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Original Article

Study on Open Intramedullary Nailing of Close Fracture of Shaft of Femur

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ABSTRACT

Backgroudn: *Comminuted femoral shaft fractures are complex fractures to treat because of rotational and vertical instability and treatment outcome of these patients poses challenge to surgeon as a result of increased risk of limb length discrepancy and rotational deformity.* ***Method and Materials:*** *A prospective study was done with 50 patients to see the result of antegrade intramedullary interlocking nailing for post traumatic closed fractures of the femoral shafts (Winquist Type I, II) in the Department of Orthopaedics, Sher E Bangla Medical College Hospital, Barishal.* ***Result:*** *21 patients (42%) had excellent clinical outcome while only 4 patients (8%) had poor outcome with superficial infection. Union rate was 96% and majority of the patients were satisfied with the treatment modality. Rate of nonunion was 4%.* ***Conclusion:*** *The fact that all our study results prove that open intramudulary nailing is an excellent method to treat close fracture shaft of femur.*

Keyword: *Comminuted femoral shaft fractures, intramudulary nailing.*

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INTRODUCTION

A number of femoral shaft fractures have in the past been considered unsuitable for nailing
because of comminution or because the fracture was too proximal or too distal. The available methods of fixation have not been able to provide adequate stabilization and many surgeons have therefore used traction and cast bracing. The introduction of locking nailing systems [1], have now made it possible to provide excellent stabilization

of almost all femoral shaft fractures however comminuted and at whatever level between the lesser trochanter and the condyles.

METHODS AND MATERIALS

Fifty patients with femoral shaft fractures were treated with antegrade Open interlocking
intramedullary nailing in the Department of Orthopaedics, Sher E Bangla Medical College, Barishal during the period from January,2017 to December, 2019. Every patient sustained high energy trauma. There were 41 men in this series with age range of 18-45 years (mean 30.38).

INCLUSION CRITERIA:

- Both sexes from 18 to 45 years old.
- Comminuted fractures of the shaft of femur (Winquist type I and II).
- Closed fracture.
- Fresh injuries of less than 2 weeks old.

EXCLUSION CRITERIA:

- Open fractures
- Pathological fractures
- Winquist type III, IV fractures.
- Patients with bilateral femoral fractures.

Patients with deformity of at least one lower limb i.e. Polio, major joint contractures, and amputees.

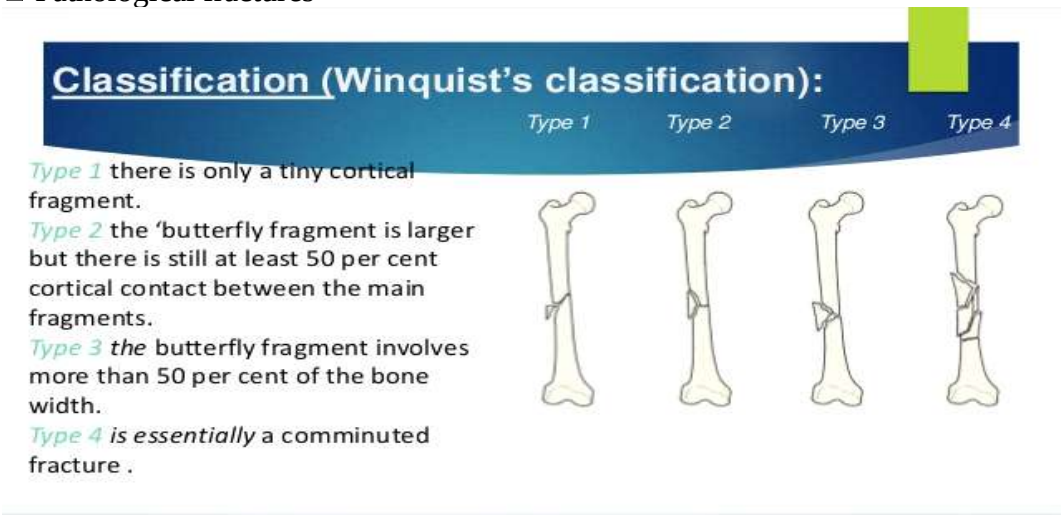
- Patient with other underlying uncontrolled co morbid conditions i.e. Diabetes mellitus,

CKD.

After admission all patients were put in upper tibial skeletal traction of the involved side with 20-25 lb of weight to maintain length and to facilitate operative reduction later. All fractures were treated between 7-14 days after the trauma. Patients were followed up at 6 th , 12 th , 18th and 36th weeks after operation.

