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Outcome of closed intramedullary interlocking nailing of diaphyseal fractures of femur in adults, a prospective study

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Abstract

Background: Interlocking intramedullary nailing is a very effective and successful method of definitive primary treatment, in most types of fractures of the shaft of the femur [9]. Present study has been aimed to evaluate the functional outcome and complication of fractures of the shaft of the femur treated with closed intramedullary interlocking nailing in our clinical conditions.

Method: As per study criteria 36 patients with diaphyseal fractures of femur were included in this study as per exclusion and inclusion criteria. Detailed history of patients admitted in the trauma department was taken to know the mechanism of injury and pre trauma functional status of limb. All patients were followed clinically and radiologically at 6 weeks, 12 weeks, 24 weeks and thereafter once in three months. Thoresen B.O classification system was used for grading of functional result.

Result: Less than 1 cm shortening was detected in 2(5.56%) patients. In 3 patients knee joint restriction was more than 90° and in one patient it was less than 90°. Superficial infection and fat embolism was present in one patient each. The functional outcome was excellent in 23(63.89%) patients, good in 10(27.78%) patients and fair in 3(8.34%) patients. In 3 patients knee joint restriction was more than 90° and in one patient it was less than 90°. Superficial infection and fat embolism was present in one patient each.

Discussion and Conclusion: Limb shortening was seen in 3 patients and joint restriction was seen in four patients. In most of the patients the outcome was excellent.

Keywords: Closed intramedullary, clinical conditions, femur in adults

Introduction

Femur is the longest bone of human body. In addition to its locomotory and weight bearing, it has also important role in haematopoiesis in its medullary cavity. This bone is highly vascular and richly supplied by perforating branches of profunda femoris artery. Femur is a strong bone in our body and can carry 30 times the weight of the body [1]. Diaphyseal fracture of femur has bimodal distribution, in younger age it is due to high impact road traffic injury (high-energy trauma) but in old age it is due to low energy trauma [2]. Fracture of diaphyseal fracture of bone is common and worldwide incidence of femoral shaft fractures ranges between 10 and 21 per 100,000 per year [3, 4]. Among all two percent of diaphyseal fracture are open [5]. Neurovascular injury and malunion that leads to shortening of limb is common complication.

There is various treatment modalities are available for diaphyseal fracture of femur but because of tubular anatomy of femoral shaft intramedullary nailing is considered as gold standard. Modern intramedullary techniques were developed by Küntscher in Germany during the 1940s [6, 7]. Intramedullary interlocking nailing can be done by open and closed method. Each method has its own advantages and disadvantages. Closed intramedullary interlocking nailing of diaphyseal fractures of femur is done by antegrade and retrograde way but antegrade intramedullary nail is gold standard for treatment of diaphyseal femur fractures. Closed intramedullary interlocking nailing of diaphyseal fractures of femur requires small incision and scar is small. Fracture hematoma is preserved and Bone shavings done during procedure are osteogenic so healing is fast. Authors have reported their experience about closed intramedullary interlocking nailing of diaphyseal fractures of femur.

Deepak MK, Jain K, Rajamanya KA has concluded that Interlocking nail offers the added advantages of early joint mobilization, early weight bearing, early muscle rehabilitation, shortened hospital stay, and most importantly early return to work and prefracture state [8]. Dr. Deepak CD and Dr. Chethan BA has reported that Interlocking intramedullary nailing is a very effective and successful method of definitive primary treatment, in most types of fractures of the shaft of the femur [9].

Present study has been aimed to evaluate the functional outcome and complication of fractures of the shaft of the femur treated with closed intramedullary interlocking nailing in our clinical conditions.

Material and Method

Place and time of study

This study has been conducted in the department of orthopaedics, Konaseema institute of medical sciences, Amalapuram, Andhra Pradesh from January 2017 to November 2020.

Type of study

This is a prospective observational study.

Ethics

Approval from institutional ethics committee was taken before start of study. A written informed consent was obtained from all patients before enrolling them for study.

Selection of patients

The patients admitted in the department of orthopaedics with diaphyseal fractures of femur were enrolled for this study as per following exclusion and inclusion criteria.

Inclusion criteria

- Age more than 18 years
- Both sex
- Closed fracture of femur involving shaft of femur
- Grade I, II Gustillo Anderson compound fracture

Exclusion criteria

- Less than 18 years
- Acute infection
- Pathological fracture and malignancy
- Other associated complicated fracture of other bone
- Grade-III Gustillo Anderson compound fracture

Method

As per study criteria 36 patients with diaphyseal fractures of femur were included in this study as per exclusion and inclusion criteria. Detailed history of patients admitted in the trauma department was taken to know the mechanism of injury and pre trauma functional status of limb. A through clinical examination of patients was done to know the general condition of patient, neurological injury, vascular injury and other local injury. After stabilization patients were evaluated radiologically to know fracture morphology. Routine haematological investigation was done and as soon as patient was stable they were taken up for surgery. After proper preoperative preparation patient were shifted to operation theatre. All patients were operated similarly using standard surgical procedure for insertion and distal and proximal locking of intramedullary nail. All patients were given standard prophylactic antibiotic. Extension and flexion movement was started on first day, isometric range of movement exercise started from next day and slow gait training was started from third day onward. All patients were followed clinically and radiologically at 6 weeks, 12 weeks, 24 weeks and thereafter

once in three months. Thoresen B.O classification system was used for grading of functional result [10].

