Treatment of Comminuted Subtrochanteric Fractures by Dynamic Hip Screw

Pages with reference to book, From 212 To 215

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Abstract

Twenty four cases of fracture of the proximal femoral shaft treated with dynamic hip screw fixation are included. All had severe comminution with subtrochanteric extensions. Dynamic hip screw provided stable osteosynthesis and helped to achieve bone union within 18 weeks in 19 of 21 followed-up cases. The anatomical configuration of the femur was maintained with minimal limb length discrepancy in one case and knee flexion of more than 110 degrees in all. Weight bearing was achieved after a mean period of 7.5 weeks post-fixation. Complications of treatment are also presented. Different implants are used to treat this injury with variable results. Dynamic hip screw system is a satisfactory implant for internal fixation in patients with these difficult fractures (JPMA 45:212 , 1995).

Introduction

The proximal femur includes the head, neck and the trochanters with the adjoining region. The precise extent ofthe region designated the subtrochanteric area remains undefined. Commonly this includes the area from the level of the lesser trochanter to within the center of the isthmus of the femoral shaft[1] and fractures in this area are believed to have a high incidence of unsatisfactory results alter operative treatment. This paper analyses the result of treatment with Dynamic Hip Screw (DHS) system of extensively comminuted fractures. of the upper femoral shaft with subtrochanteric extension. The fractures reviewed in this study do not include the intertrochanteric or subtrochanteric fractures that are considered within the premise of hip fractures nor are all fractures limited to the upper third of the femoral shaft. Inclusion of trochantenc fractures is believed to confuse the analysis of results of treatment[2].

Patients and Methods

This is a retrospective study of 24 cases treated at Asir Central Hospital, Abha, Saudi Arabia, between January, 1988 and June, 1993. The sample included 5 females and 19 males. The age ranged between 20 and 60 years, the mean being 36.5 years. The peak incidence was observed to occur between 20 to 40 years. Twenty- three patients had been involved in road traffic accidents and one had fallen from a height. Left sided fractures accounted for 15 cases and right for 9 cases. There were no open fractures. Fourteen patients had associated osseous and/or torso injuries. Patients were treated with DHS fixation using a long barrel plate. The type of fractures treated, were broadly of the types B 1.1, B2.1, B3. land C3.l of the AO classification[3]. All fractures involved the proximal shalt of femur with upward extension. They were severely comminuted (Figure 1).

