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Functional evaluation of proximal femoral fractures managed with cephalomedullary nailing by oxford hip score - A prospective study

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Abstract
Fixation of proximal femoral fractures by cephalomedullary nailing has become very popular due to the superior biomechanics and prevention of various complications associated with sliding hip screw. **Material and Methods:** In this study we followed 94 patients admitted and managed in the Department of orthopaedics at SGRRIMHS Dehradun. the followup period was of one year duration during which the functional status of patients was assessed by Oxford hip score at regular intervals.
Results: All the patients had uneventful post-op recovery. The pain swas quite severe in 70% of the patients at 1 month but by end of 12 months 76% of patients had very mild or no hip pain. No significant difference in hip score was seen in patients managed by long nails and short nails. for the first 3 followups at 1, 3 and 6 months no significant difference between scores of hips managed by open and closed reduction was seen however at 12 months the score of hips managed by open reduction was lower. All the fractures were united at the end of 1 year.
Conclusion: Although cephalomedullary nailingg in proximal femoral fractures is a bit technically demanding it has the advantage of providing rotational as well as axial stability and excellent clinical results allowing a faster post-operative restoration of walking ability, with overall better outcome.

Keywords: Cephalomedullary nailing, Oxford hip score

Introduction

Aim and objectives

For evaluation of the results of proximal femur fracture in patients using cephalomedullary nail in adult patient admitted in the Department of Orthopaedics at SGRRIMHS, Dehradun with following objectives –

1. To evaluate the functional outcome of cephalomedullary nail in proximal femoral fracture using oxford hip score.
2. For assessing the complication associated with this method of internal fixation in these fractures.
3. To evaluate the reliability and safety of cephalomedullary nail in proximal femoral fracture.

Materials and methods

Study included 94 cases which were managed by use of different implants (cephalomedullary nail) and was randomized irrespective of fracture types and pattern.
The study was done over a period of 12 months (with 1 month, 3 month, 6 month, 12 month follow up. At every visit patient was assessed as per Oxford Hip Score.
The Inclusion Criteria was all the patients with Proximal Femoral Fractures, with or without multiple co-morbidities but declared fit as per the pre anaesthetic check-up. Medically unfit patients or unwilling patients or those having femoral neck fractures were excluded from the study.

Methodology

This prospective study was carried out in 94 patients suffering from proximal femoral fracture fractures admitted in orthopaedic ward.

Clinical Assessment

All patients were examined with detailed history to ascertain age, sex, mechanism of injury, type of injury (open /close/polytrauma), neurovascular status, preinjury ambulatory status and co-morbidity that may affect recovery. Full clinical examination along with ATLS protocol was done to assess the general condition of the patient. Laboratory investigation were done to evaluate surgical fitness as per the requirement. X-RAY Pelvis with both hips AP view, X-ray Hip with Thigh AP and lateral of affected hip were taken preoperatively to study the fracture geometry and plan for treatment. Preoperative assessment was done by determination of nail diameter by measuring femoral diameter at isthmus on xray, length of the hip screws and distal locking screws and neck shaft angle. The implantts used were PFNA, INTERTAN and SIRUS NAIL. Post operative clinical assesment was done by pain management on first post op day followed by sitting on the second post op day and non weight bearing with help of walker on the third day.

Day of Discharge Condition was assessed and follow up After 1 month, 3 month, 6 month 1 year (with Oxford Hip Score) was done. We allowed our patients to walk with partial weight with walker at 1 month and full weight bearing walk after 3 months.

The results are presented in mean±SD and percentages. The change in hip score from one month to subsequent follow-ups was compared by using Wilcoxon rank sum test. The Mann-Whitney U test was used to compare the Hip score between ORIF & CRIF and short & long nail. The p-value<0.05 was considered significant.

Data analysis and results

Table 1: Age distribution of the patients

Age in years	No. (n=94)	%
<50	10	10.6
51-60	20	21.3
61-70	30	31.9
71-80	24	25.5
>80	10	10.6
Mean±SD	65.68±13.55	

About one third of the patients were between 61-70 years (31.9%) followed by 71-80 (25.5%), 51-60 (21.3%) and <50 & >80 (10.6%) years. The mean age of the patients was 65.68 (±13.55) years.

