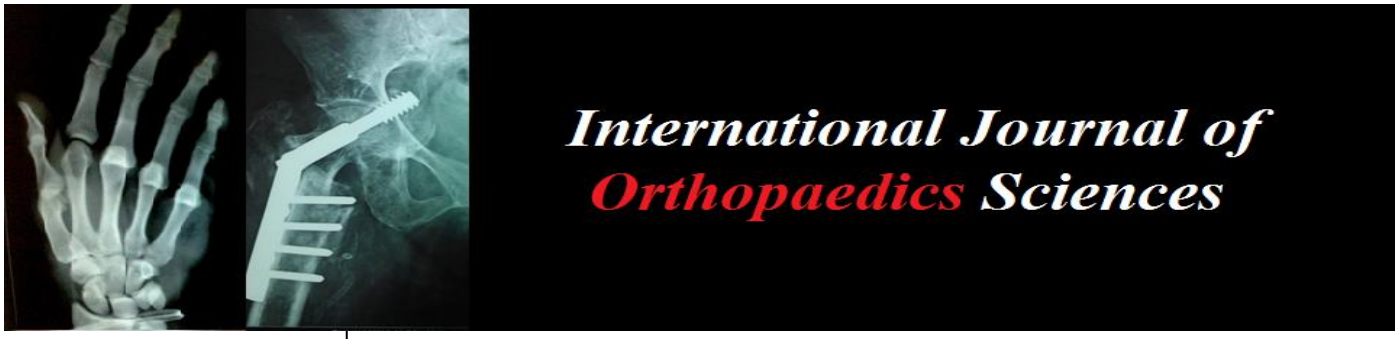

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A comparative study of studying osteosynthesis in intertrochanteric fractures using dynamic hip screw and proximal femoral nail

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Abstract
Background: Intertrochanteric fractures are those occurring in the region extending from the extracapsular basilar neck region to the region along the lesser trochanter. D.H.S (Dynamic Hip Screw) with side plate assembly is most commonly used device for fixation of intertrochanteric fractures. The latest implant for management of intertrochanteric fracture is the P.F.N (Proximal Femoral Nail). In view of these conditions, this study is taken up to compare the results of D.H.S and P.F.N.
Materials and Methods: The study comprised of 50 patients as per the inclusion criteria and two groups were made, one operated with DHS while other operated with PFN with 25 patients in each group.
Results: We found 25 patients each in D.H.S. and P.F.N. group, 64% of the cases being females and 52% of the cases with unstable fractures, we found that the average surgical time was significantly less for P.F.N. than for D.H.S. Also the average blood loss for D.H.S. surgery was significantly more than for P.F.N.
Discussion: There was no significant difference in the duration of hospital stay and the time required for the fracture to unite in both the modalities of treatment.

Keywords: Comparative, dynamic hip screw, intertrochanteric fractures

1. Introduction
Intertrochanteric fractures are those occurring in the region extending from the extracapsular basilar neck region to the region along the lesser trochanter. Intertrochanteric fractures of the femur are the most commonly operated fractures. Due to an increasing life span and sedentary lifestyle the incidence of these fractures is on the rise. Also the geriatric age group has a higher incidence of osteoporosis, with low energy falls from standing height accounting for approximately 90% of the community hip fractures in patients more than 50 years of age, with a higher proportion in women. Higher velocity traumatic intertrochanteric fractures are relatively rare and are more common in men less than 40 years of age [1].
Cummings *et al*. [2] noted that neither age related osteoporosis, nor the increasing incidence of falls with age sufficiently explains the exponential increase in the incidence of hip fracture with aging. Their hypothesis was that four conditions correlated for a fall to cause a hip fracture: The faller must be oriented to impact near the hip. Protective responses must fail. Local soft tissues must absorb less energy than necessary to prevent fracture. The residual energy of fall applied to the proximal femur must exceed its strength.
This concept applies primarily to strategies to prevent hip fractures. Fall with rotational component is more common with extracapsular hip fractures [3].
Intertrochanteric fractures can be managed by conservative or operative methods. Conservative methods were the treatment of choice until 1960 when Horowitz documented that the mortality rates in conservative methods were higher as compared to operative methods [4]. As conservative methods resulted in higher mortality rates and complications like decubitus ulcer, urinary tract infections, pneumonia, thromboembolic complications, these methods have been abandoned. Conservative methods are now indicated under 2 conditions, Elderly person with high medical risk for anesthesia and surgery. Non ambulatory patient with minimal discomfort following injury. Rigid internal fixation and early mobilization has been the standard method of treatment.

