International Journal of Research in Orthopaedics
Kalia A et al. Int J Res Orthop. 2019 Jul;5(4):582-587
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20192562

Results of sagittaly unstable intertrochanteric fractures managed by dual reduction technique

Anoop Kalia[1]*, Gaurav Saini[1], Isha Sharma[2], Sagar Kadam[1]

[1]Department of Orthopaedics, Max Super Speciality Hospital, Mohali, Punjab, India
[2]Department of Anaesthesia, Fortis Hospital, Amritsar, Punjab, India

Received: 10 May 2019
Revised: 29 May 2019
Accepted: 30 May 2019

***Correspondence:**
Dr. Anoop Kalia,
E-mail: kaliaanoop@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: We evaluated the functional and radiological outcome of sagittally unstable intertrochanteric fractures reduced by dual technique consisting of a crutch placed posteriorly over distal fragment and pushing the flexed proximal fragment by ramrod anteriorly over a period of 12 months.
Methods: A fracture was defined as sagittally unstable intertrochanteric fracture when posterior sagging of distal fragment and flexion of proximal fragment worsens after routine maneuvers for closed reduction. Out of the 80 intertrochanteric fractures treated from February 2018 to April 2019, 16 hips had sagittal instability and after reduction were treated with proximal femoral nail (Stryker Trauson) in some patients and DePuy Synthes proximal femoral nail PFNA in remaining patients. These 16 patients were followed up for a period of 1 year and functional and radiological outcome was noted.
Results: Out of the 16 patients, 10 were males and 6 were females. The mean age was 68.2 years. According to the A.O classification out of the 16 patients, 7, 5 and 4 patients were classified as A1.3, A2.1, and A2.2 or more. The mean time from injury till surgery was 4.6 days. The mean surgical time was 45.8 minutes. The mean time for radiological union was 22.4 weeks. The mean pre injury activity level was 4.2 while the mean final activity level was 3.8 (1-5) according to modified Koval activity index.
Conclusions: Anatomical reduction followed by rigid internal fixation is the key to success in intertrochanteric fractures.

Keywords: Intertrochanteric, Nail, Reduction

INTRODUCTION

Intertrochanteric fractures are best managed surgically.[1,2] With the advances in cephalo medullary nailing systems, nailing has become the treatment of choice for unstable trochanteric fractures such as those with large posteromedial fragment, with two or three fragments or reverse oblique or those with subtrochanteric extension.[3] A perfect anantomic reduction followed is mandatory for best clinical outcome.[4] Anantomic reduction is difficult in presence of an unstable fracture or when an irreducible variant is encountered.[5] An intertrochanteric fracture is labeled as sagittally unstable when posterior sagging of distal fragment and flexion of proximal fragment worsens after routine maneuvers involving longitudinal traction on fracture table.[6]

Such fractures appear to be reduced in the anteroposterior view after giving longitudinal traction but when the lateral view is taken, there is flexion of proximal fragment and posterior sagging of distal fragment which worsens after giving more linear traction. Many authors

have encountered such fracture and have described the placement of crutch to correct the sag.[7,8] Some authors have described the use of Hohman retractor or Bennet retractor introduced through incision of lag screw and placed under posterior sag and elevating it upwards.[7,9,10] Sometimes the posterior sag is the manifestation of overriding of proximal and distal cortices which requires open reduction.[11] Open reduction requires longer surgical time, more blood loss which can lead to delay in rehabilitation and sometimes wound problems. We managed such sagittally unstable fractures by using crutches to lift the posterior sag and using an artery forceps or ramrod type device applied anteriorly to push down the flexed proximal fragment.

METHODS

This is a prospective study carried out at Max Superspeciality Hospital, Mohali which is a tertiary level hospital.

Inclusion criteria was only those patients with intertrochanteric fractures in whom on giving traction on fracture table, sagging of distal fragment and flexion of proximal fragment worsened were included in the study.

Exclusion criteria were patients with injury more than 3 weeks old; patients sustaining polytrauma with associated pelvis, spine, abdominal or any other associated orthopaedic inury; pathological fractures; irreducible variant of intertrochanteric fractures requiring open reduction.

Among the 80 intertrochanteric fractures treated between February 2018 to April 2019, in 16 patients this sagittally unstable fracture pattern was found. These patients were treated by proximal femoral nail by closed means and were followed up for a period of 1 year. The study was approved by institutional ethics committee.

