

INTRAMEDULLARY OSTEOSYNTHESIS VERSUS PLATE OSTEOSYNTHESIS IN SUBTROCHANTERIC FRACTURES.

Orthopaedics

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ABSTRACT

Introduction: Subtrochanteric fractures of the femur remain some of the most challenging fractures facing Orthopaedic surgeons. Due to an ever-aging population and a growing prevalence of osteoporosis and motor vehicle accidents, the number of sub-trochanteric fractures is increasing worldwide. The sub-trochanteric region has certain anatomical and biomechanical features that can make fractures in this region difficult to treat. The preferred type of device is a matter of debate. Increased understandings of biomechanical characteristics of the hip and improvement of the implant materials have reduced the incidence of complications. The surgeons choose between the two methods according to Seinsheimer's classification and also to their personal preferences. **Aim and objective:** The aim of this study was to compare the clinical and functional outcomes of intramedullary osteosynthesis versus plate osteosynthesis in sub-trochanteric fractures. **Materials and Methods:** This prospective study was conducted at post graduate department of Orthopaedics, Govt. Bone and Joints Hospital, Barzulla, an associated hospital of Govt. Medical College, Srinagar. In this study a total of 50 patients with sub-trochanteric fractures were enrolled between June 2019 and May 2022. The enrolled patients were divided in two groups A and B, 25 patients in each group. In group A patients were treated with plate osteosynthesis and group B patients were treated with intramedullary nailing. **Results:** The average operating time for group A patients was 86 minutes and hospitalization of 8.2 days. In group B patient average operating time was 69 minutes, the hospitalization time approximately 6.1 days. Post-operative complications were more common in group A as compared to group B patients. The average Harris hip score at the end of 1 year follow up was 78 and 82 for group A and group B respectively. In group A there were 14 (52%) patients with an excellent Harris hip score, 8 (32%) patients with a good score, 2 (8%) with fair score and 1 (4%) patients had poor scores. In group B there were 12 (48%) patients with an excellent Harris hip score, 11 (44%) patients with a good score, 1 (4%) with fair score and 1 (4%) patients had poor score. **Conclusion:** We recommend that, despite the perioperative problems associated with nailing, this technique is preferable to plate fixation especially for specific fracture types with medial cortical comminution.

KEYWORDS

Hip, Fracture, Subtrochanteric fractures, Management, Plate osteosynthesis, Intramedullary nailing.

INTRODUCTION

Hip fractures are the second most common cause of hospitalization in elderly patients^[1]. Subtrochanteric fractures typically occur in the proximal femur between the inferior aspect of the lesser trochanter upto a distance of about 5 cm distally. These fractures have a bimodal age distribution. Subtrochanteric fractures are relatively rare, accounting for 10 to 34% of all hip fractures^[2]. These fractures are associated with a mortality percentage of 5% up to 15% in elderly, functional disability, and loss of mobility and independence with a negative impact on the patient's life and on healthcare costs^[3-5]. Due to an ever-aging population and a growing prevalence of osteoporosis and motor vehicle accidents, the number of subtrochanteric fractures is increasing worldwide. These fractures occur in the young by high-energy trauma, often polytraumatized population and in the elderly osteopenic population typically resulting from a low-energy fall from a standing height^[6,7].

Fractures in the subtrochanteric region present challenges to achieving stable fixation and appropriate reduction because the subtrochanteric region of the femur is one of the highest stressed zones in the human skeleton where tensile or compressive stresses can exceed several multiples of body weight. Also, the short proximal fragment is deformed by the hip flexors and abductors which may make accurate reduction and fixation challenging. Methods to improve the medical care for these patients that allow early mobilization and a fast return to initial status are required^[8]. A large variety of implants for the treatment of hip fractures is available to address these types of complications. However, if different implants are used for unstable fractures, there might be considerable differences in results^[9].

Subtrochanteric fractures are treated operatively and non-operatively. Non-operative treatment of the fracture may be an option for patients who are not surgical candidates. Operative management is the treatment of choice for the subtrochanteric fractures as it permits early mobilization and minimizes the complications of prolonged bed rest.

Over the past fifty years a wide variety of implants and fixation strategies have been utilized for the surgical stabilization of subtrochanteric fractures. Open or closed reduction and internal fixation surgery is the critical method for the treatment of the subtrochanteric fractures. Intramedullary and extramedullary fixations are two types of implants for the fixation of subtrochanteric fractures. Many studies advocated the use of the intramedullary nailing as the first choice for the treatment of the subtrochanteric fractures because of the central fixation and small incision, which can minimize the soft tissue dissection and preserve vascularity at the fracture site^[10,11].

However, studies have reported that extramedullary fixation, such as plating, could achieve satisfactory outcomes because of the minimally invasive percutaneous plate osteosynthesis (MIPO) technique^[12,13].

