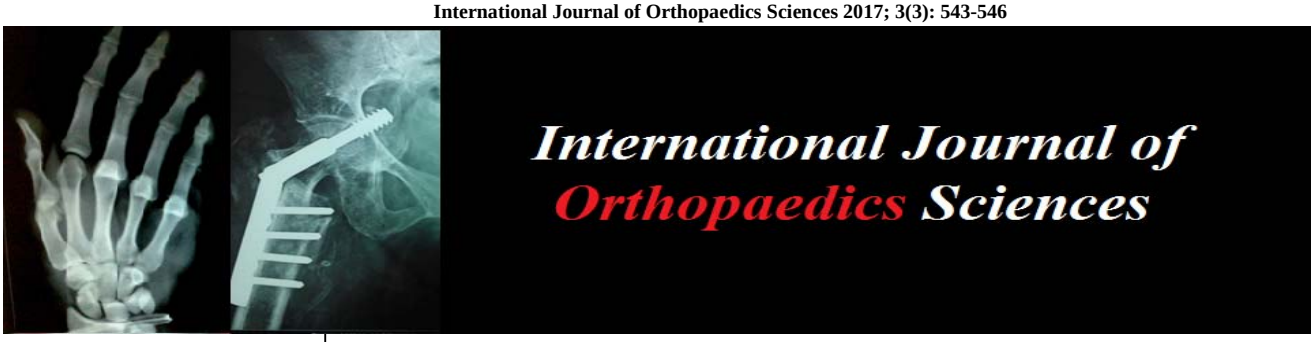

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Selection of implant based on CT evaluation of trochanteric & subtrochanteric fractures

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Abstract
Background: CT scan evaluation of the morphology of trochanteric & subtrochanteric fractures helps in the selection of appropriate implant for fixation of proximal femoral fractures, resulting in better surgical outcome.
Materials and methods: CT scan evaluation done in 64 cases of intertrochanteric and subtrochanteric fractures since April 2012 to March2014. The fracture morphology of these fractures analyzed regarding stable or unstable fracture, integrity of posteromedial part of trochanter, severe comminution of lateral cortex of trochanter, quality of the bone based on their trabecular pattern, and fracture line extending into the subtrochanteric area. Dynamic hip screw, proximal femoral nailing, proximal femoral locking plate and cemented hemiarthroplasty were selected according to fracture morphology. Results compared with previous 60 surgically treated cases of trochanter & subtrochanteric fractures done based on the xray morphology of the fractures, for the period before April 2012.
Results: 2 cases of implant penetration into the joint, 11 cases of hip screw cut out, 9 cases of varus angulations, 4 cases of implant failure with nonunion occurred of the 60 cases done with only x ray evaluation, study done from September 2008 to March 2012. After 2 years of follow up only 4 cases of nonunion occurred after implant selection for surgical treatment of intertrochanteric and subtrochanteric fractures based on CT scan evaluation.
Conclusion: CT scan evaluation provides good method of choosing an implant in surgical management of trochanteric and subtrochanteric fractures.

Keywords: CT scan evaluation, trochanteric, subtrochanteric fracture
MeSH terms: dynamic hip screw, proximal femoral nail, proximal femoral locking plate, hemiarthroplasty.

Introduction
Fracture surgery represents a big part of the orthopedic surgeon workload, and usually has associated major clinical and social cost implications. Some of these are medical and other related to surgical treatment itself [1]. Over 90% of hip fracture patients are older than 65 year-old and have preexisting medical comorbidities. Both factors have an important influence in its prognosis and treatment. Even with optimal care, elderly trauma patients suffer a higher mortality and morbidity rate when compared with general population. Medical complications may affect about 20% of patients with hip fracture. They are cognitive, neurological, cardiac and vascular complication like deep vein thrombosis/pulmonary embolism, pulmonary, gastrointestinal, urinary tract, haematological, endocrine-metabolic, pressure sores.
Complications arising from trochanteric fracture surgery are mainly mechanical, and relates to load-bearing. Early surgical fixation, role of anti-thromboembolic and anti-infective prophylaxis, good pain control at the perioperative, detection and management of delirium, correct urinary tract management, avoidance of malnutrition, vitamin D supplementation, osteoporosis treatment and advancement of early mobilization to improve functional recovery and falls prevention are basic recommendations for an optimal maintenance of hip fractured patients [2].
Stable inter trochanteric fractures do well with any kind of fixation. In the unstable fracture patterns, the complications like screw cut outs have been reported to be as high as 50%. Other complications are femur fracture and implant failure.
Screw cut-out accounts for 85% of fixation failures [3]. The greatest predictor for the appearance of cut-out is the distance from the screw tip to the subchondral bone, tip-apex