Procedure

The surgery was performed by the chief surgeon and a single assistant. A routine pelvis with both hips anteroposterior X-ray was taken. After giving spinal anaesthesia, the patient was positioned on traction table and routine reduction maneuvers of linear traction and internal rotation/ external rotation were done and the crutch was kept standby. The crutch has a screw in the superior part which gives an idea of location of the crutch during intra op IITV monitoring. Also the height of the crutch can be adjusted, so that the amount of upward force on the distal sagging fragment can be increased or decreased. When such sagittally unstable fracture pattern is noted in which distal shaft is sagging and the proximal part is flexed (Figure 1 and 2), the assistant is told to drape the crutch. The draped crutch is then placed under the distal fragment (Figure 3) which corrects the posterior sag and the flexion of the proximal fragment is neutralized by the technique described by Young et al.[6] In this method a 2 mm stab wound is made at the intersection of imaginary vertical line drawn from anterior superior iliac spine and an imaginary horizontal line drawn at the level of tip of greater trochanter and a Steinman pin was introduced whose tip lies at inferomedial cortex of proximal fragment in A.P view and on anterior cortex of proximal fragment in lateral view. We used an artery forceps in place of Steinman pin, which was replaced by ramrod type of device if the push of the artery forceps was not found to be sufficient in neutralizing the flexion of proximal fragment in lateral view. So, with artery forceps/ramrod pushing down the proximal fragment and crutch lifting the distal fragment, the deformity was neutralized. some authors use a mallet or a hohman retractor via the same incision as for lag screw to lift the distal sagging fragment but we observed that it requires an assistant who has to use sustained force till the insertion of nail and the lag screw to hold the reduction which can be tiring and frustrating for the assistant.[6,7,9,10] So the use of crutches avoids such problem. After reduction is achieved, nailing is carried out in routine manner. Guide wire is passed after taking proper entry point and checked under C-arm in both A.P and lateral views (Figure 4). After doing sequential reaming followed by proximal reaming.

Figure 1: C-arm view showing reduction in the A.P view before application of crutch.

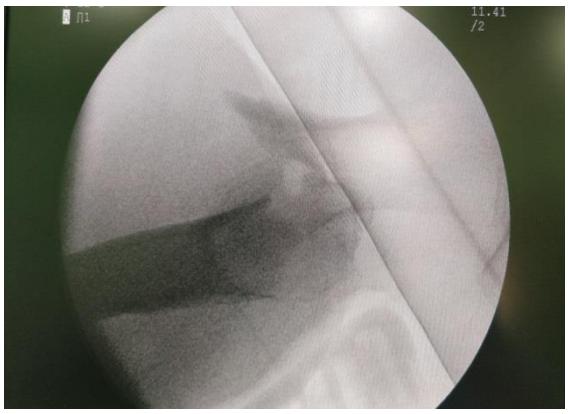

Figure 2: C-arm view showing reduction in the lateral view before application of crutch.

Figure 3: Intraoperative clinical picture showing placement of crutch.

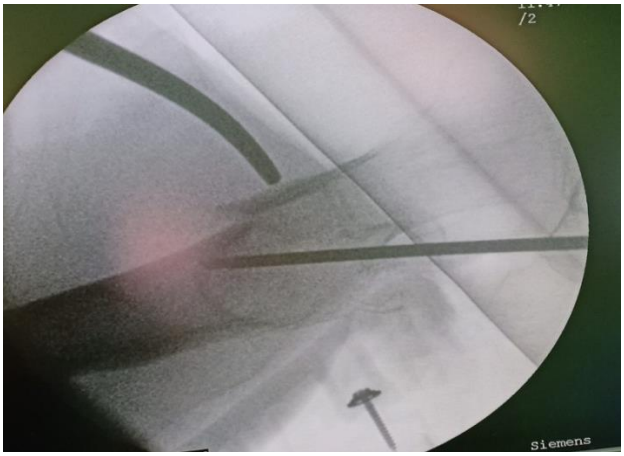

Figure 4: Guide wire being passed in lateral view with crutch applied posteriorly and artery forceps, pushing flexed proximal fragment downwards.

