Results and Complications Of Multi Fragment Tibial Shaft Fracture Managed By External Fixation: A Developing Country Perspective

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ABSTRACT:

Introduction: Tibial fractures are common due to its subcutaneous nature. Road traffic accident (RTA), fall and sports are common mechanisms of injury. Placement of intramedullary rod, open reduction and internal fixation (ORIF) and external fixation are common management options. No consensus has been achieved regarding the best or appropriate management. The aim of this study was to evaluate the outcome of multi fragment tibial shaft fractures managed by unilateral closed external fixator.

Materials and methods: A retrospective review of medical records of the patients who underwent closed external fixation for management of multi fragment tibia fracture between June 2014 till January 2020 was undertaken. This study was conducted at Gims Khairpur Mirus..Both male and female patients aged 18 years or above having multi fragment tibia fracture and with a follow up duration of 1 year or more were included. Statistical Package for Social Sciences (SPSS) version 22.0 was used for data entry and analysis. Various outcome measures were calculated by application of different descriptive statistics.

Results: Mean age of the patients was 46.17 ± 17.32 years. Total 123 (87.2%) were males and 18 (12.8%) were females. Out of 141 patients, 124 (87.9%) suffered road traffic accidents (RTA) and 17 (12.1%) suffered had fall. Union was achieved in 105 (74.5%) cases with delayed union in 17 (12.1%) and non-union in 13 (9.2%) cases. Pin tract infection was the most common complication seen in 29 (20.6%) followed by deep venous thrombosis 7 (5.0%) and osteomyelitis 3 (2.1%).

Conclusion: A high rate of union of multi fragment tibia fractures was seen by external fixation with a low complication rate with pin tract infection being the most common complication.

Keywords: tibial shaft fractures, external fixation, multi fragment fracture

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INTRODUCTION:

Tibial fractures are fairly common due to subcutaneous nature of the bone and this nature makes tibia more prone to open injuries. Road traffic accident (RTA), fall and sports are common mechanisms of injury leading to its fracture and motor vehicle accident (MVA) and sports related injuries are usually more common among males.[1] Tibial shaft fractures tend to affect men commonly between 10 to 20 years of age and women commonly between 20 to 30 years of age.[1] Open tibial fractures are often complicated by soft tissue and neurovascular bundle injuries.[2] Other potential serious complications include development of infection, non-union and malunion thereby resulting in re-surgery.[3] Placement of intramedullary rod, open reduction and internal fixation (ORIF) and external fixation are the treatment options commonly employed for tibial diaphyseal fracture management. These management methods have evolved and improved, but the use of fixation method still remains controversial.[4,5] A popular method for management include damage control with external fixation followed by internal fixation with nail or plate, this ensures that complications are reduced.[6] External fixation is another treatment option and is usually considered when soft tissue injuries coexist.[7,8] Irrigation and wound debridement is required for almost all the cases. Fasciotomies are usually undertaken if there is a risk of compartment syndrome development. However, no consensus has been achieved regarding the best or appropriate management. The aim of this retrospective study was to evaluate the outcome of multi fragment tibial shaft fractures managed by unilateral closed external fixator.

MATERIALS AND METHODS:

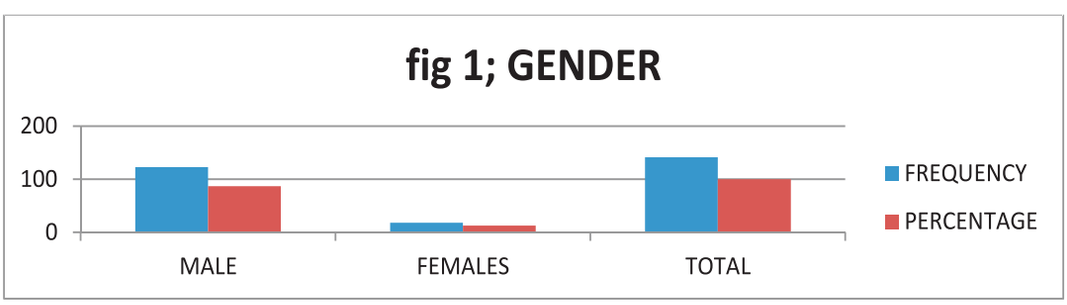
A retrospective review of medical records of the patients who underwent closed external fixation for management of multi fragment tibia fracture between June 2014 till January 2020 was undertaken. This study was conducted at Gims Khairpur Mirus..Both male and female patients aged 18 years or above having multi fragment tibia fracture and with a follow up duration of 1 year or more were included. Fractures classified as AO/ASIF type C were included. Patients were excluded if they were associated with bone defects or if they had intraarticular fracture fragments.

