

Original Research Article

Flaps in the management of open tibial fractures

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ABSTRACT

Background: The prognosis in open fractures is primarily determined by the amount of soft tissue loss and the level of contamination. Severe open tibial fractures usually require combined orthoplastic approach in the management. Our aim is to study the effectiveness of soft tissue flaps in the management of type III B open tibial fractures.

Methods: The study material consists of 20 cases of grade III B open tibial fractures admitted in our institution. Under anaesthesia, wound debridement was done and fracture stabilised with external fixator or IM nail depending upon the wound status. Patient underwent flap cover once the wound was fit. Periodic follow up was done.

Results: Nonunion occurred in one patient (5%). Chronic osteomyelitis developed in two patients (10%). Deep infection occurred in three cases (15%). There was no secondary amputation in our series. The average union time of fracture was 30.1 weeks. Lower third fractures and those patients with extensive soft tissue injury, delayed flap cover and flap failure had longer union time.

Conclusions: Fasciocutaneous flap has definitive role in the management of type III B open tibial fractures with soft tissue loss.

Keywords: Open fractures, Tibia, Flap cover

INTRODUCTION

Open fractures of the tibia are exceedingly common injuries due to increasing high velocity road traffic accident. An open fracture with extensive soft tissue loss still remains one of the challenging problem in trauma surgery. The prognosis in open fractures is primarily determined by the amount of soft tissue loss and the level of contamination rather than the configuration of fracture itself. Soft tissue loss will decrease the vascularity at the fracture site and also it will decide the method of fracture stabilization. Infection also common in open fractures because the fracture site is exposed to external environment and also the devitalized tissue acts as a medium for bacterial growth. Gustilo Anderson type III B fracture has severe soft tissue loss with exposed bone and usually they require soft tissue flap cover.^{1,2} So severe

open tibial fractures usually requires combined orthoplastic approach in the management. After stabilizing the fracture, soft tissue cover can be given by local flap, fasciocutaneous flap, muscle flap or distant microvascular flap. Early soft tissue cover will enhance fracture healing by increasing the vascularity at the fracture site, controlling the infection and also it allows early definitive fixation of the fracture.

Fasciocutaneous flaps are simple and effective in providing soft tissue cover for type III B open fractures.^{3,4}

Our aim is to study the effectiveness of soft tissue flap in type III B open tibial fractures in terms of covering the exposed bone, duration of hospital stay, union time, and the incidence of complications like nonunion, deep infection, chronic osteomyelitis, secondary amputation.⁵

METHODS

The study material consists of 20 cases of grade III B open tibial fractures (classified according to modified Gustilo Anderson classification) admitted in Coimbatore Medical College Hospital, Coimbatore between January 2017 to September 2018.^{1,2} Both males and females, age ranging from 12 years to 55 years were included in our study. We have not included type I, II, III A open fractures which does not require flap cover and type III C fractures which require additional vascular repair. The fractures were classified at the time of debridement under anesthesia. Special attention was given to soft tissue loss and wound contamination. Those open fractures with Mangled Extremity Severity Score⁶ of more than 7 were excluded from study and they were amputated primarily.

As most of the open tibial fractures are due to high velocity RTA, we first addressed the Airway, Breathing and Circulation. Bleeding was controlled by compression bandage and limb elevation. Antibiotics were given to combat all spectrum of organism. The wound was thoroughly washed with normal saline in emergency room itself. Once the general condition of the patient was stable, radical wound debridement was done under anaesthesia. The fracture was reduced to anatomical position and stabilized. Single plane half pin external fixator was commonly used to stabilize the fracture (Figure 1). Non reamed intramedullary nail was used in cases of very clean wound after debridement (Figure 2).⁷

Plate and screws were used in few cases without further damaging the soft tissue.

The wound was inspected 24 to 48 hours after debridement. If the wound was not clean, redebridement was done. Once the patient's general condition improved and the wound was relatively clean, soft tissue coverage procedure was done to cover the fracture site. Local fasciocutaneous flap was done in most of the cases after marking the perforators site with doppler. Local muscle flap was done in few cases. Whenever the donor area was not available in the same limb, we did cross leg flap or dorsalis pedis flap.⁸ The donor area was covered with split skin graft.

Once the flap was taken up well and wound healed well without infection (2 to 4 weeks) the external fixator was removed and intramedullary nailing or casting was done depending upon the wound status. Between 6 to 8 weeks when early callus was evident in X-ray, partial weight bearing was allowed.

Follow up was done at regular intervals of 4 weeks. During follow up, the fracture site was examined clinico-radiologically for evidence of union. The complication of open fractures like nonunion, deep infection, osteomyelitis and functionless limb requiring secondary amputation were looked for and noted. Follow-up was done up to union or established nonunion. Follow up was done for a minimum period of eight months to maximum up to 18 months.

