroplasty may be an effective treatment option for older patients with osteoporotic Unstable Intertrochanteric fractures. Early mobilisation reduces the risk of problems such as pressure sores and pulmonary issues that can arise from prolonged immobilisation, and this also leads to better functional outcomes in Group A (BHA) than in Group B (DHS).

Keywords: Unstable intertrochanteric fractures, bipolar hemiarthroplasty, dynamic hip screw, harris hip score

Introduction
One of the most common fractures in the senior population is the proximal femur fracture, which has a significant impact on the health care system. Mostly occurs after a slip and fall and is a low velocity injury. It is a life-changing occurrence in the older population, bringing them severe pain and impairment at a vulnerable stage in their lives. After a year, patients with proximal femur fractures only regain 30-50 percent of their pre-fracture mobility and function. The most common cause of proximal femur fractures is a low-energy fall, which occurs more frequently in the elderly. During a fall, the femoral neck's superolateral cortex is subjected to a significant amount of compressive stress. Osteoporosis is a crucial factor in the ageing process. The femoral neck's thin cortex and greater diameter all contribute to the bone's higher fracture risk. A fall can cause a significant quantity of energy to be absorbed by a person's skin, muscles surrounding the hip, and fat [1]. Because muscle mass surrounding the hip decreases and osteoporosis worsens with age, hip fractures are becoming increasingly common among the aged population as a whole. Internal fixation has improved the outcomes of elderly patients with trochanteric hip fractures [2]. Internal fixation has a significant failure rate. Initial fracture pattern, communication, inadequate fracture fixation, and low bone quality [3] were all factors in the procedure's failure after internal fixation. Some of the early failures of internal fixation include a loss of fixation, varus collapse, and lag screw cut off [4]. One group of patients is treated with bipolar hemiarthroplasty, while the other receives Dynamic hip screw fixation.

screw fixation. The functional outcomes of both groups are tracked for 12 months to determine which treatment method is superior, while also accounting for factors like surgery time, post-surgery immobilisation time, and infection rates [5].

Materials and Methods

From July 2020 through July 2021, the Department of Orthopaedics conducted a study in which Group A-bipolar prosthesis (16 cases) and group B-dynamic hip screw (DHS) (14 cases) were used on 30 elderly osteoporotic patients with unstable intertrochanteric fractures, and all patients were willing to be followed up. All fractures were classified according to the Boyd and Griffin classification (Figure 1).

Inclusion criteria: Osteoporotic fractures, unstable intertrochanteric fractures, and those beyond the age of 60 were included in the study.

Criteria for exclusion: Stable intertrochanteric fractures in individuals under the age of 60 years old, Pathological fractures, Ipsilateral related fractures, stable lower trochanter patients, and patients with accompanying lower limb fractures were all eliminated from the study.

