International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Treatment Dilemmas in Tibial Fractures: A Case Report of Infected Non-Union with Concurrent Hepatitis C Virus Infection

Dr. Saurabh Suman[1], Dr. Gaurav Vatsa[2]

[1,2]Post Graduate Resident, Department of Orthopaedics, Narayan Medical College and Hospital, Sasaram

Abstract:
Background: Tibial shaft fractures are common orthopaedic injuries that can lead to various complications, including non-union. Treatment of these fractures is challenging and requires a multidisciplinary approach.
Case details: This case report presents a 45-year-old male with an infected non-union of the tibia and chronic hepatitis C virus (HCV) infection, following a road traffic accident. The patient underwent a series of procedures over a long duration due to the persisting infection. The presence of HCV added complexity to the treatment, as individuals with HCV may have compromised immune systems, which can impede the healing process and increase the risk of infection. The treatment approach described in this case, including exchange nailing and bone grafting, proved effective in achieving fracture union.
Conclusion: Exchange nailing and bone grafting are effective methodologies in treating infected non-union of the tibia. This case highlights the importance of a multidisciplinary approach and the need for further research in this area. However, further research is needed to establish optimal treatment protocols for similar cases.

Keywords: Tibia, Non-union, Infection, HCV, Intramedullary nailing, Bone grafting

Acknowledgement:
I extend my heartfelt gratitude to Dr. Gaurav Vatsa for his unwavering support throughout the entirety of this research endeavour. His insightful feedback and encouragement have been instrumental in shaping the direction and enhancing the quality of this study. His collaborative efforts, constructive discussions, and shared enthusiasm helped immensely during the progression of this research.
Moreover, I acknowledge the faculty, juniors, and staff of the Department of Orthopaedics at Narayan Medical College & Hospital for fostering a conducive academic environment and providing resources that facilitated the successful completion of this research project.

Introduction:

Tibia is one of the long bones of the body which is responsible for weight bearing and locomotion of the person. The incidence of tibial shaft fracture is estimated to be 16.9/100,000/year. Males have the highest incidence of 21.5/100,000/year whereas women have a frequency of 12.3/100,000/year (1). Tibial diaphyseal fractures generally occur due to road traffic accidents or fall from a height or direct

blow to the tibial shin. Treatment of tibial diaphyseal fracture depends upon the fracture pattern and the type of injury i.e closed or open. The general consensus till date for treatment of displaced tibial diaphyseal fracture remains closed reduction and internal fixation with intramedullary nailing as it helps achieve functional reduction which is desired in these cases.

These fractures and their treatment protocols are often associated with variety of complications. Fracture non-union is one of the most common complications of fracture. The rate of fracture non-union varies greatly in different anatomical locations of the fracture, with an average incidence rate of 4.93% (2). Chronic post-traumatic osteomyelitis and infected non-union of the tibia are complex problems that result in considerable morbidity and can threaten viability of the limb (3). Development of infection may result from compromised soft tissue and bone vascularity, systemic compromise of the host, and virulent or resistant organisms. Biofilm formation on implant and devascularized bone surfaces protects pathogens and may lead to persistence of infection (3). Good blood supply is an important condition for fracture union. Compared to other long bones with abundant blood vessels and soft tissue, the tibia with a longer subcutaneous boundary normally has a poorer blood supply (5,6,7). Therefore, tibial fracture has a higher risk of non-union due to its special structure and blood supply.

The presence of hepatitis C virus (HCV) adds another layer of complexity to the situation. Hepatitis C virus (HCV) is a leading cause of chronic liver disease, cirrhosis, and hepatocellular carcinoma, as well as the most common indication for liver transplantation in many countries (8). Worldwide, an estimated 130–170 million people have HCV infection (9). Approximately 75%-85% of HCV-infected persons will progress to chronic HCV infection, and are at risk for the development of extrahepatic manifestations, compensated and decompensated cirrhosis, and hepatocellular carcinoma (HCC). Individuals with HCV may have compromised immune systems, which can impede the healing process and increase the risk of infection. Apart from these situations, it also poses a significant challenge for the operating surgeon as there is a very high risk of transmission.

In this study we aim to demonstrate the proper multi-disciplinary treatment protocol in a case of infected non-union of tibia with active discharge along with chronic Hepatitis C Virus infection.

Case details:

In this instance we encountered a 45year old male who presented to the orthopaedics OPD with the complaint of purulent discharge from wound over right leg for the past 2 months after being operated for compound right midshaft tibia fracture which he was managed elsewhere with closed reduction and internal fixation with intramedullary nailing along with wound debridement and suturing of the wound over the right leg around 5 months back following an incident of road traffic accident. The patient also had an established diagnosis of chronic HCV infection which was again confirmed by us.