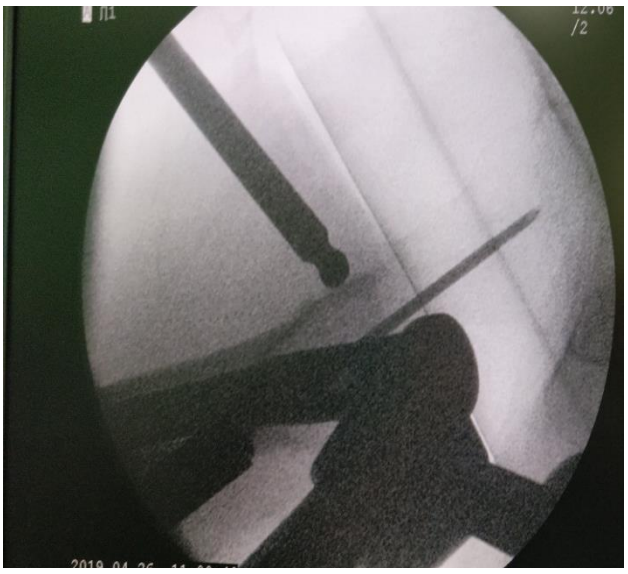

Figure 5: Guide wire for lag screw in lateral view.

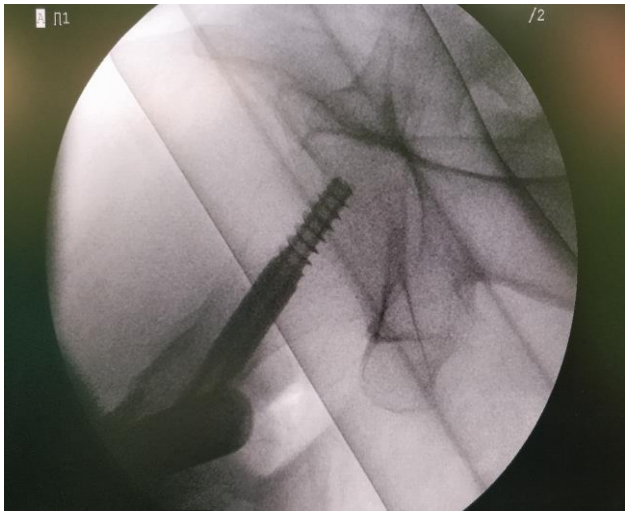

Figure 6: Final position of lag screw in lateral view.

Stryker Trauson proximal femoral nail in some cases and in some patients DEPUY SYNTHES PFNA 2 of appropriate diameter was inserted with the reduction maintained by the crutch as well as the ram rod device. now the guide wire for lag screw is passed aimed at being central in both A.P and lateral views with the reduction tools in situ (Figure 5) followed by insertion of lag screw of appropriate length (Figure 6). This is followed by distal locking. Wound was thoroughly washed, followed by suturing in layers and antiseptic dressing

Postoperative protocol

Postoperative radiographs were obtained on the first postoperative day. The patients were encouraged to do static quadriceps and active assisted/active straight leg raising (SLR) exercises once the patient feels comfortable. Patient was made to sit up on the bed side and full weight bearing walking with the support of walker was started 24 hours after the surgery. Patients were discharged from hospital 72-96 hours after surgery and stich removal was done 2 weeks from the day of surgery. Stair climbing and hip abductor strengthening exercises were gradually initiated after 6 weeks.

The patients were followed up clinically and radiologically after three weeks, six weeks, three months, six months, twelve months. Functional evaluation was done using modified index of Koval et al at final follow up.[12]

Radiologically fracture union was defined as continuity of at least three cortices in AP and lateral views without any fracture gap. Clinically fracture was considered as healed when there was no local tenderness and patient could do full weight bearing without any support.

Once the fracture was healed, patients were encouraged to sit on the floor cross legged and to do squatting as it is an essential part of the routine in Indian population.

RESULTS

Out of the 16 patients, 10 (62.5%) were males and 6 (37.5%) were females (Table 1). out of the 16 patients, 4 patients (25%)were in the age group 50-59, 7 patients (43.75%) were in age group 60-69 while 5 patients (31.25%) were in the age group 70-79 (Table 2). The youngest patient was 52 years old while the eldest patient was 78 years old. The mean age was 68.2 years (range, 52-78).

Table 1: Sex wise distribution.

Gender	No of patients	Percentage (%)
Males	10	62.5
Females	6	37.5
Total	16	100

Table 2: Age group distribution.

