



Research Article

Comparison Between Plating and Intramedullary Nailing in Treatment of open Femoral Shaft Fracture from 2014 to 2017

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Abstract

Introduction: Open fractures, often occur following high-energy trauma, are considered as medical emergencies. Due to the role of femur in body weight bearing, fractures of this bone can lead to long-term morbidities ; Therefore, proper treatment is very important. Since there are less complications in intramedullary nailing, it is accepted as the gold standard of treatment in close femoral shaft fractures but there is no consensus about open fractures. The goal of this study was to compare the therapeutic results between intramedullary nailing and plating in the treatment of open femoral shaft fracture.

Methods: This retrospective study was performed on 46 patients with isolated open femoral shaft fracture, who referred to Imam Khomeini Hospital in Ahvaz. patients were divided into two groups based on the method of treatment: plating / intramedullary nailing and their treatment results were compared.

Results: The mean time of visible bony callus formation on X-ray was 6.82 ± 0.93 weeks in intramedullary nailing group and 7.84 ± 1.82 weeks in plating group. The infection rate was 14.3% in intramedullary nailing group and 4% in plating group. There were 4 cases of non-union in intramedullary nailing group and 2 cases in plating group, but no cases of mal-union were observed.

Conclusions: There was no difference between two methods in rate of union and infection but residual pain is more significant in nailing group.

Introduction: The prevalence of femoral shaft fractures is 1 to 9% and its maximum incidence is due to highenergy traffic road accidents in young men. Two important complications of open fractures, that have always been considered by surgeon are infection and non union Since there is a connection between fracture hematoma and external environment. The likelihood of non union increases with age and underlying chronic diseases such as diabetes. Other factors such as smoking, anemia, malnutrition,

steroid or NSAID use also effect the bone union. Although 50% of smokers return to their previous habit, it is best to break the habit, at least during the healing process. Early rehabilitation of the injured limb and early return to the maximum level of previous function is the most important benefit of surgical treatment. There are two different ways to fix these fractures surgically : plating or intramedullary nailing [1-7].

Despite plate, intramedullary nail is an internal splint that helps femur in weight bearing. Due to the eccentric position of plate in front of the concentric axis of nail with femur, immediately weight bearing in plating is a risk factor of device failure. [2,8] Plating in femoral shaft fracture leads anatomical reduction of fracture without damaging other areas like femoral neck. This method can be used in all types of femoral shaft fractures, but the most important indications for plating are in cases where it is impossible to use nail like narrow bone canal or infection. The most important trouble of plating is the necessity for extensive surgical incision, leading to vascular damage at fracture site; which is expected to be associated with an increased risk of infection and non union. Also, due to quadriceps femoris damage during surgery, muscle weakness and consequent restriction of knee joint movements can be one of the inevitable complications of plating. There is no age limit for using plate, but in children before puberty, which growth plate is still active, nailing can not be used [2,6,9,10].

Intramedullary nailing weakens the strength of quadriceps less than plating. However, the use of this method requires special equipment, the lack of which makes surgery difficult. Some studies have suggested that nailing may be associated with an increased risk of femoral head avascular necrosis and proximal valgus deformity of femur ; It is also better not to use nailing in cases where there is ipsilateral femoral neck or acetabular fracture [6,10-12]. Delayed union occurs when a fracture does not heal within the expected time frame, which is about three months for a femoral shaft fracture. This phenomenon is a dangerous predictor of the possibility of non union in future. Non union is not likely to heal without further intervention and it is the most important therapeutic complication. Of course, the diagnosis of non union should not be documented without clinical and radiological evidence [2,4,8].

Non union biological causes include severe soft tissue damage, vascular damage, and infection which all of them are possible in open fractures. Non union infectious causes are more common in open fractures and sometimes require removal of device or use of a bone graft or external fixator. Intramedullary nailing is associated with a lower rate of infection and nonunion due to lack of manipulation of the fracture hematoma and maintenance of periosteal blood flow. However, some studies believe that the insertion of nail into the bone marrow canal can damage the endosteal blood flow, which is why in the past it was forbidden to use this method in open fractures because wound infection and destruction of endosteal blood flow could easily lead to provide a deep bone infection [1,4,6,13].

The aim of this study was to compare the therapeutic results of these two methods in the treatment of open femoral shaft fractures.

