

## Original Research Article

# Management of compound fractures of shaft femur: a study of 55 cases

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### ABSTRACT

**Background:** Compound femoral shaft fractures are a major cause of morbidity and mortality. Conservative treatment necessitates a long stay in hospital for traction and subsequent immobilization and chances of wound infection are much higher. The objective of this study was to find out the outcome of treatment of open femoral shaft fractures by various modalities like interlocked nailing, plating and external fixation.

**Methods:** Fifty five patients with open femoral shaft fractures were treated under spinal or general anaesthesia. These fractures were in proximal one third (n=3), middle third (n=29), distal third (n=21). Fifty patients underwent surgery within 5 days of injury. Patients were followed for a minimum of 12 Months.

**Results:** Patients achieved union in an average time of 20 weeks (range 17 to 24 weeks). Full weight bearing was started in a mean time of 16 weeks. Mean duration of hospital stay was 20 days. Complications were occurred in ten patients (4 non-unions and 3 patients with deep infection and 3 patients developed chronic osteomyelitis).

**Conclusions:** The results were excellent in 31, good in 13, fair in 3 and poor in 7 patients while one patient lost follow up as he was from far off place. We concluded that open femoral shaft fracture can be well managed by surgical intervention.

**Keywords:** Compound femoral shaft fractures, Interlocked nailing, Plating, External fixator

### INTRODUCTION

Open femoral shaft fractures occur in young population following high energy trauma, either from direct trauma (e.g. motor vehicle accident) or from axial loading (e.g. fall from height).<sup>1</sup> With the advent of technology and techniques of operative fixation like fracture reduction and stabilization, which permits early mobilization and minimizes complications of prolonged bed rest, mal-union, mal-rotation, excessive shortening, loss of functional movements of joints. Operative management has become the treatment of choice in most of the cases.

### METHODS

The prospective study was carried out and 55 patients with open femoral shaft fractures were admitted to our institute were included in present study.<sup>1-3</sup> A written informed consent was obtained from all patients, they were explained about the treatment plan, cost of treatment and hospital stay after surgery and complications. They were followed up after surgery, were clinically and radio-logically assessed for fracture healing, joint movements and implant failure. Patients with open femoral fractures with age between 10-60 years operated mostly (n = 50) within 5 days and (n=5)

after 5 days of injury and did not have any previous surgical treatment for the fracture were included in the study. Pathological fractures and fracture non-unions were excluded from the study. Examination of the patients was done thoroughly at the time of admission to exclude other injuries. In most of the patients, internal fixation was done within 5 days of injury.<sup>4,6-12</sup> In patients who were not fit for surgery due to associated injuries, haemodynamically unstable or presented late, fixation was done after 5 days of injury.<sup>2,7,11,12</sup> All the fractures were following trauma. Based on the fracture position, joint motion, pain, oedema the results are graded as excellent if the final score is between 0-3, good (final score is between 4-7), fair (if 8-12), poor if final score is above 12.<sup>11</sup>

Cases suitable for operative treatment were treated by interlocked intramedullary nailing plating or external fixators.<sup>3-5,13-26</sup> Routinely closed reduction and intramedullary interlocked nailing were performed in lateral position by taking entry through pyriform fossa. Plating was done in paediatric and adolescents. External fixation was done in cases with bad soft tissue injuries.

There were 55 patients in this study, 49 were male and 6 Patients were females. Proximal one third 3, Middle one third 29 and distal one third 21 and double level (segmental) 2 patients. According to age, the patients were divided into 6 groups at the gap of 10 years. The lowest group was 10-19 years and older age group were between 50-59 years.

## RESULTS

This is a study of 55 cases of compound femoral shaft fractures which are treated by various modes of surgical treatment. Out of 55 patients, 45 are treated by intramedullary interlocked nailing, 6 by plate and screws, 4 by external fixation.

The average age of the patients was 29 years (group 20-39 years) and there are 49 males and 6 females. Most of the patients were from hard working group (labourers). Vehicular accidents were the most common mode of injury in 86% of cases. Right side is more affected than left.