Figure 1A. Pre-operative X-ray of a B1.1 subtrochanteric fracture

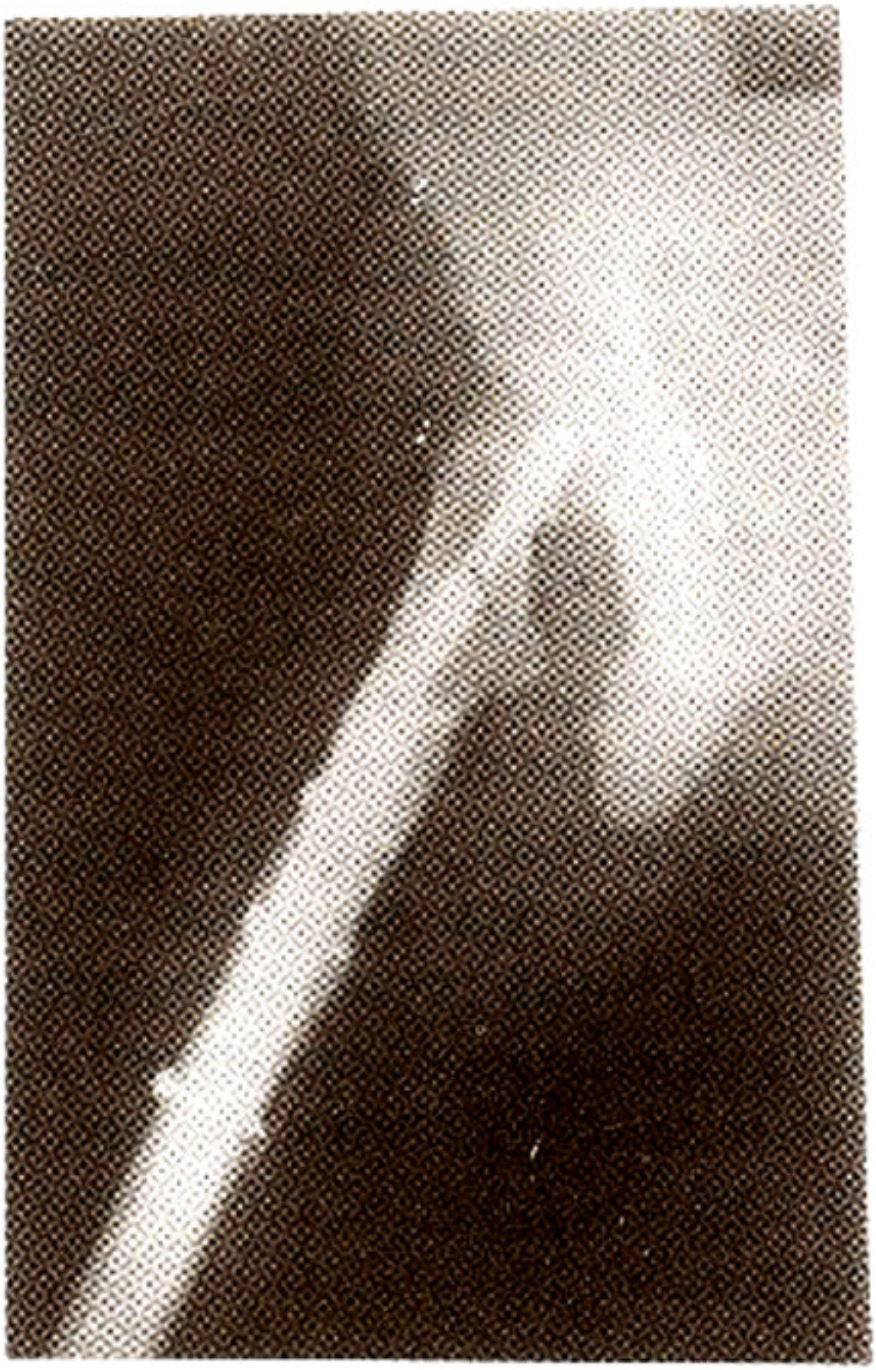

Figure 1B. X-ray - twelve weeks after fixation with DHS. Fracture has healed.

Fifteen cases had dismptionof the medial cortex, two of these had fractures of both medial and lateral cortices (Figure 2).