Age group	No of patients	Percentage (%)
50-59 yrs	4	25
60-69 yrs	7	43.75
70-79 yrs	5	31.25

4 patients out of the 16 patients had associated comorbidities with diabetes mellitus present in 2 patients, while one patient had recent incident of myocardial ischemia and 1 patient had recent (within 1 year) incident of stroke

The mean time from injury till final surgery was 4.6 days (range, 0-12).

Table 3: Fracture classification.

Fracture type	No of patients	Percentage (%)
A1.3	7	43.75
A2.1	5	31.25
A2.2 and above	4	25

Out of the 16 patients, 7 patients (43.75%) were classified as A1.3, 5 patients (31.25%) were labeled as A2.1 and 4 patients (25%) were classified as A2.2 and more (Table 3).

The mean surgical time was 45.8 minutes (35-60).

The mean pre injury activity level was 4.2 (1-5) while the mean post-surgery activity level at the final follow up was 3.8 (1-5) according to the modified Koval activity index and the mean degree of recovery after surgery (the difference between activity level before and after treatment was 0.4.

All the fractures united uneventfully. The mean time for radiological union was 22.4 weeks (range, 12-46). Lag screw cut out was not seen in any case. We did not encounter wound problems in any of our case. Clinical results are summarized in Table 4.

Table 4: Summary of clinical results.

Variables	Value
Gender	10 males, 6 females
Mean age	68.2 years
Mean surgical delay	4.6 days
Mean operative time	45.8 minutes
Mean pre injury activity	4.2
Mean activity at last f/u	3.8
Mean union time	22.4 weeks

DISCUSSION

Numerous classification systems have been proposed for intertrochanteric fractures but there are certain fracture types which do not fit into any system.[13,14]

Few authors have reported “irreducible “fractures and recommended open reduction for them Young et al noticed some difficult fracture types and among them sagittally unstable fracture pattern was of particular interest.[5,6,15] If the oblique surface of distal fragment faces posteriorly, this sagittal displacement usually gets reduced by traction and rotation but if the oblique surface faces anteriorly, the sagittal displacement gets worsened by traction and it has to be reduced by elevating the thigh and pushing down the proximal flexed fragment.

Numerous other authors have also encountered such fracture types and they have placed a crutch below the thigh to correct the sagging of distal fragment but some authors have reported the slippage of crutch requiring an additional assistant.[7,8,11,16]

Few authors have described the use of hohman retractor or bennet retractor introduced through incison of lag screw and placed under posterior sag and elevating it upwards.[7,9,10]

We too, in our case series noticed such unusual fracture pattern and did not have any episode of slippage of crutch requiring additional assistant. In all our cases, surgery was carried by the chief surgeon and an assistant.

Young et al in their study corrected the posterior sag of distal fragment by mallet which was held by an assistant with both the hands and flexed proximal fragment was pushed down while inserting the nail by the chief surgeon by steinman pin but we found in our series that continuously holding the mallet and applying sustained pressure for elevation till the insertion of nail and lag screw is often tiring for the assistant and if the assistant somehow gives away during some crucial step, the reduction is lost and every step has to be repeated again.[6] This problem was overcome by the use of crutches in our series

Few authors advocated using a posterior reduction device (PORD) to improve the posterior sag.[17] The device is attached to the fracture table and does not interfere with intra operative C arm imaging.

De Palma et al introduced a novel device, the pneumatic patient positioner (PPP), that can be used to correct for the external rotation and posterior sag of the proximal fragment in repairs of intertrochanteric hip fractures using traction on the fracture table.[18] The PPP is noninvasive and simple to set up and use, and it requires no intraoperative adjustment.

Best possible outcome in intertrochanteric fractures is possible only by combination of near anatomical reduction, rigid internal fixation and early mobilsation.

Near anatomical reduction was achieved in our series of sagittal unstable fractures by correcting the sag of distal fragment by crutches and neutralizing the flexion of proximal fragment by artery forceps / ramrod which was inserted through an additional stab incision. Possible complications of this method are wound problems, injury to lateral femoral cutaneous nerve, inadvertent vascular injury but we did not encounter any such complication in our series.