This technique also avoids extensive soft tissue dissection in the long bone fracture, which could reduce the surgical damage and complications common in patients treated by conventional plating^[14]. Although orthopedic surgeons should consider many factors to select the fixation method, whether intramedullary or extramedullary fixation is more appropriate for the treatment of subtrochanteric fractures is still controversial.

The objective of this study was to compare the clinical and radiological outcome of plate osteosynthesis and intramedullary nailing in management of these fractures.

MATERIALS AND METHODS

All patients with subtrochanteric fractures who presented to emergency department of Orthopaedics, Govt. Bone and Joints Hospital, Barzulla, an associated hospital of Govt. Medical College, Srinagar from June 2019 to May 2022 were enrolled in this study. A total of 50 patients were enrolled and divided in two groups A and B, 25 patients in each group. Mean age of the study population was 47.3 (Range 24- 71) years. In group A patients were treated with plate

osteosynthesis and group B patients were treated with intramedullary nailing. All enrolled patients met inclusion criteria.

Inclusion criteria:

- Age >18 years
- Fracture of non-pathological origin
- Patients who were able to walk prior to the fracture

Exclusion criteria:

- Age <18 years
- Patients with pathological fractures
- Patients with associated neurological problems
- Poly-trauma patients were

All the fractures were classified according to the Seinsheimer's classification (Table 1). Randomized distribution of patients was done in both groups. Patients were worked up and pre anesthetic checkup was done. Preoperatively antibiotics were given according to the hospital protocol. The group A patients were treated with open anatomic reduction, minimizing soft-tissue stripping of fracture fragments, and internal fixation using plate osteosynthesis and in group B patients closed reduction was done using a traction table and percutaneous insertion of intramedullary nailing was done without anatomical reduction.

Table 1: Demography of patients

Parameters		No. of patients	Percentage
Gender	Male	34	68
	Female	16	32
Mode of trauma	Road accidents	29	58
	Fall	17	34
	Others	4	8
Side	Right	19	38
	Left	31	62
Seinsheimer classification	Both	0	0
	3A	10	20
	3B	12	24
	4	16	32
	5	12	24

Post-operative protocol:

Post operatively the patients were started on weight bearing mobilization from the 2nd post-operative day. Both groups were recommended for physiotherapy and partial weight-bearing post-operation, as soon as possible. Patients were regularly followed up at 6 weeks, 3 months, 6 months and 1 year and patients were assessed using radiographs. After surgical treatment using standardized forms with data that includes function, pain scale and mobilization with or without aids and also a radiographic status of bone healing. Function was expressed as a change compared to the situation at the time of fracture (same as before, worse, no weight bearing). Post-surgical complications were also recorded. The functional outcome of the patients was assessed using the Harris hip score.

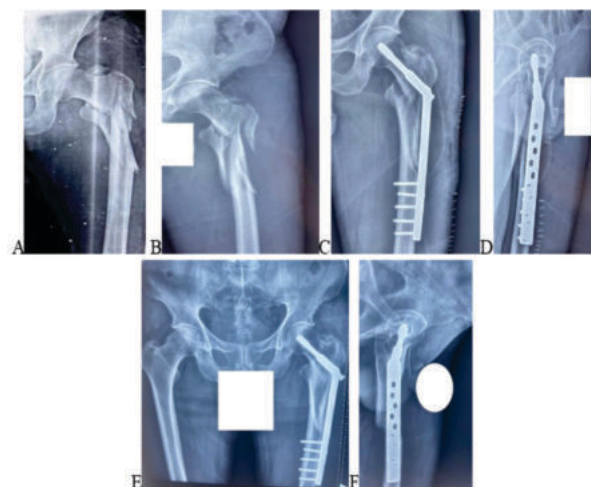


Figure 1: A and B (AP and lateral view pre-operatively), C and D (AP and lateral view post-operatively), E and F (AP and Lateral view at final follow-up)



Figure 2: A (Pre-operative radiograph), B (Post-operative radiograph), C (Radiograph at 3 weeks follow-up), D (Radiograph at 4 months follow-up)

RESULTS

The average operating time for group A patients was 86 minutes and hospitalization of 8.2 days. In group B patient average operating time was 69 minutes, the hospitalization time approximately 6.1 days.

In this study we found post-operative complications were more common in group A as compared to group B patients. In group A post-operative complications were, superficial wound infection in 3 (12%), hip pain in 3 (12%), delayed union in 3 (12%), hip stiffness in 1 (4%), knee stiffness in 2 (8%) and non-union in 1 (4%) of patients. In group B superficial wound infection was found in 2 (8%), implant failure in 1 (4%), hip pain in 1 (4%), hip stiffness in 1 (4%) and non-union in 1 (4%) of patients (Table 2).

In this study, 21 (86%) of the patients in group A and 23 (92%) in group B regained their initially walking ability.

