Treatment of ipsilateral femoral neck and shaft fractures

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Abstract: Background: No consensus exists regarding the optimal treatment of ipsilateral femoral neck and shaft fractures. We report our experience of managing 13 patients with ipsilateral femoral neck and shaft fractures by using either cannulated screws or dynamic hip screws for the neck and retrograde femoral nail for the shaft.
The purpose of this study is to evaluate the function; outcome and healing of that complicated fractures. **Material and method**s: A consent was taken from thirteen patients who sustained ipsilateral femoral shaft and neck fractures from January 2007 and March 2011 in El Minoufiya University Hospital in Egypt. 10 patients with fracture neck femur had been treated with cannulated screws while 3 patients were treated by dynamic hip screw. all fractures shaft had been treated with retrograde femoral nail.. The mean follow up period was 18 months with range from 12-36 months. **Results**: There were 10 males and 3 females. The average age was 31 years old with range of 19-45years. The mean follow up period was 18 months with range from 12-36 months. The average healing period of femoral neck fracture was 14 weeks and all femoral neck fractures united. Average union time for femoral shaft fractures was 19 weeks (range, 16–36 weeks). Three femoral shaft fractures needed bone graft at six months. **Conclusion**s: The treatment methods used in the present study achieved satisfactory functional outcome in these complex fractures. The femoral neck fracture should preferably be stabilized first.
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1. Introduction

Ipsilateral fractures of the femoral neck and shaft were first reported in 1953[1].

Combined fractures of neck femur and femoral shaft are the result of high energy trauma, such as motor vehicle accidents (MVA) and falls from heights. The fracture occurs when hip is axially loaded while leg is abducted.[2]

A number of issues increase the difficulty and complexity of managing a combined femoral neck–shaft injury as compared with addressing either fracture alone. The optimal timing of fixation, sequence of fracture fixation, and implant selection must be considered, yet little data exist regarding the optimal management of these fractures. It is clear, however, that excellent reduction of both fractures is the goal of treatment of this injury pattern. [3-9]

The ideal fixation strategy for high-energy ipsilateral femoral neck and shaft fractures remains controversial. Although a general consensus exists that early fixation of these injuries is appropriate, the prioritization of fractures and optimal implant selection in the operating room remain to be defined.

Many implant options exist to manage the combined neck–shaft injury. These include antegrade femoral nailing with cancellous screws placed around the nail for the neck fracture, cephalomedullary nailing using the proximal interlocking screws for neck fixation, plate fixation of the diaphyseal fracture with cancellous screw or sliding hip screw fixation of the neck fracture, and retrograde intramedullary nailing for shaft fixation with cancellous screw or sliding hip screw fixation of the diaphyseal fracture. All these techniques have demonstrated varying degrees of success, with reported rates of femoral neck and shaft nonunions as high as 25% and 10%, respectively. No studies to date have conclusively demonstrated superiority of any particular devices on long term clinical outcomes. [10]

Currently, there is no biomechanical evidence in the literature to support a particular construct combination from the numerous available options for ipsilateral neck and femoral shaft fracture fixation.

2. Material and methods

Between January 2007 and March 2011in El Minoufiya University Hospital in Egypt, 13 patients with ipsilateral fracture neck femur and femoral shaft fracture had been treated with either cannulated screws or dynamic hip screw for fracture neck femur and retrograde femoral nail for fracture shaft femur. Patients with neck and shaft fractures more than eighteen years of age were included. All peritrochanteric fracture ,iatrogenic neck fractures and fracture proximal third femur were excluded . There were 10 males and 3 females. The mean age was 31 years old with range of 19-45years. 8 patients had non-displaced fracture neck femur (Garden I or II) while 5 patients were displaced (Garden III). All fractures shaft femur were displaced and 2 patients were open and had Gustlio-Anderson type I. Nine

patients had a femoral shaft fracture in the middle third and four in the distal third. According to the Winquist-Hansen classification, there were 2 patients type I,7 patients type II, 4patients type III. All fractures were treated emergently within 48 hours of the injuries. Two patients had associated injuries, one had ipsilateral fracture both bone leg which was treated by interlocking tibial nail while the second had fracture patella which was treated by tension band.

