M. Shantharam Shetty · M. Ajith Kumar ·
Sandeep S. Ireshanavar · Dr Sudhakar

Ipsilateral hip and femoral shaft fractures treated with intramedullary nails

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Abstract This study retrospectively analysed 34 patients with ipsilateral hip and femoral shaft fractures treated over a period of 10 years between January 1995 and January 2005. They had an average age of 35 years. Twenty-six (76.47%) of these cases suffered high-velocity trauma (RTA); six others had fallen from a height (17.65%), and two had suffered only minimal trauma (5.88%). Twenty were extracapsular (58.82%) and 14 were intracapsular. They were evaluated with an average follow-up of 28 months, both clinically and radiologically; 26 patients (76.47%) had a good result (Friedman and Wyman score). When the intracapsular fracture was detected postoperatively, there was one delayed union and one non-union. When the fracture is diagnosed preoperatively, we recommend reconstruction nail fixation. If the hip fracture is diagnosed intra- or postoperatively following nailing of the shaft, we propose the miss-a-nail technique as an option.

Résumé Etude rétrospective de 34 patients, d'âge moyen 35 ans, qui présentaient une fracture homolatérale du col et de la diaphyse fémorale entre janvier 1995 et janvier 2005. 26 cas (76,47%) étaient survenus après un traumatisme à haute énergie, 6 (17,65%) après une chute d'une hauteur importante et 2 (5,88%) après un traumatisme minime. 20

fractures du col étaient extracapsulaires et 14 intracapsulaires. L'évaluation clinique et radiologique était faite avec un recul moyen de 28 mois et montrait 76,47% de bons résultats selon le score de Friedman et Wyman. Quand la fracture intracapsulaire était détectée après l'opération il y avait un retard de consolidation et une pseudarthrose. Quand la fracture du col est diagnostiquée précocement nous recommandons la fixation par clou. Si cette fracture est diagnostiquée pendant ou après l'enclouage diaphysaire, nous proposons une technique de clou perdu comme option thérapeutique.

Introduction

Ipsilateral hip and femoral shaft fractures are associated with high energy trauma, and consequently patients with multiple injuries [2, 3, 8, 13–15, 18]. The most common causes are road traffic accident and falling from a height. Associated intracapsular fractures can initially be missed. Late diagnostic rate can range between 19% and 50% [2, 8, 14, 15].

One half of femoral neck fractures are undisplaced [2, 6, 18]. Femoral shaft fractures are usually at the junction of the upper and middle third of the shaft, and are comminuted [2, 3, 18, 19]. Ipsilateral knee injuries are common and a cause of significant morbidity, and can range in incidence between 20 and 40% [2, 3, 6, 8, 9]. The mechanism of injury is thought to be compression of the femur with the limb in abduction [13].

Materials and methods

Thirty-four patients were treated between January 1995 and January 2005. The patients were followed up with serial radiographs. The period of follow-up ranged from 1 to 5 years. This gave an average follow-up of 28 months. Patients were treated initially according to the ATLS protocol. Open fractures were debrided, irrigated and stabilised.

M. S. Shetty
HOD Department of Orthopaedics, Tejasvini Hospital,
Mangalore, Karnataka, India

M. A. Kumar
Consultant Orthopaedic Surgeon, Tejasvini Hospital,
Mangalore, Karnataka, India

S. S. Ireshanavar · D. Sudhakar
Registrar In Orthopaedics, Tejasvini Hospital,
Mangalore, Karnataka, India
e-mail: drsandeepsi25@yahoo.com

M. S. Shetty (✉)
Tejasvini Hospital and Ssiot, Kadri,
Mangalore, Karnataka, India
e-mail: shettyortho@hotmail.com
Tel.: +91-824-2225777
Fax: +91-824-2225998

Table 1 Associated injuries

Sl. No	Skeletal Injury	Number
1	Rib fractures	4
2	Haemothorax	2
3	Blunt abdominal injury	2
4	Ipsilateral Patella Fracture	3
5	Ipsilateral knee instability	2
6	Ipsilateral Fracture distal end radius	2
7	Humerus shaft fracture	1

The patients were divided into two groups; Group I where the fracture was detected preoperatively and who were treated using a reconstruction nail, and Group II where the fracture was detected late and who underwent conventional nailing with miss-a-nail technique. Fractures were divided into two main groups, intra and extracapsular. The intracapsular fractures were subdivided depending on anatomical location; transcervical, basicervical and subcapital. Extracapsular fractures were classified according to the Tronzo classification.

All associated injuries were noted (Table 1). The patients were followed up until bony union. Postoperatively, patients were advised to be non-weight-bearing depending on the state of union. Clinically patients were scored according to the Friedman and Wyman scoring system [9].

Results

The study collected 30 male and four female patients with an average age of 35 years (range 18–60). Twenty-six patients were injured in road traffic accidents, six had fallen from a height and two had trivial trauma. Twenty-seven patients were in Group I and seven in Group II. Of the 14 intracapsular fractures, five were transcervical, seven basicervical and two subcapital. Of the 14 cases, four were detected intraoperatively and two postoperatively. In one case, the fracture was detected 2 months after surgery. Of the 20 extracapsular fractures, 13 were type I, six type II, and

one type IV, when using the Tronzo classification of extracapsular fractures; one was detected intraoperatively.

Of the femoral shaft fractures, 24 were at the upper and middle third junction, six in the mid shaft and four distal third junction. Of the 34 fractures, 32 were closed and two open. Eleven had associated injuries (Table 1).