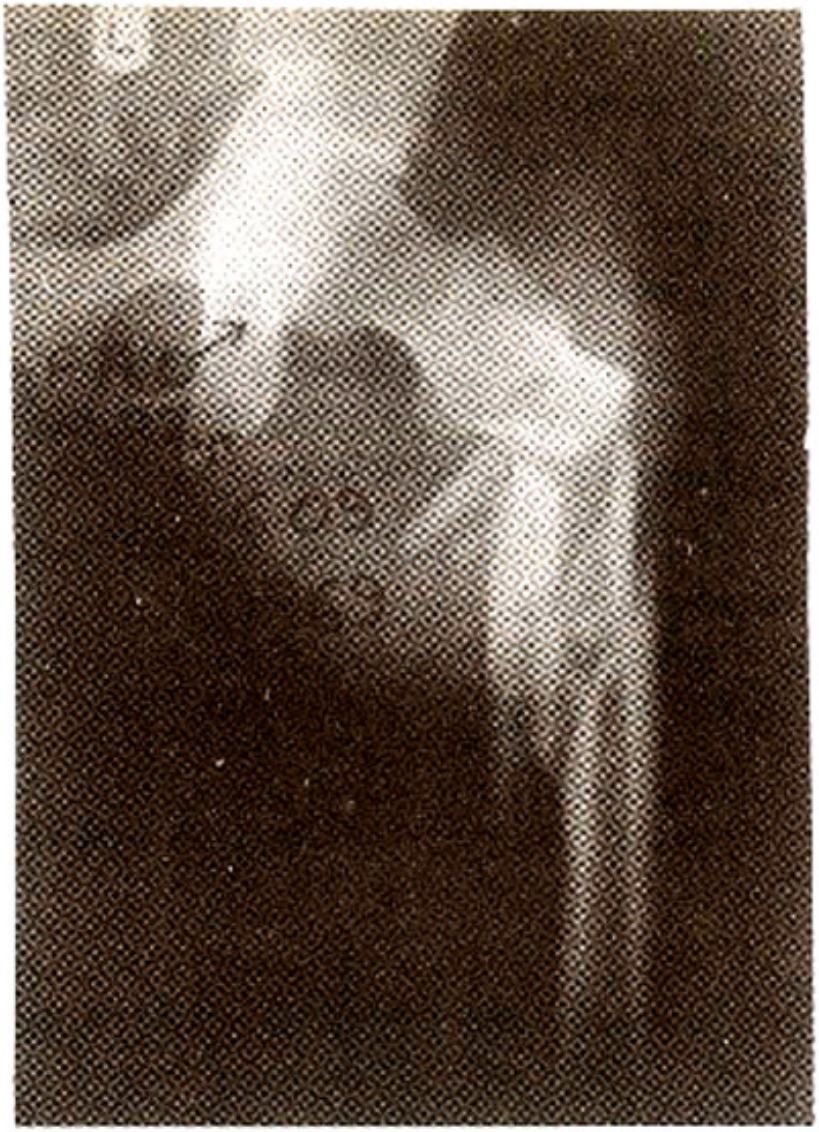

Figure 2A. X-ray of a C3.1 subtrochanteric fracture, with comminution of medial and lateral cortices.

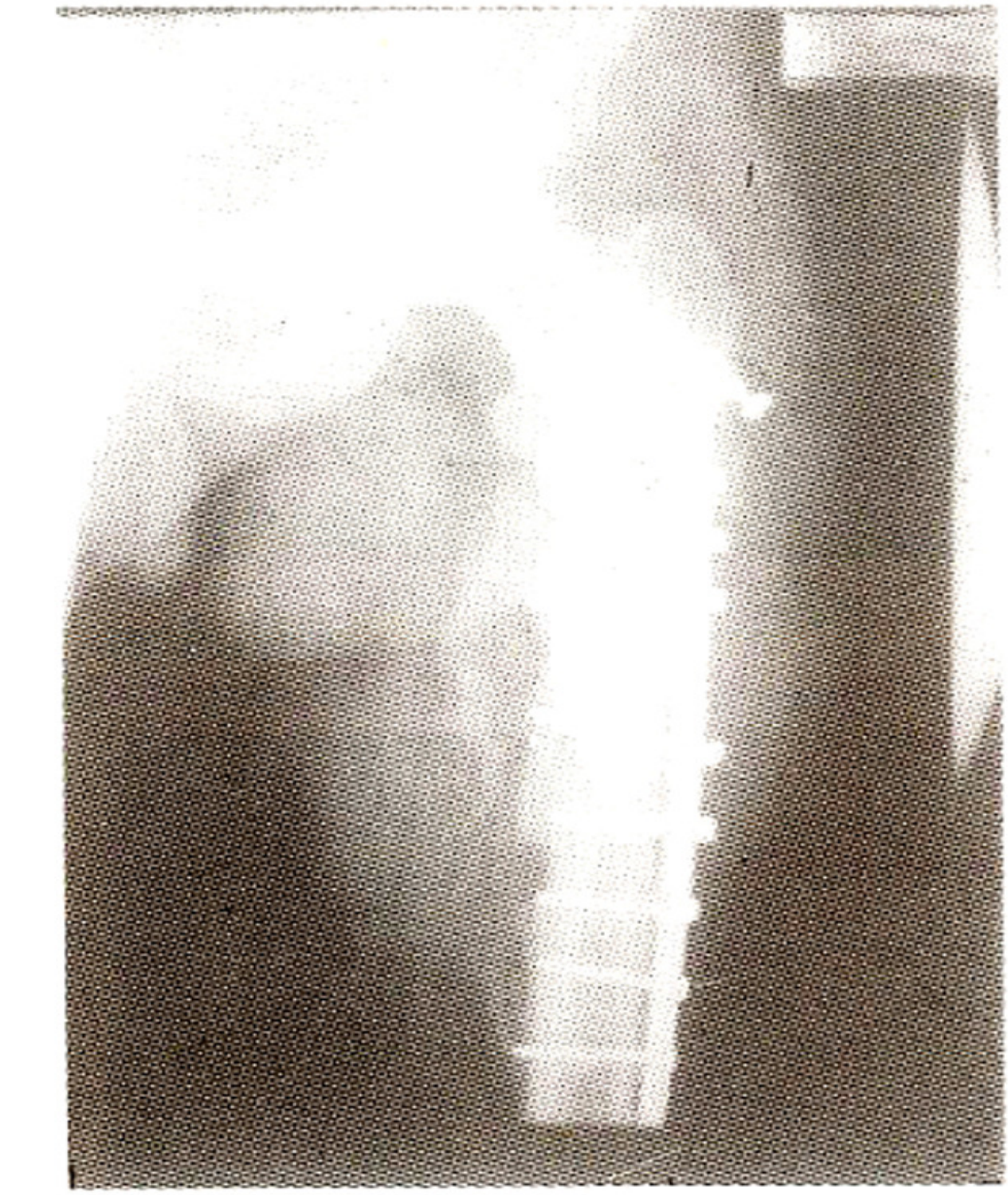

Figure 2B. Seven months later. Patient can squat.

