CASE REPORT https://doi.org/10.3329/jmcwh.v22i1.86005

TIMELY METICULOUS WOUND DEBRIDEMENT, REGULAR DRESSING AND APPROPRIATE ANTIBIOTICS CAN MAKE PRIMARY INTERNAL FIXATION A POSSIBILITY IN GUNSHOT-INDUCED OPEN GUSTILO IIIA TIBIA FRACTURE: A CASE STUDY

Md. Fazlul Haque Qasem[1*], Md. Rayhan Ali Mollah[1], Md. Insanul Alam[1], Mohammed Shakil Hossan[1], Mohammad Arif Raihan[1].

OPEN ACCESS

Reviewed by

Shantanu Dhar Imon
Jalalabad Ragib-Rabeya Medical College, Sylhet. Bangladesh

Tasnim Hossain
Medical College for Women & Hospital Dhaka, Bangladesh

***Corespondence:**
Md. Fazlul Haque Qasem
Email: mfhqasem64@hotmail.com
Orid ID: https://orcid.org/0009-0007-9057-6837

Received: 16.11.2025
Accepted: 25.12.2025
Published: January 2026

Cite this article:
Qasem MFH, Mollah MRA, Alam MI, Hossain MS, Raihan MA. Timely meticulous wound debridement, regular dressing and appropriate antibiotics can make primary internal fixation a possibility in gunshot-induced open Gustilo IIIa tibia fracture: A case study. J Med Coll Women Hosp.2026; 22(1):165-169.

ABSTRACT

The incidence of gunshot injuries to long bones is growing, and orthopedic surgeons should be more aware of the treatment and consequences of these injuries. Various treatment modalities are there to manage these types of gunshot-induced open long bone fractures. High-energy firearm injuries to the tibia are especially complex due to the bone's subcutaneous location, predisposing it to extensive soft tissue damage, contamination, and delayed union. Most interventions involve staged surgery that is temporary stabilization with external fixator followed by meticulous wound management. After satisfactory wound care, definitive fracture fixation is performed through various types of implants, like- plates or intramedullary nails in the subsequent surgery. Sometimes, primary internal fixation is possible by timely and meticulous wound debridement followed by regular wound dressing and appropriate antibiotics. Here we report the case of a 24-year-old male who sustained a high-energy gunshot injury to the right upper leg during a political conflict. The projectile caused an open comminuted proximal tibial fracture with sizable entry and exit wounds. Initial management included haemorrhage control, broad-spectrum antibiotics, urgent debridement, and limb immobilization. Culture-guided antimicrobial therapy and supportive care were provided. Once a healthy granulating wound bed was achieved, definitive internal fixation with a locking plate was performed on day 10. The patient's postoperative recovery was uneventful, showing gradual wound healing and radiographic callus formation. This case underscores the importance of prompt debridement, appropriate antibiotherapy, and timely stabilization in managing Gustilo IIIA open tibial fractures caused by gunshot injuries. Multidisciplinary care and staged surgical intervention play a critical role in optimizing outcomes, thus avoiding multiple operations in such high-energy firearm-associated limb trauma.

Keywords: Gunshot injuries, Primary internal fixation, Wound debridement.

INTRODUCTION

Gunshot injuries to the extremities constitute a significant proportion of trauma-related emergency admissions worldwide, particularly in regions experiencing political or social conflict[1].

1* Department of Orthopaedic Surgery, Medical College for Women and Hospital, Dhaka, Bangladesh, Email: mfhqasem64@hotmail.com , Orid ID: https://orcid.org/0009-0007-9057-6837 , [**Address of correspondence**]
1 Department of Orthopaedic Surgery, Medical College for Women and Hospital, Dhaka, Bangladesh,

The severity of tissue damage depends on projectile velocity, composition, trajectory, and energy transfer to surrounding structures. Open fractures resulting from firearm injuries are associated with a high risk of contamination, soft tissue devitalization, infection, osteomyelitis, and long-term functional impairment[2]. Tibial open fractures are particularly challenging because the subcutaneous location of the tibia predisposes it to more extensive soft tissue disruption and delayed healing[3].

