

Successful Implementation of Early Total Care in Polytrauma

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INTRODUCTION

Polytrauma is defined as the injury to two or more systems of the body in two or more areas where at least one injury is potentially life-threatening.¹ The management of polytrauma patients can be controversial with a debate between early total care (ETC) and damage control surgery (DCS). While DCS follows the philosophy of stabilizing the patients' physiology and doing minimal intervention at the beginning, ETC involves the definitive fixation of all injuries in a single surgical setting.² ETC requires a delicate balance among the treatment teams like emergency physicians, surgeons, and anesthesiologists because the definitive care surgery and resuscitation go simultaneously.³ This case explores the application of early total care in a 27-year-old male with multiple fractures from a road traffic accident under the influence of alcohol.

CASE REPORT

The patient presented with diverse injuries, including a shaft fracture of the right femur, Gustilo-Anderson (GA)

ABSTRACT

Polytrauma management demands a precise balance between early physiological stabilization and definitive anatomical restoration. While damage control orthopedics (DCO) uses a staged approach to avoid physiological overload, it can increase hospital stay and risks like infection, joint stiffness and muscle contractures. Early total care (ETC) involves the definitive fixation of all injuries in a single surgical setting. We present a case of a 27-year-old male who sustained polytrauma following a road traffic accident under the influence of alcohol. Following successful initial resuscitation by an interdisciplinary team of emergency physicians, surgeons, and anesthesiologists, the patient underwent early total care incorporating dynamic hip screw fixation, interlocking nailing, Ilizarov fixation, and pinning. The management results in an uneventful intraoperative and postoperative course. This case highlights that with rigorous multidisciplinary resuscitation and precise patient selection, single-stage early total care remains a safe, highly effective strategy to optimize early outcomes and streamline recovery in complex polytrauma.

KEY WORDS

Damage control orthopedics, Early total care, Polytrauma, Trauma

IIIB fracture of the right tibia and fibula with bone loss, intertrochanteric fracture of the left femur, and right metacarpal fractures (Fig. 1). A multidisciplinary team opted for early total care on the day of injury, performing procedures like closed reduction, internal fixation, Ilizarov fixation, and percutaneous pinning.

The case was received at the emergency department of a tertiary care center in a shocked state and the patient was resuscitated immediately by a team led by an emergency medicine physician that followed a stepwise approach, involving early total care, with the teamwork of anesthesiologists and surgeons. Right shaft of femur fracture and Left intra trochanteric fracture was managed with Intramedullary Interlocking Nailing and Dynamic Hip Screw respectively (Fig. 2). For management of right tibia and fibula fracture, corticotomy was done and Ilizarov ring fixator was applied for distraction osteogenesis (Fig. 3). Multiple K wires were used for management of metacarpal fractures. Intraoperative and postoperative periods were uneventful.

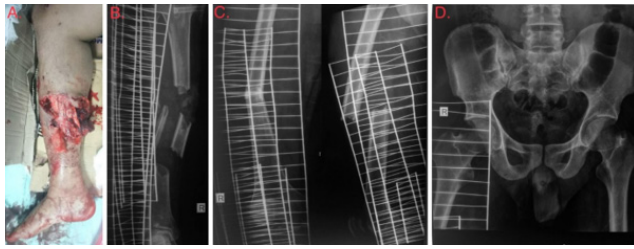


Figure 1. At the time of presentation: Open wound in Right Leg (A) along with Right shaft of Tibia and Fibula fracture (B); Fracture in Right shaft of Femur (C) and Left Intertrochanteric fracture (D)

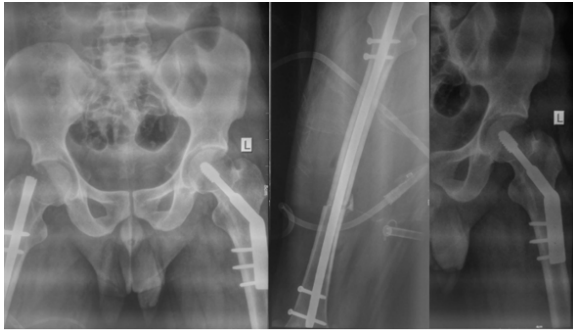


Figure 2. Postoperative status with Intramedullary Interlocking Nail in situ for right shaft of femur fracture and Dynamic Hip Screw (DHS) in situ for left sided intertrochanteric fracture.

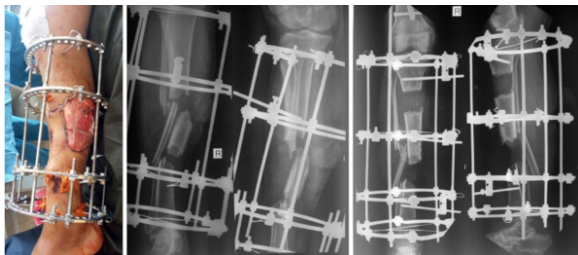


Figure 3. Postoperative status of Right Leg with Ilizarov ring fixator in situ.

