

Outcome of immediate primary skin closure in type-II and type-IIIA open tibial fractures

Muhammad Usman Ul Haq, Faisal Nazeer Hussain, Muhammad Iqbal

Department of Orthopedics, Services Hospital, Avicenna Medical College and Fatima Jinnah Medical College, Lahore, Pakistan

Objective: To determine outcome of immediate primary skin closure in type II and IIIA open tibial fractures in terms of infection rate.

Methodology: This descriptive study was conducted at Orthopedic Department, Services Hospital, Lahore from November 2009 to August 2010. One hundred patients were recruited in the study.

Results: The mean age was 30.23 ± 15.07 years. Of the 100 patients, there were 20 Type II fractures and 68 type IIIA fractures. 88 had an

excellent outcome; males with excellent outcome were 83 and females were 5 with male to female ratio 16.6:1. Four had good outcome and 8 had a poor outcome.

Conclusion: Immediate primary skin closure for Type II and Type IIIA open tibial fractures is safe option, as it avoids infection and many complications. (Rawal Med J 2014;39: 285-288).

Key words: Open tibial fractures, primary skin closure, primary wound healing.

INTRODUCTION

Open fractures remain one of the true orthopedic emergencies and was thought of as an incomplete amputation.^{1,2} It is defined as a fracture in which there is break in the skin and underlying soft tissues that communicates with the fracture and its hematoma.³ Men are more commonly affected than women with male to female incidence of about 41 and 12 per 100,000 per year respectively and the mean age of presentation is 38 year.^{4,5} Among the most common and devastating complications of an open fracture is infection. Factors contributing to tibial osteomyelitis are relative lack of muscle coverage, the tendency of tibia to become exposed widely in open fractures, and lack of an anastomotic blood supply in lower leg.^{6,7}

Infection ranges from 0-2% for type I, 2-10% for type II and 10-50% for type III open tibial fractures.⁸ The management of open tibial fractures has evolved over time introducing many techniques.⁹ Soft tissue management is the most important factor in determining the outcome of open tibial fractures like fracture healing and functional restoration of the limb.^{8,10} Soft tissues may be managed either by primary closure, delayed primary closure, open technique with secondary healing or by employing grafts and flaps.^{9,11}

The practice of leaving wound open after

debridement and external fixation was based on the experience of war wounds during a period when antibiotics were less readily available, the principles of surgical debridement were not fully developed, and the techniques for proper soft tissue reconstruction had not been established.¹¹ In the last decade, success has been achieved after early primary wound closure, after adequate wound care and fracture stabilization.²⁰ According to some studies, 95% patients show good primary wound healing without any complications with 100% success with type I and 60% with type II fractures.¹²⁻¹⁴

Benefits of primary skin closure include prevention of infection, limitation of soft tissue defects, achievement of bony union, functional rehabilitation with limb salvage, decreased requirement for repeat debridement and soft tissue procedures, better postoperative results, prevention of extensive fibrosis, minimized surgical morbidity, hospital stay and smaller economic burden.^{11,15-17} The goals of wound coverage are to prevent desiccation of tissue, optimize antibiotic delivery, optimize patient comfort, decrease exposure of deeper tissues and seal the wound from external environment.⁸ Rate of superficial infection with primary closure is only 10.9%.¹⁵ Deep infection rates is about 13% and of pain tract infection is about 10%.¹⁸ The purpose of

this study was to determine the outcome of immediate primary skin closure in type II and type IIIA open tibial fractures in order to adopt better treatment option in our setup.

METHODOLOGY

This descriptive study was conducted at Orthopedic Department, Services Hospital, Lahore from November 2009 to August 2010 and included 100 patients with open type II & IIIA tibial fracture. Wounds were fairly clean, and not have occurred in a highly contaminated environment with intact circulation and nerve supply, within 8 hour of injury. Patients had satisfactory general condition and without multisystem injuries and were prospectively recruited from emergency department. The effect modifiers like age and type of fracture were controlled through stratification. Institutional Review Board approval was taken and patients were requested to sign informed consent.

All the patients were given tetanus prophylaxis and cephadrine 1gm antibiotic along with gentamycin. Debridement was done after taking swab for culture under spinal anesthesia. Tourniquet was used. Gross superficial contaminants were removed. Wounds were irrigated with 6 liters of saline to remove debris. Debridement was done in layers removing all the dead tissue. Dead muscles were removed up till appearance of healthy bleeding muscle. Any small bone pieces, which became denuded were removed. Devitalized skin margins were removed. Wounds were closed primarily with suction drain by a single surgical team within 8 hours of primary injury. No relaxing incisions were used.

