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Comparative Analysis of Proximal Femoral Nail and Trochanteric Stabilising Plate in Management of Unstable Intertrochanteric fractures

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Abstract

There is no perfect implant for unstable intertrochanteric fractures. Proximal Femoral Nail (PFN) and Dynamic Hip Screw (DHS) with Trochanteric Support Plate (TSP) are two plausible implants for management in these fractures. In this study we compare the outcome of using PFN and TSP in 40 cases of unstable intertrochanteric fractures which were operated at our centre and completed the follow up till 6 months. These patients were analysed on various parameters. We found there was statistically significant difference among all intra-operative variables in both the groups. PFN is better in terms of length of incision, durations of surgery and blood loss. However we couldn't find any significant difference in complications. PFN was also found to be statistically better in terms of mean period of hospitalisation, mean time to union as well as early mobilisation of the patient. We have got significantly better Harris Hip Scores after using PFN for unstable intertrochanteric fractures than using TSP. Hence we may conclude that PFN is a better implant for such fractures.

Keywords: Unstable intertrochanteric femur fractures, Proximal Femur Nail, PFN, Dynamic Hip Screw, DHS, Trochanteric Support Plate, TSP.

Introduction

Intertrochanteric fracture is one of the leading causes of morbidity and mortality in the elderly population.[1,2] Unstable fractures accounts for more than 50% of all intertrochanteric fractures. Comminution of posteromedial wall, reverse oblique pattern and subtrochanteric extension are considered an unstable type of fracture.[3] Intact lateral wall is also crucial for stability and its deficiency leads to excessive collapse and varus malposition.[4]

The design of implants with multiple options for fixation of intertrochanteric fracture have evolved over the years but still, there is a conflict that which implant is better for which type of trochanteric fractures.[5,6]

Dynamic Hip Screw (DHS) which is considered by many in stable intertrochanteric fractures has failure rates of around 5 to 21 percent in unstable intertrochanteric and subtrochanteric fractures.[7,8] Such failures are mostly caused by by a telescoping displacement with medialization of femoral shaft due to lack of lateral support for proximal fragment or lag screw cut-out.[9] Some of these complications can be reduced by using a trochanteric support plate.

Proximal Femur Nail (PFN) is a cephalomedullary device and hence biomechanically more sound than DHS due to shorter lever arm. It is a load sharing device, is collapsible and has rotational stability. It is inserted with closed reduction technique.[10,11] Clinical reports of using PFN and TSP for unstable fractures are very limited.[7]

In this study we compare the outcome of using PFN and DHS with TSP for fixation of unstable intertrochanteric fractures based on various intraoperative and postoperative variables and Harris Hip Score.

Material and Methods

The study was conducted after approval from ethics committee of our institute. Patients presenting with unstable intertrochanteric fractures of greater than 18 years of age were included in the study after getting an informed consent. Patients with open or pathological fractures were excluded from the study. We have considered AO types 31A2 and 31A3 as unstable fractures.

44 patients meeting the inclusion and exclusion criteria were admitted between August 2016 and February 2018. The choice of surgery was decided on random basis by chit picking. These patients were operated under spinal anaesthesia on traction table. Open reduction was performed if closed reduction was not possible. Entry point used for PFN was the tip of Greater Trochanter and entry made with awl. We have used long PFN in all the cases. The hip screw and antirotation screw were inserted with the help of aiming device. Hip screw inserted in the region of calcar.

TSP is a specific implant designed for unstable intertrochanteric fractures. It is similar to DHS except having a support plate superior to DHS barrel for supporting greater trochanter. This part can be bent to fit the configuration of trochanter and has 4 holes which can accommodate 6.5mm cancellous screws and 4.5 mm cortical screws. Fixation technique used was also same as DHS except that additional screws and cerclage wires were inserted through the superior part as and when required by the surgeon. All surgeries were done by experienced surgeons.

Results

Out of 44 patients enrolled in our study 4 cases were lost to follow up. Hence final results were analysed on the basis of the remaining 40 cases. The patient characteristics are as per the following table 1.

There was statistically significant difference among all intra-operative variables in both the groups. PFN is better in terms of length of incision, durations of surgery and blood loss. However we couldn't find any statistically significant difference in intra-operative and post-operative complications. PFN was also found to be statistically better in terms of mean period of hospitalisation, mean time to union as well as early mobilisation of the patient.

There were 3 cases in PFN group in which there was difficulty in locking of nail. Out of these in 2 cases there was difficulty in proximal locking while in 1 case there was difficulty in distal locking. There was peri-implant fracture in 1 case while inserting the distal screw. In 2 cases of DHS with TSP there was intra-

operative fracture of lateral cortex which led to difficult surgery. Among 2 patients with crew back out in PFN group in 1 case fracture was united and screw was removed while in other case fracture was not united and screw was tightened again. It led to union later. In 1 case of TSP screw cut out was observed but it was after union and hence implant removal was performed.

PFN had better Palmer and Parker mobility score calculated at 6 months after surgery however this difference was not significant. Patients operated with PFN had significantly better Harris Hip Scores at 6 months follow up.