distance (TAD), within 10mm of the subchondral bone and the placement of screw in the center of the head. When TAD was less than 5mm have good outcome [4]. Greater than 35mm, the cut-out rate was 30%, while when TAD exceeded 45 mm, the cut-out rate rose to 60%. The best results have been with a TAD of less than 10mm.

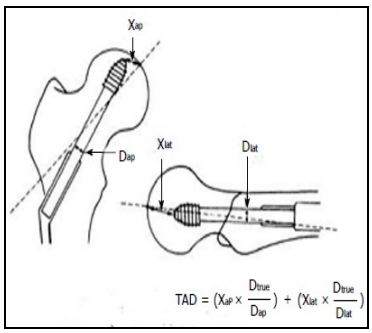

Fig 1: Equally important is the position of the lag screw in the femoral head, the ideal position being centre-centre [5].

The femoral fractures occurring with the use of short proximal femoral nailing could be avoided if long nails are chosen routinely, owing to the fact that these are osteoporotic fractures and fracture around the tip of the nail can occur due to mechanical stress concentration below it [6].

Fig 2: The choice of implants based on certain criteria may help in drastically reducing the postoperative complications after trochanteric fracture fixations.

CT scan evaluation by coronal, sagittal and reconstruction view of trochanteric fractures were done based on the following criteria:
Stable or unstable fracture pattern, based on the comminution of posteromedial part of the neck including the lesser trochanter
Lateral wall comminution
Quality of bone, osteoporosis,
Fracture line extending to the diaphysis
Reverse obliquity of the fracture line
Based on these facts, stable fractures are fixed with dynamic hip screw. Unstable fractures are treated with intramedullary device like long proximal femoral nail. Fracture line extending to diaphysis and reverse oblique fractures were treated with long intramedullary nail.
Severe comminution of the neck region, as seen in CT scan, were fixed with proximal femoral locking plate, augmented with cortical strut and cancellous bone grafts.
If there is a lateral wall or greater trochanter fracture, sliding hip screw were not used.
Patients with very severe osteoporosis were treated with cemented hemiarthroplasty.
Also, patients with implant failure and one nonunion were operated second time and cemented arthroplasty done.

Materials and methods

A total of 64 patients were managed between April 2012 to March 2014. 39 were male and 25 were female patients. 34 patients fractured on right side and 30 on left side.
56 had intertrochanteric and 8 had intertrochanteric with subtrochanteric extension.

Table 1

	April 2012 – March 2014	**Sep 2008 – March 2012**
Total cases	64	60
Male	39	-28
Female	25	32
Intertrochanteric fractures	56	53
Subtrochanteric extension	8	7

9 patients had lateral wall comminution of upper end of femur from trochanter to subtrochanter area.
14 patients had severe comminution at the intertrochanteric area with blow-out of the posteromedial part including the lesser trochanter.
3 patients had severe osteoporosis with loss of primary and secondary trabeculae in the femoral head.
17 intertrochanteric fractures which were found to be stable by CT evaluation were fixed with dynamic hip screw. 3 intertrochanteric with subtrochanteric extension dynamic compression screw done.
3 cases of severe osteoporosis cemented bipolar arthroplasty were done.
14 cases, which had severe lateral wall comminution, were fixed using proximal femoral locking plate with bone graft. In 4 of these cases, fibular strut graft used for augmentation along with cancellous bone iliac graft.
In 27 cases, proximal femoral locking nail, long nail, were used. We did not use short proximal femoral nails in our series of the last 64 cases.

