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Study of Management of Intertrochanteric Fractures of Femur in Adults by Various Surgical Modalities

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Abstract

Aim: To study the outcome of the various surgical modalities (DHS, PFN, Cemented bipolar arthroplasty) in the management of intertrochanteric fractures of femur in adults, compare the results, in various age groups, asses the complications encountered with each method. *Materials and Methods:* The present study consists of 50 adult patients with intertrochanteric fractures of femur treated with DHS, PFN and cemented bipolar prosthesis at department of Orthopaedics. *Results:* In this study of 50 patients, 14 were treated with PFN, 20 with DHS, 15 with bipolar hemiarthroplasty and 1 with other method. Intertrochanteric fractures common between 29-48 years and 49-78 years, shows bimodal age distribution. In young patients it was due to high velocity trauma, fall from height being the common mechanism of injury. Slip and fall was common mechanism in elderly. It was more common in females due to post menopausal osteoporosis. Associated injuries were more common in high velocity trauma. Early surgery increases patients comfort, facilitates nursing care, helps in early mobilization of patients and decreases hospital stay. *Conclusion:* In elderly patient with osteoporotic communited IT fracture, bipolar hemiarthroplasty is better option, Unstable, communited and reverse oblique IT fracture with good bone quality PFN is a better option. DHS is the still viable option in stable fractures and in unstable fracture with technical expertise, in improving fracture stability.

Keywords: DHS; PFN; Cemented Bipolar Arthroplasty.

Introduction

Intertrochanteric fractures are a major cause of morbidity and mortality in elderly population. The incidence of all hip fractures is approximately 80 per 100,000 persons. Intertrochanteric fracture make up 45% of all hip fractures [1]. Unstable intertrochanteric fractures in elderly patients are associated with high rates of morbidity and mortality [2] although the results have improved with the use of internal fixation. In these patients however, comminution, osteoporosis, and instability often preclude the early resumption of full weight bearing [3]. Trochanteric fractures almost invariably occur as a result of fall, at involving both direct and indirect forces. Koval [4] and Zuckerman postulated that Intertrochanteric fractures constitute almost half of all fractures of the proximal femur. Direct forces act along the axis of the femur or directly over the greater trochanter to result in Intertrochanteric fractures. Indirect forces include pull of the iliopsoas muscle on the lesser trochanteric and pull of the abductor muscle on the greater trochanteric region. Intertrochanteric fractures, are commonly encountered in patients over 60 years of age and are three times more frequent in women than men because women tend to be less active and develop

postmenopausal osteoporosis. Severe osteoporosis in these age group is responsible for high incidence with minimal to moderate trauma. Norton and Riska described patients with Intertrochanteric fractures to be 10 to 12 years older than patients with intracapsular femoral neck fractures, the average age reported in these patients in 60 to 75 years [5]. Intertrochanteric fractures frequently occur through bone affected by osteoporosis, the degree of osteoporosis can be determined by singh's index, which classifies the severity of osteoporosis by the radiographic evaluation of trabecular pattern [6] of the proximal femur.

Before the introduction of suitable fixation devices, treatment for intertrochanteric fractures was non operative, consisting of prolonged bed rest in traction until fracture healing occurred (usually >12 weeks), followed by a lengthy program of ambulation training, was associated with high complication rates, like decubiti, urinary tract infection, joint contractures, pneumonia, atelectasis and thromboembolic episodes and locally fracture malunion with varus deformity and shortening leading to high morbility. Surgery in trochanteric fractures is important in elderly patients for prevention of complications associated with conservative treatment and aimed at early rehabilitation and mobilization. Internal fixation does provide stability, but in elderly patients with osteoporotic bones, complications like loosening, implant penetration, loss of fixation, cut through of implant are not uncommon, thus is the emerging role of cemented bipolar in the management of intertrochanteric fractures.

Materials and Methods

The present study consists of 50 adult patients with intertrochanteric fractures of femur treated with one of the procedure, DHS, PFN and cemented bipolar prosthesis, followed up at regular intervals with minimum follow up of 6 months.

Data Collection

After admission of patient, clinical details, and investigations were taken, necessary was performed, discharged , followed up at regular intervals for serial clinical and radiological evaluation.

Inclusion Criteria

All patients with intertrochanteric fractures with age > 18 years.

Exclusion Criteria

Young patients age < 18 years, elderly patients with severe medical problems, unfit for anaesthesia.

Management of Patient

After patient's aadmission, necessary clinical and radiological evaluation was done and admitted with necessary resuscitation and splintage with skeletal traction.

