COPYRIGHT © 2014 BY THE ARCHIVES OF BONE AND JOINT SURGERY

RESEARCH ARTICLE

Management of Hip Fractures in Lateral Position without a Fracture Table

Hamid Pahlavanhosseini, MD; Sima Valizadeh, MD; Seyyed Hossein Saeed Banadaky, MD; Mohammad H Akhavan Karbasi, MD; Seyed Mohammad J Abrisham, MD; Hossein Fallahzadeh, MD

Research performed at Trauma Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Received: 28 April 2014 *Accepted: 27 August 2014*

Abstract

Background: Hip fracture Management in supine position on a fracture table with biplane fluoroscopic views has some difficulties which leads to prolongation of surgery and increasing x- rays' dosage.
The purpose of this study was to report the results and complications of hip fracture management in lateral position on a conventional operating table with just anteroposterior fluoroscopic view.

Methods: 40 hip fractures (31 trochanteric and 9 femoral neck fractures) were operated in lateral position between Feb 2006 and Oct 2012. Age, gender, fracture classification, operation time, intra-operation blood loss, reduction quality, and complications were extracted from patients' medical records. The mean follow-up time was 30.78±22.73 months (range 4-83).

Results: The mean operation time was 76.50 ± 16.88 min (range 50 – 120 min).The mean intra-operative blood loss was 628.75 ± 275.00 ml (range 250-1300ml). Anatomic and acceptable reduction was observed in 95%of cases. The most important complications were malunion (one case in trochanteric group), avascular necrosis of femoral head and nonunion (each one case in femoral neck group).

Conclusions: It sounds that reduction and fixation of hip fractures in lateral position with fluoroscopy in just anteroposterior view for small rural hospitals may be executable and probably safe.

Key words: Fluoroscopy, Fracture table, Hip fracture, Lateral position, Trauma

Introduction

The frequency of hip fractures continues to rise along with the increasing number of elderly people with osteoporosis who experience falls. Intertrochanteric and subtrochanteric femur fractures account for over half of hip fractures (1, 2). Different therapeutic methods include skillful neglect, conservative therapy with traction, open or closed reduction, and internal fixation with different implants and arthroplasty (3). Different operative approaches for hip fractures include the supine position on a conventional table, prone position using an extended posterolateral exposure, and lateral position for the management of intertrochanteric and subtrochanteric fractures (4-8). When reduction and fixation of hip fractures is indicated, the routine method is placing the patient in the supine position on a fracture table and using an intra-operative fluoroscopy. But fixing the patient on the fracture table is difficult and time-consuming, and in the case of unsuccessful closed reduction, exposure of the fracture site for open reduction is difficult, because the patient is in the supine position and the hip is in traction while extended (7-9). In this condition the surgeon cannot easily dominate over the operative region and hemostasis of bleeding vessels is difficult (7-9). When there are simultaneous ipsilateral hip and other lower extremity fractures, fixing the patient to the fracture table is not always safe and management of all the fractures in one session is not possible.Routine use of the fracture table may lead to such side effects as pudendal nerve neuropraxia, erectile dysfunction and perineal sloughing (8, 10-12).

Smith-Peterson et al. in 1931 reported an open reduction

Corresponding Author: Sima Valizadeh, Trauma Research Center, Shahid Rahnamoun Hospital, Farrokhi Ave., Yazd, Iran.
E-mail: valizade@ssu.ac.ir

AB&JS THE ONLINE VERSION OF THIS ARTICLE ABJS.MUMS.AC.IR

Table 1. Demographic Data

	All n=40	Trochanteric n=31	Femoral neck n=9
Gender male n (%)	27 (67.5%)	19 (61.3%)	8 (88.9%)
Gender female n (%)	13 (32.5%)	12 (38.7%)	1 (11.1%)
Age (years) (mean ± SD)	58 ± 26	67 ± 23	30 ± 11
Fracture Mechanism (Trivial fall) n (%)	20 (50.0%)	18 (58.1%)	2 (22.2%)
Fracture Mechanism (Accident) n (%)	17 (42.5%)	11 (35.5%)	6 (66.7%)
Fracture Mechanism (Fall from height) n (%)	3 (7.5%)	2 (6.5%)	1 (11.1%)
Pelvic & lower extremity co-fracture	8 (20.0%)	4 (12.9%)	4 (44.4%)