Table 2

	April 2012 – March 2014	**Sep 2008 – March 2012**
Total Cases	64	60
DHS	20	49
Proximal femoral nail	27	11
Proximal femoral locking plate	14	-
Cemented bipolar prosthesis	3	-

Of the 64 cases followed, 4 died within 6 months and 3 more before end of 1 year.
There were 4 cases of nonunion out of 20 cases of Dynamic hip screw cases, for which subsequently cemented bipolar arthroplasty done.
There were no cases of screw cut-out, or infection. There were no incidences of implant failure in these 64 cases studied.
Of the 60 surgically treated cases of intertrochanteric, and subtrochanteric fractures studied, before April 2012, from September 2008, there were 49 cases treated by dynamic hip screws and 11 by proximal femoral nailing. Surgical implants in all these 60 cases were selected based on antero-posterior and lateral x-rays.
There were 5 deaths within 6 months and 1 in the next 6 months.

Table 3

	April 2012 –March 2014	Sep 2008 – March 2012
Deaths	7	7
Screw cut-outs	-	11
Varus angulation	-	9
Implant failure	-	4
Non-union	4	7
Femoral fracture	-	1

There were 11 screw cut-outs, 9 varus angulations, 7 nonunion, and 4 implant failures.

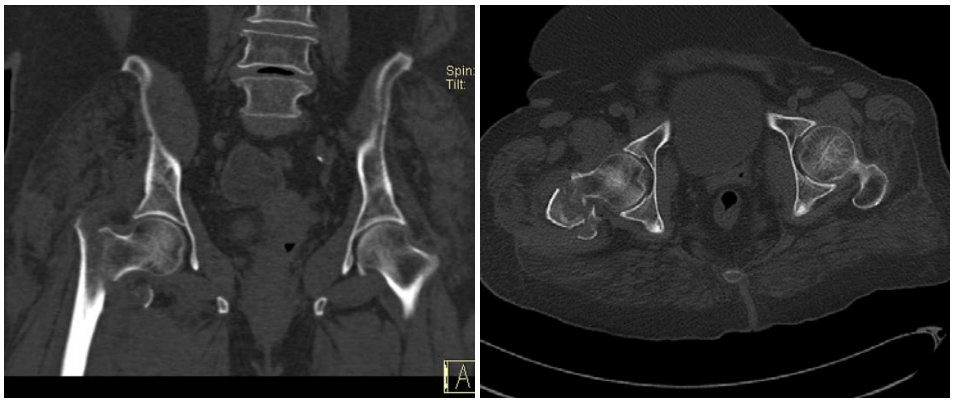

Fig 3: CT axial and coronal sections showing right trochanteric fracture.

Fig 4: Coronal reformatted and VR images showing right communited trochanteric fracture.