CLASSIFICATION OF FRACTURE

Classification system of Winquist et al (1984) was used to describe comminution of the fractures. Type I and II have no significant comminution and there is cortical integrity around the circumference of the fracture.



Classification system for the result of treatment according to Thoresen et al [2]

Trait		Excellent	Good	Fair	Poor
Mal alignment of Femur(Degrees)	Varus or Valgus	5	5	10	≥10
	Procurvatum/ Retrocurvatum	5	10	15	≥15

	Internal rotation	5	10	15	≥15
	External rotation	10	15	20	≥20
	Shortening of Femur (cm)	1	2	3	≥3
Range of knee(Degrees)	Flexion	≥120	120	90	≤90
	Extension deficit	5	10	15	≥15
	Pain or Swelling	none	sporadic	significant	severe

Operative technique: The study was conducted using antegrade open nailing [3]. The patient laid supine on the operation table with the affected limb adducted and flexed .An incision is made along an imaginary line between the lateral epicondyle and greater trochanter, along the length of the femur required by the specific fracture pattern.Then fascia lata is incised along its fiber and vastus lateralis muscle is separated from fascia lata and mobilize it from intermuscular septum. After this the bone was exposed and reaming was done and antegrade nailing was performed.Fracture was fixed in a dynamic fashion from the very beginning.

After care: When postoperative pain allowed, patients were taught about quadriceps exercise and allowed to take partial body weight using crutches provided other injuries did not preclude this. On 4th post-operative day drain was removed and stitches was off on 14th post operative day. Dynamization was done after 12 weeks and after this patient was allowed to full weight bearing movement.

RESULT

Twenty eight patients (56%) had no complaint at all while twenty patients (40%) had some kind of symptoms and two patients had severe complication of infection followed by nonunion. Thirty four patients (68%) were satisfied with their limbs for everyday activities. Forty two patients (84%) had callus formation by 12 th week while seven patients (14%) had between 12-18 th weeks and two patients(4%) were treated for nonunion by exchange nailing. The mean duration of callus formation was 12.6 weeks.

Table I: Distribution of patient by Limb length discrepancy (n=50)

Limb length discrepancy (cm)	Number of Patient	Percentage	Mean
0	48	96%	0.12
Upto 1cm (Excellent)	0	0	
1cm -2cm (Good)	0	0	
2cm -3cm (Fair)	2	4%	
≥3cm (Poor)	0	0	

Mean ±SD			0.12±0.1

Limb shortening of 0 to 1 cm occurred in 96% of patients (n=50). 2 patients had shortening of more than 2 cm. According to Thoresen criteria 96 % of patients had excellent to good limb length outcome (Table I).

Table II: Distribution of the patients by internal rotational deformity (n=50)

Internal rotation deformity (in degree)	Number of patients	Percentage	Mean
Nil	20	40	
Up to 5 (excellent)	5	10	
5-10(Good)	2	4	4.1
10-15 (fair)	1	2	
15 (poor)	0	0	

25 patients (50%) had excellent results in terms of internal rotational deformity; either they had no deformity at all or within 5 degree of internal rotation (Table II).

Table III: Distribution of the patients by external rotational deformity (n=50)

External rotation deformity (in degree)	Number of patients	Percentage	Mean
Nil	20	40	
Up to 10 (excellent)	12	24	
10-15 (good)	5	10	6.9
15-20 (fair)	4	8	
20 (poor)	1	2	

32 patients (64%) had excellent results in terms of external rotational deformity. Deformity of more than 20 degrees was seen in only 2% patients (Table III). Internal rotational deformity of more than 15 degrees occurred in 5 patients (10%). According to Thoresen criteria (9) 64% of patients had excellent limb alignment outcome.

Table IV: Distribution of the patients by range of motion of the knee (n=50)

	Range of movement (in degree)	Number of patient	Percentage	Mean
Flexion	90 (poor)	0	0	
	90 (fair)	0	0	149.5
	90-120 (good)	1	2	
	120 (excellent)	48	96	
Mean±SD				149.5±7.70
Extension deficit	Normal	35	70	
	Upto 5 (excellent)	11	22	
	5-10 (good)	2	4	.32
	10-15 (fair)	2	4	
	15 (poor)	0	0	
Mean±SD				.32±.18

Overall knee flexion of more than 90 degree was encountered in 96% of patients. By Thoresen criteria excellent to good knee flexion encountered in 98% of patients (Table IV).

28 patients (56%) had no complaint at all while 15 patients (30%) had some kind of symptoms and only 7 patients (14%) had significant pain in that limb for which they frequently needed medical advice.

