

Prospective Descriptive Study of Short-term Result of Ipsi-lateral Fracture Neck Shaft Femur Treated by Modified Traditional Ante-grade Interlocking Nailing and Lag Screw

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Abstract

- Background** Ipsilateral concomitant fractures of the femoral neck and femoral shaft are unusual (incidence 5-6%), and pose a difficult treatment problem. This injury usually resulting from high energy trauma, road traffic accident and fall from height. Many treatment methods have been invented and adopted, controversy exists about the optimal methods of treatment for such fracture.
- Objectives** To assess the short-term results of ipsilateral fracture neck and shaft femur treated by modified traditional ante-grade intra-medullary nailing.
- Methods** Fourteen patients with ipsilateral concomitant fracture neck and shaft femur treated by modified traditional ante-grade interlocking nailing. The surgery includes fixation of both neck and shaft fracture by interlocking nail (traditional type) and multiple long lag screws inserted via the nail itself toward the head and anterior or posterior to nail. Those patients followed for maximum 48 weeks to assess the risk of infection, knee stiffness, delayed union, mal-union, and non-union.
- Results** One patient had superficial infection treated by oral antibiotics and improved (7.1%). Two patients had knee stiffness of mild degree (the range is 0-120) improved by physiotherapy (14.3%). Two patients had Trendelenburg's gait (14.3%). One patient had non-union of femoral shaft (14.3%). One patient had mal-alignment of femoral neck (7.1%). One patient had mal-alignment of femoral shaft (7.1%). One patient had delayed union (failure to progress by 6 month as judged by serial radiographs) of femoral shaft (7.1%). Two patients need open reduction because of soft tissue interposed (14.3%). We lost follow up of 2 patients (14.3%).
- Conclusion** Modified method for fixation of ipsilateral neck and shaft fracture with traditional interlocking nails and multiple long lag screws still can be adopted especially in the absence of cephalo-medullary nails with good results regarding early results. Still the cephalo-medullary nails may be better and required other studies.
- Key words** Interlocking nailing, ipsilateral fracture neck and shaft femur.

List of Abbreviation: RTA = road traffic accident, FFH = fall from height, ATLS = advanced trauma life support, IMN = intramedullary nail, DHS = dynamic hip screw, PFNA = proximal femoral nail, Miss = minimal invasive surgery.

Introduction

Ipsilateral concomitant fractures of the femoral neck and femoral shaft are unusual and pose a difficult treatment problem ⁽¹⁾.

Most of these are intra-capsular fractures, with a high shear angle similar to a Pauwels type III fracture of the femoral neck. Many of these are initially completely un-displaced and therefore are difficult to diagnose ^(2,3). Concomitant femoral neck fractures occur in 3% to 10% of patients with femoral shaft fractures, which are

usually non-displaced and missed injuries in 30% to 57% of cases⁽⁴⁻⁸⁾.

The presumed mechanism of injury requires that the hip be flexed and abducted to a degree that the femoral head is well-seated within the acetabulum. The load is initiated at the knee and then applied longitudinally along the femoral shaft⁽⁹⁻¹³⁾. Most of the force is dissipated in the femoral shaft fracture, therefore often resulting in undisplaced or minimally displaced fractures of the femoral neck, which therefore have less soft-tissue damage and a much lower incidence of avascular necrosis of the femoral head than would be expected^(2,14).

Most authors agree on the need for a high index of suspicion (especially for mid-shaft fractures), adequate antero-posterior views of the pelvis with femoral fractures, repeat films if suspicious and early accurate reductions of the femoral neck fracture⁽¹⁾. Approximately 25% of femoral neck fractures are discovered during nailing of shaft fractures. Although most of these fractures have been discovered during preliminary positioning and preparation, nearly one third of femoral neck fractures initially missed are discovered at completion of operation⁽¹⁾. Ipsilateral fracture neck shaft femur is often the result of high energy trauma and usually occurs in young patients^(15,16).

Plates combined with femoral neck screws have been reported to be associated with a high incidence of infection and non-union^(17,18).

The advantages of closed locked intramedullary nails are a low incidence of infection and non-union, minimal surgical trauma, and control of both length and rotation in comminuted unstable shaft fractures⁽¹⁹⁾.

Technical complications have been encountered with reconstruction nailing, and a high incidence of non-union and complications related to the knee have been reported with retrograde nailing combined with lag screws or DHS^(20,21). The PFN-long has been shown to result in favorable outcomes, but the availability of only three nail lengths and one diameter presents certain drawbacks⁽²²⁾.

The PFNA is designed for peri-trochanteric femoral fractures. It provides reasonable biomechanical fixation and yields better purchase of the helical blade in the femoral head^(23,24).

The objectives of this study was to To assess the short-term results of ipsilateral fracture neck and shaft femur treated by modified traditional ante-grade intra-medullary nailing.