Table 2: Distribution of the patients according to AO classification

AO classification	No. (n=94)	%
Pertrochanteric simple	32	34.0
Pertrochanteric multifragmentary	38	40.4
Intertrochanteric	2	2.1
Oblique	2	2.1
Transverse	16	17.0
Fragmented wedge	2	2.1
Spiral	2	2.1

Pertrochanteric multifragmentary (40.4%) was observed among most of the patients followed by Pertrochanteric simple (34%) and Transverse (17%). The percentage of other AO classification was less than 5%.

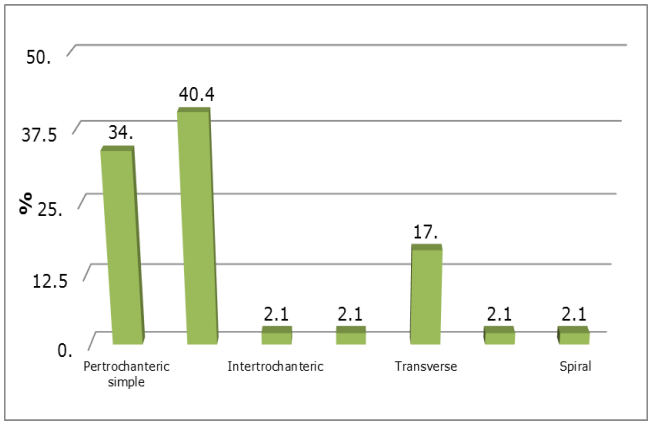


Fig 1: Distribution of the patients according to AO classification

Table 3: Description of pain in hip

	One month		3 month		6 month		12 month	
	No.	%	No.	%	No.	%	No.	%
Severe	66	70.2	0	0.0	0	0.0	0	0.0
Moderate	24	25.5	24	25.5	14	14.9	2	2.1
Mild	4	4.3	38	40.4	36	38.3	20	21.3
Very mild	0	0.0	32	34.0	34	36.2	58	61.7
None	0	0.0	0	0.0	10	10.6	14	14.9

The severe pain was observed among majority of the patients at one month (70.2%) which became mild (40.4%) and moderate (34%) at 3 month. Very mild pain was found in 36.2% patients at 6 month and in 61.7% at 12 month.

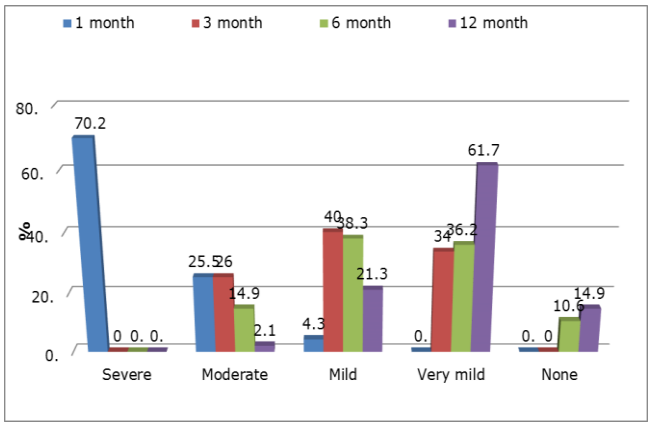
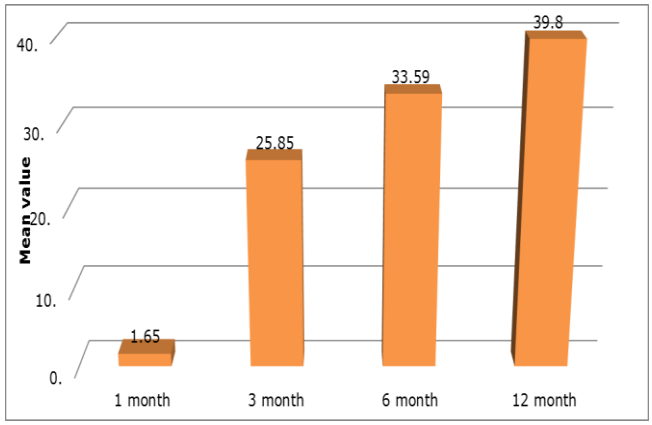


Fig 2: Description of pain in hip

Distribution of Hip score at 1, 3, 6 and 12 month

The mean hip score was 1.65 (±1.04) at one month which became 25.85 (±7.07) at 3 month, 33.59 (±7.65) 6 month and 39.80 (±6.53) at 12 month.