Principles of management include prompt haemorrhage control, early resuscitation, meticulous wound debridement, broad-spectrum antibiotic coverage, stabilization of the fracture, and timely soft-tissue management. Internal fixation has been shown to improve alignment, stabilization, and eventual good functional outcome once the wound environment is optimized[4].

We present a case of an open comminuted fracture of the proximal tibial shaft in a young male resulting from a gunshot injury. This report highlights the clinical course, staged management, and final outcome, demonstrating the importance of timely meticulous wound debridement, regular dressing, appropriate antibiotics, early stabilization and proper physiotherapy in the management of high-energy open tibial firearm injuries.

CASE REPORT

A 24-year-old previously healthy salesman from Tongi presented to our emergency department with severe pain and profuse bleeding from the right upper leg following a gunshot injury sustained approximately five hours prior during a political unrest incident. The bullet traversed the right upper leg from the lateral to the medial aspect below the knee.

The entry wound measured approximately 3 cm × 3 cm on the lateral side (Figure1), and the exit wound measured about 5 cm × 3 cm on the medial side (Figure 2). Wound swabs were taken for culture and sensitivity prior wound debridement. The patient was unable to move his right leg due to extreme pain.

Figure 1: Entry wound

Figure 2: Exit wound

He had no history of diabetes, hypertension, smoking, betel leaf chewing, drug allergies, or chronic illness. His bowel and bladder habits were normal. His immunizations were up to date, including COVID-19 vaccination. Socio-economically, he belonged to a lower-income group.

On arrival, he was ill-looking but hemodynamically stable (pulse 96/min, BP 125/80 mmHg, respiratory rate 16/min, temperature 98.6°F). General physical examination was otherwise unremarkable. Local examination revealed open wounds over the upper tibial region with marked tenderness and severely restricted movement of the knee and ankle due to pain. Systemic examination findings were normal.

Initial radiography of the right leg revealed comminuted fracture of the proximal tibial shaft (Figure 3a,b) and clinically it was Gustilo type 3a. Bleeding was controlled by limb elevation and pressure bandaging in the emergency room. Immediate extensive wound debridement was performed, and the limb was immobilized using a long-leg posterior slab.

Figure 3a: Preoperative x-ray of upper tibia fracture (AP view)

Figure 3b: Preoperative x-ray of upper tibia fracture (Lateral view)

Intravenous broad-spectrum antibiotic was started empirically, later escalated to more appropriate one based on culture sensitivity report. Adequate analgesia and gastroprotective therapy were provided.

On day 10 post-injury, after ensuring a healthy granulating wound bed (Figure 4), definitive fixation was performed and wounds were closed with layers (Figure 5). The patient underwent internal fixation of the proximal tibial shaft using a locking plate and screws under spinal anaesthesia (Figure 6). Post-operative course was uneventful. He received fluid resuscitation, antibiotics, analgesics, anti-ulcerants, and two units of packed red blood cells. Drain output progressively reduced and was removed on day 3. Then, he was discharged with advice for follow up.

