

Early Results of Primary Soft Tissue Coverage in Type III A and B open Fractures of Tibia

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Objective: To observe the outcome of primary (early) soft tissue coverage of type III open fractures and develop a safe protocol for these injuries.

Material & Methods: A prospective study of 65 patients suffering from open fractures of tibia Gustilo and Anderson type III A and B, treated with external fixation and primary soft tissue coverage was carried out in the Department of Orthopedic Surgery, Services Hospital, Lahore from February 2004 to June 2006. Motorcycle and automobile vs pedestrian accidents were the commonest cause comprising 90% of the injuries encountered. Strict criteria for inclusion in the study included debridement within 12 hours of injury, no sewage or organic contamination and absence of peripheral vascular disease. Poly-trauma patients were excluded. In all patients radical debridement and stabilization with mono-lateral AO external fixator was done within 12 hours, followed by primary soft tissue coverage.

Results: At mean follow-up of 9 months (7-11), the outcome was excellent in 86.7%, good in 6.4% and poor in 6.9%. A total of 16 complications occurred in 12 patients; superficial infections occurred in 09, deep infections in 05 and 02 patients developed non-union requiring further surgery.

Conclusion: Primary soft tissue coverage with the above indications optimizes the recovery of the patients in terms of lesser soft tissue infections and bone non-union due to chronic osteomyelitis.

Key Words: Chronic osteomyelitis, soft tissue coverage, open fractures of tibia

Introduction

Debate continues on the timing of closure in open fractures in Gustilo and Anderson type III injuries.¹⁻³ The commonest practice of leaving wound open after debridement^{4,5} was based on the experience of war wounds during a time when antibiotics and principles of surgical debridement were not fully developed and the techniques for proper soft tissue coverage had not been established.^{6,7} With the availability of potent antibiotics and refinement in techniques of debridement surgeons have advanced towards early closure of wound.^{1-3,6-10}

Fifteen years ago, 20% poly-trauma patients requiring surgery the world over, died from wound infection; those who survived, had significant morbidity.⁴ However, with recent advances in the line of treatment and availability of a wide spectrum of antibiotics, mortality is almost negligible, but morbidity is still prevalent if soft tissue coverage to the exposed bone is not applied timely.

Ger was one of the first advocates of early muscle transfer in open tibial fractures associated with soft tissue loss.¹¹ During the past two decades, muscles and fascio-cutaneous flaps have gained a lot of popularity and have been used with increasing

frequency to solve the problems of wounds in open tibial fractures. Since we belong to a third world country where trauma is increasing every day, type III A and B Gustilo and Anderson open fractures are quite common. This prompted us to carry out a prospective study to observe the outcome of primary (early) soft tissue coverage of type III open fractures and develop a safe protocol for these injuries.

Material and Methods

A total of 65 patients suffering from type III A and B Gustilo and Anderson open fractures of tibia were treated with local rotational skin and muscle flaps (gastrocnemius, soleus and peroneal), after radical debridement and stabilization with AO mono-lateral external fixators in Orthopaedic Surgery Department at Services Hospital, Lahore from February 2004 to June 2006. There were 49 male and 16 female patients, the age of the patients ranged from 05 to 45 years (mean age 22 years). Most of the patients were admitted through Accident and Emergency Department.

Inclusion criteria

1. Debridement within 12 hours of injury

2.Type 3A and B (Gustilo and Anderson) open tibial fractures with skin defect

Exclusion Criteria

1. No sewage contamination
2. No organic contamination
3. Absence of peripheral vascular disease
4. Poly-trauma patients
5. Late presentation 12 hours after injury
6. Adverse local soft tissue conditions

All patients underwent a pre-operative assessment of local muscle and skin conditions. In the operation theatre after draping the limb, deep samples from wound for culture and sensitivity (c/s) were obtained. After radical debridement, wound was washed with 5- 6 liters of normal saline and fractures were stabilized with mono-lateral AO external fixator. Wounds were covered with aseptic dressings. Wound debridement on 2nd and 3rd day was carried out to remove any dead or necrotic tissue. All the flaps were done meticulously within 1st week of the trauma and no tissue tension was accepted at the end of the procedure. There were 28 gastrocnemius, 12 soleus, 03 peroneus and 22 fascio-cutaneous flaps. A suction drain was placed at the site of the donor area. Delayed skin grafting was done in 19 patients, while primary skin grafting was done in 06 patients having muscle flaps. All the patients were given anti-tetanus prophylaxis and put on 2nd generation cephalo- sporins in post-operative period till c/s report was obtained. Subsequently patients received antibiotics according to c/s report for 7-10 days. Patients were evaluated as Excellent (which had no superficial wound infection or deep wound infections and there was no non-union of the fracture and ankle movements were full range), Good (which had superficial wound infection but there was no deep wound infection or non union of fracture and ankle movements were restricted, planter flexion decreased by 20 degrees) and Poor (signified by presence of superficial and deep wound infections and non-union and compromised limb function due to marked reduction in ankle movements).