Comminution of the lateral cortex was present in 5 cases and vertical splitting of the femoral shalt in 4 cases, one of which was associated with anterior cortex separation. Twenty one cases were followed up in the clinic over a mean period of 14.8 months (range 8-28 months).

Surgical Treatment

The patients were positioned on a fracture table. Fracture fragments were manipulated and checked under image intensifier until gross bony alignment was achieved. The fracture was approached through a lateral incision[4]. Vastus lateralis muscle was released at its upper attachment, mobilized and retracted to expose the fracture. Through a combination of image intensification and visual inspection., the fracture was reduced and fragments repositioned anatomically. Caution was exercised to avoid excessive soft tissue dissection from the fragments particularly on the medial side. Bone clamps were used to hold reduction. Interfragnientary screws or cerciage wire were used, when necessary, to keep fragments in position. Under intensifier control, a cancellous hip screw, of suitable length, was inserted into the neck and head of femur. Along, 10 to 12 hole, barrel plate was then coupled and held in position with screws. Cancellous bone grafts for medial cortex deficiency were used in 7 cases only. The wound was closed when stability of the fracture was achieved. Active movements of the knee were instituted on the first postoperative day. Non-weight-bearing ambulation was allowed on the third post operative day and graduated weight bearing was allowed in accordance with the appearance of radiological signs of union. Full weight bearing was achieved at a mean period of 7.5 weeks (range 6-16 weeks). Patients were allowed to return to sedentary jobs once they were fully weight bearing. Mobilization was delayed in patients with associated head or upper limb injuries. However, active and passive movements were encouraged in bed, before upright mobilization was allowed. An antibiotic (Cephalosporin) was administered prophylactically in all patients.

Results

Union was achieved in 19 patients between 8 and 18 weeks (mean 11.5 weeks) (Figure 3).

Figure 3A. X-ray of C1.1 fracture.