Table 2. AO Classification n (%)

31.A1	9 (29.0%)	31.B1	0 (0%)
31.A2	11 (35.5%)	31.B2	7 (77.8%)
31.A3	11 (35.5%)	31.B3	2 (22.2%)

and internal fixation of intra-capsular hip fractures, approached through an anterior iliofemoral incision with the patient in the supine position (4). Then Caldwell et al. in 1943 and Horwitz et al. in 1952 recognized the difficulty in obtaining adequate reduction and fixation of trochanteric area fractures with the patient in the supine position (5, 6). They placed the patient in the prone position using an extended postero-lateral exposure in order to improve the accuracy and ease of reduction. Davis et al. in 1969 introduced the lateral position for management of trochanteric area fractures with Jewett nail for the first time (7). They found that this method decreases the difficulties due to obscured visualization caused by soft tissue folds and bleeding vessels in the supine position (7). In 2010 Ozkan et al. performed hip nailing surgery without difficulty in the lateral decubitus position with manual traction on a radiolucent table without using the fracture table (8). They found that this position facilitates the entry to the trochanteric tip. However, their experience was limited to the treatment of type A3 fractures. They used routine anteroposterior and lateral views with a fluoroscopy.

In 2012 Connelly et al. described that the lateral decubitus position facilitated reduction and exposure in locked plating of complicated proximal femoral fractures (9). Their experience was on 8 patients with 31-A type fractures and 2 patients with 32-B type fractures that were done on a conventional table with routine fluoroscopy.

Despite extended use of the lateral position in femoral intramedullary nailing and some few reports about reduction and fixation of intertrochanteric and subtrochanteric fractures in the lateral position, we could not find cases of reduction and fixation of femoral neck fractures in the lateral position in the literature (7-9, 13, 14). In this study we retrospectively reported the results of reduction and internal fixation of intertrochanteric and subtrochanteric fractures and femoral neck fractures in the lateral position on the conventional operating table with manual traction and intraoperative fluoroscopy only in the anteroposterior view.

Materials and Methods

Between Feb 2006 and Oct 2012, 40 consecutive patients with hip fractures (31 intertrochanteric-subtrochanteric fractures and 9 femoral neck fractures) underwent surgery in the lateral position on a conventional operating table in Rahnemoun Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. All the patients were operated on by a single surgeon.

Written informed consent and operation-related permission, including the use of radiographs were obtained from each patient and the Research Committee of the Shahid Sadoughi University of Medical Sciences approved the study.

All patients referred to the hospital immediately except for one, who referred after 1 week. Twenty-seven cases (67.5%) were male with a mean age of 58±26 (range: 13–100 years). The mechanism of trauma was a trivial fall in 20 cases (50%), car accident in 17 cases (42.5%) and fall from height in 3 cases (7.5%). There were 8 patients (4 in each group) with other fractures in the pelvic and lower extremities (Table 1). The fractures were classified according to the Orthopedic Trauma Association (AO) classification (15) (Table 2).

Open reduction and fixation for hip fractures were done in the first 24 hours of admission in the lateral position on a conventional operating table with either a dynamic hip screw (DHS), dynamic condylar screw (DCS), or multiple screw and washers (Table 3). Ipsilateral femoral or tibial fractures were fixed by a dynamic compression plate (DCP) in the same session, before or after hip surgery.

Data about operation time, amount of intra-operation blood loss, additional frog leg views, quality of reduction, consolidation time and complications were extracted from the patients' medical files.