Some authors have corrected the flexion of proximal fragment by Hohmann retractor or a Wagner Raspatory or a Jocher elevator inserted through the standard proximal incision and slid anterior to the fragment and exerting downward pressure over it.[10,11]

Our study has few drawbacks. since it was neither randomized or prospective, the results cannot be generalized. Very few patients are involved. more information could have been elucidated, had our study compared the results of open reduction and internal fixation in such fracture pattern with closed reduction and internal fixation achieved by our method but in the elderly with comorbidities doing open reduction and internal fixation for the sake of research could do more harm than this technique and it would have been unethical. But despite these drawbacks it does provide an algorithm for treating such fracture patterns. If any surgeon encounters such fracture pattern, we recommend not spending time on routine maneuvers of traction and internal rotation, rather immediately crutch should be draped and placed distally to correct the sag.

CONCLUSION

Intertrochanteric fractures although being the commonest fracture type still continue to intrigue the surgeons and pose technical challenges due to the associated deformities like varus angulation, posterior sag of distal fragment, flexion of proximal fragment etc. correction of these deformities by any of the method followed by rigid internal fixation is the key to success in such fractures.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Hornby R, Evans JG, Vardon V. Operative or conservative treatment for trochanteric fractures of the femur: a randomized epidemiological trial in elderly patients. J Bone Joint Surg Br. 1989;71(4):619-23.
2. Lorich DG, Geller DS, Nielson JH. Osteoporotic pertrochanteric hip fractures: management and current controversies. Instr Course Lect. 2004;53:441-54.
3. Barquet A. Proximal IM nailing of unstable trochanteric fractures: minimally invasive reduction aids- a review. J Clin Exper Traumatol. 2016;1(1):4-5.
4. Desjardins AL, Roy A, Paiement G, Newman N, Pedlow F, Desloges D, et al. Unstable intertrochanteric fracture of the femur: a prospective randomized study comparing anatomical reduction and medial displacement osteotomy. J Bone Joint Surg Br. 1993;75(3):445-7.
5. Said GZ, Farouk O, Said HG. An irreducible variant of intertrochanteric fractures: a technique for open reduction. Injury. 2005;36(7):871-4.
6. Chun LYS, Oh H, Cho YJ, Rhyu KH. Technique and Early Results of Percutaneous Reduction of Sagittally Unstable Intertrochateric Fractures. Clin Orthop Surg. 2011;3(3):217–24.
7. Riehl JT, Widmaier JC. Techniques of obtaining and maintaining reduction during nailing of femur fractures. Orthopedics. 2009;32(8):581.
8. Koval KJ, Zuckerman JD. Hip fractures: II. Evaluation and treatment of intertrochanteric fractures. J Am Acad Orthop Surg. 1994;2(3):150-6.
9. Schlickewei CW, Ruger JM, Ruecker AH. Nailing of displaced intertrochanteric hip fractures. Tech Orthop. 2015;30:70-86.
10. Aktselis I, Papadimas D, Fragkomichalos E. Intramedullary nailing of trochanteric fractures-operative technical tips. Injury. 2012;43:961-5.
11. Carr JB. The anterior and medial reduction of intertrochanteric fractures: a simple method to obtain a stable reduction. J Orthop Trauma. 2007;21(7):485-9.
12. Koval KJ, Skovron ML, Aharonoff GB, Meadows SE, Zuckerman JD. Ambulatory ability after hip fracture: a prospective study in geriatric patients. Clin Orthop Relat Res. 1995;(310):150-9
13. Evans EM. The treatment of trochanteric fractures of the femur. J Bone Joint Surg Br. 1949;31(2):190-203.
14. Boyd HB, Griffin LL. Classification and treatment of trochanteric fractures. Arch Surg. 1949;58(6):853-66.

15. Moehring HD, Nowinski GP, Chapman MW, Voigtlander JP. Irreducible intertrochanteric fractures of the femur. Clin Orthop Relat Res. 1997;(339):197-9.
16. Pape HC, Tarkin IS. Intraoperative reduction techniques for difficult femoral fractures. J Orthop Trauma. 2009;23(5 suppl):S6-S11.
17. Langford J, Burgess A. Nailing of proximal and distal fractures of the femur: limitations and techniques. J Orthop Trauma. 2009;23(5):22-5.
18. DePalma AA, O'Halloran K, Shenoy K, Gruson KI, Sharan AD. A novel technique for reducing intertrochanteric hip fractures. Am J Orthop (Belle Mead NJ). 2014;43(9):402-4.

Cite this article as: Kalia A, Saini G, Sharma I, Kadam S. Results of sagittaly unstable intertrochanteric fractures managed by dual reduction technique. Int J Res Orthop 2019;5:582-7.