Methods

Our prospective descriptive study involved 14 patients with ipsilateral basal fracture neck femur and middle 3/5 shaft fractures treated surgically between October 2010 until April 2012, in Al-Imamain Al-Kadhimain Medical City, by using traditional Targon interlocking nails with multiple screws (at least two) for neck fractures.

Those patients with skeletally mature bone (closed proximal and distal physis) and ipsilateral basal fracture neck femur and middle 3/5 of the shaft femur were included and treated surgically within 72 hours from the injury. On the other hand, those with the following criteria were excluded from the study:

1. Closed and open type I Gustillo fractures.
2. The exclusion criteria:
3. Multiple injured patients (i.e. other injuries like head, spine...etc.).
4. Previously traumatized limb, e.g. previous fracture or soft tissue injury in the same limb.
5. Peripheral vascular insufficiency.
6. Associated chronic medical illness, like Diabetes mellitus, hypertension, heart failure, and uremia.
7. Associated vascular injuries.

The surgery includes fixation of both neck and shaft fracture by interlocking nail (traditional type) and multiple long lag screws inserted via the nail toward the head and anterior or posterior to nail. All the operations performed under general anesthesia, with fluoroscopic control on traction table, static locking, closed and open reduction done for them. All the patients were followed up by regular intervals at five days, two weeks, and then monthly for a

maximum of forty eight weeks recording the following on a special formula for each patient:

- a) Presence and type of infection (early and delayed maximum 12 weeks).
- b) Mal-alignment (maximum acceptable limits were 1cm shortening and 5 degrees angulation for shaft fracture and 10 degrees for neck fractures, compared with the other normal hip joint).
- c) Union rate, confirmed by clinical and radiological findings, delayed union if no signs yielded for maximum 32 weeks, non-union if passed the maximum follow-up period (48 weeks) with radiological findings of non-union.
- d) Trendelenburg gait.
- e) Knee joint stiffness, mild if 5-15 degrees, moderate 16-25 degrees, severe more than 25 degrees.

The patients managed initially in the emergency room according to ATLS protocol. The patients were prepared for elective surgical management within seventy two hours. Femoral shaft fixed by traditional method of locked IMN (Targon) and the neck is fixed by insertion of two cannulated long screws guided by k-wire, one inserted via the nail and the other screw inserted anterior or posterior to the nails (Fig. 1 and 2).



Fig. 1. Interlocking nail with proximal targeting device (conventional method)

Protected weight bearing was permitted as soon as possible postoperatively. Quadriceps-setting and straight leg raising exercises are begun

before hospital discharge. During the postoperative interviews; the patient examined clinically and radio logically. Clinical examination includes general examination, local examination of the wounds and fracture site with neurovascular evaluation of the lower limbs, also the range of motion of hip, knee was measured, compared with the contralateral side and assessment of the hip musculoskeletal integrity through Trendelenburg’s testing.



Fig. 2. Inter-locking nail (the modified method, the screw via the neck)

Radiological examination includes anterior-posterior view of pelvis and both hips and anterior-posterior and lateral view of the affected femur.

Results

Out of the 14 patients of the study sample, there were 9 males (64%) and 5 females (36%), (Table 1), with an average age of (36.79±8.84 years); range (25-50).

Table 1. Frequency distribution of age group

| Age group (years) | Frequency | % |
|-------------------|-----------|-------|
| 20-29 | 3 | 21.4 |
| 30-39 | 4 | 28.6 |
| 40-49 | 4 | 28.6 |
| 50-60 | 3 | 21.4 |
| Total | 14 | 100.0 |

Nine patients were injured by RTA and 5 patients had been injured by FFH (Fig. 3).

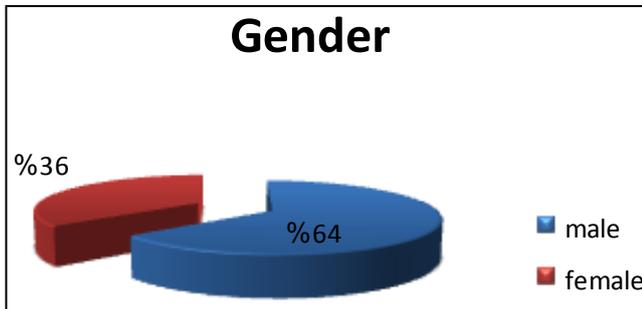


Fig. 3. Pie chart showing the percentage of the patients according to the gender

Table 2 showed that one patient had superficial infection treated by oral antibiotics and improved (7.1%). Two patients had knee stiffness of mild degree improved on physiotherapy (14.3%). Two patients had trendelenburg's gait (14.3%). One patient had non-union of femoral shaft (7.1%). One patient had mal-alignment of femoral neck (7.1%). One patient had mal-alignment of femoral shaft (7.1%). One patient had delayed union of femoral shaft (7.1%). Two patients need open reduction because of soft tissue interposed (14.3%). We lost follow up of 2 patients (14.3%).