Distribution of Hip score at 1, 3, 6 and 12 month

Table 4: Troubled by pain from hip in bed at night

	One month		3 month		6 month		12 month	
	No.	%	No.	%	No.	%	No.	%
Every night	1	2.1	0	0.0	0	0.0	0	0.0
Most nights	44	93.6	13	27.7	6	12.8	1	2.1
Some nights	2	4.3	27	57.4	18	38.3	4	8.5
Only 1-2 nights	0	0.0	7	14.9	18	38.3	35	74.5
No nights	0	0.0	0	0.0	5	10.6	7	14.9

Table shows the distribution of the patients according to category of troubled by pain from hip in bed at night. The pain in most night at bed was in 93.6% at one month. However, the pain in some night was in 57.4% at 3 month and in 38.3% at 6 month. At 6 month, only 1-2 nights was in 74.5% patients.

Table 5: Have been limping when walking because of hip

	One month		3 month		6 month		12 month	
	No.	%	No.	%	No.	%	No.	%
All of the time	47	100.0	0	0.0	0	0.0	0	0.0
Most of the time	0	0.0	11	23.4	8	17.0	2	4.3
Often, not just at first	0	0.0	22	46.8	7	14.9	6	12.8
Sometimes or just at first	0	0.0	14	29.8	27	57.4	25	53.2
Rarely/never	0	0.0	0	0.0	5	10.6	14	29.8

Table shows the distribution of the patients according to category of limping when walking because of hip. The limping was all the time among all the patients at one. However, the limping was found often in 46.8% at 3 month and sometimes in 57.4% at 6 month and 53.2% at 12 month.

Table 6: Have been able to climb a flight of stairs

	One month		3 month		6 month		12 month	
	No.	%	No.	%	No.	%	No.	%
No, impossible	47	100.0	0	0.0	0	0.0	0	0.0
With extreme difficulty	0	0.0	10	21.3	2	4.3	1	2.1
With moderate difficulty	0	0.0	20	42.6	10	21.3	0	0.0
With little difficulty	0	0.0	17	36.2	31	66.0	24	51.1
Yes, easily	0	0.0	0	0.0	4	8.5	22	46.8

Table shows the distribution of the patients according to category of able to climb a flight of stairs. All the patients were not able to climb a flight of stairs at one month. However, 42.6% were able with moderate difficulty to climb a flight of stairs at 3 month, with little difficulty (66%) at 6 month and 51.1% at 12 month.

Comparison of Hip score according to ORIF and CRIF at 1, 3, 6 and 12 month

There was no significant (p>0.05) difference in the hip score between ORIF and CRIF at one, 3 and 6 month. The hip score was significantly (p=0.004) lower among the patients of ORF than CRIF.

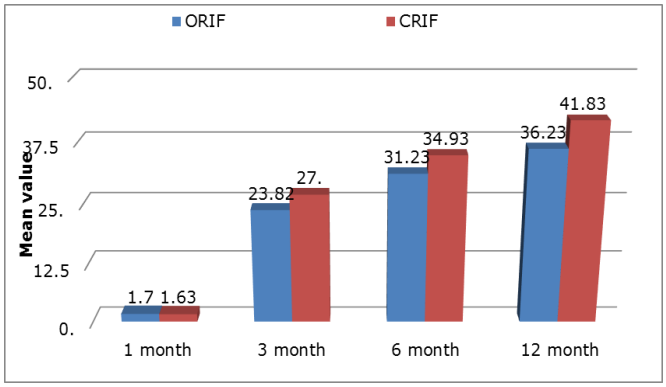


Fig 3: Comparison of Hip score according to ORIF and CRIF at 1, 3, 6 and 12 month

Comparison of mean change in Hip score according to ORIF and CRIF from one month to follow-ups

Fig. shows the comparison of Hip score in ORIF and CRIF from one month to 3, 6 and 12 months. There was significant (p=0.0001) in the hip score in both ORIF and CRIF from one month to subsequent follow-ups.