Only 2 fracture ended in non union and 2 patient developed superficial infection.

According to Thoresen criteria 21 (42%) patients had excellent clinical outcome while 16 patients (32%) good, 9 patients (18%) fair and only 4 (8%) patients had poor outcome.

DISCUSSION

Numerous methods can be used to treat femoral shaft fractures. Orthopedic surgeon should be aware of the advantages, disadvantages, and restrictions of these various methods. The position of the fracture, the extent of fragmentation, the age of the patient, the social and economic demands of the patient, and other factors help to determine the treatment method [4]. Literature states that the average clinical and radiological recovery period after standard fixation of femoral diaphysis is between 12 and 24 weeks [5]. Numerous studies report that a healing rate of 97–100 % takes place within this period with interlocking intramedullar fixation [6].

Due to the reasons stated below, we used the open intramedullar fixation method in all our patients.

- Less and cheaper equipment was required to those used in closed fixation.
- No requirement for a special fracture or operating table.
- Achieving total anatomic reduction is easier using the open technique.
- Being able to see the fracture line directly helps to discover displaced pieces, or pieces not indentified from the X-ray.
- Being able to bring the fragments together increases rotational stability. Rotational malalignment is a complication that rarely develops after open reduction.
- The middle segment is stabilized easier for segmental fractures using the open method. This can prevent the rotation and bending caused by

closed reduction and medullar reaming.

- A fracture may occur in the femur neck when nailing during the closed technique.
- As reaming is easier in the open method, it is easier to designate the correct length and diameter for the nail.
- In comminuted fractures, bone fragments can be stopped from escaping to the medulla.
- The risk of disruption of blood supply of the femoral head based on unsuitable entrances and additional femoral fracture is lower in the open method in comparison to the closed method.
- The risk of superior gluteal nerve damage is lower.
- As the medulla is reamed when open, the risk of reaming-based emboli is lower in comparison to the closed method.

The fact that the surgery lasts longer and the excessive amount of radiation that the surgeon is exposed are among the most important disadvantages of closed interlocking intramedullar fixation surgery. Studies report that the radiation that surgeons are exposed cause leukemia, bone sarcoma, brain tumors, thyroid carcinoma, skin cancer, and lung cancer [7, 8].

Özsoy et al. proved that there is a risk that the superior gluteal nerve is damaged due to the different flexion positions of the hip during the closed intramedullar fixation procedure [9].

One of basic problem during antergrade nailing is not to determine correct entry point. Correct entry point will prevent problems that can cause a lot of complications of entry point. Even if described entry point will be chosen at proximal end, femoral anatomic variations can be possible distally. Each femoral canal architecture and curve is different. Therefore, retrograde nailing will provide optimal entry point for each patient individually. A fracture may occur in the femur neck when incorrect entry point was chosen at the closed technique. Wild et al. reported that the total rate of complications for intramedullary femoral nailing was low (4.9 %), but a high rate of intraoperative femoral neck fractures was observed (1.4 %) [10].

Literature refers to complications such as damage to the sciatic, peroneal, and pudendal nerves as a result of treating femoral shaft fractures with the interlocking intramedullar fixation method under traction. Pudendal nerve paralysis is a known complication of femoral nailing. This situation appears in the form of labial sensory change in women, and scrotal and penile sensory change in men, sometimes together with erection disorders. Pudendal nerve paralysis can be prevented by decreasing traction-based pressure [11]. None of our cases developed a nerve paralysis as we did not use a traction table for all our cases.

Rothwell et al. reported significance shortness for all femoral fractures regardless of the treatment method. However, they emphasized that the rate of complication was lower for interlocking intramedullar nails [12]. Winquist et al. reported that the rate of shortness above 2 cm was 2 % [13]. They reported that shortness was rarely seen in type 1 stabile, short oblique, or transverse fractures, and that shortness less than 2 cm rarely caused leg or back pain. Accordingly, they identified that shortness of 1.5 cm was acceptable for young patients, and shortness of 2.5 cm was acceptable for patients that were 65 and over. In our study, 27.2 % of the patients had shortness between 1 and 2 cm.

One prospective cohort study (CoE level III) and one retrospective cohort study (CoE level II) were summarized by the AO Foundation [14]. There is insufficient high quality evidence to determine treatment superiority. No significant differences between intramedullary nails versus plates were found. We think that fracture hematoma is an orthopedic myth, the key point is periosteum.

CONCLUSION

The fact that all our study results prove that open intramudulary nailing is an excellent method to treat close fracture shaft of femur.

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