Thereafter, the patient was thoroughly examined along with regular dressing. The patient was then taken up for implant removal along with combination of broad-spectrum antibiotic cover. It was followed by application of above knee POP slab and the wound allowed to heal by the end of 7th month. Serial radiological follow ups were also done to monitor the situation of the fracture site and callus formation. These radiographs demonstrated mild and suboptimal callus formation.

As the wound healed, priority shifted to fracture union which had been affected due to the persisting infection. Considering the HCV status of the patient and the time frame of only 7 months from the initial date of operation, treatment line of administration of around 8-10 mL of freshly prepared platelet rich plasma prepared from patient's autologous blood was taken forth followed by application of Patellar

Tendon Bearing cast. The patient was initially advised partial weight bearing with the help of walker for next 3 months and callus formation checked monthly.

At the end of 10th month, the callus formation was suboptimal and fracture still had no signs of union. Considering the current scenario of the patient, it was planned to place another intramedullary nail after achieving proper reduction along with autologous cancellous bone grafting at the fracture site under proper precautions. Following this, the patient was ambulated two days after operation with initially non weight bearing on operated limb for 3 weeks followed by partial weight bearing with the help of walker for a duration of 6 weeks.

Serial radiographical images were taken monthly after the operation to assess callus formation and fracture union. They demonstrated optimal callus formation and adequate fracture union in accordance to the time elapsed after operation.

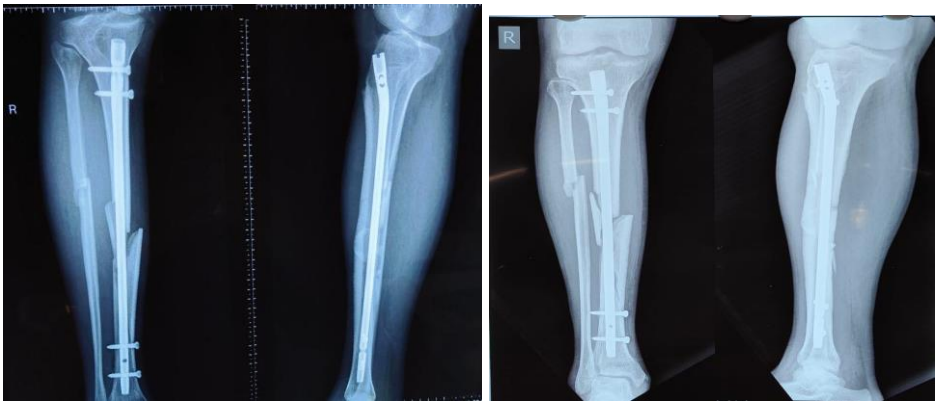

Figure 1: X-ray film of the patient at initial presentation with operation done elsewhere

Figure 2: Intra-operative image of the fracture site depicting non- union of tibia.

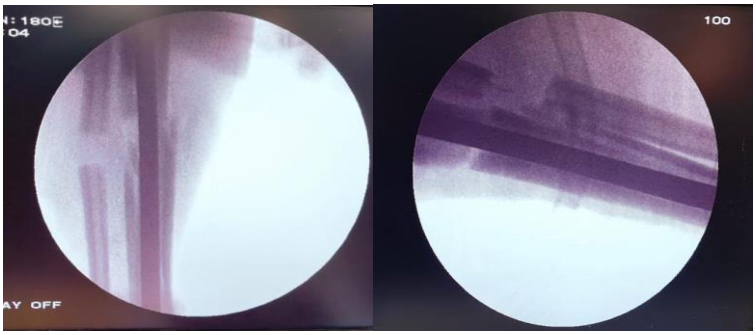

Figure 3: C-arm images of fracture site depicting proper reduction and fresh nail placement