Surgery was performed with the patient in a supine position with fractured limb on sterile radiolucent table and knee flexed 90 degree. With this positioning, movement of the C arm is free in both AP and lateral position around the hip and thigh.

Fracture neck femur was fixed first, non-displaced fractures neck femur (Garden I or II) were fixed by three cannulated screws without manipulation. Displaces fractures neck femur (Garden III) was reduced by gentle manipulation except in one case were open reduction had been done.

A midline incision from the upper pole of the patella to tibial tubercle, then medial parapatellar approach is done to expose intercondylar notch. Awl was placed 1cms anterior to attachment of anterior cruciate ligament, in midline of the shaft in both AP and lateral view. Guide wire is introduced and trial reduction is attempted by applying manual traction. In 10 cases closed reduction had succeeded while in 3 cases closed reduction had been failed, so open reduction had been done. All cases were fixed by retrograde interlocking nail femur.

Operations were performed within a mean of 48 hours following trauma

All patients received perioperative antibiotic prophylaxis in the injection form 1 h before surgery until the seventh postoperative day followed by oral antibiotic until removal of stitches. On the second postoperative day, range of movement exercises was started. Non touch weight bearing was allowed using crutches after stitches removal.

3. Results

The mean follow up period was 18 months with range from 12-36 months

Patients were followed at monthly intervals up to six months, then at three monthly intervals up to one year, and then every six months up to the last follow-up. The follow-up study included both clinical and radiological evaluations.

Table I: The function assessment system adapted from Friedman and Wyman, 1986

Result	Activities of daily living	Pain	Range of motion
Good	No limitation	Nil	Less than 20% loss of hip or knee
Fair	Mild limitation	Mild to moderate	20%–50% loss of hip or knee motion
Poor	Moderate limitation	Severe	More than 50% loss of hip or knee motion

Nine cases were good, three cases were fair and only one case was poor.

The poor result was attributed to open reduction of the femoral neck and delayed union of the femoral shaft and the patient had more than 50% limitation of knee motion.

Progressive weight bearing was allowed after the appearance of callus on radiographs. Postoperative radiographs follow up were done for all cases to assess accuracy of fracture reduction, progression to union and early detection of femoral head osteonecrosis.

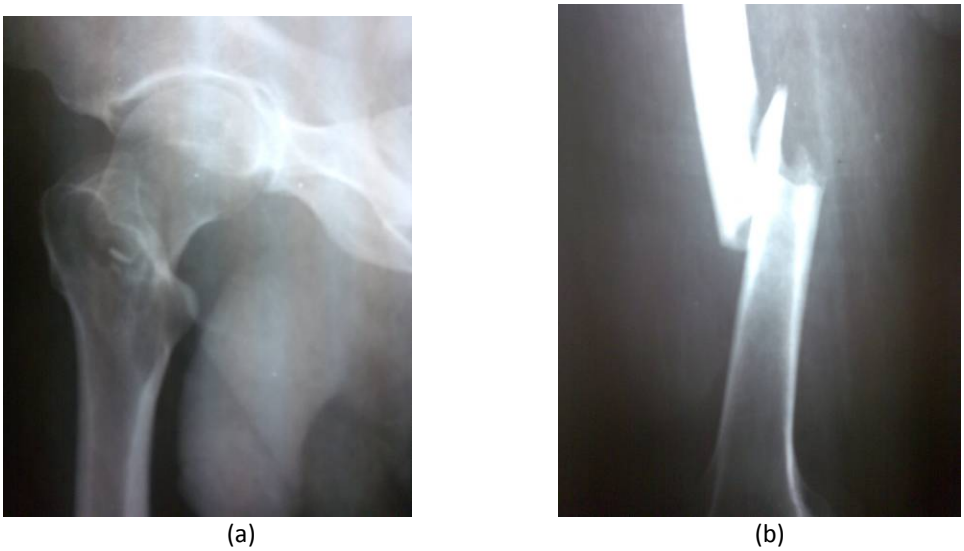
The average healing period of femoral neck fracture was 14 weeks and all femoral neck fractures united. Neither osteonecrosis of femoral head nor fracture neck femur nonunion was observed.

