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An investigation into the problems of Proximal Femoral Nails (PFN) in the management of intertrochanteric fractures

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***Abstract*---**Aim: An investigation into the problems of proximal femoral nails in the management of intertrochanteric fractures. Methods: This research comprised 50 patients with intertrochanteric fractures who received intramedullary fixation with PFN. The limb was adducted and held in traction. Under C-arm guidance, the entry location was seen, and a guide wire was passed over the fracture site. To repair the fracture, a short PFN with proximal and distal locking was inserted under C-arm guidance. Results: There were 33 men and 17 women. In 28 cases, the right side was implicated, whereas the left side was engaged in 22 patient. The average period of follow-up was 13 months. Closed reduction was used in 40 patients, whereas open reduction was used in 10 patients. Complications occurred in 15 of 50 individuals. All were early issues, and the causes of failure were investigated. Complications include a broken nail at the distal locking screw level (2%), screw back out (2%), perioperative proximal femur fracture (4%), inadequate fracture reduction (2%), varus distortion (4%), improper positioning of the distal locking screw (2%), placement of a single screw in the neck (4%), abductor lurch (4%), and Infection on the surface (4%). Conclusion: The exact and professional technical execution of implantation is the basic surgical necessity for stabilising intertrochanteric fractures with a PFN. To minimise management

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failure, good reduction with little dissection and the insertion of an adequate implant are required.

***Keywords*---**PFN, Intertrochanteric fracture, management of intertrochanteric.

Introduction

Intertrochanteric femoral fractures are described as fractures affecting the top end of the femur through and between both trochanters, with or without extension into the upper femoral fragment. Because of the growing age of the population, the incidence has risen dramatically in recent years. In young people, the damage is caused by high energy trauma, however in the elderly, the majority of fractures caused by a little fall are due to osteoporosis.[1]

Sir Astley Cooper[2] (1824) described osteoporosis as "that constant degradation of nature which is easily noticed in the body, and one of the major of these is observed in the bones, for they become thin in their shell and spongy in their structure." The major cause of this fracture is osteoporosis of the bones. Previously, these fractures were treated conservatively for 6-8 weeks with a non-rotating boot or upper tibial skeletal pin traction. As a result of the extended immobility, problems such as DVT, hypostatic pneumonia, pressure sores, dehydration, and so on increased morbidity and mortality.

Furthermore, fracture healing was frequently followed by varus distortion and hip shortening due to traction's failure to properly counteract the deforming muscle forces. Non-operative therapy is indicated in the following circumstances: a) An old individual whose medical state poses an abnormally high risk of death from anaesthesia and surgery. b) A non-ambulatory patient who is in only minor discomfort as a result of the fracture. c) Stable undisplaced two-part fracture (relative).

Nowadays, Intertrochanteric fractures are almost always treated with early internal fixation, not because they do not unite with conservative management (they do), but to a) obtain the best possible position and b) get the patient up and walking as soon as possible, thereby reducing the complications associated with prolonged recumbency.[3] Because most femoral intertrochanteric fractures are exceedingly unstable, internal fixation is the management of choice. These are treated using a variety of techniques, with the Dynamic Hip Screw (DHS) being the gold standard for intertrochanteric fractures.[4] New therapeutic techniques for intertrochanteric fractures are emerging, similar to recent breakthroughs in the surgical sector. The Proximal Femoral Nail (PFN), developed by the AO/ASIF group in 1996, has shown to be a promising implant in peritrochanteric, intertrochanteric, or subtrochanteric femoral fractures.[5]

Intertrochanteric fractures, when treated with an intramedullary device (such as PFN); the above-mentioned compilations can be reduced, particularly in unstable patterns. It enables for early weight bearing and more effective recovery. As a result, the PFN is becoming more popular in the management of intertrochanteric

fractures. The primary goal of employing PFN is to restore length, rectify neck shaft angle, and minimise rotational distortion by putting the neck and head into proper connection with the femoral shaft. In comparison to a lateral fixed side plate device, an intramedullary device reduces hip joint stresses on implants by 25 to 30%. This is especially beneficial in older patients, whose primary objective is to begin weight bearing and ambulate as soon as possible. To prevent rotation during weight bearing, the proximal femoral nail has a second anti-rotational screw (hip pin) implanted in the femoral neck.[6,7]

Material and Methods

This research comprised 50 patients with intertrochanteric fractures who received intramedullary fixation with PFN. All of the patient had their femurs nailed with short PFN. This research excluded patients with long spiral fractures with subtrochanteric extension and those treated with lengthy PFNs. Among the postoperative rehabilitation protocols were: Day Zero: static quadriceps exercises and ankle pump; Day one: in bed, knee mobilisation exercises; Day two: if fracture construct and fixation stable, partial weight bearing as tolerated; if fracture construct and fixation unstable, weight bearing after 6 weeks. All patient with short PFNs who underwent surgery were positioned supine on the fracture table. The limb was adducted and held in traction. Under C-arm guidance, the entry location was seen, and a guide wire was passed over the fracture site. To stablize the fracture, a short PFN with proximal and distal locking was inserted under C-arm guidance.