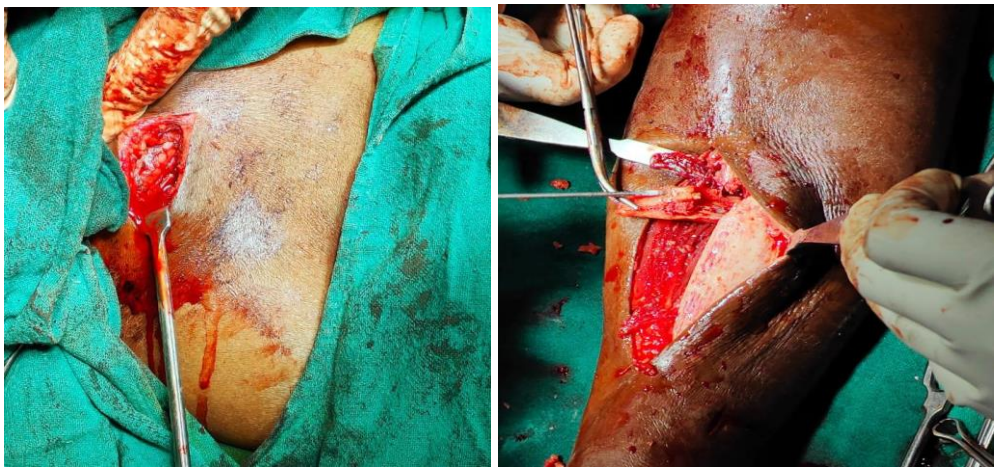

Figure 4: Harvesting of bone graft and its placement at fracture site.

Figure 5: Post operative X-ray image with fresh nail placement with bone grafting

Discussion:

The condition of the patient's wound including the fracture site combined with the added risk due to concomitant chronic HCV infection posed a very difficult challenge in its treatment. This multidisciplinary, holistic and creative approach of treatment helped to deal with such a difficult case with good outcome.

Tsang STJ et al in 2016 concluded in their study that Exchange nailing is an effective treatment for aseptic tibial diaphyseal non-union (9). Zelle BA et al in 2004 also concluded in their study that exchange reamed nailing for non-unions of the tibia results in a high union rate and is associated with a low complication rate. This technique is recommended as a standard procedure for aseptic tibial non-unions after initial unreamed intramedullary nailing (10). In 2017, Hierholzer C et al in their study also inferred that reamed intramedullary exchange nailing including correction of axis alignment is a safe and effective treatment of aseptic tibial shaft non-union with a high rate of bone healing and a good radiological and functional long-term outcome (11).

Conclusion:

Exchange nailing of tibia in cases of infected non-union proved to be an effective methodology in treating such cases. Furthermore, bone grafting helps in promoting growth, callus buildup and henceforth fracture union. However, in the presence of severe infection with a highly resistant organism, or extensive sclerosis of the bone, other fixation modalities, such as Ilizarov treatment, could be considered. This study also needs further working in a larger population to come to a final treatment plan.

References:

1. Larsen P, Elsoe R, Hansen SH, Graven-Nielsen T, Laessoe U, Rasmussen S. Incidence and epidemiology of tibial shaft fractures. Injury. 2015 Apr;46(4):746-50. doi: 10.1016/j.injury.2014.12.027. Epub 2015 Jan 16. PMID: 25636535.
2. Zura R, Braid-Forbes MJ, Jeray K, et al. Bone fracture nonunion ratedecreases with increasing age: A prospective inception cohort study. Bone. 2017; 95:26–32.
3. Patzakis, Michael J. MD; Zalavras, Charalampos G. MD. Chronic Posttraumatic Osteomyelitis and Infected Nonunion of the Tibia: Current Management Concepts. Journal of the American Academy of Orthopaedic Surgeons 13(6):p 417-427, October 2005.
4. Zura R, Watson JT, Einhorn T, et al. An inception cohort analysis topredict nonunion in tibia and 17 other fracture locations. Injury. 2017;48(6):1194–203.
5. Bell A, Templeman D, Weinlein JC. Nonunion of the Femur andTibia: An Update. Orthop Clin North Am. 2016;47(2):365–75.
6. Calori GM, Giannoudis PV. Enhancement of fracture healing with the diamond concept: the role of the biological chamber. Injury. 2011;42(11): 1191–3.
7. McMillan TE, Johnstone AJ. Technical considerations to avoid delayed and non-union. Injury. 2017;48(1):64–8.
8. Chen SL, Morgan TR. The natural history of hepatitis C virus (HCV) infection. Int J Med Sci. 2006;3(2):47-52. doi: 10.7150/ijms.3.47. Epub 2006 Apr 1.
9. Tsang STJ, Mills LA, Frantzias J, Baren JP, Keating JF, Simpson AHRW. Exchange nailing for nonunion of diaphyseal fractures of the tibia. Bone Joint J. 2016 Apr 1;98-B (4):534-541.
10. Zelle BA, Gruen GS, Klatt B, Haemmerle MJ, Rosenblum WJ, Prayson MJ. Exchange reamed nailing for aseptic nonunion of the tibia. Journal of Trauma and Acute Care Surgery. 2004 Nov 1;57(5):1053-9.
11. Hierholzer C, Friederichs J, Glowalla C, Woltmann A, Bühren V, von Rüden C. Reamed intramedullary exchange nailing in the operative treatment of aseptic tibial shaft nonunion. International orthopaedics. 2017 Aug; 41:1647-53.