ORIGINAL ARTICLE

Concept of Conservative Management of Displaced Tibial Shaft Fractures in Advanced Orthopaedic Era of Internal Fixation

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ABSTRACT

Background: Fractures of tibia are very common but management is controversial which ranges from conservative to different surgical methods. However, standard treatment for low-energy tibial shaft fractures includes closed reduction and cast immobilization.

Objectives: To analyze the efficacy of conservative policy in management of isolated displaced tibial shaft fractures.

Patients and methods: All cases of the diagnosed displaced tibial shaft fracture were treated conservatively at Social Security Teaching Hospital, Lahore during two years period w.e.f.14th August, 2007 to 13th August, 2009. All displaced fractures of shaft of tibia in patents above 16 years of age were included. Conservative policy was adopted that included early bone grafting when indicated. Those fractures involving the knee or ankle joint and undisplaced fractures in adults were excluded.

Results: The healing time in comminuted fractures varied from 19.2 to 25.3 weeks depending on degree of communition and that of displaced fractures varied from 18.4 to 25.2 weeks. Even slightly compound wounds <1 inch in length had a noticeably delayed union time of 25.4 weeks. Only small puncture wounds, compound from within had no effect on union time i.e. 18.5 weeks. Varus deformity less than 14 degree (12.5%) being the most common and valgus over 14 degree found nil.

Conclusion: Basically conservative policy of treatment is satisfactory if early bone grating is performed when indicated, bony union of all displaced tibial shaft fractures is possible in reasonable period of time.

Key words: Conservative policy, Early bone grafting, Long leg plaster cast

INTRODUCTION

Fractures of the tibia are common due to its superficial location. However their management remains controversial. Management of tibial shaft fractures is often complex and disagreement exist about the optimal method of treatment. Both conservative and surgical techniques have been introduced in an effort to speed time to union while minimizing the occurrence of complications. Standard treatment for low-energy tibial shaft fractures includes closed reduction and cast immobilization.[1,2] Sarmiento[3] and Tausch et al[4] supported conservative management. However the great advances in orthopaedic, especially with regard to methods of rigid internal fixation have swung the pendulum in this direction. Christensen et al[5] and Wagner[6] stated that "rigid internal fixation is advocated for all displaced fractures of the shaft of the tibia and is advocated as an urgent procedure especially in open fractures". In their opinion operative treatment was mandatory in every case of displaced tibial shaft fractures. The literature shows a decline in popularity of the bone plate which is designed to hold the fracture rigidly. This decline is traceable to two main trends of

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opinion. First, the belief that any method which prohibits all movement at the fracture site removes the essential stimulus to callus formation and thus the fracture healing becomes indolent; and second, the widely held belief that absorption of bone ends occurs and that any method which keeps the fragments apart after this absorption is likely seriously to impede the natural healing process. Because of these beliefs conservative treatment is the acceptable method.

PATIENTS AND METHODS

This prospective study was carried out at Social Security Teaching Hospital, Lahore during two years period w.e.f.14th August, 2007 to 13th August, 2009. Eighty diagnosed cases of isolated displaced tibial shaft fracture were treated conservatively additionally with early bone grafting when indicated. All displaced fractures of shaft of tibia in patients with age above 16 years were included. Those fractures involving the knee or ankle joint and undisplaced fractures in adults were excluded. 20% cases required bone graft and the healing time was 36 weeks. Whereas fractures that healed primarily took on average 17 weeks. The number of complications, most of which were minor, was considered acceptable. The precise nature of conservative treatment used depended on the nature of the fracture. In low velocity injuries with little soft tissue damage closed reduction under

general anaesthesia was performed and a long leg plaster cast applied. Regular radiographs were taken to check the length and alignment, and the plaster was wedged or changed as necessary. Fractures which felt unstable under anaesthesia were treated by os calcis traction for two to three weeks; a long leg plaster cast was then applied and retained until the twelfth week. Open fractures were explored immediately under general anaesthesia; the wound was cleaned and the skin edges excised. If the skin could not be closed without tension, a skin graft was applied as soon as possible. The fracture was stabilized by os calcis traction or by a long leg plaster as necessary. All patients were assessed for union, both clinically and radiologically, at 12 weeks. If the fracture was united, unprotected weight-bearing was allowed. If union had not occurred at 12 weeks the limb was immobilized for a further four weeks and then reassessed. If union was still not present at 16 weeks then bone grafting was performed using strips of bone from the iliac crest. Occasionally, if delayed union was predictable at 12 weeks, grafting was performed earlier.