Time of fixation was generally within the first 24 hours (25 cases); for a further eight it was within 1 week. One patient had a delay in diagnosis and was stabilised after 2 months.

Nineteen fractures were extracapsular, and eight were intracapsular treated with reconstruction nail.

The miss-a-nail technique was used in five patients detected intraoperatively following fixation of the femoral shaft (Figs. 1, 2, 3, 4), in addition to two patients detected postoperatively were treated by cancellous screw fixation.

According to the outcome score followed by Friedman and Wyman [9], 76.47% had good results, 17.63% fair and 8.9% poor.

In group I there were 21 good, six fair and no poor results (Figs. 5, 6, 7, 8).

In group II there were three good, two fair and two poor results. There were no cases of avascular necrosis or infection in our series.

Four patients had additional surgery; two underwent dynamisation, and two needed bone grafting for delayed union of shaft of femur.

Other complications included were knee stiffness (two patients), two drill-bit breakages, and one superficial wound infection.

Of the 14 cases of neck of femur fractures, 12 united at 17 weeks (15–36 weeks), one patient had delayed union and one non-union. All trochanteric fractures united after an average period of 13 weeks (10–24 weeks). The femoral shaft fractures united at an average of 18 weeks (14–34 weeks). Our results are comparable with the other series. [9, 11].

Discussion

This injury pattern usually occurs in a patient with high-energy trauma with multiple injuries. The common

Fig. 1 Preoperation X-rays showing hip a.p. undisplaced intertrochanteric fracture and middle third shaft fracture a.p. and lateral

Fig. 2 Immediate postoperation X-ray showing reconstruction nail

mechanisms of injury are high-energy trauma, usually road traffic accidents.

Early recognition of all fractures is of paramount importance in planning the surgical treatment, and is the first step towards good results. A careful examination and proper roentgenograms of the hip, including lateral view, are necessary. In our opinion, entire shaft and knee-joint X-rays are mandatory, to minimise late detection of these injuries.

Associated injuries are quite frequent, because of the high-velocity impact [2, 3, 6, 9, 19]; 14.7% in our series.

Previous research shows that intracapsular fractures are more common than extracapsular fractures, in the ratio of 6:1 (Table 2). In our series, however, extracapsular fractures (58.8%) were more common, corroborating the results of Friedman and Wymen [9].

Fig. 3 X-ray of femur at 4 months postoperation

Fig. 4 X-ray of a.p. and lateral at 1 year follow-up showing complete consolidation

Seven hip fractures were undetected (20.5%) in our series; most of these (5/7) were in the early part of our study (1995–1998). Following our recognition of this injury pattern, and a consequent change in protocol, including lateral views of the hip in all patients with femoral shaft fractures, there were only two missed hip fractures in the later part of our study (1999–2005).

There was one case of delayed union and one case of non-union of the fractured neck of femur.

Many different methods of fixation are available for the management of these combined injuries [3, 10, 14, 15]. There is no consensus in literature as to which of the fractures should be fixed first [6, 10–16]. Though avascular necrosis is the most disabling complication of fractured neck of femur, rates are lower in these combined injuries

Fig. 5 Preoperation X-ray showing shaft femur a.p.

Fig. 6 X-ray of hip on two postoperative days after conventional nail showing missed fracture neck of femur

[3, 6, 7, 17]. The ultimate aim is to obtain stable internal fixation of both fractures by whatever means of internal fixation are familiar to the surgeon.

The authors who used reconstruction nails to manage these injuries have reported variable results [1, 4, 9, 12].

Reconstruction nailing has the advantage of fixing both injuries at the same time. An appropriate-sized reconstruction nail is inserted and the proximal fracture is fixed first with cephalic screws. Subsequently, distal femoral locking is performed. Significant internal rotation may be needed in order to reduce the hip fracture into an anatomical position [10], and this can be done after fixing the femoral shaft fracture first [3].

The authors feel reconstruction nailing is a technically demanding procedure with a steep learning curve. The advantages of the reconstruction nail approach are

Fig. 7 Immediate postoperative X-ray after fixing the missed neck of femur fracture by miss-a-nail technique

Fig. 8 X-ray of hip showing union of neck of femur fracture after 8 months

numerous, and include lower blood loss, a closed technique, biological fixation for both fractures. Biomechanically, they are load-sharing devices and early rehabilitation is possible [4, 5, 10–12]. Technical problems include placement of screws into the neck. This can be achieved by significant internal rotation of femur. We conclude that the reconstruction nail is an ideal implant for combination fractures, in which fractures of the hip are detected preoperatively. Conventional nails in conjunction with cancellous screws by the miss-a-nail technique are appropriate for fractures detected intraoperatively or postoperatively, or in those cases where in there is difficulty in placing the cephalic screws through the jig. The object is to achieve the goal of anatomical reduction and stable fixation in these combined fractures.

Table 2 Ipsilateral hip and femoral shaft fractures

Series	Year	No. of cases	Intracapsular	Extracapsular
Delaney and Street	1953	4	4	0
Denker	1965	8	3	5
Schatzker and Barrington	1968	6	6	0
Bernstein	1974	15	11	4
Casey and Chapman	1979	21	12	9
Zettas and Zettas	1981	12	10	2
Swiontkowski et al.	1984	15	15	0
Friedman and Wyman	1985	24	10	14
P. Jain et al.	2004	23	19	4
Shetty et al.	2006	34	14	20

With Denker et al., Friedman and Wyman, and **Shetty et al.**, extracapsular fractures were more common than intracapsular fractures

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