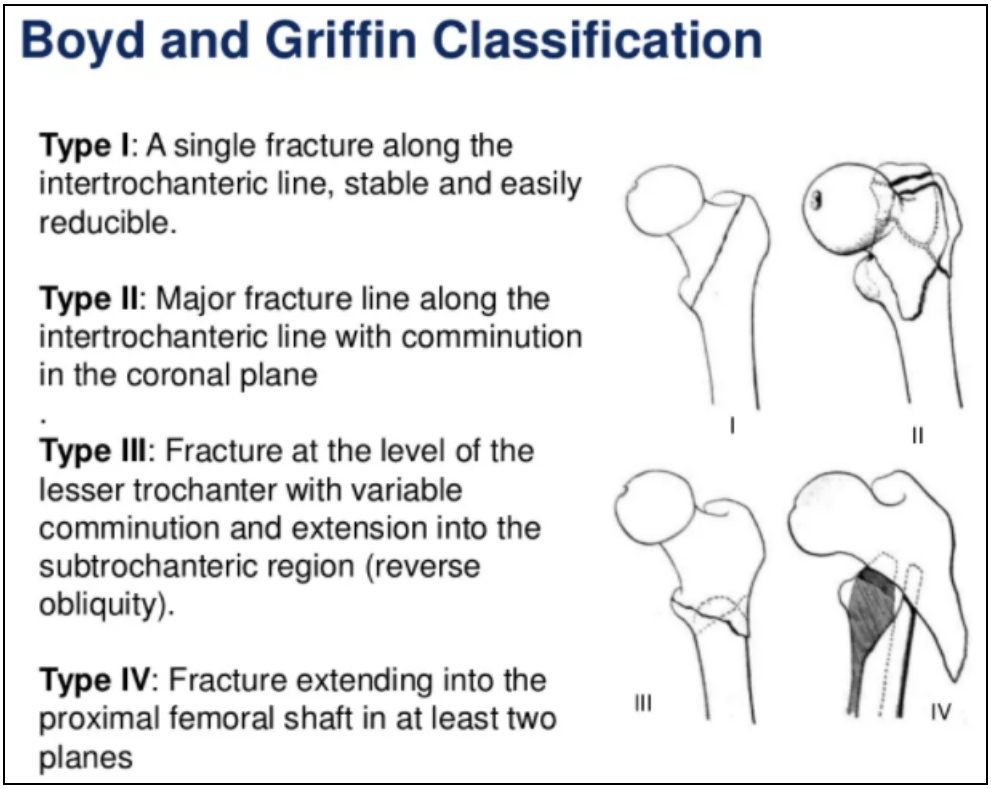

Fig 1: Boyd and Griffin Intertrochanteric fracture classification

Pre-operative evaluation: Comorbidities are registered at admission and the patient's general health was examined. A traction device was used on individuals who had difficulty obtaining anaesthesia. Anteroposterior and lateral radiographs were used for the examination. At follow-up, the Harris hip score was used to assess functional outcomes. Tossing a coin determined which patients would be in Group A or Group B.

In Group A, Spinal anaesthesia was used to perform a bipolar hemiarthroplasty. Parts cleaned and draped under SA. Patient in lateral posture. A posteriorly directed lazy-J incision is made over the greater trochanter using the Hardinge approach to the hip. Fascia lata divided in line with the skin incision and centered over the greater trochanter. The vastus lateralis and the insertion of the gluteus medius were exposed when the tensor fasciae latae and the gluteus maximus retracted anteriorly and posteriorly, respectively. Tendon of gluteus medius cut across the greater trochanter, however the back half remained attached. Gluteus medius incision carried out proximally in line with the muscle fibres at the muscle's mid-and-posterior-third junction. The vastus lateralis fibres are cut along the anterolateral surface of the femur, and the incision is carried anteriorly in line with the fibres down to the bone. The vastus lateralis and gluteus minimus anterior tendon insertions were raised. The hip joint's anterior capsule is exposed when the thigh is lowered. The femoral head is removed from the joint capsule. The medullary canal was repeatedly broached with rasps of increasing size. The hip was reduced and the stability and range of motion were examined, and the trial stem of size 1 and the head size 45 were found to be stable throughout the range. The medullary canal was filled with a cement restrictor. The medullary canal was filled with cement. A size 1 femoral stem and stem centralizer were placed into the patient. The hip joint was decreased by inserting a femoral head of size 45. There were no issues with the stability of the system when it was tested. The wound was thoroughly washed. The condition of haemostasis has been stabilised. Ethilon 2-0 was used to make the closure. Antibiotic coverage was provided by Inj. Taxim 1g. On the second post-operative day, drain removal was done. Static quadriceps strengthening exercises and knee range of motion exercises were prescribed to the patients. Using a walker for support, non-weight bearing walk was started on post-operative day 2. Weight bearing walking began on post-operative day 3 of recovery.