Factors determining the strength of fracture implant assembly depends on the bone quality, fragment geometry, fracture reduction, implant type and implant placement. Surgeon can control only the quality of reduction, choice of implant and its placement.

As intertrochanteric fractures have the highest postoperative fatality rate amongst surgically treated fractures, they have become an important health issue and thus it is very important to study and compare different surgical options available for these fractures. Implants for the fixation of intertrochanteric fractures can broadly be divided into extramedullary devices, example: D.H.S Intramedullary devices, example: P.F.N

D.H.S (Dynamic Hip Screw) with side plate assembly is most commonly used device for fixation of intertrochanteric fractures. It is a fixation device which permits the proximal fragment to collapse or settle on the fixation device seeking its own position of stability.

The latest implant for management of intertrochanteric fracture is the P.F.N (Proximal Femoral Nail). This implant is a cephalomedullary device and has many potential advantages like being intramedullary, load transfer is more efficient. Shorter lever arm results in less transfer of the stress and less implant failures. Advantage of controlled impaction is maintained. Sliding is limited by intramedullary location, so less shortening and deformity. Shorter operative time, less soft tissue dissection and less blood loss. In view of these conditions, this study is taken up to compare the results of D.H.S and P.F.N.

Material and Methods

This prospective study was done under the guidelines of the ethical committee of the hospital. Patients presenting with recent traumatic history, isolated intertrochanteric, fractures, stable and unstable fractures, the patients willing to give consent to participate in the study were included in the study.

Patients with pathologic fractures, patients with multiple fractures, patients with old neglected, fractures, fractures in paediatric age group, fractures in elderly patient with high medical risk for anesthesia and surgery, reverse intertrochanteric fractures were included in the study.

The patients confirming into criteria were included in the study. Clinical diagnosis of intertrochanteric fracture was done with external rotation, shortening and history of trauma. Emergency treatment in the form of analgesics is given. Antero posterior X-ray of pelvis with both hips in 15 degree internal rotation and lateral view of the injured joint were taken. Classification of the fracture was done using the Tronzo's classification. The preoperative neck-shaft angle and the medullary canal diameter was calculated with the help of the radiographs of the normal opposite hip. Injured limb was kept in a Thomas' splint with skin traction with adequate splintage to correct flexion deformity if any and to prevent overriding whenever present.

Preoperative routine blood and urine investigations were done. Informed consent was obtained by patient for both the surgical procedure and participation in the study.

Limb elevation was given. Foot end elevation was given for one day, DVT prophylaxis was given if high risk patient. Post–operative anteroposterior and lateral view x-rays of the operated hip were taken. Post–operative Haemogram and Serum Electrolytes were done immediately and 24 hrs later. Static exercise in bed for glutei, hamstrings, quadriceps and breathing exercises were started next day of surgery. Sitting was allowed on next day of surgery with passive exercises in bed. Drain if inserted was removed after 48 hours. ROM exercises were started actively.

The protocol for weight bearing was, in stable fractures partial weight bearing was started next day after surgery and full weight bearing was started after 6 weeks, while in unstable fractures non-weight bearing walking was allowed on operated side with the help of a walker or crutches next day after surgery, partial weight bearing after 6 weeks and full weight bearing was started after 3 months approximately. However weight bearing was modified as per the type of fracture, stability of the internal fixation, the fracture union and the tolerance of the patient.

Postoperative dressings were done on 2nd and 7th day. Suture removal was done on or after 14 days. The patients were discharged within one week if the surgery was uneventful. Follow up was done at 2, 4, 6 weeks, 3 months, 6 months, and 1 year after the surgery. The patients were assessed functionally on the basis of Harris Hip Score and radiologically in the form of anteroposterior and lateral X-rays of the operated hip. The post operative pain was also assessed as per the Harris Hip Score criteria at the end of 1 year and the post operative gait was also assessed at the end of 1 year. Union was decided on the basis of obliteration of fracture line with bridging callus so as to allow unprotected function of the limb.