Methods

This retrospective study was performed on 46 patients with open femoral shaft fractures who were treated with either intramedullary nailing or plating. Criteria for admission to study

- People must be in the age range of 16 to 50 years.
- Individuals who had isolated femoral shaft fracture were studied and if they had other fractures they were excluded.
- People with chronic liver or kidney disease were excluded from the study.
- Individuals who required hospitalization in the intensive care unit due to severe trauma were excluded from the study

Finally, 86 people with open femoral shaft fractures between 2014 and 2019 had referred to Imam Khomeini Hospital, 20 of whom were excluded from the study due to lack of age range. 5 patients were excluded from the study due to treatment with external fixators and 15 patients were excluded from the study due to concomitant fractures such as femoral neck, intertrochantric, tibial plateau or pelvis. At the end 46 patients were included in the study. Subjects were examined by an orthopedist for non union evidence, knee and hip range of motion, limping. Patients' pain was assessed based on VAS score. In this study, lack of radiological evidence of union (formation of bone callus in three of 4 bone cortices) or tenderness at fracture site up to 6 months after surgery was considered as non union.

Results

In intramedullary nailing group, the mean age of the subjects was 26.71 ± 7.43 years, of which 19 were male and 2 were female. In the plating group, the mean age of the subjects was 26.48 ± 9.19 years, of which 21 were male and 4 were female. The most common type of fracture in plating group was Complex segmental and in intramedullary nailing group was Simple spiral and Complex segmental. The mean time of bony callus view on X-RAY was 6.82 ± 0.93 weeks in nailing group and 7.82 ± 1.82 weeks in plating group. The infection rate was 14.3% in nailing group and 4% in plating group. 4 cases in nailing group and 2 cases of non-union in plating group were detected, but no cases of mal union were seen. The mean return to function time (walking without help) was 5.14 ± 4.07 months in nailing group and 7.56 ± 6.71 months in plating group.

In nailing group, 4 cases and in plating group, 7 cases of limping were seen. 3 cases of device damage were in the plating group, which led to reoperation. The mean residual pain was 4.14 ± 1.45 in nailing group and 3.16 ± 1.49 in plating group. The amount of knee pain in nailing group was 2.19 ± 1.40 and in plating was

1.44 ± 1.1. In nailing group, 3 cases of non union due to infection were seen, in all three cases, device was removed and an external fixator was inserted. One case of non union was non infectious, which intramedullary nail was implanted in bone canal for patient after one year. Finally, union was seen in all four cases. In plating group, there was one case of non union due to infection, which was switched to an external fixator and one case was non infectious, in which the plate was replaced by nail. In nailing group, a decrease in knee range of motion was seen in 2 cases.

Conclusion

The first time of bony callus formation on X RAY was longer in plating group, but this difference was not statistically significant (7.84 ± 7.82 weeks vs. 6.82 ± 0.93 weeks P value = 0.064). In nailing, the union rate was 81% versus in plating was 92%. (P value = 0.390). In a study conducted by Dorigan et al. To evaluate intramedullary nailing, the rate of union in nailing reported to be 92%, although both closed and open fractures were examined. In another study of 89 patients with open fractures of femoral shaft, the overall non union rate in nailing method was 14.1%, which was consistent with the current study. Kwan et al reported a non union rate of 10.5% in 152 patients, all of whom were treated with intramedullary nailing. In another study by Cao et al. On 157 patients with closed and open fractures of femoral shaft, the non union rate was reported to be 5.5% after nailing. The difference in the amount of union in nailing in this study compared to other studies could be related to the type of fracture, considering that all fractures in this study were open. However, no significant difference was observed between the amount of union in the plating and nailing [14-17].

Out of 6 cases of non union, 4 were smokers which was a significant difference between the rate of union in smokers and non smokers. smoking is a risk factor of non union that was consistent with previous studies. (P value = 0.015) 3 cases (14.3%) of infection was in nailing and 1 case (4%) in plating. In a study of 42 patients with open fractures of femoral shaft treated with intramedullary nail, Lowe and Hansen reported an infection rate of 5%. In a review of 63 open fractures of femoral shaft with intramedullary nailing, O'Brien et al. Reported a 4.8% prevalence of infection. In this study, the rate of infection was not significantly different between the two methods (P value = 0.31) ; But the rate of infection in nailing was higher than previous studies. [15] In the study of Singh et al. 4% of limb length discrepancy and limping were observed in 46 patients with nailing. In this study, 7 cases (28%) of limping in plating group and 4 cases (19%) in nailing group was observed, but the difference between the two groups was not statistically significant. (P value = 0.478) [7]. The amount of knee pain in intramedullary nailing was significantly higher than plating group (2.19 vs. 1.44) (P value = 0.043). The amount

of residual pain in intramedullary nailing was higher than plating group (4.14 vs. 3.16) (P value = 0.018). In previous studies, the amount of pain in plating and intramedullary nailing was similar and there was no significant difference. Therefore, it seems that the results of treatment of femoral shaft open fracture in terms of healing time, healing rate and infection rate are similar between the two methods but knee and residual pain in nailing are more than plating.

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