Duration of hip fracture surgery was considered as the time from induction of anesthesia until wound closure. The amount of hemorrhage during the operation was estimated according to the numbers of blood-stained gauzes and the volume of blood in the suction container. The quality of reduction was determined by measuring the angle and displacement of main fracture fragments on postoperative radiographs. Anatomic reduction was defined as less than 2 mm of displacement and less than

Table 3. Main results

	All n=40	Trochanteric n=31	Femoral neck n=9
Surgery time (minutes) (mean ± SD)	76.50±16.88	78.71 ± 14.89	68.89 ± 21.76
Blood loss (milliliter) (mean ± SD)	628.75±275.00	601.61±272.79	722.22± 277.39
Implant (DHS) n (%)	25 (62.5 %)	24 (77.4%)	1 (11.1%)
Implant (DCS) n (%)	6 (15.0%)	6 (19.4%)	0 (0%)
Implant (Screw & washer) n (%)	9 (22.5 %)	1 (3.2%)	8 (88.9%)
Reduction quality (Anatomic) n %)	26 (65.0 %)	19 (61.3%)	7 (77.8%)
Reduction quality (Acceptable) n (%)	12 (30.0%)	10 (32.3%)	2 (22.2%)
Reduction quality (Poor) n (%)	2 (5.0%)	2 (6.5%)	0 (0%)
Follow up (months) (mean ± SD)	30.78±22.73	29.23± 23.18	36.11 ± 21.47
Consolidation Time (week) (mean ± SD)	14.41±3.05	14.00 ±2.58	16.00±4.28
Complication n (%)	7 (17.5%)	5 (16.1%)	2 (22.2%)

5 degrees of varus, valgus, anteversion or retroversion. Reductions with displacements of 2 to 5 mm and 5 to 10 degrees of angulation were considered “acceptable” and those with displacements more than 5 mm and more than 10 degrees of angulation were considered “poor”(9, 16).

Post-operative protocol included

Tolerated partial weight bearing for 8-12 weeks in isolated hip fractures, and non-weight bearing until consolidation of other fractures in multiple trauma cases, range of motion exercise program for hip and knee joints and strengthening exercises as tolerated and physical examination and control radiographs were performed monthly for each patient until complete union was achieved.

Fracture consolidation was considered as no pain in the fracture site in monthly physical examinations and filling the fracture site with callus on monthly radiographs. Patients were evaluated regarding possible complications, including avascular necrosis, non-union, and mal-union in monthly outpatient visits as well.

Technique of the operation

General or regional anesthesia was used. The patient was positioned on a conventional operating table in the lateral decubitus position and the affected lower extremity was positioned up. The entire affected extremity was circumferentially prepped and draped in a sterile fashion (Figure 1). An anterolateral approach (modified Watson-Jones) to the proximal femur was carried down through the skin and subcutaneous tissue just proximal to the greater trochanter of the hip and extended as distally as deemed necessary to obtain reduction. Dissection was taken down to the iliotibial band and tensor facia lata, which was separated on the incision line. The origin of the vastus lateralis was transected posterior to

Figure 1. Position of patient and fluoroscopic device.

Figure 2. Intra operative fluoroscopic view.

Figure 3. Post operative AP view X-ray.

Figure 4. Post operative Lat. view X-ray.

anterior and elevated in a submuscular manner along the posterior intermuscular septum, and then release of soft tissue from the bone of the anterior trochantric area and joint capsule was carried down, which exposed the subtrochanteric–intertrochanteric and neck region of the femur. The surgeon did an arthrotomy to evacuate the hemarthrosis and do an open reduction of the femoral neck fracture with a transverse incision on the insertion of the capsule to the femoral neck. Because the lateral decubitus position relaxed the muscles and soft tissues, more exposed area was available, so hemostasis could be done more easily. The surgeon's assistant tracted the affected lower extremity gently with flexion, abduction, and external rotation of the hip concurrently so the surgeon could easily reduce the fracture with a wide exposed area because of relaxed muscles and soft tissues. Then the fracture was fixed temporarily by multiple cross pins in the region of the greater trochanter. To locate a suitable place for the guide pin to insert the implant (DHS, DCS or multiple screws), initially a pin was placed on the anterior aspect of the femoral neck to detect how much the neck was anteverted, and then the guide pin of the femoral neck was placed parallel to the foresaid pin in the lateral plan and in a suitable angle and position in the anteroposterior plan with the aid of fluoroscopic imaging in the cross-table position (Figure 1), and then the guide pin was placed in the desired position of the femoral neck.