Results

Table 1
Demographic parameter

	Number	%
Sex		
Female	17	34
Male	33	66
Age		
Below 20	2	4
20-30	5	10
30-40	8	16
Above 40	35	70
Reduction technique		
Closed	40	80
Open	10	20
Affected Limb		
Right	28	56
Left	22	44
Mean operating time (min)	74.5	
Complication (%)	15	30
The average time for fracture union(weeks)	13	

Table 3
Complications of management

	N	%	Pattern
Infection on the surface	2	4	Fourth
One single neck screw	2	4	Second
Abductor lurch	2	4	Second
Incorrect arrangement of the distal locking screw	1	2	Third
Inadequate fracture reduction	1	2	Second
Screw cutout	1	2	Third
Varus distortion	2	4	Third
Implant broken	2	4	Third
Proximal femur fracture	2	4	Second

PFN was implanted to 50 patient, 15 of whom had problems and management failure. Implant failure was defined as loss of reduction, insufficient attachment, the necessity to replace the implant, and nail breaking. The age range ranged from 18 to 55 years. There were 33 men and 17 women. In 28 cases, the right side was implicated, whereas the left side was engaged in 22 patients. The average period of follow-up was 13 months. Closed reduction was used on 40 patients, whereas open reduction was used in 10 patients. Complications occurred in 15 of 50 individuals. All were early issues, and the causes of failure were investigated. Complications include a broken nail at the distal locking screw level (2%), screw back out (2%), perioperative proximal femur fracture (4%), inadequate fracture reduction (2%), varus distortion (4%), improper positioning of the distal locking screw (2%), placement of a single screw in the neck (4%), abductor lurch (4%), and Infection on the surface (4%).

Figure 1: X ray showing screw cutout in elderly patient.

Figure 2: Inadequate fracture reduction

Figure 3: X ray showing varus collapse

Figure 4: X ray showing impending cutout and collapse

Discussion

Intertrochanteric femur fractures are a rather common injury among the elderly. To decrease the morbidity and mortality associated with conservative care of intertrochanteric fractures, surgical surgery of these fractures is recommended as the best technique in addressing these fractures. Leg shortening, medialization of the distal fragment, nonunion, and implant cuts are common in unstable intertrochanteric fractures. This resulted in the creation of intramedullary

devices. These devices have the advantages of being intramedullary fixation devices, having a shorter lever arm that causes less tensile strain on the implant, having controlled fracture impaction due to the incorporation of a sliding screw, having a shorter operative duration, and having less soft tissue dissection.

When compared to other fractures, subtrochanteric fractures have somewhat greater failure rates.[8] In a multicenter research, the failure rate of PFN due to inadequate reduction, malrotation, or incorrect screw selection was reported to be 5%, while the screw cut out rate was reported to be 0.6 percent.[9] The increased inherent instability of the subtrochanteric fracture, poor control of fracture fragments [8,13] and the difficulties in attaining the medial buttress owing to communition are all grounds for failure. Intramedullary nails with an entrance site in the piriformis fossa have the potential to shift the proximal fragment into varus or perhaps burst the proximal femur during insertion.[10]

The PFN construct's proximal component consists of two screws: the bigger (lag) screw is meant to carry the load, while the smaller screw (hip pin) offers rotational stability. The lag screw is longer than the hip pin because if the hip pin were longer, vertical stresses on the hip pin would rise, causing cut out, a knife effect, or a Z- effect. As a result, the hip pin may migrate into the joint and the lag screw may slip laterally.[11,12] The usage of PFNs is stated to have a cut out rate ranging from 0.6 to 8%.[13] Complications occurred in 15 individuals (30% of the total). All problems occurred during the perioperative period, immediately following the surgery, or within three months of the initial procedure.

At the sixth post-operative week, the hip pin slipped laterally in one patient. This was due to the wrong length of the lag screw and hip pin. Implant failure at the distal locking screw hole with nail fracture accounted for 4% of problems. A short PFN was employed in both individuals. The distal tip of the nail was near to the fracture site (3cm and 4cm), which was an optimum distance according to earlier research.

There was no alternative explanation for the minimal effective distance between the distal locking screw and the fracture site that we could find. The distal tip of the nail and the implant's distal locking screw hole should ideally be located at a distance distal to the fracture that provides sufficient mechanical stability while exerting little internal mechanical stress on the implant. We employed lengthy PFNs for all comminuted fractures in subsequent cases since they are fundamentally unstable even after fixation.

An intraoperative fracture of the proximal femur fragment occurred in 4% of patient. This problem arose as a result of the usage of an improper entry point. The piriformis fossa is the primary entrance location for routine intramedullary nailing. PFNs, on the other hand, have it at or somewhat lateral to the apex of the greater trochanter.[10] When the PFN is inserted into the piriformis fossa, the proximal fragment tends to move into varus and may potentially rupture the greater trochanter during nail insertion.[10] 2% of our patient who had a screw back out received revision surgery, and the fracture healed as a result. In 2% of patient, both the lag screw and the hip pin could not be placed in the neck.

It was owing to a femoral neck that was too tiny to accept both screws. Despite attempts to change the location of the nail, neither screw could be installed. The decision was made to leave the patient with only the lag screw. This patient's union occurred within the expected time limit. Due to failure of reduction at the fracture site, two patient developed varus distortion. There was no attempt to adjust the varus because it was less than 10 degrees. Fracture union went smoothly. Only 2% of patient had the distal locking screw incorrectly positioned. Short PFN was employed in this situation. Because the radiological union was obvious at the initial assessment, no intervention was performed after six weeks.

Conclusion

The exact and professional technical execution of implantation is the basic surgical necessity for stabilising intertrotrochanteric fractures with a PFN. To minimise management failure, good reduction with little dissection and the insertion of an adequate implant are required.

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