Result and Observation

During our study period 36 diaphyseal fractures of femur patients treated with closed intramedullary interlocking nailing were included in this study as per selection criteria.

Table 1: Demography of patients with diaphyseal fractures of femur

Variables		Number	Percentage (%)
Age (years) 35.23±3.24	18 to 30	24	66.67
	31 to 50	8	22.23
	More than 50	2	5.56
Sex	Male	28	77.78
	Female	8	22.23
Mode of injury	RTA	26	72.23
	Fall	10	27.78
Level of fracture	Upper 1/3 rd	8	22.23
	Middle 1/3 rd	22	61.12
	Lower 1/3 rd	6	16.67
Side of fracture	Rt	23	63.89
	Lt	13	36.12

The mean age of the patients was 35.23±3.24 years. Most common age group were between 18 to 30 years that was 24(66.67%), number of patients between 31 to 50 years were 8(22.23%) and more than 50 years old patients were 2(5.56%) in number. There was male predominance and male to female ratio was 28/8. Road traffic accident was common mode of injury (72.23%) and fracture of middle 1/3rd was common (61.12%). Fracture of right side (63.89%) of bone was common than left (36.12%).

Table 2: Weight bearing and radiological outcome after surgery

Variables			Number	Percentage
Weight bearing	6 to12 wks	Partial	24	66.67
		Full	0	0
	12 to18 wk	Partial	12	33.37
		Full	24	66.67
	19 to 24 wks	Partial	0	0
		Full	12	33.37
Radiological fracture healing	6 to 12 wks		8	22.23
	12 to 18 wk		24	66.67
	19 to 24 wks		2	5.56

Regarding weight bearing within 6 to 12 weeks, partial weight bearing was possible in 24(66.67%) patients. After 12 weeks partial weight bearing was possible in 12(33.37%) patients and full weight bearing was possible in 24(66.67%) patients. After 18 weeks full weight bearing was possible in 12(33.37%) patients. Within 12 weeks 8 fracture healed radiologically, 24(66.67%) healed radiologically after 12 weeks and 2 healed radiologically after 19 weeks.

Table 3: Complications of intramedullary nailing

Variables		Number	Percentage
Shortening of limb	Less than 1 cm	2	5.56
	More than 1 cm	0	0
Knee joint restriction	More than 90 degree	3	8.34
	Less than 90 degree	1	2.78
Superficial infection		2	5.56
Deep infection		0	0
Fat embolism		1	2.78
Implant failure		0	0

Less than 1 cm shortening was detected in 2 (5.56%) patients. In 3 patients knee joint restriction was more than 90° and in one

patient it was less than 90°. Superficial infection and fat embolism was preset in one patient each.

Table 4: Functional outcome of surgery

Variables	Number	Percentage
Excellent	23	63.89
Good	10	27.78
Fair	3	8.34
Poor	0	0

The functional outcome was excellent in 23(63.89%) patients, good in 10(27.78% patients and fair in 3(8.34%) patients. In 3 patients knee joint restriction was more than 90° and in one

patient it was less than 90°. Superficial infection and fat embolism was preset in one patient each.



Fig 1: Closed intramedullary interlocking nailing of diaphyseal fractures of femur

Discussion

Various treatment modalities are available for treatment of diaphyseal fracture of femur and closed intramedullary interlocking nailing is one of them. Present study is designed to present our experience with closed intramedullary interlocking nailing as treatment modalities of diaphyseal fracture of femur. The mean age of the patients was 35.23±3.24 years. Most common age group were between 18 to 30 years that was 24(66.67%) with male predominance. This is supported by the study of Rune Hedlund & Urban Lindgren and Singer BR, McLauchlan GJ, Robinson CM, Christie J *et al.* [3, 11]. In our study right side was commonly effected, road traffic accident was common cause and middle one third was most commonly effected. This finding corroborates with the study of Deepak MK, Jain K, Rajamanya KA *et al.* and Ricci WM, Gallagher B, Haidukewych GJ *et al.* [9, 12].

We have recorded in our study that partial and full weight bearing was started in all patients by 3rd week and radiological healing was also very encouraging from third week onward. This finding is supported by the work of Pillai MG *et al.* and Sang Heon Sang *et al.* [13, 14].

Limb shortening was present in only one patient, in 3 patients knee joint restriction was more than 90° and in one patient it was less than 90°. Superficial infection and fat embolism was preset in one patient each. This finding is supported by the work of

Salem KH, Maier D, Keppler P, *et al.* and Herscovici D, Scaduto JM *et al.* [15, 16]. The functional outcome was excellent in 23(63.89%) patients, good in 10(27.78% patients and fair in 3(8.34%) patients this is supported by the work of) Deepak MK, Jain K, Rajamanya KA, Gandhi PR, Rupakumar CS, Ravishankar R *et al.* and Dr. Deepak CD and Dr. Chethan BA [8, 9].

Conclusion

From present study we can conclude that diaphyseal fracture of femur was common in young patient with high mechanical injury in the middle one third. Most of the patients have radiological healing and weight bearing in third week of treatment. Limb shortening was seen in 3 patients and joint restriction was seen in four patients. In most of the patients the outcome was excellent.

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