Intra-operative evaluation was done by fluoroscopy in the anteroposterior view (Figure 2) and clinical examination of the hip was done in passive range of motion. Reduction and location of the guide pin was evaluated with fluoroscopy. Normal hip passive range of motion (free movement without crepitation) in all directions, during and at the end of surgery, showed that the pin and screw did not penetrate the articular surface, and were in a suitable position. However, in case of a suspicious examination or long screw in the anteroposterior view of fluoroscopic imaging, an additional lateral view in the frog leg position with the fluoroscopy in the same position was done. Postoperative X rays including anteroposterior and lateral views were taken the day after operation (Figure 3, 4).

Results

The mean duration of the operation was 76±17 minutes (range: 50 to 120 minutes). The mean estimated intra-operative blood loss was 629±275mililitters (range: 250-1300 milliliters) (Table 3). During the first 24 hours after surgery, 16 cases (40%) needed a packed cell transfusion due to having hemoglobin values less than 10 mg/dl. In the trochanteric group 10 cases (32.3%) and in the femoral neck group 6 cases (66.7%) received packed cell transfusion.

The intra-operative lateral view in the frog leg position was done for 11 patients (27.5%) before suturing to ensure the correct placement of the implant, which were satisfactory in all cases. In the remaining patients, fluoroscopy was done in the anteroposterior view.

Post-operative x-rays showed that all implants were placed in the desired positions and there were not any cases of screw penetration into the articular surface or femoral neck cortex. Anatomic and acceptable reduction was observed in 26 (65%) and 12 (30%) cases.

Follow up was done in an outpatient clinic. The mean time of follow-up was 31±23 (range: 4 to 83 months). The mean consolidation time was 14±3 (range: 10 to 24 weeks). Complications after surgery in the trochanteric group included: one case of GI bleeding (3.2%) 5 days after surgery, one case of acute deep infection (3.2%) that resolved with debridement and medical treatment, two cases of ipsilateral peroneal nerve neuropraxia (6.4%) that resolved spontaneously, and one case of malunion (3.2 %) after 5 months. In the femoral neck group one

case of avascular necrosis of the femoral head (11.1%) one year after operation and one case of non-union (11.1%) 6 months after operation were observed (Table 3).

Discussion

In our study using the fluoroscopy in the anteroposterior view patients and operating room staff received less X-ray dose. It did not increase the failure rate; Consolidation time, reduction quality and complications were acceptable according to the usual method(3). There were no cases of early implant failure and anatomic reduction was observed in 65% of cases. Acceptable reduction was acquired in 30.0% of cases. In the trochanteric group, there was one case of implant displacement leading to malunion 5 months after surgery that was due to severe osteoporosis in a 90 year-old patient. In the femoral neck group, we found one case (11.1%) of femoral head avascular necrosis after one year and one case of non-union (11.1%) after 6 months and this was acceptable according to the 23% complication rate of avascular necrosis and 9% complication rate of non-union in the femoral neck fractures (3).

Davis et al. in 1969 used the lateral position as a facilitated position for reduction and exposure for the first time in intertrochanteric and subtrochanteric fractures of the femur, Ozkan et al. used this position in proximal femoral nailing in 2010 and Connelly et al. in complex proximal femur locked plating in 2012 (7-9). In our study better exposure, hemostasis, and decreased surgery time was observed as well; however, lack of a control group made the comparisons impossible.

Routine fluoroscopy in two anteroposterior and lateral views takes time due to the need to frequently reposition of the device and may lead to increased probability of infection. But regarding the possibility of intra-operative examination of hip range of motion and taking additional lateral fluoroscopic views in the same lateral position in the frog leg position in case of a suspicious examination or feeling of crepitation, dependence on the fluoroscopy might decrease as Davis PH. mentioned (7). Moreover, in this study the lateral position was advantageous because all of the patients' fractures were managed in the same session without requiring patient repositioning.

Concerning surgeon hesitation in the lateral position and spinal injuries, which Connelly mentioned, our surgeon did not report any hesitations and he became experienced after carrying out this position a few times (9). In the case of spine injuries, they should be reduced and fixed first, and then the patient can be placed onto the lateral position; however, none of our patients had spine problems.