Fourteen patients were part of Group B, which received DHS. Closed reduction is performed on the fracture table for all patients. A skin incision of 10 cms was created from the greater trochanteric area to the proximal femoral shaft using

the lateral approach. Incision and retraction of skin, subcutaneous tissue, and deep fascia. A band of scar tissue forms around the fibres of the Vastus Lateralis muscle. Lateral aspect of proximal femur exposed. Threaded guide wire passed using 135 degree angle guide into the subchondral aspect of the head. 8.5mm lag screw 90mm x 1 inserted after drilling and tapping and attached to 4 holed long barrel plate and screws. Checking the C-arm for fracture reduction and fixation, the results were satisfactory for all of the patients. Ethilon 2-0 was used for skin closure. Group B patients received Inj.Taxim1g for antibiotic coverage. Exercises to strengthen the quadriceps and improve knee range of motion began on post-operative day 1. After the second post-operative day non weight bearing walking with the aid of a walker was started. On the fifth postoperative day, the patient began full weight bearing walk. On the 12th postoperative day, sutures were removed from patients in Groups A and B. Functional results were examined at 3, 6, and 12 months using the Harris hip score in both Group A and Group B patients, respectively.

Statistical Analysis

Data is reported as a mean and a significant difference between the two groups of data was studied using two sample Wilcoxon rank-sum (Mann-Whitney) test. A significant P value was one which was less than 0.05.

Results

A total of 30 elderly patients with Unstable Intertrochanteric Fractures treated with Bipolar Hemiarthroplasty or Dynamic Hip Screw was studied between July 2020 – July 2021. Both sides were equally injured. 70.5 years was the mean age of the patients ranging from 61 to 82 (Figure 2). There were 14 males and 16 females in a study among 30 patients (Figure 3). SAF was the most common mode of injury in a study accounting for 17 patients (Figure 4).

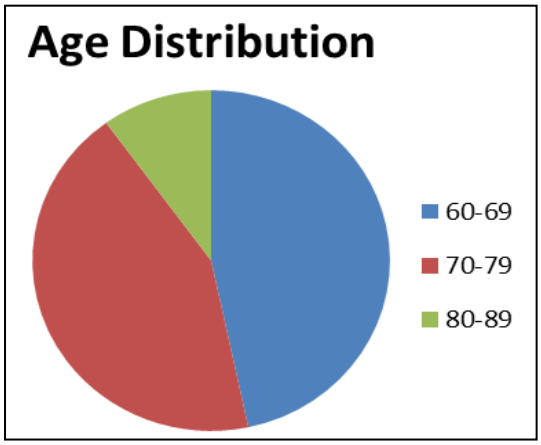

Fig 2: Age Distribution

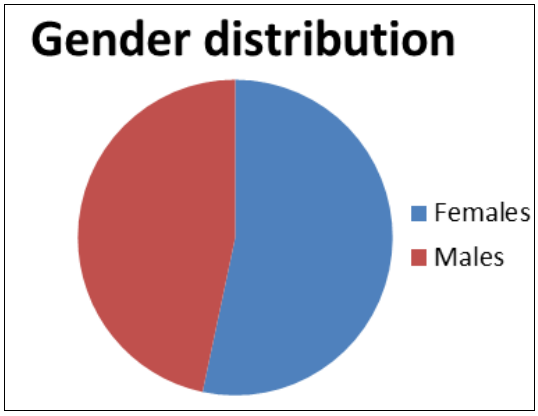

Fig 3: Gender Distribution

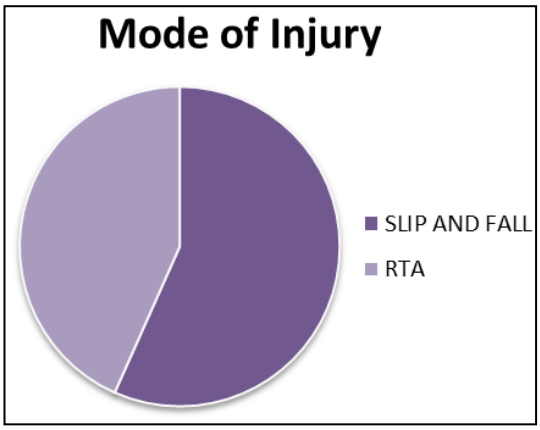

Fig 4: Mode of Injury

16 patients underwent Bipolar Hemiarthroplasty in Group A & 14 patients underwent Dynamic Hip Screw fixation in Group B. Type 4 fractures according to Boyd & Griffin classification was more commonly seen in the study (Figure 5).