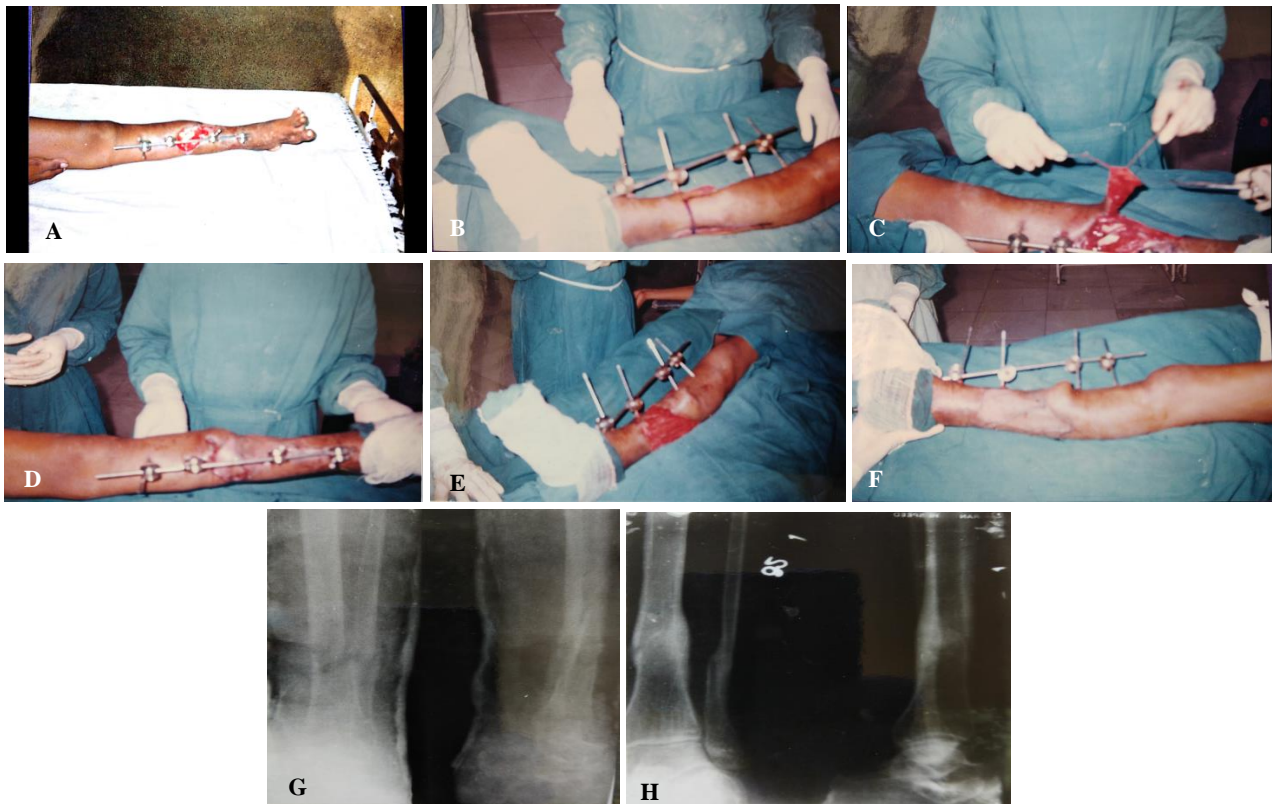


Figure 1: (A-F) Steps in fasciocutaneous flap cover in type III B open tibial fracture on external fixator; (G, H) Follow up x-rays showing fracture union.



Figure 2: (A-C) Primary intramedullary nailing and flap cover for type III B open tibial fracture; (D, E) follow up X-rays showing fracture union.

RESULTS

In our study most of the patients were between 21 to 40 years of age with average age of 30 years. 85% of them were males and 15% were females.

85% of them sustained injury by road traffic accidents, 10% by fall and 5% injured because of wall collapse.

60% fracture located in the middle third of leg followed by lower third of leg 25% and upper third of leg 15%.

60% had comminuted fracture and remaining 40% had either transverse or oblique fracture.

45% patient had initial external fixator later converted to intramedullary nail (25%), POP casting (20%) and 35% had primary intra medullary nail stabilization at the same time of debridement. 20% had primary plate and screw stabilization.

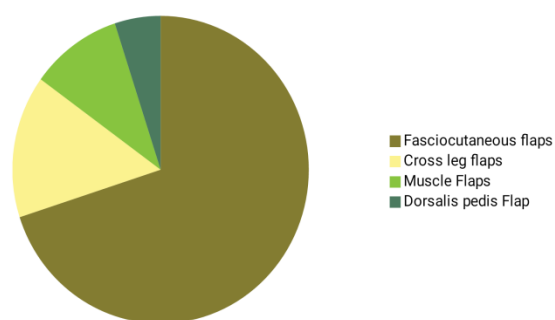


Figure 3: Types of flaps done in our study.