The patient was discharged after five days of inpatient management and rehabilitation training. Subsequent interventions included distraction osteogenesis initially followed by docking and removal of the Ilizarov frame.

The treatment course spanned 34 months, including implant removal after ensuring fracture union (Fig. 4). A few complications like broken Ilizarov wires, pin tract infection, and ankle stiffness were managed appropriately. The recent follow-up after two and a half years showed full recovery with an appropriate adjustment in society leading to a productive life.

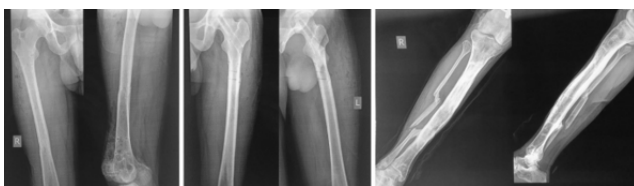


Figure 4. Status post implant removal - Right Femur, Left Femur and Right Leg.

DISCUSSION

Trauma constitutes one of the leading causes of death among low and middle-income countries (LMIC) where preventive measures are still lacking, and healthcare systems are still developing.⁴ In Nepal, the burden seems to be increasing. The proportion of deaths from injuries has increased from 6.31% to 9.21%.⁵ In a hospital-based injury surveillance study, road traffic accidents were the most common injuries presented to the emergency department.⁶ Polytrauma often involves people in their young productive years and thus presents a substantial burden to society.⁶

Polytrauma, involving multiple severe injuries to different body regions, necessitates a comprehensive and multidisciplinary approach to optimize patient outcomes. The proper treatment of a patient with polytrauma can demand the expertise of multiple disciplines such as emergency physicians, orthopedic specialists, anesthesiologists, trauma-trained surgeons, diagnostic and interventional radiologists, neurosurgeons, intensivists, urologists, otolaryngologists, rehabilitation specialists, nursing staffs, among many others.³ The need for a multidisciplinary approach to a case of polytrauma is exemplified in our case as, the management of a single case can require the expertise of multiple professionals including but not limited to emergency care physicians, orthopedic surgeons, anesthesiologists, radiologists, nurses, and physiotherapists among many others.

The concept of ETC had existed even before DCO. In a study done by Bone et al., early definitive fixation (within 24 hours) allowed for early mobilization and rehabilitation and reduced the pulmonary complications and length of hospital and ICU stays.⁷ But there were also contrasting studies where there were reports of increased pulmonary complications and multiorgan dysfunction especially in unstable patients.⁸ These contrasting studies showed that ETC couldn't be applied in every case and further evidence and guidelines were needed to determine a suitable approach to each case.

Understanding the pathophysiological and immunological mechanism that regulates the host response to injury is crucial for determining a suitable approach to the management of the patient with polytrauma. Following injury there is an initial phase of inflammation termed systemic inflammatory response syndrome (SIRS).⁹ Initial traumatic injury is considered a "first hit" where the patient develops SIRS and is susceptible to further deterioration which can lead to multiorgan failure raising the risk of mortality.⁹ In such patients, without initial stabilization, any surgery performed can be considered a "second hit" which can add to hypoxia and further increase the risk of deterioration and mortality.⁹

With the understanding of this pathophysiology, the concept of damage control surgery was applied to the management of polytrauma patients.⁹ Only the life-saving procedures and measures to control hemorrhages are done initially and definitive fracture fixation is performed only after stabilization of the patients.² In emergency treatment, external fixators and less invasive methods like splinting and skeletal traction can be used. DCO is currently the suggested approach to treatment for “unstable” patients with fractures.¹⁰ The “second hit” in these individuals would result from prompt surgery and might induce ARDS, MODS, or possibly death.¹⁰

However, the approach via DCO does not apply to every situation. It involves temporary stabilization, which may lead to delayed definitive fixation and necessitate multiple surgeries and thus can increase the risk of morbidity, length of hospital stay, and total overall cost.¹¹ Early definitive fracture fixation in ETC is now recommended for those present early at the healthcare center and who respond well to resuscitation.¹⁰ In stabilized patients, trauma and surgery can be considered the “single hit” contributing to the single phase of inflammation.²

In order to decide between ETC and DCO in approach to patients with polytrauma, there are grading systems based on the patient’s clinical parameters. Pape et al. devised a criterion of four parameters- acidosis, temperature, coagulation profile, and soft tissue damage and patient were classified as either extremis, unstable, borderline, or stable to guide treatment between ETC and DCO.¹² Nahm et

al. further revised and validated this grading system.¹⁰ These modifications by Nahm et al. along with the base deficit range were adopted by ATLS.^{10,13} In extremis and unstable patients, DCO is preferred while for stable patients ETC is more suitable. The treatment of borderline patients can be controversial. Acidosis (serum lactate > 2.5 mmol/L, PH < 7.24), coagulopathy (platelets < 90000/cmm), hypothermia (temperature < 35 C), extended surgical recovery (> 90 min), and substantial transfusion requirements (> 10 units of packed red blood cells) are all considered borderline patient characteristics, which prioritize DCO above ETC.¹⁴ Based on these criteria our patient was stable and thus early total care was the appropriate approach for management. Additionally, these patients should not have persistent occult hypoperfusion, evidence of coagulopathy, deranged acid-base balance, or hypothermia. ETC allows for early mobilization and therapies for the patient.^{7,14} Patients with polytrauma require careful evaluation to tailor specific treatment as per the patient’s condition considering both DCO and ETC to optimize outcomes.