Observation and Results

The study comprised of 50 patients as per the inclusion criteria and two groups were made, one operated with DHS while other operated with PFN with 25 patients in each group. Of the 50 patients there were 32 females and 18 males. The youngest patient in our series was 17 years and the oldest was 82 years. The average age of the patient for DHS was 46.96 years and for PFN was 47.72 years. 24 patients had stable type of fracture and 26 had unstable type of fracture. 47 patients were community ambulatory pre operatively and 3 were house hold ambulatory. 21 patients were operated within 3 days, 15 in 4-7 days, 8 in 8-11 days and 6 required more than 11 days to get operated due to co morbidities.

Table 1: Type of Fractures

Type of Fracture	PFN – cases	DHS - cases	Total	Chi square Df=3	P
1	5	6	11	0.322	0.956
2	7	6	13		
3	7	6	13		
4	6	7	13		
Total	25	25	50		

The average surgical time for DHS was 88 minutes (range 50-150 min) and for PFN was 60 min (range 40-125 min). Thus there was a significant less surgical time needed for PFN than for DHS (p value <0.05).

Table 2: Average surgical operative time

Surgical Time	PFN - cases	DHS – cases	Unpaired T	P
Mean in minutes	60.0	87.8	3.824	<0.001
SD	20.76	29.83		

The average intra operative blood loss for DHS was 280 ml (range 120-640 ml) and 9 patients needed blood transfusion. The average intra operative blood loss for PFN was 85 ml (range 40-125 ml) and only 2 patients needed blood transfusion. Thus there was a significant less blood loss in PFN surgery as compared to DHS surgery (p value <0.05).

The patients' average stay in the hospital was 10.32 days

(Range 5 to 24) in DHS group and 9.48 days (range 3 to 20) in PFN group (p value >0.05). Out of the 50 patients, 2 expired during follow up due to unrelated causes (both due to myocardial infarction) and 4 patients were lost in follow up.

Discussion

The treatment of intertrochanteric fracture is still associated with some failures. High stress concentration that is subject to multiple deforming forces and high incidence of complications reported after surgical treatment compels the surgeon to give a second thought regarding selection of proper implant. A large number of fixation implants has been devised and discarded. The treatment still merits the type of fracture and condition of the patient.

The development of the Dynamic Hip Screw in the 1960's saw a revolution in the management of unstable fractures. It provided control compression at the fracture site. Its use has been supported by its biomechanical properties which have been assumed to improve the healing of the fracture.

But Dynamic Hip Screw requires a relatively larger surgical exposure, more tissue dissection and anatomical reduction. All these increase the morbidity, probability of infection and intraoperative blood loss. The common causes of fixation failure are instability of the fractures, osteoporosis, Lack of anatomical reduction, failure of fixation device and incorrect placement of the screw.

In the early 90's intramedullary devices were developed for fixation of intertrochanteric fractures. The Proximal Femoral Nail with a hip screw together with a smaller distal shaft diameter reduces the stress concentration and thus avoids failures. From mechanical point of view, an intramedullary device inserted by means of minimally invasive procedure seems to be better in elderly patients. The Proximal Femoral Nail is found to be more useful in unstable and reverse oblique patterns due to the fact that it has better axial telescoping and rotational stability. It has shown to be more biomechanically stronger because it can withstand higher static and several fold higher cyclical loading than Dynamic Hip Screw due to its proximity to the centre of gravity of the body as it is an intramedullary device. The implant compensates for the function of the medial column [20]. Proximal Femoral Nail also acts as a buttress in preventing the medialization of the shaft.

Facilitation of closed reduction in P.F.N. preserves the fracture hematoma, an essential element in consolidation process. Intramedullary fixation allows the surgeon to minimize soft tissue dissection, thereby reducing surgical trauma, blood loss, Infection and wound complications.

In the present study, with 25 patients each in D.H.S. and P.F.N. group, 64% of the cases being females and 52% of the cases with unstable fractures, we found that the average surgical time was significantly less for P.F.N. than for D.H.S. Also the average blood loss for D.H.S. surgery was significantly more than for P.F.N.

There were two cases of infection, one case of screw cut out and one case of bed sore in the D.H.S. group as compared to one case of non union in the P.F.N. group. There was no significant difference in the duration of hospital stay and the time required for the fracture to unite in both the modalities of treatment.

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