

An audit on open tibia fracture management at a tertiary level ortho-plastic center in Sri Lanka: are we following current guidelines?

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Abstract

Introduction

Despite the availability of guidelines for the surgical management of open tibia fractures set out by developed countries, the adherence of the surgical teams to current recommendations is explored sparsely in resource-poor surgical settings. Here, we report current practice and ortho-plastic care gaps at managing open tibia fractures at the National Hospital of Sri Lanka [NHSL].

Methods

An audit was conducted on patients with open tibia fractures presenting to the NHSL. We explored if the ortho-plastic management practices adhere to the recommendations of the standard international guidelines.

Results

Thirty patients with compound fractures of the tibia were analyzed. The majority [n=12, 40%] had Gustilo-Anderson type 2 injuries. The median time of presentation from the injury was 2h [IQR=2.5h]. Only 50% of the patients received the first dose of antibiotics within three hours of injury. Initial wound debridement was conducted after a median time of 4.5h [IQR=2.2h] after admission. Only 16.6% of procedures liaised with the plastic surgical team. The median flap cover time was 10 [IQR=4] days. None of the patients underwent simultaneous internal fixation and soft tissue cover by orthopaedic interventions.

Conclusions

Timely antibiotic prophylaxis for open tibia fractures was achieved only in 50% of the patients due to late presentation. There were divergences from the current recommendations in the timing of soft tissue debridement and simultaneous ortho-plastic interventions, probably due to limited facilities, theatre time and relatively high patient load. We recommend strengthening ortho-plastic approaches and developing

national guidelines for open tibia fracture management which could help improve surgical outcomes.

Introduction

Open tibia fractures represent the commonest long bone fractures [1] with a reported global incidence ranging from 8.1 to 37.0 per 100 000 patients [2, 3]. Significant mortality and long-term morbidity are associated with open fractures of the tibia in patients with polytrauma [4], making surgical management challenging.

Several professional bodies in the developed countries have set forth guidelines for the management of open fractures of the tibia to optimize surgical management and improve postoperative outcomes. The British Orthopaedic Association [BOA] and the British Association of Plastic, Reconstructive and Aesthetic Surgeons [BAPRAS] published joint standards for the management of open fractures of the lower limb in 2009 [5, 6] which emphasized the importance of timely multidisciplinary management of open fractures to enable optimum recovery and minimize the risk of infection. In 2016 the national institute for health and care excellence [NICE] published 'newer NICE Complex Fractures: Assessment and Management guidelines', which aimed to minimize mortality and long-term morbidity by improving the quality of open fracture management at emergency units [7].

Despite widespread awareness of these guidelines and emphasis of their importance in orthopaedic and plastic surgery, the level of adherence to these protocols in developing countries is reported to be highly variable, mostly related to fracture stabilization, antibiotic prophylaxis and flap coverage [8]. The deviations from the recommended practice could be partly attributed to a lack of awareness among surgeons [8], hence regular audits to evaluate patterns of orthopaedic management in local settings are recommended. To our knowledge, there are no published audits on the management of open tibia fractures in Sri Lanka to date. Here, we report the results of an audit in a designated trauma centre in Sri Lanka with established orthopaedic and plastic surgical units, to provide insight into the current practice and ortho-plastic care gaps at managing open tibia fractures.

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Methods

This audit was conducted on patients with open fractures of the tibia admitted to accidents and orthopaedic service, National Hospital of Sri Lanka [NHSL] between 2019 July to 2020 July. Patients with multiple life-threatening injuries which affected the timing of open fracture management were excluded from the analysis. Details on patient demographics, type of injury, Gustilo-Anderson classification, initial assessment and treatments offered, the timing of initial debridement, involvement of the plastic surgical team, timing to soft tissue cover and antibiotic administration were obtained from medical notes and theatre records. Data from the initial survey were critically analysed against the published BOA/BAPRAS guidelines for the management of open fracture in view of identifying any deficiencies in management and possible areas of improvement.

Statistical analysis

Categorical data were presented as frequency and percentages while continuous data were reported as median and interquartile range unless otherwise specified. Mann Whitney U test was used to compare continuous data. Data analysis was conducted using SPSS version 27 at a significant level of 0.05.

Results

Thirty patients were analysed in this study. Of them, 19 were direct admissions to the NHSL while 11 were transferred from other hospitals. The male to female ratio was 10:3. The median age was 38 [IQR=30] years. All had compound fractures of the tibia and fibula. Additionally, one patella, one calcaneal and two closed femur fractures were present. The majority had right-sided fractures [n=21, 70%]. The frequencies of Gustilo-Anderson types 1, 2 and 3 injuries were 11 [37%], 12 [40%] and 7 [23%] respectively.