The following Investigations were done routinely on all these patients. Blood Hb%, Bleeding time, Clotting time, Blood grouping and Cross matching, Fasting and Post prandial blood sugar, Blood urea and Serum Creatinine, Urine Albumin, Sugar, microscopic examination. X-ray Pelvis with both hips (AP view), Chest X ray PA view. All the patients were evaluated for associated medical comorbidities and associated injuries (if any) were treated simultaneously. The patients were operated on elective basis after overcoming the avoidable anaesthetic risks.

Pre-Operative Planning

Ap X Ray Involved Hip And Traction Views Are Taken singhs index assessed, age of the patient and fracture geometry were considered in the selection of the treatment modality.

Geriatric patients(>65years) with unstable fracture and singhs index <4 — cemented bipolar

Unstable fractures with subtrochanteric extension and reverse oblique types — proximal femoral nail. All simple and stable fractures - dynamic hip screw.

Pre-Operative Treatment

After PAC, written informed consent taken, local part preparation, prophylactic antibiotics were given.

Surgery: after SA, patient is mounted on fracture table, fracture reduction is checked in c-arm image, if it is simple and stable, DHS is performed, If fracture is unstable and comminuted, reduction is achieved and PFN is performed.

In both procedures, final image is checked. In cases already decided for bipolar prosthesis, after SA, lateral position, aseptic, posterio lateral approach, fracture is approached, head extracted, neck is prepared rasped, measured head size bipolar is inserted after cementing, with length and anteversion and offset were taken in to consideration, grater trochanter is stabilised (TBW), soft tissue repair was done meticulously.

Post Operative Treatment

Iv fluids,antibiotics,drain monitoring and dressings were performed, gradual mobilisation as per fracture stability were performed.

Results

It is a non randomised prospective, observational study, with sample size of 50.

Table 1: Incidence

Age group	No. of Patients	Percentage
18—28	1	1.33%
29—38	2	4%
39—48	5	8%
49—58	11	17.33%
59—68	17	38.67%
69—78	11	1.33%
79---88	2	8%
89---98	1	1.33%
Sex		
Female	28	56%
Male	22	44%
Side involved		
Left	27	54%
Right	23	46%

Table 2: Injury, fracture, surgical procedure

Mode of Injury	No. of Patients	Percentage
fall on slippery floor	30	60%
fall from stairs & height	10	20%
RTA	7	14%
Other	3	6%
fracture type (Evans classification)		
Stable	12	24%
Unstable	38	76 %
surgical procedure		
dynamic hip screw	20	40%
proximal femoral nail	14	28%
cemented bipolar	15	30%
others	1	2%
hospital stay duration in days		
10-15 days	31	62%
16-20 days	11	22%
>21 days	8	16%

Table 3: Average blood loss, full weight bearing duration

Operative procedure	Cemented bipolar	PFN	DHS
Blood loss	200 ml	100 ml	250 ml
Full Weight bearing	6 weeks	8 weeks	12 weeks

Table 4: Surgical outcome

Outcome	Cemented Bipolar		PFN		DHS	
	N	%	N	%	N	%
Excellent	12	80	13	92.96	17	85
Fair	2	13.33	1	7.14	1	5
Poor	1	6.67	0	0	2	10

In this study out of 15 patients of bipolar hemiarthroplasty, 12 (80%) had excellent outcome , 2 (13.33), 1 (6.67%%), had, fair and poor outcomes respectively. Out of 14 patients of PFN, 13 (92.96%) had excellent and 1 patient (7.14%) had fair. Out of 20 patients of DHS, 17 (85%) patients are excellent results, 1 (5%) patient had fair and 2 (10%) patients had poor results.

Table 5: Post-operative complications in 3 surgical modalities

	dynamic hip screw group	
Complications	**No. of patients**	**percentage**
loss of reduction	0	0
screw cut out	0	0
varus malunion	1	5%
screw back out	1	5%
non union	0	0
implant cut out	1	5%
proximal femoral group		
Complications		
implant failure	0	0
superficial infection	1	7.14%
screw back out	1	7.14%
thigh pain	0	0
non union	0	0
peri prosthetic #	0	0
cemented bipolar group		
Complications		
dislocation	0	0
superficial infection	1	6.67
limb shortening	1	6.67
limb lengthening	1	6.67
peri prosthetic #	0	0
aseptic loosening	0	0