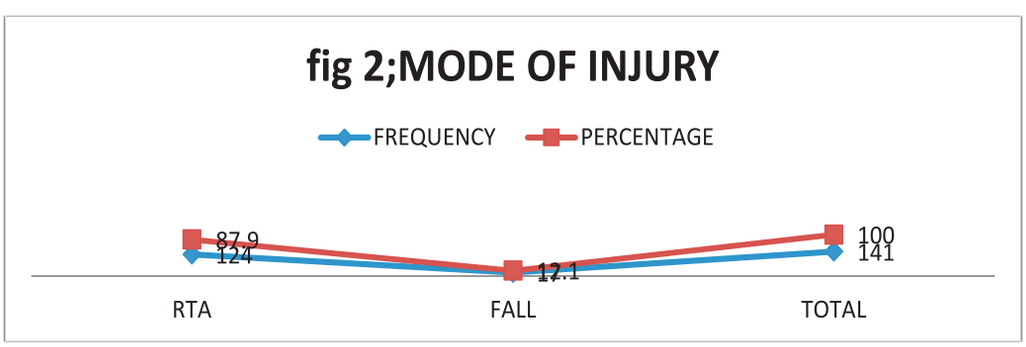
All the procedures of closed external fixation were performed under general or local anesthesia with administration of prophylactic antibiotics. Patient was placed supine on a radiolucent operating table and external fixator was assembled and applied. Post operatively, appropriate intravenous (IV) antibiotics were administered for duration of 2 weeks according to the culture and sensitivity. Early movement at knee and ankle joints were encouraged after surgery. Statistical Package for Social Sciences (SPSS) version 22.0 was used for data entry and analysis. Various outcome measures were calculated by application of different descriptive statistics.

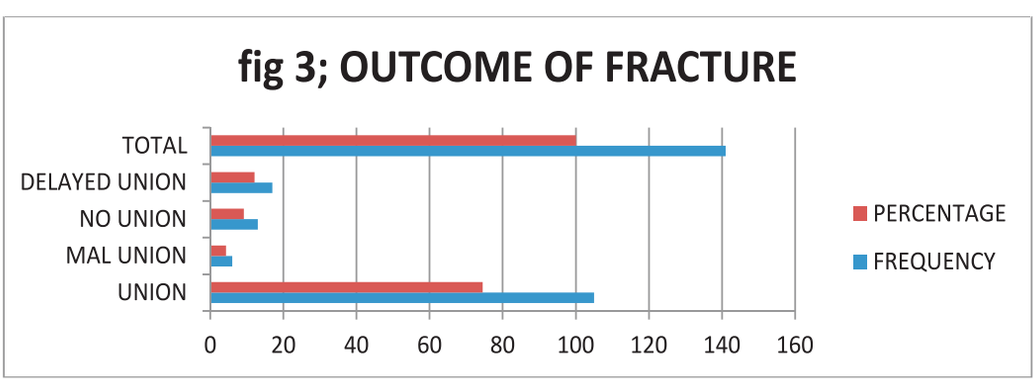
RESULTS:

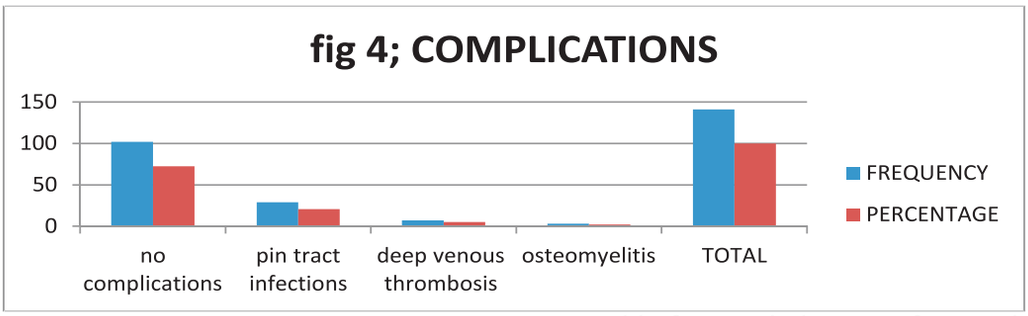
Retrospective review identified 141 patients as per inclusion criteria. Mean age of the patients was 46.17 ± 17.32 years. Total 123 (87.2%) were males and 18 (12.8%) were females. Out of 141 patients, 124 (87.9%) suffered road traffic accidents (RTA) and 17 (12.1%) suffered had fall. Our study further showed that union was achieved in 105 (74.5%) cases. Total 6 (4.3%) were malunited, 13 (9.2%) were non-united and 17 (12.1%) achieved delayed union.