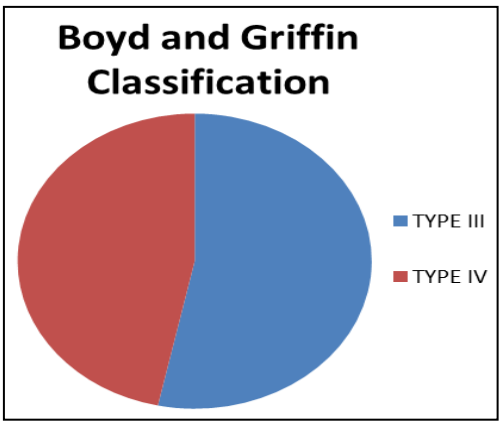

Fig 5: Boyd and griffin classification

The average surgery duration for BHA was 94.5 minutes and was 104.3 minutes for DHS fixation. Average blood loss during BHA was 188.8 mL and was 187.5mL for DHS. Average hospital stay was 7 days for BHA and 9 days for DHS. Average post-op Harris Hip Score after 3 months, 6 months and 12 months in case of BHA were 72.5, 77, 77.6 and 63.35, 67.14, 72.78 for DHS. 2 patients who underwent DHS developed superficial surgical infection which resolved with antibiotic treatment. All patients came back to pre-injury status after 18 weeks with no gait abnormalities. There were no other additional complications. None of our patients were lost during follow up (Table 1).

Table 1: Patients Demographics and data

S. No	Age	Sex	Side	Mode of injury	Fracture type (Boyd And Griffin)	Surgery	Surgical time (minutes)	Blood loss (ml)	Harris hip score (3 Months)	Harris hip score (6 Months)	Harris hip score (12 Months)
1	62	F	R	SAF	IV	BHA	90	180	70	76	82
2	64	M	L	SAF	IV	BHA	100	160	72	77	81
3	65	F	L	RTA	III	DHS	81	190	62	66	72
4	72	F	R	SAF	III	BHA	95	240	73	77	84
5	77	M	L	SAF	III	DHS	105	210	64	68	76
6	69	F	R	RTA	IV	BHA	97	170	74	78	86
7	70	M	R	RTA	III	DHS	80	160	62	65	70
8	68	F	L	SAF	IV	DHS	110	190	61	66	72
9	76	M	R	SAF	III	BHA	87	190	74	80	89
10	62	F	L	RTA	IV	DHS	120	210	65	69	73
11	66	F	R	SAF	III	DHS	115	170	63	68	75
12	82	M	L	SAF	IV	BHA	90	150	70	75	78
13	73	F	R	RTA	IV	DHS	105	205	62	65	70
14	69	F	L	SAF	III	BHA	95	190	72	78	84
15	71	M	R	RTA	IV	DHS	100	195	61	64	71
16	67	M	L	SAF	IV	BHA	98	210	74	78	82
17	78	F	L	RTA	III	DHS	110	180	62	68	75
18	64	F	R	SAF	IV	BHA	90	180	74	81	84
19	77	M	R	RTA	III	BHA	95	205	74	78	81
20	63	M	L	SAF	III	DHS	105	170	66	69	72
21	67	M	L	RTA	IV	BHA	110	210	68	70	77
22	70	F	R	SAF	III	DHS	115	170	64	68	75
23	82	M	L	SAF	IV	BHA	90	150	72	75	80
24	73	F	R	RTA	IV	DHS	105	205	64	66	70
25	70	M	L	SAF	III	BHA	91	197	74	77	83
26	71	F	R	RTA	IV	DHS	100	195	62	66	71
27	69	M	L	SAF	IV	BHA	98	210	73	78	82
28	76	F	L	RTA	III	DHS	110	180	69	72	77
29	61	F	R	SAF	IV	BHA	93	175	74	78	84
30	80	M	R	RTA	III	BHA	95	205	72	76	81