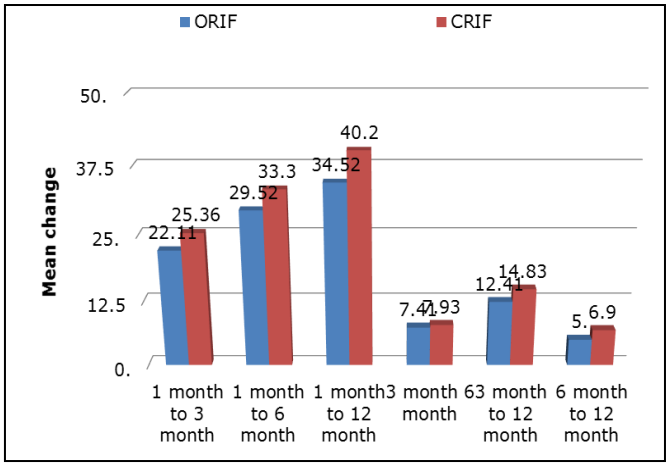


Fig 4: Comparison of mean change in Hip score according to ORIF and CRIF from one month to follow-ups

Table 7: Comparison of Hip score according to long and short nail at 1, 3, 6 and 12 month

Follow-up	Hip score (Mean±SD)						p-value[1]
	Long intertan (n=7)	Long PFNA (n=2)	Long PFNA2 (n=24)	Short intertan (n=3)	Short PFNA2 (n=8)	Long sirus nail (n=3)	
1 month	1.42±0.53	1.50±0.70	1.75±1.39	2.00±0.00	1.37±0.51	2.00±0.00	0.82
3 month	22.14±9.40	24.50±0.70	26.91±5.71	34.33±4.72	25.25±7.83	20.00±6.92	0.14
6 month	29.42±8.92	35.50±0.70	34.66±6.81	41.00±3.46	33.12±8.02	27.33±10.78	0.11
12 month	35.85±7.42	44.00±1.41	40.62±4.70	45.33±1.52	40.62±5.60	32.00±15.13	0.06

There was no significant ($p>0.05$) difference in the hip score in long and short nails.

Discussion

The incidence of fractures in the trochanteric area has risen with the increasing numbers of elderly people with osteoporosis. Although dynamic hip screw fixation is the gold standard for the treatment of stable intertrochanteric femur fractures, treatment of unstable intertrochanteric femur fractures still remains controversial. Intramedullary devices such as Gamma nail or proximal femoral nail and proximal anatomic femur plates are in use for the treatment of proximal femur fractures. There are still many investigations to find the optimal implant to treat these fractures with minimum complications. For this reason, we aimed to perform role of cephalomedullary nail in proximal femoral fractures.

The proximal femoral intramedullary nail provides more stability and allows for earlier weight bearing than the locking plate when used for the treatment of unstable intertrochanteric fractures of the femur. Clinicians should be cautious for early weight bearing with locking plate for unstable intertrochanteric femur fractures.

Early operative treatment of trochanteric fractures reduces both the mortality and morbidity (Laskin, Gruber and Zimmerman, 1979) [1] giving best chance of early independency and reducing the risks of prolonged bed rest. In the management of proximal femoral fractures of femur, it is of at most importance to re-establish bone to bone contact of the postero-medial cortex.

The optimal fixation device is still controversial at present. Jones *et al*. [2] compared the intramedullary nail (IMN), which involved gamma nail, intramedullary hip screw (IMHS), and PFN, with sliding hip screw (SHS) for treatment of extracapsular proximal femoral fractures. They concluded that there was no statistically significant difference in the cut-out rate between the IMN and SHS while total failure rate and reoperation rate were greater with IMN.

Parker & Handoll [3] also compared gamma and other cephalocondylic intramedullary nails with extramedullary implants for extracapsular hip fractures in adults. In their systematic review the authors enrolled four studies which included PFN and Targon PF nail compared with SHS. The authors concluded that there was no significant difference between the groups in outcomes of blood loss and transfusion, fixation complications, and post-operation complications and hospital stay.

Comparative studies show that failure of fixation occurs at approximately the same frequency for intramedullary and extra-medullary devices, and that intramedullary nails have the added disadvantage of being associated with femoral shaft fractures. Because of these factors, some authors recommend using intramedullary devices only for the treatment of unstable trochanteric fractures. The question arises whether the cephalomedullary nails with its new design is associated with fewer major implant specific complications. Occurrence of femoral shaft fractures does not seem to be a major problem with the cephalomedullary nails, which has a narrower distal diameter and added distal flexibility which is caused by the varus movement acting on the screws (Matthews *et al*. 1981).

The Cephalomedullary nails like Gamma nail, Proximal Femoral nail attempts to combine the advantages of a sliding lag screw with those of intramedullary fixation while decreasing the lever arm as compared with that of a sliding nail plate system. It can be inserted by a closed procedure, which retains the fracture haematoma, an important consideration in fracture healing (McKibbin 1978) [4] and reduces both the exposure and dissection thereby reducing the chances of infection and morbidity.