Among complications, 102 (72.3%) developed no complications, 29 (20.6%) developed pin tract infections, 7 (5.0%) developed deep venous thrombosis and 3 (2.1%) developed osteomyelitis.









DISCUSSION:

Wound irrigation and debridement are usually undertaken initially for management of multi fragment open tibia fractures. Up till now, no consensus has been achieved regarding the optimal method for maintaining tibia alignment and stability following open and comminuted fracture. External fixation[9], external fixation with limited internal fixation[10] and intramedullary nail placement[7], all have been proposed. The present study was undertaken to determine the outcome of closed external fixation for management of multi fragment tibial shaft fractures and its associated complications. Recently, an increased trend has been observed to manage open fractures with unreamed or reamed intramedullary nails.[11] However, it is believed that immediate intervention with nail may increase the risk of development of pulmonary complications, sepsis or non-union. Therefore, another management method with initial external fixation followed by a delayed placement of reamed intramedullary (IM) nail.[12] However, in this method, the appropriate time between pin removal and intramedullary nailing is a main concern and this hasn't been answered appropriately.[13] According to a study, 26 days were the mean conversion time from external fixation to reamed IM nail placement,[14] and this technique has rate of infection of approximately 17%.[14] Our study results have shown a high prevalence of union in our population. Almost 74.5% of the cases achieved union in our study which is almost comparable to the one reported 73.53% by another study.[15]Another study reported union in 70.3% of the cases in open tibia fractures, which is slightly lower than the one reported in our study.[9] A difference in the union rate could be attributed to the difference in sample size. Moreover, difference in genetic and environmental factors could also have a role in the union difference. Following fracture, non-union is a condition carrying significant morbidity and burden. It is reported to be established when nine months have passed after traumatic event and no signs of healing have been observed for a duration of three months. Non-union was identified in 9.2% of the cases in our study results. Another study non-union in 14.7% of the cases.[15]Another study reported 8.18% rate of non-union which is slightly lower than the one reported in our study.[16] Absence of healing progression according to radiographs or unstable fracture in between four to six months following injury on clinical examination is usually termed as delayed union.[17,18] Our study results have shown that was evident in 12.1% of the cases. Another study reported delayed union in 9.54% of the cases which is lower than the one reported in our study.[16] Pin tract infection was the most frequent complication observed in our population cohort and was found in 20.6% of the cases. Few other studies have reported pin tract infection as the frequent complication of external fixation with a variable frequency. Beltsios et al reported pin tract infection in 26.36% of the cases[16] and Milenkovic et al reported pin tract infection in 21.85% of the cases.[19] An other study has reported a lower incidence of pin tract infection as compared to our study.[15] Post operative osteomyelitis is an important complication and presence of internal hardware may increase the possibility of infection. Post operative implant related infections may have fatal outcomes. Its traditional management usually include wound irrigation and debridement, clearing of dead space, use of intravenous (IV) antibiotics and removal of the hardware.[20] In our study, osteomyelitis was found in 2.1% of the cases which is slightly higher than the one reported by another study.[16] Another study reported no deep infections in their population cohort.[19] Deep venous thrombosis (DVT) and pulmonary embolism (PE) are also potentially serious complications of orthopedic surgery. In our study the reported rate of DVT was found to be 5.0%. Another study reported development of DVT in 0.39% of the cases.[21] No case of PE was reported in our population cohort whereas 0.39% was reported in another study.[21] A meta analysis of randomized controlled trials was undertaken regarding unreamed intramedullary nail versus external fixation for management of tibial fractures. The results of the study showed that rate of delayed union and nonunion showed no change between the two groups. Moreover, there was also no change in the rate of deep infection post operatively. However, use of external fixation led to a reduction in failure of hardware.[22]Our study is not without limitations. This study was retrospective in nature and is one of the relative weakness of the study. Another limitation of the study is that we did not take into account the co-morbidities of the patients. Diabetic patients tend to suffer from complicated fractures. Diabetic patients with good glycemic control and good lower limb

peripheral vascularity can be treated with external fixator with a lower rate of complication and comparable results with the non-diabetic population.[23] There fore, this needs further evaluation in our population cohort. Another limitation of our study was that pediatric population was not studied. Despite these limitations, we believe that this study was an attempt to determine the outcome and complications of external fixation in management of multi fragment tibial shaft fractures. It is recommended that further studies on larger sample size and incorporating various co-morbid factors such as diabetes, hypertension and ischemic heart disease shall be carried out so that its relation with fracture union could be established.

CONCLUSION:

This study concluded that a high rate of union of multi fragment tibia fractures is seen by external fixation with a low complication rate. Pin tract infection was the most common complication followed by deep venous thrombosis and osteomyelitis.

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