The average Harris hip score at the end of 1 year follow up was 78 and 82 for group A and group B respectively. In group A there were 14 (52%) patients with an excellent Harris hip score, 8 (32%) patients with a good score, 2 (8%) with fair score and 1 (4%) patients had poor scores. In group B there were 12 (48 %) patients with an excellent Harris hip score, 11 (44%) patients with a good score, 1 (4%) with fair score and 1 (4%) patients had poor scores (Table 3).

Table 2: Comparison of post-operative complication

Complications	Group A (Plate osteosynthesis, N=25)		Group B (Intramedullary nailing, N=25)	
	No. of patients	Percentage	No. of patients	Percentage
Superficial wound infection	3	12	2	8
Hip pain	3	12	1	4
Hip stiffness	1	4	1	4
Knee stiffness	2	8	0	0
Delayed union	3	12	0	0
Non-union	1	4	1	4
Implant failure	0	0	1	4

Table 3: Comparison in results according to Harris hip score

Parameters	Group A (Plate osteosynthesis, N=25)		Group B (Intramedullary nailing, N=25)	
	No. of patients	Percentage	No. of patients	Percentage
Excellent	14	52	12	48
Good	8	32	11	44
Fair	2	8	1	4
Poor	1	4	1	4

DISCUSSION

Subtrochanteric fractures of the femur are usually the result of high energy trauma, the fracture fragments are significantly displaced, because of which there is difficulty in maintenance of reduction. Because of the high incidence of malunion, non-union and delayed union, there is no role of conservative treatment as previously advocated by Lee et al. [14]. The classification of subtrochanteric fractures is very difficult [2, 5, 8] the actual borderline between trochanteric, subtrochanteric and dia-meta-epiphyseal fractures is unclear. In the evaluation of the results, we used Seinsheimer's classification [15], which was applied in the majority of studies on subtrochanteric fractures and which, in our opinion, also proved the most practicable system.

Due to the anatomical peculiarity, the treatment of subtrochanteric

fractures is still a great challenge to the orthopedic surgeons not only because of the osteosynthesis difficulties but also for the still frequent complications. The optimal device for stabilization of subtrochanteric fractures would be an implant that resists the tendency for shaft medialization, as well as rotation and Varus angulation of the proximal fragment. There has been considerable controversy in the literature regarding the best type of implant^[16]. Both intramedullary and extramedullary fixation have been championed for the management of subtrochanteric fractures^[17].

The advantages of intramedullary nailing consist in^[18, 19, 20], small skin incision, lower operating times, fracture hematoma is preserved and early weight bearing is possible. The disadvantages consist in a difficult closed reduction due to important muscular forces although the nail can be used as a reduction instrument and a higher implant cost^[3, 21].

In open reduction internal fixation techniques, the advantage is represented by anatomical reduction which in our opinion is not necessary. The disadvantages are represented by higher operating time, demanding surgery, higher infection rates, late weight bearing, medial instability, refracture after plate removal and inesthetic approach^[4, 9, 22, 23]. The implant configuration and placement must be done according to the fracture type and weight bearing should be adapted accordingly to fracture type, implant type and bone quality. We recommend that, despite the perioperative problems associated with nailing, this technique is preferable to plate fixation especially for specific fracture types with medial cortical comminution.

Postoperative complications including infection, non-union, delayed union, and device failure were observed in 11 (22%) of patients of the study population. Although the incidence of complications in our study was not statistically different between the two groups, the complications such as delayed union were observed only in the plate osteosynthesis technique. Haefeli and colleagues studied 17 patients who were treated by locking plate. In their study, one person has been infected, and one person needed reoperation^[24].

Our study shows a good outcome of subtrochanteric fractures treated with the plate osteosynthesis and intramedullary nailing. We had Good to excellent results in 22 (88%) and 23 (92%) in group A and B respectively. In this study we had a better average Harris hip score in both groups. The average Harris hip score at the end of 1 year follow up was 78 and 82 for group A and group B respectively.

We had some limitations in our retrospective study. We only considered 2 implants, for which reason our findings may not be applicable to other devices or techniques, such as the Dynamic Condylar Screw. New techniques are being developed. secondly the number of patients were less.

CONCLUSION

The advantages of intramedullary nailing consist in small skin incision, lower operating times, fracture hematoma is preserved and early weight bearing is possible. The disadvantages consist in a difficult closed reduction due to important muscular forces although the nail can be used as a reduction instrument and a higher implant cost. In open reduction internal fixation techniques, the advantage is represented by anatomical reduction which in our opinion is not necessary. The disadvantages are represented by: higher operating time, demanding surgery, large devascularization, higher infection rates, late weight bearing, medial instability, refracture after plate removal and inesthetic approach. It was concluded that detailed fracture classification, restoration of length, rotation and alignment of fragments, is essential (anatomical reduction is not necessary). The implant configuration and placement must be done according to the fracture type and weight bearing should be adapted accordingly to fracture type, implant type and bone quality. We recommend that, despite the perioperative problems associated with nailing, this technique is preferable to plate fixation especially for specific fracture types with medial cortical comminution.

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