This study was limited to a few cases of femoral neck fractures and absence of a control group to compare estimated intra-operational bleeding, duration of surgery, and fluoroscopic views. Also, one surgeon operated on all of the patients.

Reduction and fixation of proximal femoral fractures in the lateral position with fluoroscopy or portable radiography in the anteroposterior view for small rural hospitals that lack a fracture table or advanced fluoroscopic devices may be executable and probably safe. However, we suggest clinical trials regarding lateral positioning for hip fracture management.

Acknowledgments

The authors would like to thank the Trauma Research Center of the Shahid Sadoughi University of Medical Sciences, who supported this study and the Shahid Rahnemon Hospital staff for their assistance. The authors declare that they have no conflict of interests.

Hamid Pahlavanhosseini MD
Sima Valizadeh MD
Trauma Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Seyyed Hossein Saeed Banadaky MD
Mohammad H Akhavan Karbasi MD
Seyed Mohammad J Abrisham MD
Department of Orthopedics, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Hossein Fallahzadeh MD
Department of Biostatistics and Epidemiology, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

References

1. Nork SE, Reilly MC. Subtrochanteric fractures of the femur. Skeletal Trauma, 4th ed Philadelphia, PA: WB Saunders; 2008:1977-2034.
2. Egol K, Koval KJ, Zuckerman JD. Handbook of fractures: Lippincott Williams & Wilkins; 2010.
3. Canale ST, Beaty JH. Campbell's Operative Orthopedics. 12th ed. Canada: Elsevier Mosby; 2013.
4. Smith-Petersen MN, Cave EF, Vangorder GW. Intracapsular fractures of the neck of the femur: treatment by internal fixation. Archives of Surgery. 1931;23(5):715.
5. Caldwell JA. Subtrochanteric fractures of the femur: An operative approach for open fixation. The American Journal of Surgery. 1943; 59(2):370-82.
6. Horwitz T. The posterolateral approach in the surgical management of basilar neck, intertrochanteric and

subtrochanteric fractures of the femur; a report of its use in 36 acute fractures. Surgery, gynecology & obstetrics. 1952; 95(1):45-50.

7. Davis PH, Frymoyer JW. The lateral position in the surgical management of intertrochanteric and subtrochanteric fractures of the femur. J Bone Joint Surg Am. 1969;51(6):1128-34.
8. Ozkan K, Cift H, Akan K, Sahin A, Eceviz E, Ugutmen E. Proximal femoral nailing without a fracture table. European Journal of Orthopaedic Surgery & Traumatology. 2010;20(3):229-31.
9. Connelly CL, Archdeacon MT. The Lateral Decubitus Approach for Complex Proximal Femur Fractures: Anatomic Reduction and Locking Plate Neutralization: A Technical Trick. Journal of orthopaedic trauma. 2012;26(4):252.
10. Callanan I, Choudhry V, Smith H. Perineal sloughing as a result of pressure necrosis from the traction post during prolonged bilateral femoral nailing. Injury. 1994;25(7):472.
11. Kao JT, Burton D, Comstock C, McClellan RT, Carragee E. Pudendal nerve palsy after femoral intramedullary nailing. J Orthop Trauma. 1993;7(1):58-63.
12. Brumback RJ, Ellison TS, Molligan H, Molligan DJ, Mahaffey S, Schmidhauser C. Pudendal nerve palsy complicating intramedullary nailing of the femur. J Bone Joint Surg Am. 1992;74(10):1450-5.
13. Carr JB, Williams D, Richards M. Lateral decubitus positioning for intramedullary nailing of the femur without the use of a fracture table. Orthopedics. 2009;32(10).
14. Winquist R, Hansen S, Clawson D. Closed intramedullary nailing of femoral fractures. A report of five. J Bone Joint Surg Am. 1984;66:529-39.
15. Müller M. CCF—Comprehensive Classification of Fractures I & II. MEM üller Foundation. Bern: MAO/ ASIF Documentation Center; 1996.
16. Lin J. Encouraging results of treating femoral trochanteric fractures with specially designed double-screw nails. The Journal of trauma. 2007; 63(4):866-74.