Figure 4: Granulating wound before operation

Figure 5: Wound closure at the end of operation

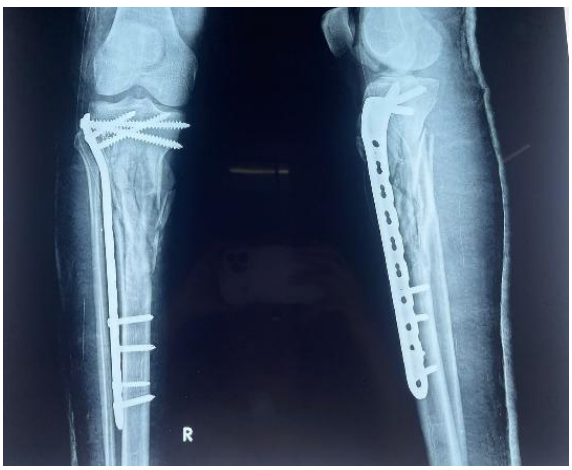

Figure 6: Postoperative x-ray

The patient was followed up after 2 weeks. Then, stitches of the wound were removed along with the long leg posterior slab. Furthermore, he was educated to perform quadriceps strengthening exercise, knee and ankle mobilization exercises. Subsequently, he was allowed toe-touch walking for next 4 weeks. On further follow up at 6 weeks, he was allowed for full weight bearing up to his pain tolerance.During the 2 months follow up, his range of motion of knee and ankle joints was full. X-ray revealed satisfactory callus formation in fracture site (Figure. 7,8).

Figure 7: Postoperative follow up at 6 weeks

Figure 8: Patient can stand without any walking aid at 6 weeks

Figure 9: Satisfactory callus formation at fracture site at 6 weeks

DISCUSSION

Tibial gunshot wounds pose a great challenge to orthopedic surgeons as the bone is covered with a tight envelope of skin and soft tissue. Soft tissue disruption and associated contamination warrant early operative treatment in cases of fractures following high-velocity gunshot wounds[4]. Successful management, therefore, requires a multidisciplinary approach, integrating principles of early and thorough debridement, broad-spectrum antibiotic coverage, stable skeletal fixation, and early soft-tissue reconstruction to restore limb function and minimize long-term disability[5].

The Gustilo-Anderson classification remains the most widely accepted system for grading the severity of soft-tissue injury and guiding management[6]. In our case study, we used the Gustilo Anderson classification system. Our patient was diagnosed with open tibia fracture (Gustilo-Anderson grade IIIA).

Open extremity fractures can be treated by several fixation methods. In their study of 291 patients, Bicen et al. showed that they had used several fixation methods like plate-screw fixation for 82 cases, intramedullary nailing for 42, external fixator for 41, K-wire fixation for 27, foreign body excisions for 26, arthrodesis for 15, amputation for , arthroplasty for 11, and soft tissue operations for 78[7].For Gustilo-Anderson type II and type III open fractures, Li et al. selected the appropriate fixation method according to the actual situation of the patient, adopted the principle of staged treatment, and performed the external fixation after the initial debridement, or simultaneously performed limited internal fixation[8]. Khatri et al. used primary internal fixation for a series of high-velocity gunshot fractures of tibia. Among twenty-nine cases, twenty-two cases were managed with un-reamed interlocking nail and fixation was done with plate-screw in seven cases[4]. In our study, we choose primary internal fixation of open tibia fracture using plate-screw after meticulous wound management.

Soft tissue management is very crucial part of treatment of open fractures. Ukai et al. showed that the mean time required for soft-tissue reconstruction was 13.7 daysfor G–A type IIIB fractures[8]. In our case, meticulous debridement and regular dressing were carried out under proper antibiotic coverage according to culture sensitivity report.Within ten days, the wound became healthy enough to permit primary internal fixation along with delayed primary closureby proximal tibial locking plate and screws through bridge plate technique.

There is a significant role of antibiotic therapy in open fractures specially Gustilo-Anderson grade III to prevent post-traumatic bone infection (osteomyelitis).The present guidelines suggest the use of narrow (cephalosporins) and extended Gram-negative (aminoglycosides) coverage for such wounds, as used in our case as well[10].

Post-traumatic infection rates also depend on fracture classification according to Gustilo-Anderson classification system. Ukai et al. stated that the infection rate in Gustilo-Anderson grade IIIA tibia fractures was7.8% (6 out of 77 patients)[9].Liu et al. showed that infection rate in type IIIB + IIIC was significantly higher than those in type I + II and IIIA[11]. In our case, we encountered no infection during wound healing.