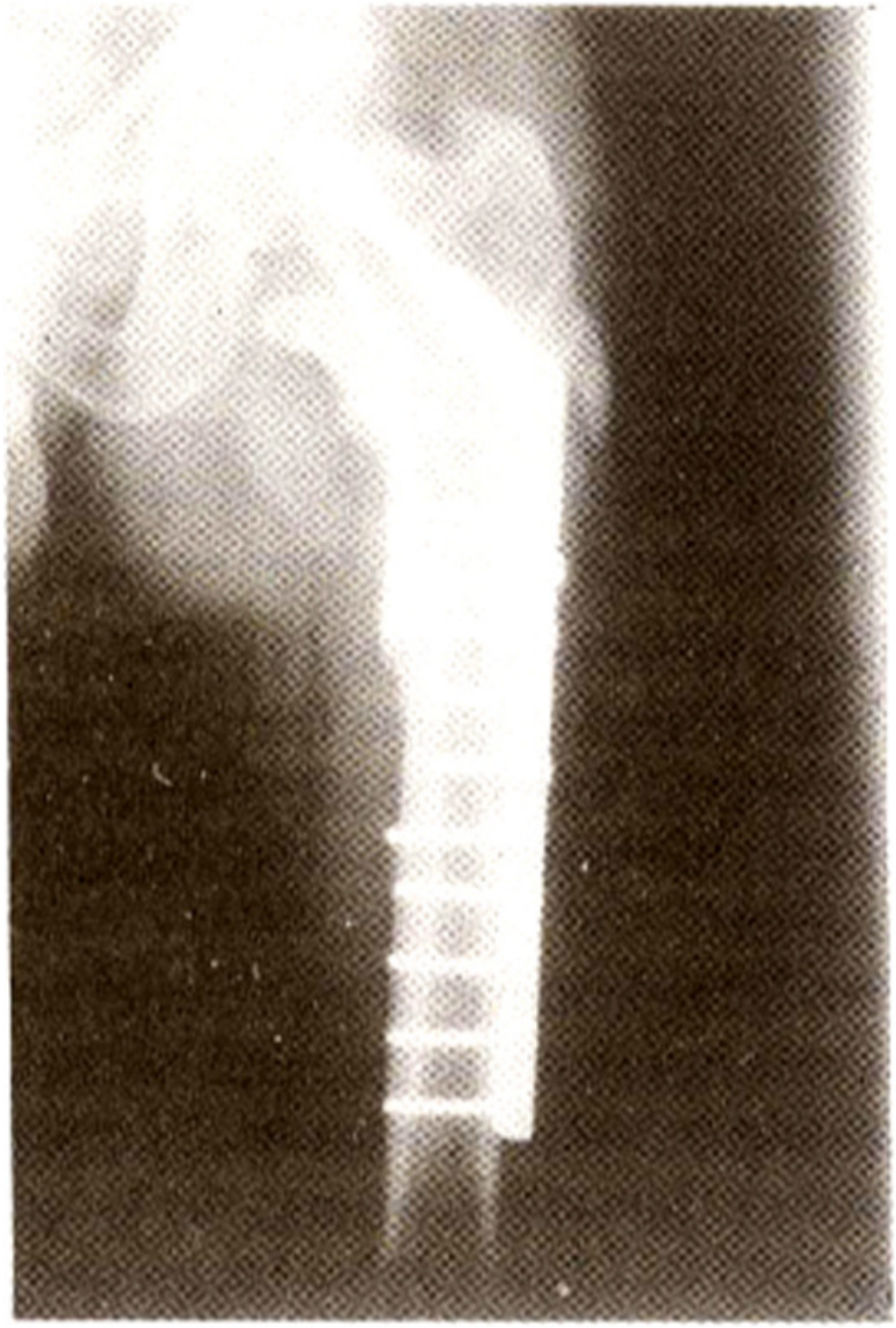

Figure 3B. X-ray ten weeks after fixation shows union of fracture.

None of the patients had less than 110 degrees of knee flexion. Pseudomonas infection was encountered in one case with uncontrolled diabetes mellitus. This resulted in delayed healing of the fracture and was treated with debndenient, insertion of antibiotic impregnated cement beads and repeated lavage with systemic antibiotic therapy. The fracture healed 20 months afterfixation and did

not require removal of implant. One patient developed non-union. This patient, in retrospect, should have had a primary bone graft for his medial comminution. He was subsequently treated by bone graft 18 months after his first surgery and proceeded to healing, though with avams deformity resulting in a shortening of 2.5 cms. Deep vein thrombosis occurred in one case who was confined in bed due to associated injuries. This delayed the time to achieve weight-bearing and increased the duration of hospitalisation. He made full recovery with appropriate medication.

Discussion

The limiting factors in these fractures were the amoutit of bone mass involved and the degree of comminution. The linear extension into the proximal subtrochanteric region carried the diaphyseal fractures into an area of high stress concentration with compression on the inside and tension on the outside[5]. These factors posed additional problems in achieving adequate osteosynthesis. The variety of methods available for the management of such fractures include intramedullaiy nails, with or without cerclage wire or tangential screw fixation, intramedullary nails with locking[1,6], Smith-Peterson pin and plate, fixed angled nail plate[2,7], condylar blade plate[8,9], Zickel nail[10], codviocephalic insertion of malleable rods[11,12], dynamic condylar screw[13] and sliding screw system[14]. This spectrum reflects the difficulty in the management of such fractures[15]. Each of these modalities has listed advantages for its use and variable results have been obtained by each[16-19] . However, no single option of treatment can be recommended for all cases[20].

Favourable results have been obtained by the use of different sliding screws14,21,22. Head penetration may be avoided and the rigid plate enables stabilization of the fracture. Failure generally result from technical[20] or mechanical[23] errors. In our patients DHS allowed a firm hold on the proximal fragment. When coupled with a long barrel plate, firm fixation was obtained. Reposition of the medial cortex under direct and intensified visualization reduced soft tissue stripping from the fracture fragments. This minimized the chance of avascular necrosis and enabled medialization of the cortex. Primary union in 19 of these cases, achieved within 18 weeks implies that the judicious use of the DHS system can favourably influence osteosynthesis of femoral shaft fractures irrespective of the degree ofcomminution and location. An anatomical reduction, stable fixation and restoration of the medial cortex are important for tile success of the dynamic hip screw[21,24]. A predominantly satisfactory clinical result obtaified in the majority of our patients, all of whom were victims of severe tmuma, supports this contention. It is concluded that with appropriate reduction and adequate bone contact, fixation with compression hip screw can allow stable osteosynthesis and ensure satisfactory bone healing in such difficult fractures.