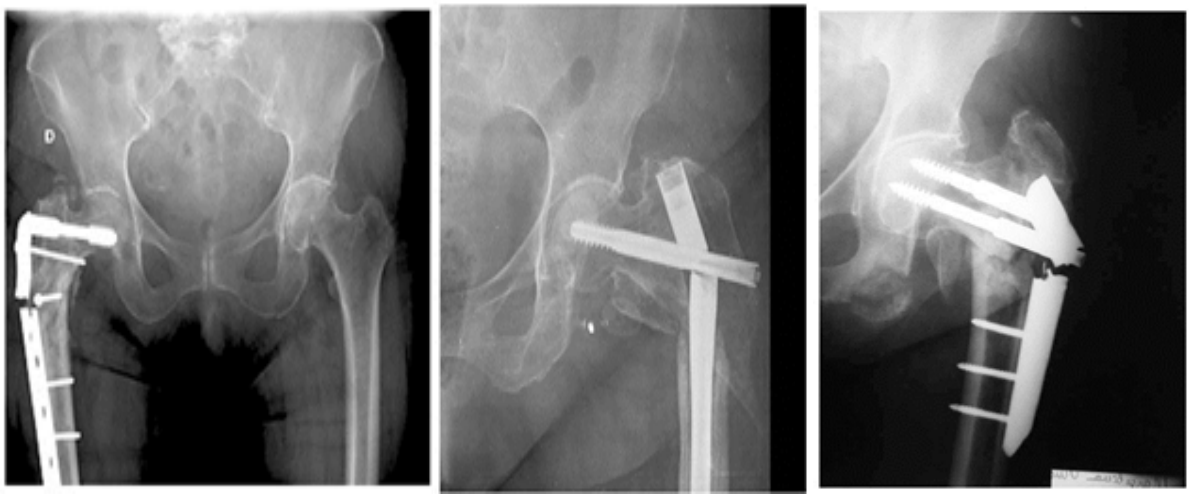

Fig 5: Post operative implant x-rays.

All the cases were adults with age ranging from 23 years to 90 years.

Table 4

Age group	April 2012 – march 2014	Sep 2008 –march 2012
20 -30	3	-
31 – 40	4	3
41 - 50	5	6
51 - 60	8	9
61 - 70	19	16
71 – 80	14	15
81 - 90	11	11

Discussion

There are several classifications of intertrochanteric and subtrochanteric fractures. The commonly followed are Boyd & Griffith's classification, Evans, AO/OTA classification.

The surgical complications can be classified as due to fracture related, related to choice of implant, routine operative and general complications.

Stable inter trochanteric fractures do well with any kind of fixation. On the other hand with the unstable patterns, complication rates such as screw cut outs have been reported to be as high as 50% in unstable IT fractures

The gold standard method of fixation was by dynamic compression screw or the sliding screw fixation.

There are many studies mentioning the preference of proximal femoral nailing to dynamic compression screw due to its load sharing principle. There is an increase in usage of intramedullary devices in the last decades up from 3% to more than 65%

However intramedullary nails have complication set of their own which includes iatrogenic femoral fractures, difficult initial reduction and persistent thigh pain due to stress concentration around nail tip, varus angulation and secondary risk of femoral fractures. The classical indications for nailing are in the management of unstable patterns that include reverse obliquity fractures, transtrochanteric fractures, fractures with large posteromedial fragment implying loss of calcar buttress, and fractures with subtrochanteric extension.

Conclusion

The clinical results of surgical treatment of trochanteric and subtrochanteric fractures based on the CT scan evaluation of the fracture morphology in selecting the implant used in those fractures gave a better result when compared to those cases in which implants were selected after X ray evaluation of the same type of fractures.

References

1. The hip fracture incidence curve is shifting to the right. Bergström U, Jonsson H, Gustafson Y, Pettersson U, Stenlund H, Svensson O Acta Orthop. 2009; 80(5):520-4.
2. Complications of hip fractures: A review Pedro Carpintero, Jose Ramón Caeiro, Rocío Carpintero, Angela Morales, Samuel Silva, Manuel Mesa.
3. Lorich DG, Geller DS, Nielson JH. Osteoporotic pertrochanteric hip fractures: management and current controversies. Instr Course Lect. 2004; 53:441-454 [PMID: 15116633]
4. Kyle RF, Cabanela ME, Russell TA, Swiontkowski MF, Winquist RA, Zuckerman JD *et al*. Fractures of the proximal part of the femur. Instr Course Lect 1995; 44:227-253 [PMID: 7797861]
5. Girish HR, Won YY. The ideal position of hip lag screw within the femoral head: based on micro-CT analysis of the trabecular structure of the femoral head. Journal of Research in Orthopedics and Sports Medicine 2016; 2(1).
6. Parker MJ, Pryor GA. Gamma versus DHS nailing for extracapsular femoral fractures. Meta-analysis of ten randomized trials. Int Orthop 1996; 20:163-168 [PMID: 8832319]