SAF- Slip and Fall, RTA- Road traffic accident, BHA- Bipolar Hemiarthroplasty, DHS- Dynamic Hip Screw

Discussion

Since intertrochanteric fractures tend to occur after a fall, the elderly population is more likely to suffer from them. Almost all intertrochanteric fractures are caused by low velocity injuries. Complication rates with internal fixation are still in the 10% to 40% range [6] despite substantial reduction in mortality risk. Intertrochanteric fractures can be stabilised by using a bipolar hemiarthroplasty. This procedure is most effective in allowing the patient to be mobilised as soon as possible after surgery, and it provides adequate fixation as well as pain relief and improved functional outcomes. Postoperative problems, such as pneumonia and pressure sores, are also less likely to occur when using this technique. As part of a research project led by Hernigou, patients with comminuted intertrochanteric fractures who had been fitted with a bipolar Bateman-Leinbach prosthesis were monitored for an average of twenty-eight months. Patients in this study were, on average, seventy-eight years old. Screw backout and infections were not recorded. Pre-discharge, 91% of patients were able to do full weight bearing walk [8]. Ninety-four elderly individuals were given bipolar Vandeputte prostheses as part of a study by Im *et al*. The bipolar hemiarthroplasty group had a reduced death rate, a shorter average operating duration, and superior functional outcomes [9]. Eighty percent of Harris' hip scoring patients had well to outstanding results. Because of postmenopausal osteoporosis and lower peak bone mass, women made up the majority in this study, making up 60% of the study. A bipolar Leinbach-hemiprosthesis was implanted in 54 elderly patients in a study by Lafosse *et al*. A loosening or dislocation of the stem was not observed in any of the cases reported here. Eighty percent of Harris' hip scoring patients had well to outstanding results [10]. Group A results were superior to Group B in terms of blood loss and surgical time [11]. While the difference in operating time between the two groups was statistically insignificant (p value of 0.0004), the findings from Kyle, *et al*. [12] show that hemiarthroplasty requires an average of 112 minutes and p value of 0.0001 in the hemiarthroplasty group. As in the Levy, *et al*. trial, where the mean blood loss from the hemiarthroplasty group was just under 200 millilitres (p = 0.005), the amount of blood lost in group A (188.8 millilitres) was less than that from group B (187.5 millilitres). Pressure sores occurred at a lower rate (4.7% in Group A patients) in comparison to patients who received DHS (group B) because patients who underwent BHA (group A) began mobilisation earlier [13]. Group B (DHS) had two patients who acquired post-operative infections, which were treated with IV antibiotics [14]. In our study, there were no reports of dislocation". Group A had a higher Harris hip score than Group B. When it comes to Harris hip scores, the results at 12

months follow-up are statistically significant (P value of 0.04). This is comparable to the study by Rodopi, *et al*., which found that hemiarthroplasty patients' scores were statistically significant at 24 months follow-up.

Conclusion

Bipolar hemiarthroplasty appears to be a superior treatment for older patients with unstable intertrochanteric fractures, according to the study's findings. Problems including pressure sores and pulmonary complications were significantly reduced in individuals who underwent BHA rather than DHS because patients who underwent BHA mobilised quicker. Patients in group A spend less time in the hospital, which reduces the likelihood of hospital-acquired infections. Patients with Intertrochanteric fractures benefit significantly with BHA, as evidenced by their improved functional outcomes. An even larger prospective study is needed in the long run to compare internal fixation with hemiarthroplasty, even if the short-term results are encouraging.

Conflict of Interest

Not available

Financial Support

Not available

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