The purpose of reporting this case is to give emphasis on prompt management of any gunshot-induced open long bone fractures by meticulous wound debridement, regular dressing and appropriate antibiotics to avoid multiple operations, thus reducing the rate of infections.

CONCLUSION

Gunshot injuries are increasing day by day due to rising political conflicts throughout the world. Bangladesh is no different. So, more intensive care should betaken to manage these types of injuries to prevent multiple operations, thus reducing the rate of infections as well as hospital costs.

CONFLICT OF INTEREST

There is no conflict of interest.

REFERENCES

1. Yeganeh A, Amiri S, Otoukesh B, Moghtadaei M, Sarreshtedari S, Daneshmand S, et al. Characteristic Features and Outcomes of Open Gunshot Fractures of Long-bones with Gustilo Grade 3: A Retrospective Study. Arch Bone Jt Surg. 2022;10(5):453–8. doi: 10.22038/ABJS.2021.52886.2624.
2. Maqungo S, Kauta N, Held M, Mazibuko T, Keel MJ, Laubscher M, et al. Gunshot injuries to the lower extremities: Issues, controversies and algorithm of management. Injury. 2020;51(7):1426-1431. doi: 10.1016/j.injury.2020.05.024.
3. Nicolaides M, Pafitanis G, Vris A. Open tibial fractures: An overview. J Clin Orthop Trauma. 2021 ;20:101483. doi: 10.1016/j.jcot.2021.101483.
4. Khatri JP, Kumar M, Singh CM. Primary internal fixation in open fractures of tibia following high-velocity gunshot wounds: a single-centre experience. Int Orthop. 2020;44(4):685–91. doi: 10.1007/s00264-019-04387-x.
5. Kharbanda H, Kumar M, Shamim S, Singh GK. Complications and Functional Outcomes in Open Tibia-Fibula Fractures: A Retrospective Analysis from a Tertiary Care Centre. J Orthop Case Rep. 2025 ;15(11):365-373. doi: 10.13107/jocr.2025.v15.i11.6404.
6. Tian R, Zheng F, Zhao W, Zhang Y, Yuan J, Zhang B, Li L. Prevalence and influencing factors of nonunion in patients with tibial fracture: systematic review and meta-analysis. J Orthop Surg Res. 2020 ;15(1):377. doi: 10.1186/s13018-020-01904-2.
7. Biçen Ç, Akdemir M, Ekin A. Management of orthopaedic injuries in Libyan civil war: experiences of a distant hospital. Int Orthop. 2020;44(9):1639-1646. doi: 10.1007/s00264-020-04755-y.
8. Li J, Wang Q, Lu Y, Feng Q, He X, Li Md Z, Zhang K. Relationship Between Time to Surgical Debridement and the Incidence of Infection in Patients with Open Tibial Fractures. Orthop Surg. 2020;12(2):524-532. doi: 10.1111/os.12653.
9. Ukai T, Hamahashi K, Uchiyama Y, Kobayashi Y, Watanabe M. Retrospective analysis of risk factors for deep infection in lower limb Gustilo-Anderson type III fractures. J Orthop Traumatol. 2020;21(1):10. doi: 10.1186/s10195-020-00549-5.
10. Lloyd BA, Murray CK, Shaikh F, Carson ML, Blyth DM, Schnaubelt ER, et al. Early infectious outcomes after addition of fluoroquinolone or aminoglycoside to posttrauma antibiotic prophylaxis in combat-related open fracture injuries. J Trauma Acute Care Surg. 2017 ;83(5):854-861. doi: 10.1097/TA.0000000000001609..
11. Liu X, Zhang H, Cen S, Huang F. Negative pressure wound therapy versus conventional wound dressings in treatment of open fractures: A systematic review and meta-analysis. Int J Surg. 2018;53:72-79. doi: 10.1016/j.ijsu.2018.02.064.