RESULTS

There is high incidence of road traffic accidents seen in any hospital in a large industrial city. It is important to note that more than half the fractures had complicating factors. The tibia is the most common site of non-union in long bone fractures. However, sound bone union was seen in all cases. We have considered several factors in relation to the time they take to unite and to the need for bone grafting. In this series, fractures of the middle third took the longest and required bone grafting in 31.4 per cent of cases. Table 1 shows the effect on fracture healing of comminution (25.3, 19.2 and 19.4 weeks) and of the displacement (25.2 and 18.4 weeks) seen on the first radiograph. The distinction between severe and slight was, of necessity, arbitrary. In grading comminution, small fragments or undisplaced cracks were regarded as slight, whereas butterfly fragments or several displaced fragments were regarded as severe. All the fractures were, by selection, displaced. Those with up to half a diameter displacement were graded as slight, those with more as severe. Comminution and displacement clearly affect healing time; the average time to union in the groups graded as severe was six weeks longer than in the groups graded as slight. Small wounds less than one inch in length were classified as slight. It appears that the degree of compounding has a profound effect on the healing time of the fracture. Even slightly compound wounds had a noticeably delayed union time (25.4 weeks). Only small puncture wounds, compound from within had no effect on union time [18.5 weeks] (Table 2).

Table 3 shows the malnunion, varus deformity less than 14 degree (12.5%) being the most common and valgus over 14 degree found nil.

Table 1: The effect of comminution and displacement on the time to union

Severity of fracture	No.	Time of union (weeks)	Grafted (percent)
Severe comminution	20	25.3	25.0
Slight comminution	15	19.2	18.7
No comminution	45	19.4	56.3
Severe displacement	35	25.2	43.7
Slight displacement	45	18.4	56.3

Table 2: The effect of skin damage on the time to union

Severity of skin damage	No.	Time of union (weeks)	Grafted (%)
Slightly compound	9	25.4	11.3
Compound from within	11	18.5	13.7
Closed fractures	60	19.6	75.0

Table 3: Complications: malunion (n = 80)

Types of malunion	5-14°	Over 14°
Valgus	5(6.25%)	-
Varus	10(12.5%)	1(1.2%)
Medial rotation	2(2.5)	1(1.2%)

DISCUSSION

The orthopaedic literature abounds with reports on the treatment of tibial fractures by various methods. These include rigid plates[7,8], dynamic compression plates[5,9], intramedullary nailing[10,11], locking compression plate and interlocking nails[12], external fixation[13], and various forms of cast bracing.[14-16]. It is not the purpose of this present study to arbitrate between the various factions proposing or justifying any particular form of treatment. They all have advantages and disadvantages. Lengthy reviews already exist for reference[13,17,18]. In our study, all the fractures have united including those regarded as failures of conservative treatment and all the patients are now independently mobile. This series does not confirm the generally held view that fractures of the lower third take longest to unite. It also shows that severe degrees of displacement, comminution and compounding cause significant delay in union. This is to be expected since such fractures are caused by high energy injuries, with associated major soft tissue damage. Tibial fractures are prone to delayed union or non-union[19]. To overcome this, we offered bone grafting for those fractures not united at 16 weeks after injury. Some might have progressed to union with further immobilization, but to predict which would do so is difficult. Our somewhat aggressive policy of bone grafting resulted in these difficult cases uniting at an average of 35 weeks. In fact 93% of the fractures were united by eight months. There has

been no complication from bone grafting and we feel this is a safe and useful procedure which ensures bone union without greatly prolonging the period of immobilization.

Sound bony union is the primary objective in the treatment of tibial fractures. However, the method chosen to obtain union must take into account the soft tissues and must not itself be responsible for a significant number of complications.[20] In this series there was no delayed amputation, no case of chronic osteomyelitis and, most significantly, no complication attributable to operative interference. Post-traumatic stiffness was a problem. One third of the patients had some degree of stiffness affecting one or more joints. One of the patients developed Sudeck's atrophy with marked swelling and stiffness of the foot and ankle. Lack of knee flexion affected function most. We have not found it easy to predict which patients are likely to become stiff. To have a universal policy of internal fixation is to impose upon the majority of patients an operation that, in our opinion, is unnecessary and that has its own potential for complications. The possibility of improved results in the problem cases can hardly be used as a justification to operate on all fractures[21]. However, they do not invariably develop complications when treated conservatively and to superimpose operative trauma onto a severely damaged limb is inviting complications which may result in disaster. Chronic osteomyelitis, skin necrosis and infected non-union of fractures can all occur as a result of internal fixation.

CONCLUSION

The conservative approach with early bone grafting if necessary, is justified as the basic method of treatment. Bony union of all displaced tibial shaft fractures is achieved in a reasonable period of time. Comminuted and open fractures had sound union. Conservative policy is appropriate in underdeveloped countries where orthopaedic facilities might be lacking. Treatment with plaster cast of tibail shaft fractures can be technically difficult and requires considerable skill especially when reduction is indicated. Noting the fact that most patients were young, active and healthy prior to their injury, long-term recumbency in cast treatment and longer follow-up periods could prevent their physically demanding occupations. Therefore, patients must be informed before the treatment selection.

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