



Original Article

Evaluation of Results of Management of type IIIB Open Tibial Shaft Fractures Using Local Fasciocutaneous Flaps in Adults

M R Haque¹, M Q Parvez², F Hamid², M S Islam³

Abstract

Use of local fasciocutaneous flap is gaining popularity as an effective method of treating type III B open tibial shaft fracture in adults. We treated 16 fractures at National Institute of Traumatology and Orthopedic Rehabilitation, Dhaka during the period between March 1993 and December 1994 to evaluate the result of management of type III B open tibial shaft fracture using local fasciocutaneous flaps in adults. Of the 16 tibial fractures the mean healing time was 6.13 months (3.5 to 11 months). The major post operative complications were deep infections (43.75%), non-union (31.25%) and malunion (12.5%). The results were excellent in 18.75%, good in 37.5%, fair in 18.75% and poor in 25% cases. Salvage of the limb should be the primary aim of management of type III B open tibial shaft fracture. We conclude that use of local fasciocutaneous flap is an easy and effective method of management of open type III B tibial shaft fractures.

TAJ 2009; 22(1): 119-122

Introduction

A tibia fibula fracture is the most common diaphysial fracture of the long bones¹. Open fractures of tibia comprise the largest group of casualties in most of the hospitals. The common causes are road traffic accident, sports injury, gunshot and bomb blast injuries. The location of tibia make it exposed to frequent injury. Because one third of its surface is subcutaneous throughout most of its length, open fractures are common in tibia than any other long bones². The classification of open fractures has evolved through the last two decades and has delineated five types.

Type III B open tibial fractures are characterized by extensive soft tissue injury or loss with periosteal stripping and bone exposure³. This is the

most problematic open tibial fracture in terms of both treatment and prognosis. The goals of treatment of open tibial fracture are to prevent infections, achieve bone union and restore function. The results of treatment is largely affected by the initial soft tissue loss, wound contamination, fracture stability and neurovascular status⁴. Since the establishment of National Institute of Traumatology and Orthopedic Rehabilitation Centre at Dhaka, most of the type III B open tibial fractures had been dealt with the traditional method of wound debridement, stabilization of fracture fragments by plaster cast or external fixation devices and delayed wound closure by split thickness skin graft. In sporadic cases, cross leg flap had been used to cover the exposed bone which is distinctly hazardous. In this

¹ Junior Consultant, Department of Orthopedics, General Hospital, Pabna.

² Medical Officer, Department of Orthopedics, General Hospital, Pabna.

³ Asst. Registrar, Department of Orthopedics, General Hospital, Pabna.

study, twenty type III B open tibial fractures were treated using local fasciocutaneous flaps and result was evaluated.

Material and Methods

This prospective study has been carried out at NITOR, Dhaka during the period between March 1993 and December 1994 to evaluate the results of management of type III B open tibial fracture using local fasciocutaneous flaps in adults. During the period, 20 patients were included in the intent to treat group and 16 were evaluated for analysis.

Operative technique:

An open tibial fracture is a surgical emergency. Surgery was performed as soon as the patient's general condition permitted. Once the diagnosis was made of a type III B tibial fracture, definitive treatment was planned. The essential element in the treatment were antibiotic therapy, debridement and irrigation, stabilization of fractures, wound closure using local fasciocutaneous flap and rehabilitation. The knowledge of blood supply of the flap was the most important aspect of dissection technique. Perforating vessels from the three main arteriovenous system pass towards the surface in the intermuscular septa to reach the investing layer of deep fascia forming a plexus from which branches pass superficially to perfuse the skin. The specific blood supply of the flaps are as follows:

a) Proximally based flaps

1. Medial flap-The saphenous artery that enters the leg between the tendon of the sartorius and gracilis muscle.
2. Anterolateral flap-Perforators coming from peroneal vessels along the anterior & posterior border of lateral compartment of leg.

b) Distally based flaps

1. Lateral flap –Two constant perforators arising from peroneal artery at 5-10 cm above the lateral malleolus respectively.
2. Medial flap-Two constant perforator arising from posterior tibial artery at 4cm & 7.5 cm above the medial malleolus respectively.

The operative limb was elevated and supported by pillow for about 48 hours. Parenteral antibiotics were given for 3 days followed by oral antibiotics till stitches were removed. Analgesics were given as and when necessary. The dressing were changed on the next day of operation to see the vascularity of the flap. Quadriceps exercise and active movement of the toes were encouraged as soon as possible. Stitches were removed between 10 to 14 days. Non weight bearing crutch walking was allowed when stable soft tissue coverage was achieved. The fixator was left in place until fracture healing was stable enough as evidenced by clinical and radiological examinations. After removal of the fixator the patients were discharged with long leg plaster cast or a patellar tendon bearing cast. The patients were advised to attend out patient department with the check x-ray of leg including knee and ankle. They were advised to attend every six weeks interval for first six months, then every twelve weeks interval for next one year. The plaster cast was removed when there was definite evidence of bone healing.

Results

Taking help from the article of of two different authors^{5,6} the following criteria were used to evaluate the results. Each criteria was graded A, B or C (table-I).

Table- I: Criteria used in this study to evaluate the result.

| Criteria | A | B | C |
|-----------------------------------|----------------------|------------------------------|---|
| Skin condition | Normal | Slightly discoloured | Ulcer or fistula ;persistent infection |
| Muscle atrophy | 0 to 1 cm | 1 to 2 cm | >2 cm |
| Deformity | None | Slight,not noticeable | Considerable,noticeable, Shortening >2 cm |
| Loss of knee movement | 0 to 10 degree | 10 to 20 degree | >20 degree |
| Loss of ankle movement | 0 to 5 degree | 5 to 10 degree | >10 degree |
| Deep infection | Mild asymptomatic | Moderate | Severe symptomatic |
| Radio graphic evidence of healing | Complete healing | Delayed union | Established nonunion |
| Return to employment | Activities unchanged | Incapacitated for some works | Stopped working because of injury |

Results were classified into excellent, good, fair and poor groups.