Clinical Case 1: Bipolar arthroplasty

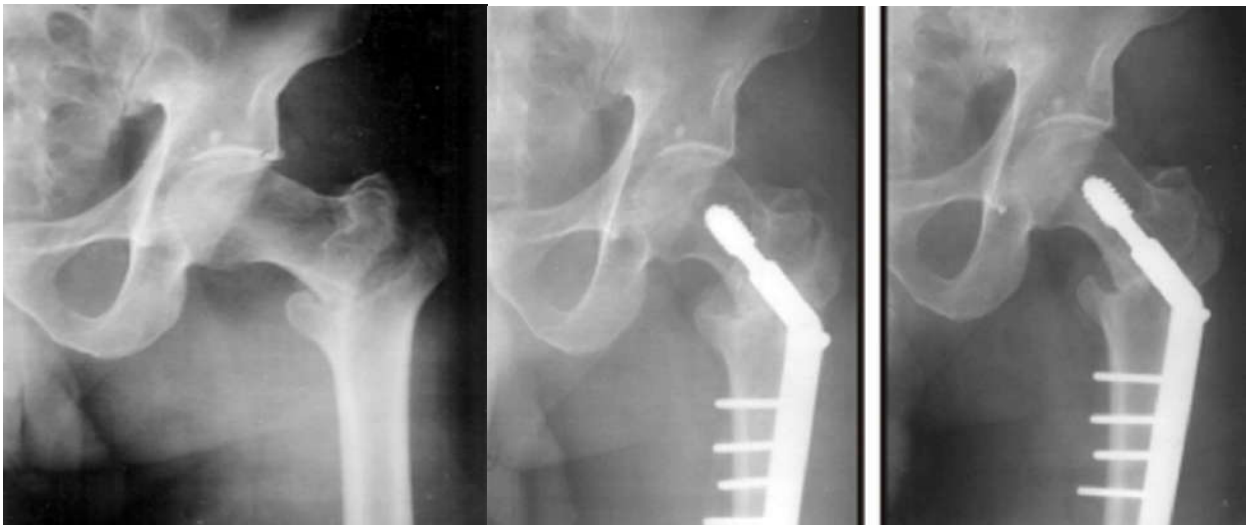
Pre Operative

Post Operative

IT #, geriatric, unstable comminuted, osteoporotic

Follow up after 6 months

Case 2: Dynamic hip screw (DHS)



Pre Operative X-ray IT #, stable | Immediate Post Operative | 6 months Post-Operative

Clinical photos

Case 3: Proximal femur nail

Pre op- IT #,unstable | 1 month follow up | 3 months follow up

Clinical photos

Discussion

The treatment of intertrochanteric fracture is still associated with some failures. High stress concentration that is subject to multiple deforming forces, high incidence of complications reported after surgical treatment, compels the surgeon to give a second thought regarding selection of proper implant.

DHS: The simple, most commonly used method of fixation is sliding screw system for stable fractures. Unstable fractures requires stabilising procedures like Dimon and hughston Osteotomy which is major procedure and needs expertise.

PFN: The AO ASIF in 1996, therefore developed the Proximal Femoral Nail with an antirotation hip pin together with a smaller distal shaft diameter which reduces stress concentration to avoid failures. From mechanical point of view an intramedullary device inserted by means of minimally invasive procedure seems to be better in elderly patients. Closed reduction preserves the fracture heamatoma, an essential element in consolidation process. Intramedullary fixation allows the surgeon to minimize soft tissue dissection, there by reducing surgical trauma, blood loss, infection and wound complications.

Bipolar Hemiarthroplasty: Unsatisfactory surgical outcome is common in elderly patients with intertrochanteric fracture fixation methods, existing medical illness, osteoporosis, and fracture instability being contributing factors, may lead to loss of reduction, malunion, implant breakage. In order to give early mobilisation to decrease the risk of mortality and morbidity, we preferd cemented bipolar hemi arthroplasty for the treatment of osteoporotic, unstable trochanteric fractures in the elderly. outcome was evaluated with harris hip score .

On Comparision with Other Studies

Age Incidence: The average age in our series was 65 years with a range of 18-98 years. The average age in Casey MD series 2000 was 84.2 years and Heidelberg 2002 was 75.6 years. The age incidence in our series is at lower side, probably due to malnutrition, early onset of senile osteoporosis in our country. The average life expectancy of an Indian is 10 years less than western standards.

Sex Incidence: In our series, male to female ratio was 44:56. is similar to the reported series. According to Long and knight [16] females were 65.38%. In our study also IT fracture common in elderly female in post menopausal age and associated osteoporosis.

SIDE Incidence: 23 (46%) patients had fracture on right side and 27 (54%) patients had fracture on left side.

Fracture Patern: Evans unstable fractures were more accounting for 76%. In our study, intertrochanteric fracture was common due to fall on a slippery surface.