Table 1: Observations

Parameters:		PFN Group	TSP Group	p value
Total number of cases		20	20	NA
Mean age of patient		64 years	63 years	0.84
Interval between Injury and Surgery		11.2 days	11.2 days	1
Intra-operative parameters	Length of incision	6.5 ± 0.5 cm	14.5 ± 0.7 cm	<0.001
	Duration of Surgery	71 ± 13 min	105 ± 13 min	<0.001
	Blood loss	97 ± 16 ml	294 ± 52 ml	<0.001
Intra-operative implant related complications (no. of cases)	Difficulty in locking	3	0	0.07
	Peri-implant fracture	1	0	0.33
	Break of lateral cortex	0	2	0.15
	Total	4	2	0.39
Postoperative Complications (no. of cases)	Implant related	2	1	0.56
	Delayed Union	1	1	1
	Malunion	1	3	0.3
	Surgical Site infection	1	3	0.3
Mean Period of Hospitalisation (days)		18.10 ± 3.878	21.60 ± 5.826	0.003
Mean Time of Union		14.9 weeks	17 weeks	0.001
Mobility	Pain free toe-tip touch weight bearing with crutch in one side	4.80 ± 3.205 days	8.15 ± 2.477 days	0.001
	Partial weight bearing with using crutches on both side	5.45 ± 0.887 weeks	6.00 ± 0.918 weeks	0.061
	Full weight bearing without crutches	15.00 ± 1.622 weeks	17.25 ± 1.916 weeks	<0.001

Parker And Palmer Mobility Score at 6 Months	7.05 ± 0.945	6.5 ± 1.606	0.19
Harris Hip Score at 6 Months	90.25 ± 5.26	81.6 ± 11.812	0.005

Fig. 1: Progress of a case of PFN over 6 months

Fig. 2: Progress of a case of TSP case over 6 months

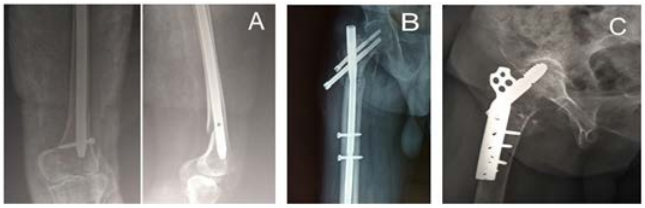

Fig. 3: Complications A) Peri-implant fracture, B) Lag screw back out, C) Lag screw cut out

Discussion

The major implants for unstable intertrochanteric femur fractures include PFN, DHS supplemented by Trochanteric Support Plate or K-wires and SS wires and Proximal Femur LCP. Both latter devices are extramedullary devices and require open technique whereas PFN is a cephalomedullary device and is mostly done with a closed technique.

The mean incision length for PFN was 6.5cm and 14.5cm for TSP. Nargesh A et al[8] reported mean incision length of around 8.5cm for PFN and 16.5cm for DHS. Ravishankar et al reported a mean incision length of 5-6cm for PFN.[12] In our study mean blood loss was 97ml for PFN and 294ml for TSP. N. Selvam et al[2]reported mean blood losses of 97.5ml for PFN and 163ml for DHS and Nizamoddin Khateeb et al[5]reported mean blood loss of 120ml for PFN and 250ml for DHS.A smaller incision has advantages of less blood loss, less risk of post-operative infections and less soft tissue stripping which helps in the fracture healing.[6]

The mean duration of surgery for PFN was 71 minutes and 105 minutes for TSP. The mean operating time was 88.3 minutes for TSP fixation, 79.8 minutes for Gamma nail and 75.1 minutes for DHS in unstable pertrochanteric fractures in the study conducted by Adams CI et al.[10]

The surgical site infections subsided with i.v. antibiotics. Implant removal or debridement was not required in any case. All cases achieved union with mean union time of 15 weeks in PFN group and 17.2 weeks in TSP group. In peri-implant fracture case only 1 distal screw was placed and above knee slab was applied for 3 weeks and eventually fracture healed well. Varus deformity was seen in a case in PFN group and 3 cases in TSP group. The reason for varus deformity was inability to achieve proper reduction and failure to maintain neck shaft angle intraoperatively. Ozkan K et al[13] noted that it is important to place the inferior lag screw as close to inferior femoral neck cortex on AP view and both screws as close as possible to centre of the femoral head in lateral view. Varus fixation causes excessive loads on the implants and a possibility of implant failure.[14]

Conclusion

Treatment of unstable intertrochanteric fractures has been challenging due to difficulty in obtaining and maintaining stable anatomical reduction. We found that

cases operated using PFN had shorter incisions, short duration of surgery, less blood loss, earlier mobilisation and earlier union than TSP. We have got significantly better Harris Hip Scores after using PFN for unstable intertrochanteric fractures than using TSP. Hence we may conclude that PFN is a better implant for such fractures. However we could not find any significant difference in complications among these techniques due to small sample size. Larger studies with longer follow up periods are required to throw light on these aspects.

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