Regarding Gustilo's open fractures grading, 9 patients were grade 1, 27 patients were grade 2, 11 patients were grade 3a and 8 patients were grade 3b.<sup>27</sup>

About 48 (87.2%) patients having isolated femur shaft fractures and 7 (12.72%) patients had some associated injury. Fractures were 25 spirals, 12 fractures were transverse, 16 were oblique, 2 fractures were segmental and region commonly affected was mid-shaft (29 patients) followed by (21 patients) lower third region.

Most of the patients (50) were operated within 5 Days of injury while only 5 Patients were operated after 5 days of injury.

**Table 1: Age variations.**

Age (years)	No. of cases	Percentage
10-19	11	20
20-29	14	25.5
30-39	20	36.36
40-49	6	11
50-59	4	7.27
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 2: Sex variations.**

Sex	No. of cases	Percentage
Male	49	89
Female	6	11
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 3: Gustilo's grading of complex fractures study.**

Grade	No. of cases	Percentage
1	9	16.4
2	27	49.1
3 a	11	20
3 b	8	14.5
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 4: Level/site of fracture.**

Site of fracture	Total	Percentage
Proximal one third	3	5.5
Middle one third	29	52.7
Distal one third	21	38.2
Segmental (double level)	2	3.6
<b>Total Cases</b>	<b>55</b>	<b>100</b>

**Table 5: Type of fracture.**

Type of fracture	Number of cases	Percentage
Transverse	12	21.8
Spiral	25	45.45
Oblique (long & short)	16	29
Segmental	02	3.6
<b>Total</b>	<b>55</b>	<b>100</b>

Average hospital stay was 20 Days. Average fracture union time was about 20 weeks. Average partial weight bearing period was 8 weeks and average full weight bearing period was 14 weeks.

Excellent functional results are obtained in 31 Patients while good in 13 patients, fair in 3 patients and poor in 7 patients, 1 patient had lost follow up because of far area

of residence (in U.P). 47 patients got union of fracture while 3 patients had delayed union. 10 patients developed complications like 4 non-unions, 3 patients develop deep infection and 3 patients turned out into chronic osteomyelitis.

**Table 6: Associated injuries.**

	No. of cases
Pelvis injury	1
Head injury	2
Facial with mandibular fracture, tooth injury	1
Fracture of Tibia	3
<b>Total</b>	<b>7</b>

**Table 7: Period of hospital stay.**

Days	No. of patients	Percentage
0-10	14	25.45
11-20	24	43.63
21-30	10	18.18
More than 30	7	12.72
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 8: Injury operation intervals days.**

Interval (days)	No. of patients	Percentage
0-5	50	91
More than 5	5	9
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 9: Modality of treatment.**

	No. of patients	Percentage
Interlocked nailing	45	81.8
Plating	6	10.9
External fixators	4	7.27
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 10: Complications.**

Complication	No. of cases	Percentage
Deep infection	3	5.45
Chronic Osteomyelitis	3	5.45
Non-union	4	7.27

**Table 11: Results- union, delayed, non-union.**

	Total cases	Percentage
Union	47	85.45
Delayed union	3	5.45
Non-union	4	7.27
Lost follow up	1	1.8
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 12: Results- functional outcome.**

Results	Marks	No. of cases	Percentage
Excellent	0-3	31	57.4
Good	4-7	13	24
Fair	8-12	03	5.5
Poor	More than 12	07	13
Lost follow up		1	1.8
<b>Total</b>		<b>55</b>	<b>100</b>

## DISCUSSION

The majority of emergency in most trauma centres are fractures of long bones. Open fractures of femur traditionally have been managed with traction. Since the introduction of interlocked intra-medullary nailing, complications like shortenings, malunion, delayed non-unions and non-unions and loss of joint movements have been minimised.

Three factors must be evaluated when deciding on the timing and type of stabilization for an open fracture of the femoral shaft: the magnitude of the patient's multiple organ-system injury (most often measured by injury severity score), the degree of disruption and contamination of the soft tissues, and the technical considerations of available fixation devices.