Type of Surgery and Outcome: In our study, 88% good and excellent results were noted with bipolar hemiarthroplasty comparable to other studies conducted by Rosenfeld et al. [12] used arthroplasty and reported 86% satisfactory results in the early period. Haentjens et al. [6] compared the clinical results of internal fixation and bipolar arthroplasty for unstable trochanteric fractures and reported 75% satisfactory results and less postoperative

complications in the latter group. They insisted that early weight bearing was the major factor responsible for decreasing postoperative complications. K. Casey Chan and Gurdevs Gill [7] found that use of standard cemented hemiarthroplasty is a reasonable alternative to a sliding screw device for the treatment of intertrochanteric fractures to achieve less postoperative complication. Prof. Chris Grimsud, Raul J. Monzon [8] treated all unstable three and four part hip fractures with standard femoral stem and circlage cabling of trochanters and they conclude that bipolar arthroplasty allows safe early weight bearing on the injured hip and had a relatively low rate of complication

Hospital Duration: A study of 50 patients of unstable intertrochanteric fractures treated with PFN, DHS & Bipolar by other studies (2004), they found duration of stay for PFN and DHS were 14 and 22 days, blood loss was 275 and 475ml, This correlated with our study where the duration of hospital stay was 14 days, average blood loss was100 and 250 ml.In bipolar hemiarthroplasty, hospital stay was avg 10 days and avg blood loss was 200ml. This correlated with our study where the restoration of post op walking ability was faster in pfn, bipolar hemiarthroplasty when compared with DHS.

Post Operative Complications: We noted one superficial infection in our study, with regular aseptic dressings and culture directed antibiotics the infection subsided Dislocation of the bipolar prosthesis is not seen our study, may be due to adeaquate and optimal repair of abductor mechanism by meticulous suturing of vastus – gluteal complex. Mericevic A et al. [9] study dislocation was seen in 2.6% patients, loosening seen in 1.3% patients, infection 2.3% intra hospital mortality in 1.3% patients in Bipolar Hemiarthroplasty. We noted shortening of less than 2cm in 1 of patients and limb lengthening in 1 of patients .this is because of excessive comminution of the fracture. We noted screw backout in 2 patients, 1 in DHS and 1 in PFN may be due to osteoporosis. varus malunion in 1 patient, implant failure in 1 patient, both of which occurred with DHS. This may due to imperfect fixation and incorrect selection of patient. i.e. osteoporotic.

Nuber S et al. [10] compared the dynamic hip screw (DHS) with trochanteric stabilisation plate (TSP) as the extramedullary power transmission system and the proximal femur nail (PFN) as the means of intramedullary stabilisation are both standard in the treatment of unstable trochanteric femoral fractures. At low complication rates, the radiological operation results are equally good. 6 revisions were necessary in the case of the DHS with TSP and 4 in the case of PFN. A significantly shorter operation time (44.3 vs. 57.3 min) and a considerably shorter in-patient stay (18.6 vs. 21.3 days) were common with PFN. The application of full-weight bearing immediately after the operation was possible for 97% of the PFN patients and 88% of the DHS patients. In a follow-up 6 months after the operation, the PFN patients displayed a significantly lower pain intensity in the operated leg at the same score for ambulation and the same subjective degree of satisfaction,hence recommonded PFN.

Parker MJ et al. [11] compared all cephalocondylic intramedullary nails with extramedullary implants for the surgical treatment of extracapsular hip fractures in adults. The one trial of 230 patients comparing the Kuntscher-Y nail with the SHS, reported no major difference the outcome aside from a significantly increased number of patients with leg shortening, and a tendency for poorer recovery of mobility in the Kuntscher-Y nail group. Five trials involving 603 patients compared the intramedullary hip screw (IMHS) with the SHS. Fracture fixation complications were more common in the IMHS group: all cases of operative and later fracture of the femur occurred in this group. Results for post-operative complications, mortality and functional outcomes were similar in the two groups. Two under-reported trials tested the proximal femoral nail (PFN).

The results of one study of 206 patients with a trochanteric fracture showed no advantages for the PFN compared with the SHS. The other study, involving 39 patients, comparing the PFN with the dynamic condylar plate for treating more distal and uncommon trochanteric fractures gave better intra-operative and fracture fixation results for the PFN. One trial of 60 patients reported favourable preliminary results for an experimental mini-invasive static intramedullary nail compared with the SHS.

Conclusion

In elderly patient with osteoporotic bone, communited IT fracture, cemented bipolar hemiarthroplasty is better option. Unstable (reverse oblique, sub trochanteric extension), communited fractures with good bone quality, PFN is a better option .

DHS is the still viable option in stable fractures and as well as unstable fracture with technical expertise.

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