This case underscores the successful early total care application in a polytrauma patient, emphasizing the importance of immediate good resuscitation followed by comprehensive surgical management. It demonstrates early total care’s feasibility in managing complex orthopedic injuries, contributing valuable insights to the ongoing debate about damage control orthopedics and early total care in the scenario of polytrauma. Careful patient evaluation is vital in deciding between damage control orthopedics and early total care.

REFERENCES

- Marsden NJ, Tuma F. Polytraumatized Patient. Stat Pearls Publishing, 2023.
- Nicola R. Early Total Care versus Damage Control: Current Concepts in the Orthopedic Care of Polytrauma Patients. *ISRN Orthop*. 2013; 2013: 329452.
- Bach JA, Leskovan JJ, Scharschmidt T, Boulger C, Papadimos TJ, Russell S, et al. The right team at the right time - Multidisciplinary approach to multi-trauma patient with orthopedic injuries. *Int J Crit Illn Inj Sci*. 2017 Jan-Mar;7(1):32-37. doi: 10.4103/IJCIIS.IJCIIS_5_17. PMID: 28382257; PMCID: PMC5364767.
- World Health Organization. Injuries and violence: the facts 2014, https://apps.who.int/iris/bitstream/handle/10665/149798/9789241508018_eng.pdf (2014, accessed 11 November 2023).
- Pant PR, Banstola A, Bhatta S, Mytton JA, Acharya D, Bhattarai S, et al. Burden of injuries in Nepal, 1990-2017: findings from the Global Burden of Disease Study 2017. *Inj Prev*. 2020 Oct;26(Suppl 1):i57-i66. doi: 10.1136/injuryprev-2019-043309. Epub 2020 Jan 8. PMID: 31915272; PMCID: PMC7571348.
- Bhatta S, Magnus D, Mytton J, Joshi E, Bhatta S, Adhikari D, et al. The Epidemiology of Injuries in Adults in Nepal: Findings from a Hospital-Based Injury Surveillance Study. *Int J Environ Res Public Health*. 2021 Dec 2;18(23):12701. doi: 10.3390/ijerph182312701. PMID: 34886427; PMCID: PMC8656929.
- Bone LB, Johnson KD, Weigelt J, Scheinberg R. Early versus delayed stabilization of femoral fractures: a prospective randomized study. 1989. *Clin Orthop Relat Res*. 2004 May;(422):11-6. PMID: 15187827.
- Riska EB, von Bonsdorff H, Hakkinen S, Jaroma H, Kiviluoto O, Paavilainen T. Primary operative fixation of long bone fractures in patients with multiple injuries. *J Trauma*. 1977 Feb;17(2):111-21. doi: 10.1097/00005373-197702000-00005. PMID: 846017.
- Volpin G, Pfeifer R, Saveski J, Hasani I, Cohen M, Pape HC. Damage control orthopaedics in polytraumatized patients- current concepts. *J Clin Orthop Trauma*. 2021 Jan;12(1):72-82. doi: 10.1016/j.jcot.2020.10.018. Epub 2020 Nov 6. PMID: 33716431; PMCID: PMC7920204.
- Nahm NJ, Moore TA, Vallier HA. Use of two grading systems in determining risks associated with timing of fracture fixation. *J Trauma Acute Care Surg*. 2014; 77: 268–79.
- Lankester BJ, Paterson MP, Capon G, Belcher J. Delays in orthopaedic trauma treatment: setting standards for the time interval between admission and operation. *Ann R Coll Surg Engl*. 2000 Sep;82(5):322-6. PMID: 11041030; PMCID: PMC2503628.
- Pape HC, Giannoudis PV, Krettek C, Trentz O. Timing of fixation of major fractures in blunt polytrauma: role of conventional indicators in clinical decision making. *J Orthop Trauma*. 2005 Sep;19(8):551-62. doi: 10.1097/01.bot.0000161712.87129.80. PMID: 16118563.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support for Doctors-ATLS: Student Course Manual. American College of Surgeons; 2008.
- Gupta B, Farooque K. Early total care to early appropriate care - What every anesthesiologist must know! *J Anaesthesiol Clin Pharmacol*. 2023 Jan-Mar;39(1):3-10. doi: 10.4103/joacp.joacp_157_21. Epub 2023 Jan 10. PMID: 37250253; PMCID: PMC10220203.