Discussion

Different modalities for treatment are invented and adopted, but in the majority of cases the full range of implants are not available (or the experience is not ideal) namely the cephalo-medullary long nails, dynamic hip screws, retrograde and ante-grade traditional intramedullary nails.

At the time of our study, the cephalo-medullary nail was not available; we used traditional interlocking nails with multiple lag screws to fix these fractures and we estimated the early results regarding union rate, early infection, knee stiffness, Trendelenburg's gait and the need for open reduction of femoral shaft fracture.

Table 2. Patients' number, age, mechanism of injury and side of injury

| Case No. | Age (years) | gender | Mechanism of injury RTA/FFH | side |
|----------|-------------|--------|-----------------------------|------|
| 1 | 25 | M | RTA | L |
| 2 | 47 | M | RTA | L |
| 3 | 40 | M | FFH | R |
| 4 | 30 | F | RTA | L |
| 5 | 50 | F | RTA | R |
| 6 | 31 | M | FFH | R |
| 7 | 35 | F | RTA | L |
| 8 | 43 | F | RTA | L |
| 9 | 36 | M | FFH | L |
| 10 | 30 | M | FFH | R |
| 11 | 50 | M | RTA | R |
| 12 | 28 | M | RTA | L |
| 13 | 44 | F | RTA | L |
| 14 | 26 | M | FFH | R |

Shantharam et al (2007) stated that of the 14 cases of neck of femur fractures were treated with AO ASIF Group miss a nail technique, one patient had delayed union (7.1%) and one non-union (7.1%), two patients had knee stiffness (14.3%) and one patient had superficial wound infection (7.1%)⁽²⁵⁾.

Chang-Wug et al (2006), use retrograde nailing with subsequent screw fixation for ipsilateral femoral shaft and neck fractures, there were 16 patients, in femoral neck fractures one (6.25%) nonunion with avascular necrosis occurred and of femoral shaft fractures nonunion occurred in five (31.25%) patients⁽²⁷⁾.

Pavel et al (2011), in his study stated that out of five patients, three patients stabilizing with reconstruction nail, and two stabilized with 95 blade plate or with lag screws, there was one case of mal-union of diaphyseal fracture (20%) and one case (20%) in which the distal locking screws of the reconstruction nail broke which resulted in a fracture non-union⁽²⁸⁾.

Hossam et al., Koldenhoven et al., and Randelli et al. reported excellent results in patients with ipsilateral fracture of the femoral neck and shaft

treated with the Russell-Taylor reconstruction nail⁽²⁹⁾.

Wang et al (2010) stated that out of 21 patient 11 were treated with cancellous lag screws or dynamic hip screws (DHSs) for the fractured femoral neck and compression plate fixation for the fractured femoral shaft (group 1). 10 patients underwent surgery with PFNA-long (group 2).

In group 1, one patient developed a deep infection (9.09%) another patient experienced implant failure of the femoral shaft fracture (9.09%). In group 2, one patient developed a superficial wound infection (10%) and one patient (10%) had delayed union of the femoral shaft fracture⁽²⁶⁾.

In our study, we have 14 cases treated by modified traditional ante-grade interlocking nails; two cases have been missed on follow up. Two patients had knee stiffness of mild degree improved on physiotherapy (14.3%). One patient had superficial infection treated by oral antibiotics (7.1%). Two patients had Trendelenburg's gait (14.3%). One patient had non-union of femoral shaft fractures (7.1%).

One patient had delayed union of femoral shaft fractures (7.1%). One patient had mal-alignment of femoral shaft fractures (7.1%). One patient had mal-alignment of femoral neck fractures (7.1%). Two patients need open reduction because of soft tissue interposed (14.3%).

In conclusion, modified method for fixation of ipsilateral neck and shaft fracture with traditional interlocking nails and multiple lag screws still can be adopted especially in the absence of cephalo-medullary nails with good results regarding the rate of infection, knee stiffness, union progression, mal-alignment, and Trendelenburg's gait; still our method is better than fixing the two fractures by two implants like DHS and plate and screws or retrograde nailing as compared to international studies since there is no many studies using our procedure (miss anail technique); no conclusive treatment methods have been found; much better preoperative assessment to minimize the per-operative difficulties may necessitate

preoperative CT-scan. We encourage further researches in Iraqi hospitals to compare the results of such methods of fixation and more meticulous management of the shaft fracture, neck reduction, postoperative weight bearing may improve the outcome and reduce complications.

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Author contribution

Both authors contribute equally in the practical surgical operations and literature review and preparing this paper.

Conflict of Interest

No conflict of interest of any type in the work.

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