Comparative studies on Extramedullary implants and intramedullary nails show similar or superior results for extramedullary devices in the treatment of stable trochanteric fractures (Bridle S H *et al*. 1991, Goldhagen *et al*. 1994) [5, 6]. Intramedullary nails therefore, are recommended mainly for unstable trochanteric fractures, subtrochanteric and reversed oblique fractures or pathological fractures (Hardy *et al*. 1998, Ramakrishnan *et al*. 2004) [7, 8].

The Proximal femoral nail (PFNA), AO-ASIF device introduced in early 1997 was designed to reduce the risk of implant related complications. An anatomic 6 degree neck valgus bend in the coronal plane, a narrower distal diameter and distal flexibility of the nail eliminates the need for routine reaming of the femoral shaft and also minimizes the stress concentration and tension in the femoral shaft. This should reduce the risk of intraoperative and postoperative femoral shaft fractures.

The rate of failure of fixation in our patients lies in the range reported by other authors using other intramedullary nails. Failure of fixation is related to the quality of fracture reduction and positioning of the screws. Open reduction is recommended if closed reduction is not satisfactory. Some authors have reported that rotational instability of the femoral head-neck fragment (a component of the cut out mechanism) may occur when the screw is not placed centrally in the femoral head. The supero-medial quadrant of the femoral head has been identified as a high-risk zone for cutouts. Precise placement of the screw is not always achieved and as much as 21.4% of unsatisfactory positioning of screws has been reported. This problem can be reduced if attention is paid to certain operative techniques. Poor positioning of screws can occur because of problems with the jig. The jig can loosen during maneuvering of the nail in the intramedullary canal. The jig should be tightened again before beginning the screw positioning procedure.

The aim of our study was to assess the functional outcomes of cephalomedullary nail in proximal femoral fractures with this newer method of intramedullary fixation with proximal femoral nail.

In an experimental study Gotze *et al*. (1998) compared the load ability of osteosynthesis of unstable intertrochanteric fractures and found that the PFNAA could bear the highest loads among all the devices.

Menzes *et al*. (2005) [9] in a clinical study of 155 consecutive patients treated with proximal femoral nail antirotation, reported failure of fixation in 2%, femoral shaft fractures in 0.7%. Fixation failures included one cut out, one delayed fracture healing. In our study there was one case of implant failure and one case of nonunion with no case of screw cut out and no case of Z effect snoted in our study with bony union of 90% in 4 to 6 month with no iatrogenic femoral fracture.

Utrila *et al* [10] *in a randomised prospective study* of 210 patients, in which 104 patients were managed by trochanteric gamma nail and compression hip screw was used in 106 patients, observed that Trochanteric nail is an effective method for fixation of trochanteric fractures in elderly patients. They concluded that the indication for either Trochanteric nail or compression hip screw is similar in stable fractures, but Trochanteric nail for fixation unstable trochanteric fractures was a better choice.

The present study was done to see role of cephalomedullary nail in proximal femoral fracture as per oxford knee score which shows the comparison of severity of hip score from one month to subsequent follow-up till 1 year. The hip score was found to be severe among all the patients at one month. However, moderate to severe hip was in 46.8% patients at 3 month, mild to moderate was in 57.4% at 6 month and satisfactory joint function was in 68.1% at 12 month showing that result and functional outcome of cephalomedullary nails are good and satisfactory.

Conclusion

Proximal fractures of the femur is common in the elderly due to osteoporosis and in young due to high velocity trauma. As the fracture is more common in the elderly, early reduction and internal fixation increases patient comfort, facilitates nursing care, helps in early mobilization of the patient and decreases the duration of hospitalization. Anatomical reduction can be achieved by closed manipulation or open methods. As the incidence of communition is high, these fractures may require a stable reduction and internal fixation. Bone grafting is required if there is a deficiency.

Osteosynthesis with cephalomedullary nails with antIrotaion blade offers the advantages of high rotational stability of the head-neck fragment, an reamed implantation technique and the possibility of static or dynamic distal locking of proximal femoral nail has the advantage of collapse at fracture site and is biomechanically sound.

Most of the complications are surgeon and instruments related which can be cut down by proper patient selection and good preoperative planning. Because of the

increasing occurrence in younger age groups, higher demand is placed on the treating surgeon to restore near normal function of the leg. Post operatively early mobilization can begin as the fixation is rigid and the implant designs are good.