The visual inspections and normality tests of main variables showed that the data were not normally distributed [Supplementary Table 1]. The median time of presentation from the injury was 2h [IQR=2.5h]. This was significantly higher for those who were transferred [median=3h, IQR=2.5 h] as opposed to direct admissions to the NHSL [median=1h, IQR=1.3 h] [U=176.5, p=0.002]. The initial assessment was done by the attending registrar in 28 cases while the rest [n=2] were done by a medical officer. Initial photographs were taken in 8 [27%] patients on admission. Tetanus toxoid and intravenous cefuroxime were administered to everyone. Also, gentamycin was started on 9 patients. Fifty percent [n=15] of the patients received the first dose of antibiotic within three hours of injury while 11 [16.7%] received antibiotics within one hour of injury. Initial wound toilet with or without definitive surgery was conducted after a median time of 4.5h [IQR=2.2h] after admission, with a median duration of 7h

[IQR=4h] from injury to the initial treatment. The duration of injury to treatment was significantly higher in patients who were transferred from regional hospitals [median=7h, IQR=4.5 h] compared to direct admissions [median=6h, IQR=3.5 h] [U=160.5, p=0.014]. Nonetheless, there was no statistically significant difference in the duration between presentation and initial treatment of those who were admitted directly or transferred from regional hospitals [U=128.5, p=0.307]. However, all patients [100%] had initial surgical intervention done within the first 24 hours of injury. During the initial debridement external fixation, internal fixation and plaster of Paris [POP] cast application was performed in 13, 8 and 9 patients, respectively. None of the patients underwent simultaneous internal fixation and soft tissue cover by ortho-plastic interventions. The median time of definitive surgery after the initial injury for flaps was 10 [IQR=4] days. The median duration for exchange external fixation or POP to reamed tibia nails was 8.5 [IQR=4] days. Overall, ortho-plastic interventions were done in 5 [16.67%] patients. Seven patients were decided to be managed conservatively.

The median duration of hospital stay of the patients who underwent definitive surgery or plastic interventions [n=23] during initial admission was 16 [IQR=5] days.

Discussion

Sri Lankan primary healthcare system has been internationally recognized as a leading and highly cost-effective model among the developing countries [9]. Nonetheless, the state sector faces substantial difficulties in providing specialized healthcare facilities due to the lack of resources and heavy patient load. This audit reports current practices in the management of open tibia fractures in the National Hospital of Sri Lanka with an emphasis on potential avenues to improve ortho-plastic healthcare delivery.

Compared to developed countries, we report a considerable delay in the presentation of the patients after compound fracture of the tibia in Sri Lanka [median=2h, IQR=2.5h]. Therefore, only 50% of patients received prophylactic antibiotics within 3 hours of injury. Although there was a significant delay in the presentation of transferred patients compared to direct admissions, all received the initial dose of prophylactic antibiotics before the transfer. Antibiotic prophylaxis is considered the single most important intervention to prevent secondary infections at the injury site, thus guidelines recommend administering broad-spectrum antibiotics as soon as possible following the injury, at least within 3 h [6]. Current recommendations are to use either intravenous co-amoxiclav 1.2g 8-hourly or a cephalosporin such as cefuroxime 1.5g 8-hourly as prophylaxis, gentamicin 1.5 mg/kg at the time of debridement and gentamicin 1.5 mg/kg and either vancomycin 1 g or teicoplanin 800 mg on

induction of anaesthesia at the time of skeletal stabilization with or without soft tissue cover. [6] In line with these standards, all patients in our study sample received cefuroxime prophylaxis. Also, some patients who had highly contaminated wounds received a single dose of gentamycin during the initial assessment. Rupp et al. advocated the use of additional gram-negative antibiotic coverage for Gustilo-Anderson type III fractures and high dose penicillin prophylaxis if faecal or clostridia contamination is suspected [10]. However, prophylaxis with piperacillin/tazobactam showed no inferior results compared to the combined use of cephalosporin and gentamicin for Gustilo-Anderson type III open fractures with regard to surgical site infections after 30 days, fracture non-union, re-hospitalization rates or deaths at one year [11].

The majority of the patients underwent initial debridement within 12 hours irrespective of the mechanism of injury or time of the admission to the hospital. Guidelines advocate to practice early but proper and extensive initial debridement in an elective trauma list once experienced orthopaedic and plastic surgeons are available, because of avoiding repeated debridement as it found to increase risk of infections [12]. We found that the majority of the initial wound debridement was performed by a speciality training orthopaedic registrar or a medical officer while only 16.6% of procedures liaised with the plastic surgical team. This practice is suboptimal as current guidelines encourage performing initial debridement with the involvement of both orthopaedic and plastic surgeons [6]. This, most likely, could have been a result of heavy patient burden and limited theatre time which is universally observed in developing countries. Nonetheless, this practice is consistent with the findings of other similar research conducted in the developed countries [13, 14].

The optimal timing of soft tissue cover has been debated over the last few decades [15, 16]. Performing flap cover for open tibia fractures early as possible, at least within 7 days, may help minimize complications [17]. In contrast, we report an average flap cover time of 12.5 days after the injury. None of the patients underwent simultaneous internal fixation and soft tissue cover by ortho-plastic intervention, instead, internal fixation was planned after achieving a desirable soft tissue status. This too is a divergence from current recommendations for performing definitive fracture stabilization with soft tissue cover at the same time as it is associated with significantly low rates of infections [6].

This audit has certain limitations owing to the small sample size and since it was based on a single centre. We recommend regular audits to capture the current practices in orthopaedic care delivery in multiple stations. Developing national guidelines, considering the facilities available, could

circumvent the difficulties in strictly adhering to the guidelines set out by developed countries, which has been successful in improving orthopaedic care in many low and middle-income countries [18]. Moreover, attention should be paid to improve ortho-plastic approaches for limb reconstruction which could improve surgical outcomes of patients with open tibia fractures in Sri Lanka [6].

Conclusion

Timely antibiotic prophylaxis for open tibia fractures was achieved only in 50% of the patients. There were divergences from the current recommendations in the timing of soft tissue debridement and simultaneous ortho-plastic interventions, probably due to limited facilities, theatre time and relatively high patient load. We recommend strengthening ortho-plastic approaches and developing national guidelines for open tibia fracture management which could help improve surgical outcomes.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

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