The shaft fracture is often highly comminuted, reflecting the high-energy nature of this injury. Average union time for femoral shaft fractures was 19 weeks (range, 16–36 weeks). Three femoral shaft fractures needed bone graft at six months and on 9 months follow up, those united without further interventions.

(a) (b)

(c)

Figure 1: (a) Preoperative radiogtraph of 25 years old male with RTA (b)and (c) Postoperatve radiograph 6 months showing complete union at 6 months follow up.



(a) (b)

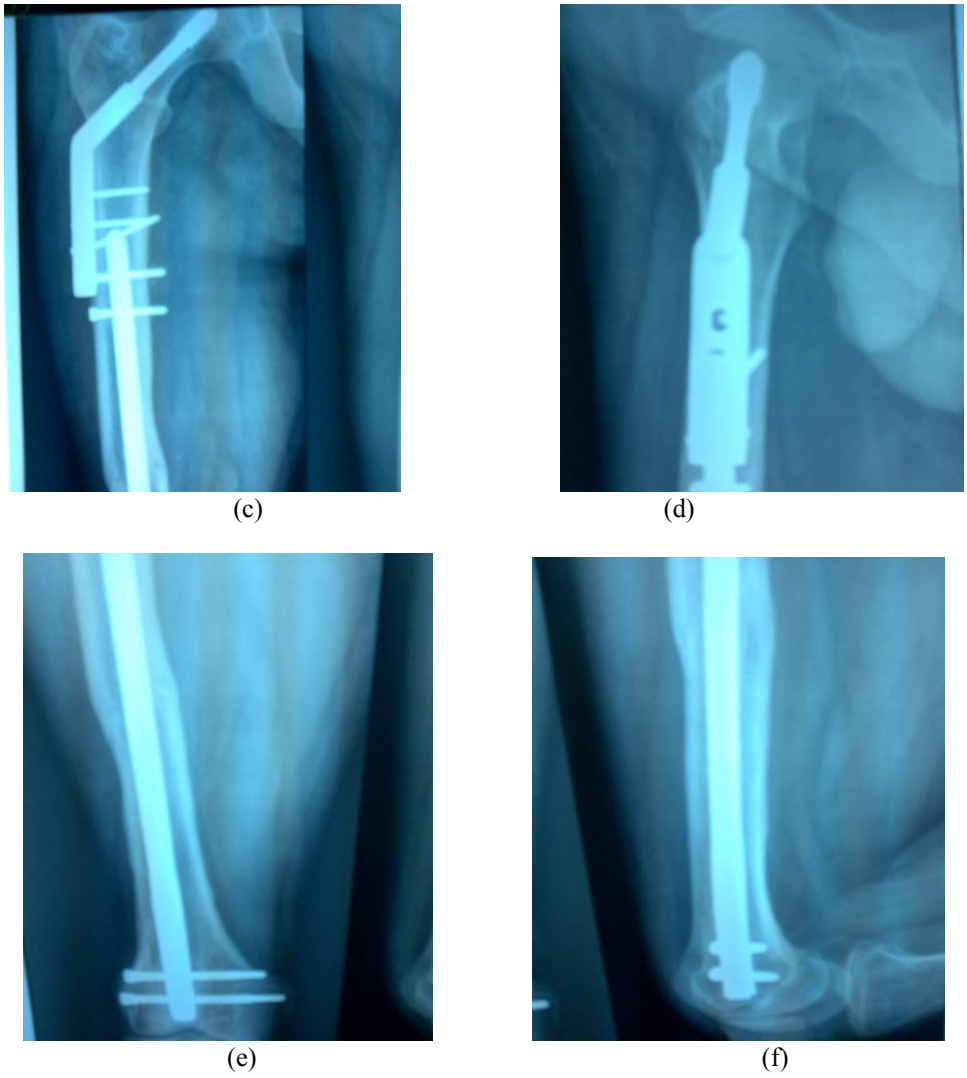


Figure 2 (a) (b) Preoperatve radiograph of 39 years old male with RTA
(c) (d) (e) (f) Postoperatve radiograph showing complete union at 9 months follow up.

4. Discussion

Ipsilateral fracture neck femur and fracture shaft femur represent complex fracture pattern so it is mandatory to do plain antero-posterior and lateral views of the hip to avoid miss diagnosis of fracture neck femur in each fracture shaft femur. The majority of the patients in the present series were young males with high-energy trauma, as also reported in the literature. Femoral neck fractures were most often basilar in the present series and in other series. [(2)]

Although evidence has been presented to support fracture fixation in either sequence, the most devastating potential sequelae involve the management of the femoral neck fracture. Delayed fixation of displaced neck fractures has been shown to be associated with an increased risk of a vascular necrosis. Due to the lack of successful salvage options for femoral head osteonecrosis in the young adult, prioritization of formal reduction and internal fixation of the displaced neck fracture has been advocated

Though there is confusion regarding which fracture should be managed first, there appears to be a general consensus regarding the seriousness of the complications involving femoral neck fractures so we stabilized femoral neck fractures first in all patients.

There is still no consensus on the optimal treatment method for these complex fractures. In a meta-analysis of the reports published in the literature, the locked intramedullary nails or reconstruction nails yielded results that were superior to those for combinations of plates. The plate series was associated with more frequent infections and nonunion, while the nail fixations were complicated by rotatory malalignments and shortenings.