Postoperatively, first generation cephalosporin & an aminoglycoside were given IV initially in all patients and switched to oral cephalosporin when condition improved. Antibiotics were continued for ten to twelve days. Wound condition was assessed on 1st, 2nd and 12th day. Stitches were removed at 12th day. When infection appeared, antibiotics were changed according to culture and sensitivity and continued till infection resolved. The choice of implant for stabilization reflected the fracture pattern with consideration of site of injury and age of patient. Data were analyzed using SPSS version

11. Frequencies and percentages were calculated for qualitative variables like sex and outcome (excellent wound healing).

RESULTS

Of 100 patients, mean age was 31.3 ± 2.57 years, with younger patient being 10 years of age and oldest being 70 (Table 1). 95 (95%) patients were male. Type II fracture was seen in 24 patients and Type IIIA in 76 patients.

Table 1. Age distribution of study population.

Age	Number (%)	Mean \pm SD
Upto 20 years	35 (35%)	16.77 \pm 2.526
21-40 years	43 (43%)	28.21 \pm 4.044
41-60 years	19 (19%)	52.3 \pm 5.302
More than 60 years	3(3%)	68.33 \pm 4.157
Overall	100 (100%)	30.23 \pm 15.07

Of 100 patients, 88 (88%) had an excellent outcome with wounds epithelializing normally with no signs and symptoms of wound infection and the skin edges being well approximated 4 (4%) had a good outcome with wound showing marginal necrosis but complete recovery without intervention and 4 (8%) had poor outcome with wound infection requiring secondary debridement with or without secondary coverage. Out of 88e patients with excellent outcome, Type II fractures were in 20 (22.7%) and type IIIA fractures in 68 (77.2%) patients.

Table 2. Outcome according to fracture type.

Outcome	Number (%)	
	Type II	Type III A
Excellent	20 (83.33%)	68 (89.47%)
Good	4 (16.67%)	0
Poor	0	8 (10.52%)

Male patients with excellent outcome were 83 (94.3%) and female patients were 5 (5.6 %) with male to female ratio of 16.6:1. All the patients with good outcome (4) had Type II fracture and all the patients with poor outcome (8) had Type III-A fracture.

No patient developed gas gangrene or compartment syndrome. There was no mortality. The presence of

bleeding from wound margins which could be opposed without tension was found to be more important than the nature, size of wound or fixation method. The patients in poor outcome showed wound dehiscence with necrosis of skin edges requiring redebridement performed within one week followed by daily dressing and latter on skin cover. No bony infection was observed in these consecutive patients as external fixation was done in all these cases and patients were mobilized with crutches.

DISCUSSION

Recently the traditional concept that wounds in open fractures must be left open at the initial surgery has been challenged. The suggestion that primary closure may lead to an increased rate of infection seems, however, inappropriate since there is growing evidence that most acute infections after open injuries are the result of pathogens acquired in the hospital rather than from the site of injury.

In a follow up of 173 patients for 6.2 years, 150(86.7%) had excellent outcome, 11(6.4%) a good outcome and 12(6.9%) a poor outcome.²⁰ The patients with excellent outcome had type A or type B wounds with type A wound had characteristics such as wounds epithelializing normally with no signs and symptoms of wound infection and the skin edges being well approximated.²⁰ The patients with poor outcome had type D wound with wound dehiscence requiring flap cover.²⁰ In our study, 88% had excellent outcome, 4% had good outcome and 8% had poor outcome. DeLong et al. reported a 7% deep wound infection rate in open fractures, which were managed aggressively.²¹ A study in children reported an infection rate of 7.8% with primary closure compared with 14.6% with secondary closure.²² In our study infection rate was found out to be 12% after primary closure.

Henley and Chapman reported a deep infection rate of 4% in type II open fractures and 10% in type IIIA open fractures, which were fixed with an unreamed solid interlocking nail.²³ In our study, surgical site infection rate (superficial) for type II fracture was 4% and for type IIIA it was 8%. Criteria for patient selection included early debridement, no organic

contamination, minimal or no skin loss either primarily or secondarily during debridement, bleeding skin margins, wound edges approximation without tension and the absence of peripheral vascular disease.

In our study, we followed strict indications, extensions of wound for proper debridement was done in longitudinal direction to avoid jeopardizing closure. Care was taken to avoid creating a dead space so that no collection takes place which might form a nidus for infection as well as fractures were immobilized which is an important adjunct to healing of soft tissues.

CONCLUSION

Immediate primary skin closure for Type II and Type IIIA open tibial fractures was a safe option after thorough debridement, as it prevented the emergence of hospital acquired bacterial infections, results in shorter hospital stay, early return to activity, better scar and is cost effective.

Author contributions:

Conception and design: Usman UI Haq
Collection and assembly of data: Usman UI Haq
Analysis and interpretation of the data: Muhammad Iqbal Mirza
Drafting of the article: Faisal Nazeer Hussain
Critical revision of the article for important intellectual content: Faisal Nazeer Hussain
Statistical expertise: Muhammad Iqbal Mirza
Final approval and guarantor of the article: Usman UI Haq
Corresponding Author email: usmanulhaq884@gmail.com
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