Bulletin of the *Transilvania* University of Braşov • Vol. 3 (52) - 2010
Series VI: Medical Sciences

INTRAMEDULLARY FIXATION IN STABLE SHAFT FRACTURES OF TIBIA

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Abstract: *The treatment of tibia fractures is yet a controversial one and the treatment difficulties grow with fracture complexity. Usually the stable ones, with sharp of transversal or short oblique, are closed or grad I-II open fractures and less complicated. In a series of 78 cases we treat this type of fractures by intramedullary fixation without locking. The radiological callus appears at 5-6 weeks and the patients were able to full weight bearing in an average of 10 weeks. The method is biological, easy and efficient one, and is related with a facile nursing and an efficient use of resources.*

Key words: *tibial stable fractures; intramedullary nailing.*

1. Introduction

Our hospital is an emergency one and is located in an area with road accidents, and close to the biggest sky area of the country. In this situation, we have o large experience with tibial shaft fractures, common injuries for us.

As a result of growing trend to widen the indications for surgical treatment, attention has been focused on the difficulty of the indication related with complexity of fractures. The ideal goal of fracture union without deformity or dysfunction is a result of a number of important principles. The most important is to look for the "biological fixation" and to find a reliable method of internal fixation, both from biological and mechanical point of view [1, 4]. We think, in stable shaft fractures, intramedullary fixation, observe the biological and biomechanical conditions in all stages of natural healing.

Classically a stable tibial shaft fractures were treated by casting but our days most of them have a surgical treatment [4]. In open fracture, even in mechanically stable one, the mean of fixation have to respect the requirement of biological fixation. The most important is to respect the bone circulation and to keep the anatomical position of the shaft without risk of displacement [3]. Out from all intramedullary fixations, we consider Ender nail in secant arc respect best the endomedullary circulation and have a real indication, especially in open, stable fractures. In this type of fractures it is a safe procedure and produces reliable results.

In closed fractures the protection of bone circulation is not such important like in open one, and rigid nail can be used.

2. Material and method

Over a period of three years, a number of 78 stable tibial fractures were treated by intramedullary nailing without locking. Out of this, 67 cases were treated with rigid compressible nails and 11 with Ender

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nail in secant arc. They have a mechanically stable sharp, most of them a transversal one. Seven were open, 5 grade I and 2 grade II fractures. Out of the 78 cases, a number of 71 had isolated tibial shaft fractures and the remaining had associated injuries. If the associated injuries required surgical intervention, this was carried out at the same time.

The inclusion criteria were the mechanically stable tiblal shaft fractures from 10 cm distal to tibial plateau to 10 cm proximal to level of tibio-astragalian joint. Fractures in proximal or distal third closed to the metaphiseal zone were not included. These types of fractures were treated by other types of fixation, usually used for epiphiseal or metaphiseal lactations.

The level fractures were in proximal third in 19 cases, in middle third in 25 cases and in distal third in 34 cases and the time from injury to operation was in majority of them under 24 hours.

All of them were treated by a single primary surgical procedure. In closed fractures it was a classical rigid nailing with a median point of enters immediately up to anterior prominence, after a longitudinal incision of rotulian tendon (Fig. 1.).

Fig. 1. *Example of rigid nail fixation*

When flexible fixation is used, it was a "closed" fixation with two Ender roads in secant arc, in association with adequate treatment of the soft tissue injuries in open ones. We used two stainless steel nails (Ender Nails), in secant arc. Each of them was placed through a lateral longitudinal 2-3 cm incision, using a manual drill. The points of entry were on the medial and lateral aspects of proximal epiphysis of tibia at the level of anterior prominence. Before insertion, the nails were pretension like large constant convexity (Fig. 2.).