In the light of these results, one can conclude that the cephalomedullary femoral nail, despite few unfavorable results and complications, is a satisfactory method of treatment in proximal femoral fractures, with comminution and instability.

Proximal femoral nailing creates a shorter lever arm, which translates to a lower bending moment and a decreased rate of mechanical failure. In our study we have concluded that cephalomedullary femoral nail give good fixation and good functional outcome which is comparable with other studies. The nails are load sharing implants so it cause early mobility of the patients thus increase overall functional results.

According to studies conducted by Yu, J. *et al* [11], GS Kulkarni *et al* [12] Gamma nail was found to have a higher risk of complications and sliding hip screw was superior for fixation of inter trochanteric fractures. While studies by Xiao Huang *et al* [13] showed equivocal results between PFN and DHS. In our series we found that cephalomedullary femoral nail had good functional outcome and role and had reduced intra-operative blood loss, lesser operative time, reduced radiation exposure, less amount of shortening, reduced hospital stay, lesser infection rates and early mobilization which is in accordance with recent studies like that by Jiang, Lei-Sheng *et al*. [14]

Cephalomedullary femoral nailing has the advantage of providing rotational as well as axial stability in cases of these proximal femoral fractures allowing a faster post operative restoration of walking ability, with overall better outcome as assessed by oxford hip score.

Reference

1. Laskin, Richard S, Gruber FACS, Martin A, Zimmerman FACS, Alan J. *et al* Intertrochanteric Fractures of the Hip in the Elderly: A Retrospective Analysis of 236 cases Clinical Orthopaedics & Related Research: 1979; 141:188-195
2. Jones HW, Johnston P, Parker M. Are short femoral nails superior to the sliding hip screw? A meta-analysis of 24 studies involving 3,279 fractures. International Orthopaedics. 2006; 30(2):69–78.
3. Parker MJ, Handoll HHG. Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults. Cochrane Database of Systematic Reviews 2005, Issue 4. Art. No.: CD000093. DOI: 10.1002/14651858.CD000093.pub3.
4. McKibbin. The biology of fracture healing in long bones, Journal of Bone and Joint Surgery B, 1978; 60(2):150-162.
5. Bridle SH. Fixation of intertrochanteric fractures of the femur. A randomised prospective comparison of the gamma nail and the dynamic hip screw. J Bone Joint Surg Br. 1991; 2:330-4
6. Goldhagen P, O'Connor DR, Schwarze D, Schwartz EA. Aprospective comparative study of compression hip screw and the Gamma nail [abstract]. Orthopaedic Transactions. 1993; 17(4):1048-9.
7. Hardy, de Ridder VA, de Lange S. Use of an intramedullary hip-screw compared with a compression hip-screw with a plate for intertrochanteric femoral fractures. A prospective, randomized study of one hundred patients [letter; comment]. Journal of Bone and Joint Surgery – American. 1999; 81(10):1502-3.
8. Ramakrishnan M. Management of subtrochanteric femoral fractures and metastases using long proximal femoral nail." Injury 2004; 35(2):184-90.
9. Menezes DF, Gamulin A, Noesberger B. Is the proximal femoral nail a suitable implant for treatment of all trochanteric fractures? Clin Orthop Relat Res 2005; 439:221-227.
10. Utrilla AL1, Reig JS, Muñoz FM, Tufanisco CB. Trochanteric gamma nail and compression hip screw for trochanteric fractures: a randomized, prospective, comparative study in 210 elderly patients with a new design of the gamma nail. J Orthop Trauma. 2005; 19(4):229-33.
11. Yu J. Internal fixation treatments for intertrochanteric fracture: a systematic review and meta-analysis of

randomized evidence. Sci. Rep. 5, 18195; doi: 10.1038/srep18195, 2015.
12. Kulkarni GS, Limaye R, Kulkarni M, Kulkarni S. Intertrochanteric fractures. Indian J Orthop. 2006; 40:16-23
13. Xiao Huang, Frankie Leung, Zhou Xiang, Pei-Yong Tan, Jing Yang, Dai-Qing Wei *et al*. Scientific World Journal. 2013; 2013: 805805. Published online 2013, 19. doi: 10.1155/2013/805805
14. Jiang, Lei-Sheng. Intramedullary fixation of subtrochanteric fractures with long proximal femoral nail or long gamma nail: technical notes and preliminary results. Annals of the Academy of Medicine, Singapore. 2007; 36(10):821-6.