Open fractures of the femoral shaft are often the result of high energy trauma, and the needs of the patient frequently take precedence over the surgeon's preference for treatment of the femoral injury. Many studies have demonstrated that early fixation of a long bone improves the rate of survival of multiply injured patients.<sup>5-10</sup> Bone et al reported that, in patients in whom the injury severity score was more than 18 points, there were decreases in the incidence of adult respiratory distress syndrome, the number of days in intensive care unit, the number of days of ventilator respiratory support, the length of stay in the hospital, and the over-all cost for patients in whom immediate stabilization of fracture of femoral shaft was done compared with those in whom fixation of the fracture was delayed.<sup>6</sup> The discovery of the improved rates of survival of multiply injured patients who are treated with immediate fixation of a long bone is a primary reason for the increased interest in immediate intra-medullary nailing of open fractures of femoral shaft.

The time since injury may be an important factor in determining the type and timing of treatment of an open fracture. All open-fracture wounds are contaminated, and the longer the delay before debridement, the greater the colonization of the wound and the risk of infection.<sup>36,37</sup> The results of interlocking nailing of closed fractures of the femoral shaft have been shown to be superior to those of plating external fixation.<sup>17-19,22-24</sup>

Open reduction with plating of open fractures has been advocated but with plating increased rates of infection, delayed union, non-union and failure of implant have been widely reported.<sup>5,20-22,28-34</sup> In series reported by Ruedi and Luscher and by Mageryl et al these complications occurred frequently, despite the fact that both series predominantly included closed fractures.<sup>22,34</sup> Bone grafting, which is generally unnecessary with interlocking nail fixation, was recommended by those authors for all comminuted fractures treated by plating.

External fixation is the quickest and reliable method of stabilization for severe open/ highly contaminated fractures of femoral shaft. Fixators are complicated by decreased range of motion of the knee and pin tract infection.<sup>23-26</sup> Interlocked intra-medullary nails control the length and rotation of comminuted fractures of femoral shaft.<sup>17,18</sup>

The operative care of open fractures has been improved by recent advances in extensive soft-tissue debridement and coverage, methods of fracture fixation and broad spectrum antibiotic coverage.<sup>16</sup>

O'Brien and Powell, in their study of 63 patients reported results – functional outcomes excellent (66.66%), good in 19.16% and poor in 14.3% of the patients while in present series results are as excellent (57.4%), good (24%) and fair (5.5%) and poor in 13% of the patients. Results in both of the series almost match.<sup>15,16</sup>

In O'Brien and Powell series, regarding the Gustilo's grading of open fractures, grade 3 reported 24% and grade 2 (41%), grade 1 (35%) while in present series grade 3 open fractures reported (34.5%), grade 2 (49.1%) and grade 1 (16.4%).<sup>15,16,27</sup> There are variations as in the present series incidence of higher Gustilo's grading of open injuries is higher which can be explained by increase of incidence of high velocity vehicular accidents.

Regarding injury– operation interval, in present and Smith, Wiber series most of the fixations were done in early period i.e. within 5 days of injury.<sup>11,12</sup>

In O'Brien and present series, healing rate of wounds (no infection) is more than 85% and the incidence of chronic osteomyelitis (1.6%) and deep infection (3.2%) in O'Brien study was 1.6 % while in present series it is 5.45% each which can be attributed to higher incidence of open wound grade 3 injuries in present series.<sup>15,16</sup>

In O'Brien series there were 3 (4.76%) non-unions and 7 (11.11%) mal-unions while in present series there are 4 (7.27%) non – union and no mal-union.<sup>15,16</sup>

## CONCLUSION

Femoral shaft fractures are among the most common fractures encountered in orthopaedics. The intramedullary

interlocked nailing technique is ideally suited for these kinds of fractures because it gives more stability than plates due to its load sharing nature and its closeness to the weight bearing axis of body.<sup>4,14,15,18</sup> Also it allows early mobilisation and weight bearing with axial compression on fracture site. It can be used in Gustillo grade 3b open fractures with proper irrigation and debridement of wound while it is not wise to use plates in grade 3 wounds.

One striking feature of open fractures of the femoral shaft that are treated with intra-medullary nailing is their propensity to heal, despite the magnitude of the soft tissue disruption and the loss of major cortical fragments through injury and debridement. In case of wounds having soft tissue loss with bone exposed or having severe comminution with bone loss are not suitable for internal fixation. External fixation can be used in primary stages like AO tubular fixator followed by plating in secondary stages after wound healing. Infection rate is more in present series as compared to other author. The likely reason for the infections are higher incidence of open grade 3 injuries, big soft tissue loss and severe contamination of wounds.

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