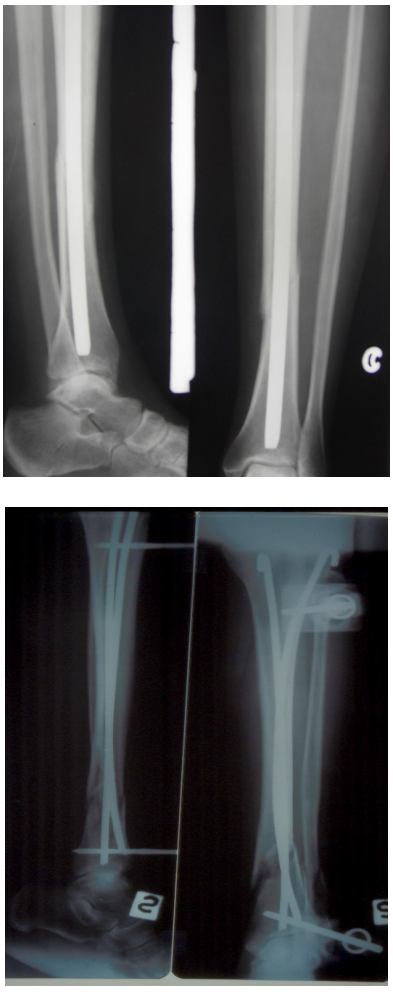

Fig. 2. *Example of Ender fixation*

The operations were performed on usual table which permits fluoroscopy with leg elevated on a modified Böhler device under traction with 5 kg. The elevated and parallelism with table position of tibia, permits a facile insertion and exposition of fluoroscopy.

After the operation and a period of 5-7 days in hospital, the course of treatent, fracture healing and rehabilitation were monitorised.

3. Results

All the fractures were nailed closed with same difficulties in three cases with transversal sharp fracture. There was only a tolerable malalignament in recurvatum of 3˚.

The wounds healed primarily with no infection but a superficial one in one case open grade II.

Mobilization starts second day and progressive weight bearing starts at the end of first postoperative week after surgery in transversal type. In oblique type the progressive weight bearing starts at the end of second week. The patients were able to full weight bear in an average of 7 weeks. Two of them have some difficulties with the mobilization of the knee.

Radiological periosteal callus appears at 5-6 week, first in the lateral of the fracture corresponding to the insertion of membrane.

All the patients healed and recovery was of good satisfaction.

4. Discussion

Usually, in transversal or short sharp fractures, the mechanism is of low or medium energy and, if present, the associated soft tissues injuries are of Gustilo type one or two. This type of soft tissues injuries do no require multiple staged surgical procedures and are to be treated by a single primary one.

At present, the treatment philosophy is to promote biological methods and to create around the fracture site a healing promoting medium [1, 4]. Most references are made to protect the circulation. This remark has made us to draw attention towards certain biomechanical elements that have been partly neglected.

In our view, there are three healing stages: immediate, early and late. The immediate period is represented by the first week. In this period there is a biological condition (protecting the circulation: avoiding reaming, and protecting soft tissue around the fractures) and a mechanical condition with two aspects (stabilizing fracture and promoting easy reconstruction). Ideally, the fixation should be primary and definitive.

The early period is represented by the first three-five weeks, until periostal radiological callus appears. In this period there is one biomechanical condition (stimulating osteogenesis by controlled movement). The ideal fixation must have enough flexibility to activate early biological response resulting in abundant early periostal callus.

The late period begin after the radiological appearance of callus. The late biomechanical condition is to stimulate osteogenesis by axial dynamic intermittent compression. The ideal fixation must allow dynamic axial compression [4]. We consider that in stable fracture, out of all endomedullary types, the flexible in secant arc observes best all the biological and biomechanical conditions in all stages of natural healing.

On the bases of these considerations we used for stable shaft fractures of tibia intramedullary fixations: in closed rigid and in open flexible ones.

In unstable fractures is difficult to have elasticity and stability in one construct, but in stable one intramedullary nailing are able to stabilize in all directions [1, 3].

When Ender nails are used, working from the concept of three point fixation, surgeons are able to improve stability significantly by using two pre-tensioned nails inserted from opposite sides of the bone [2]. Rotational stability was also better than had previously been experienced, although this is to remain the weakest point of the technique.

We avoid static locking and consider in all type of fractures it would be ideal to accelerate consolidation by controlled micromovements in the fracture site and, especially, by axial dynamic compression [3]. At present, the anatomic reduction of fracture site is no longer considered a fundamental principle. However, the best and favourable biomechanical medium for consolidation can only be achieved in inter-fragmentary contact conditions.

5. Conclusion

We recommended the use of compressible rigid intramedullary nailing without static locking for closed stable tibial shaft fractures. Flexible fixation has to be reserved for open fractures, especially in grade I and in grade II.

This type of fixations is associated with facile nursing, satisfaction about treatment and efficient use of resources. The advantages are even greater, with early healing rehabilitation and return to normal life.

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