The choice of the implant was influenced by the surgeon's preference. Kao has found

reconstruction nailing to be technically demanding. It is difficult to achieve reductions in displaced femoral neck fractures in such complex injuries with reconstruction nailing, and varus nonunion or malunion can occur.[11]

In our series, fractures with neck fractures were managed effectively with 2 devices. In all cases, anatomic neck alignment was maintained; fixation of the femoral neck was performed in all cases with a screw, before nail passage, and we feel that this was an important factor in preventing displacement of the femoral neck fracture during shaft fixation.

Singh *et al.,* stated that the choice of the treatment method should be dictated primarily by the type of femoral neck fracture and the surgeons familiarity with the treatment method chosen. The femoral neck fracture should preferably be stabilized first, and a delay of 56 days does not affect the ultimate functional outcome. [1]

Watson and Moed also reported more femoral shaft non unions than expected in their series, requiring more revision procedures than femoral neck non unions to achieve union. [12]

Bedi *et al.,* stated that open reduction and internal fixation of a displaced femoral neck fracture followed by retrograde nailing of the femoral shaft allowed accurate reduction and uneventful union of both fractures in most patients. The use of a cephalomedullary device to address both fractures simultaneously led to a significantly higher rate of mal reduction of one of the fractures.[13]

5. Conclusion

Fracture neck femur in ipsilateral fracture neck femur and fracture shaft femur differ from isolated fracture neck femur in that most of energy is absorbed by the fracture shaft lead to non displaced or partially displaced fracture which reflect on the incidence of union and oestonecrosis; while in isolated neck fracture almost all energy is absorbed by fracture neck which may result in markedly displaced fracture.

Uses of cannulated screws or dynamic hip screw for fixation of fracture neck femur and uses of retrograde interlocking nail for femoral shaft fracture achieved satisfactory functional outcome in these complex fractures.

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