- Excellent - All of the criteria of grade A
- Good - All of the criteria of grade B
- Fair - One criteria of grade C and others of grade A or B
- Poor - More than one criteria of grade C

Patients were followed up for a minimum of 6.25 months and maximum of 18.25 months (mean 12.5 months). The mean healing time was 6.13 months (range 3.5 to 11 months). The major post operative complications were – 7 deep infections (43.75%), 5 nonunions (31.25%), 2 malunions (12.5%) and 01 partial flap failure (6.25%). The overall results were excellent in 3 (18.75%) cases, good in 6 (37.5%) cases, fair in 3 (18.75%) cases, poor in 4 (25%) cases (table II).

Table II: Final results

| Result | No. of patients | Percentage (%) |
|-----------|-----------------|----------------|
| Excellent | 3 | 18.75 |
| Good | 6 | 37.50 |
| Fair | 3 | 18.75 |
| Poor | 4 | 25.00 |

Discussion

The best method of treatment for tibial fracture of all types continues to be controversial subject. So far as type III B fractures are concerned, the essential elements in the management are thorough wound debridement, antibiotic therapy, stabilization of fractures, wound closure with local or free flaps and early rehabilitation. These principles have been strictly employed in this series. Adequate debridement and irrigation are the most important steps in the treatment of an open fracture. It must be systemic and complete and later it must be repeated. Treatment with antibiotic although not universally accepted in the past has been well documented in the literature^{7,8,9}. It must be started before debridement and irrigation to prevent sepsis.

In the management of open fractures, achieving fracture stability is as important as debridement and irrigation. It maintains fracture alignment, facilitates care of the wound, preserves integrity of the remaining viable tissue and provides early

rehabilitation. Experimental study by Friedrich and Klaue¹⁰ has shown that stable fixation is a major contributor to prophylaxis against infection. The goal of soft tissue coverage in open fractures are to (a) achieve a safe, early and durable coverage, (b) avoid nosocomial infection and optimize the healing milieu and

(c) facilitate the future reconstruction. In this series we have used local fasciocutaneous flaps to cover the exposed bone. The advantage of these flaps are greater versatility, easier execution and a lesser donor defect. The ultimate objective of rehabilitation is to restore the extremity to the greatest degree of function of which it is capable. It should be initiated as soon as possible and continued throughout the treatment programme. It was observed that the mean healing time was 6.13 months in this series. In a series of 10 cases of type III open tibial fractures reported by Lawyer and Lubbers¹¹ the mean healing time was 8.8 month which was comparable to the present series. In this series major post operative complications were deep infection (43.75%) and non union (31.25%). In a series of 42 type III B open tibial fracture reported by Caudle and Stern¹², the incidence of deep infection 29% and nonunion 43%, which was comparable to the present series.

Conclusion

Salvage of the limb should be the primary aim of management of type III B open tibial fracture. It has been observed that even seemingly bad injury of first look had a fair result on final outcome. The optimum treatment involves appropriate initial evaluation, administration of antibiotics, Urgent wound debridement, skeletal stabilization, flap coverage and early rehabilitation. This intensive treatment helps early functional recovery and an improved clinical outcome for patients who have an open fracture of the tibial shaft.

References

1. Wilson JN, In : Watson-Jones Fractures and joint Injuries, 6th ed, Ed. by Wilson JN, Churchill Livingstone, pp 1093, 1982.
2. Sisk TD : Fractures of lower extremity, In: Campbell's Operative Orthopedics, 7th ed, Ed by Crenshaw AH, St. Louis, C.V. Mosby, pp 1636, 1987.

3. Gustilo RB, Mendoza RM and Williams DN: Problems in the management of type III (severe) open fractures: A new classification of Type III open fractures. J Trauma 1984;24:742-746.
4. O' Meara PM: Management of Open fractures. Orthop Rev 1992;21: 1177-1185.
5. Karlstrom G and Olerud S: Percutaneous pin fixation of open tibial fractures. J Bone Joint Surg 1975;57:915-923.
6. Gustilo RB : Fractures of the tibia and fibula, In: Fractures and dislocations, Ed. by Gustilo RB, Kyle RF and Templeman DC, St. Louis, Mosby-Yearbook Inc. pp901-940, 1993.
7. Patzakis MJ, Harvey JP and Ivler D: The role of antibiotics in the management of open fractures. J Bone Joint Surg 1974;56 : 532-541.
8. Gustilo RB and Anderson JT: Prevention of infection in the treatment of 1025 open fractures of long bones. J Bone Joint Surg 1976;58:453- 458.
9. Patzakis MJ, Wilkins J and Moore TM: Considerations in reducing the infection rate in open tibial fractures. Clin Orthop 1983;178:36-41.
10. Friedrich B and Klaue B: Mechanical stability and post traumatic osteitis; an experimental evaluation of the relationship between infection of bone and internal fixation. Injury 1977; 9: 23-29.
11. Lawyer RB and Lubbers LM: Use of Hoffmann apparatus in the treatment of unstable tibial fractures. J Bone Joint Surg 1980; 62: 1264-1273.
12. Caudle RJ and Stern PJ: Severe open fractures of the tibia. J Bone Joint Surg 1987;69: 801-807.

All correspondence to:
M Reazul Haque
Junior Consultant
Department of Orthopedics
General Hospital, Pabna