References

1. Russell, T. A. Fractures of Hip and Pelvis. In 8th ed. Crenshaw, A. H., ed. Campbell's Operative Orthopaedics. St. Louis, Missouri, Mosby Year Book Inc., 1992; pp. 895-987.
2. DeLee, J. C. Fractures and Dislocations ofthe Hip. In: 2nd ed. Rockwood, C. A., Green, D. P eds. Fractures in Adults. Philadelphia, J. B. Lippincott, 1984, pp. 1211-1356.
3. Muller, M. E., Nazarian, S., Koch, P. et al. The comprehensive classification of Fractures of Long Bones. Berlin, Heidelberg, Springer-Verlag, 1990, pp. 134-37.
4. Ruedi, 1., von Hochstetter, A. H. C. and Schlumpf, R. Surgical Approaches for Internal Fixation. Berlin Heidelberg, Springer- Verlag, 1984, pp. 115-129.
5. Inman, V. T. Functional Aspects of the Abductor Muscles of the Hip. J. Bone Joint Surg., 1 947:29:607-619.
6. Wiss, D. A, and Brien, W. W. Subtrochanteric fractures of the femur, Results of treatment by

interlocking nailing. Clin. Ortho., 1992, 231-236.
7. Iqbal, M. Q. An Appraisal of Treatment of Femoral Shaft Fractures, Open Vs. Closed. Med. J. Aust., 1976;1 :392-95.
8. Muller, M. E., Ailgower, M.. Schneider, R. et al. Manual of Internal Fixation-Techniques Recommended by the AO-ASIF Crroup. Berlin Heidelberg, Springer-Verlag. 1992, pp. 535-45.
9. Kinast, C., Bolhofner, B. R., Mast, J. W. et al. Subtrochanteric fractures of the femur. Results of treatment with the 95 degrees condylar blade-plate. Clin. Orthop., 1989;238:122-130.
10. Zickel, R. E. An Intramedullary Fixation Device for the Proximal Part of the Femur. J. Bone Joint Surg., 1976;58-A:866-72.
11. Kudema, H., Bohler, N. and Collon, D. J. Treatment of lntertrochanteric and Subtrochanteric Fractures of the Hip by the Ender Method, J. Bone Joint Surg., 1976;58-A:604-11.
12. Harris, L. J. Condylocephalic Nailing of Proximal Femoral Fractures. Instr CourseLect., 1983;32:292-303.
13. Sanders, R. and Regazzoni, P. Treatment of subtrochanterie femur fractures using the dynamic condylar screw. J. Orthop. Trauma, 1989;3:206-213.
14. Massie, W. K Extracapsular Fractures of the I-Lip Treated by Impaction Using a Sliding Nail Plate. Clin. Orthop., 1962;22:180-202.
15. Waddel, J. P. Altematives in the management ofsuhtrochanterit fractures. Instr. Course Lect., 1984,33:222-229.
16. Papagiannopoulos, G., Stewart, H. D. and Lunn. P.G. Treatment ofsubtrochanteric fractures of the femur: a study of intramedullary compression nailing Injury, 1989;20:106-110.
17. Thomas, W. G. and Villar, R. N. Suhtroehanteric fractures- Zickel nail or nail-plate? J. Bone Joint Surg. (Br.), 1986:68:255-59.
18. Whitelaw, G. P., Segal, D., Sanzone, C. F. et al. Unstable intertrochanteric/subtrochanteric fractures of the femur. Clin. Orthop., 1990;238-45.
19. Dobozi, W.R., Larson, B. J., Zindriek, M. et al. Flexible intramedullary nailing ofsubtrochanteric fractures of the femur. A multicenter analysis. Clin. Orthop., 1986;68-78.
20. Simpson, A.H.R.W., Varthy, K., Dood, C.A.F. Sliding Hip Screws: Modes of failure. injury, 1989;20:227-31.
21. Senter, B., Kendig, R. and Savoie, F. H. Operative stabilization of subtrochanteric fractures of the femur, J. Orthop. Trauma, 1990;4:399-405.
22. Gruss, M. and Traut, R. Management of unstable pertrochanteric and per-to subtrochanteric femoral fractures with the dynamic hip screw. Aktuel. Traumatol., 1992;22;144-148.
23. Mainds, C. C. and Newman, R J. Implant Failures in Patients with Proximal Fernoral Fractures Treated with a Sliding Screw Device. Injury, 1989;20:98-100.
24. Kyle, R. F Fractures of the Proximal Part of the Femur. J. Bone Joint Surg. (Am.), 1994;76-A :924-950.