Results

All patients were hospitalized for an average period of three weeks. The average duration of follow-up was up to 06 months (five to nine months). Out of 43 muscle flaps, 39 flaps showed complete recovery while 4 flaps showed partial recovery (margins of flaps became necrotic). Out of 22 fascio-cutaneous flaps, 18 flaps showed complete recovery while 4

Table 1: Comparison of complete/partial recovery of flaps showed partial recovery of flaps in 86.7%. A patients after muscle and fascio-cutaneous flaps

	Muscle flaps (43)	Fascio-cutaneous (22)
Complete recovery	39 (90.7%)	18 (81.8%)
Partial recovery	04 (9.3%)	04 (18.2%)

patients, good results were in 6.4% patients and poor results were in 6.9% patients. Non-union of tibia was in 6.9% patients.

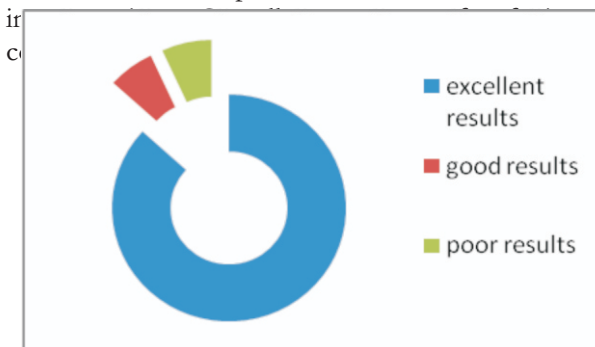
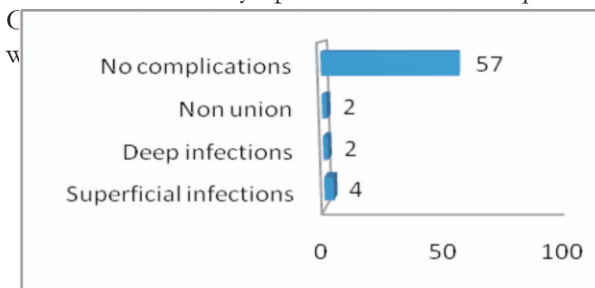


Figure 1: A donut chart showing excellent, good and poor results.

Four cases of muscle flaps showed leg odema, which settled subsequently. The ankle movements were reasonably good in majority of patients; there was no problem of skin and soft tissue at donor site or distal to it, except a long scar at the postero-medial aspect of leg which was hypertrophied in 05 cases. In 04 patients, flap margins became necrotic and there was scanty discharge which settled with normal saline dressings and antibiotics.

In 04 patients of primary grafting there was 50% take up of split skin grafting (SSG).

In all patients of secondary skin grafting, the uptake of graft was more than 80%. There was no major problem with fascio-cutaneous flaps, those flaps having partial recovery improved with saline dressing and no secondary procedure was required.



Discussion

The higher rate of complications seen in open fractures of tibia in terms of acute infections, chronic osteomyelitis, non-union and even amputations has been documented by Behrens.¹² The Gustilo and Anderson system of classification of open tibial fractures has shown a prognostic value regarding the outcome of treatment in terms of infection and non-union.

It is generally accepted that tissues surrounding the bone play an important role in healing of bone.¹³ There are various methods of coverage of soft tissue defects including fascio-cutaneous, myo-cutaneous and free muscle flaps.¹⁴

Muscle flaps have proved to be excellent for the coverage of exposed tibia.¹⁴⁻¹⁷

In our study fascio-cutaneous and pedicle (gastrocnemius, soleus and peroneus) muscle flaps were used; all the fractures were stabilized with mono-lateral AO external fixators and early soft tissue coverage and bone union was achieved in majority of cases.

There was marked reduction in the rates of infection, non-union, duration of hospitalization and number of procedures performed and less financial burden when soft tissue coverage was performed within ten days. Our findings were similar to those noted by Caudle, Stern and Mathes et al.^{7,18}

The rate of complications was higher in patients

when soft tissue coverage was performed 05 to 06 weeks after the injury, a finding consistent with Bryd et al.¹⁵ The reason for the high rate of infections in procedures done after 05 weeks of injury is probably due to a change in biology of the wound because of contamination by bacterial colonization which takes place in 02 weeks.

Fascio-cutaneous and muscle flaps provide a stable, pliable and non-adhesive coverage to the bone which makes subsequent procedures easy. The possible reasons for partial fascio-cutaneous and muscle flaps necrosis in this study were poor native conditions, too much tension at the donor site, too much tension at the flap site and excessive severance of skin and muscle feeders. Non-union of tibia in two patients was as a result of chronic osteomyelitis, which was treated by conversion of mono-lateral fixator to AO compression fixator. Union did take place in 09 months time in both cases.

Conclusion

We conclude that early soft tissue coverage to the exposed bone within 02 weeks of open fracture has low rates of infection, shorter hospital stay, less financial burden and early rehabilitation of the patients.

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