In our study local fasciocutaneous flap was used in 70% of cases. Cross leg flap was used in 15% of cases of lower third fractures. Muscle flap was used in 10% of cases. Dorsalis pedis flap was used in one case(5%) (Figure 3).

Table 1: Comparison of results in various series treated with flaps.

Results	Our study	Wiss ¹¹	Fischer ⁹	Moda ¹²
Timing of Flap	5-30 days	1--42 days	Early Delayed	Early
Deep infection	15%	3%	18%. 83%	Nil
Osteomyelitis	10%	Nil	9%. 53%	Nil
Nonunion	5%	33%	-. -	Nil
Amputation	Nil	Nil	9%. Nil	Nil
Hospital stay (weeks)	5 wk	-	5.5 wk. 11 wk	3.5 wk
Union time (weeks)	30.1 wk	50 wk	53 wk. 90 wk	23.4 wk

The average duration of hospital stay was 35 days. It ranged from 15 days to 60 days.

The average union time of fracture except one case of non union was 30.1 weeks. It ranged from 22 weeks to 44 weeks.

Nonunion occurred in one patient (5%), chronic osteomyelitis developed in two patients (10%) and both the patients had developed partial flap loss (10%). Deep infection occurred in three cases (15%). There were no secondary amputation in our series (Figure 4).

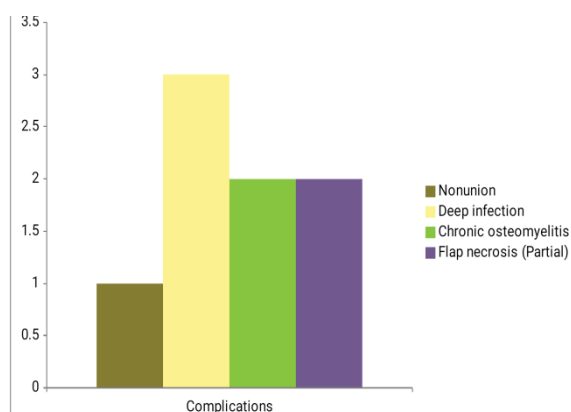


Figure 4: Complications occurred in our study.

DISCUSSION

In our study fasciocutaneous flap was used in 85% of cases. There were two partial flap loss in our study (10%). In a study by Fischer free muscle flap was done in 50% of cases while local muscle flap was done in 50% of cases.⁹ Flap failure rate was 17%. In another study by Cole fasciocutaneous flap was done in all patients, out of which 4% had flap failure.¹⁰

In our study six major complications occurred in 5 patients. The rest of the 15 patients (75%) did not have any complications. Nonunion occurred in one patient (5%), chronic osteomyelitis developed in two patients (10%) and both patients had developed partial flap loss. Deep infection occurred in three cases (15%). There were no secondary amputation in our series.

In our series average duration of hospital stay was 35 days. It ranged from 15 days to 60 days. Those patients with complications stayed longer. Those patients who had earlier flap cover and primary nailing had less hospital stay.

In our series the average union time of fracture except one case of non union was 30.1 weeks. It ranged from 22 weeks to 44 weeks. Lower third fractures and those patients with extensive soft tissue injury, delayed flap cover and flap failure had longer union time.

In a study series conducted by Wiss et al noted 3% deep infection and 33% nonunion.¹¹ The average union time in their study was 50 weeks (Table 1).

Fischer et al noted that the incidence of deep infection and osteomyelitis was high when flap cover was delayed.⁹ The incidence of osteomyelitis was 53% when flap cover was delayed and it was only 9% in early flap cover cases. Union time was also more for delayed flap cover cases.

In a study series conducted by Moda et al early fasciocutaneous flap cover was done in all cases and all of them had good outcome results.¹² There was no case of

deep infection, osteomyelitis and nonunion. The average union time was 23.4 weeks in their study.

There is no entirely identical two series in literature. The method of initial treatment, use of antibiotics, the method of fracture stabilization, the type of flap cover and the timing of flap cover vary in different study series. Even though two different study series may be dealing with only type III B open tibial fracture, the cases in each series are not having the same amount of injury and they are not located in the same site in tibia. This should be kept in mind while comparing different study series.

The hospital stay, union time and incidence of complications varied in different series. Those series with early flap cover and early definitive fixation of fracture had less complications, less hospital stay and early union of fractures.

CONCLUSION

From our study, we conclude that fasciocutaneous flap has definitive role in the management of type III B open fractures with soft tissue loss. Early flap cover establishes vascularity at the fracture site and achieves early union of fractures with less complications.

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Ethical approval: Not required

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