

Surgical Window and Treatment Strategy for Patient with Multiple Fractures Escaping Inflammatory Response: A Case Report

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ABSTRACT

Background:




Today's Orthopedic surgeons must be adept at the evaluation and management of complicated Multiple Injured Patients (MIP). Despite dynamic strategies, advance modern medical care, the mortality rate of 50-70% has been reported due to high-velocity accidental cases with femoral shaft fractures associated with pelvic fractures and injuries to other organs. We hereby present an interesting case of MIP with the unstable pelvic acetabulum, ipsilateral femoral shaft fracture, floating elbow, and distal radius fracture. It is essential to follow an optimal protocol for such complex fractures. Therefore, we stated the appropriate surgical window and treatment intervention to fix all the major fractures by overcoming the hyperinflammatory state.

Keywords: Multiple Trauma, Pelvic Fracture, Humerus Fracture, Operative time, surgical window

INTRODUCTION

The high-velocity accidents are associated with multiple fractures and mortality rates as high as 50%-70%.¹ By appropriately prioritizing care and optimizing fracture management, a decrease in morbidity, mortality, and hospital stays results in improved utilization of resources and reduced societal cost in association with a frequent injury of these populations. Likewise, proper timing on the

Pelvis, acetabulum, femoral shaft, other upper extremities fractures, organs injuries associated with an inflammatory state of the body is very important for improved long-term functional outcomes of patients. Hence, we have proposed a case report on the strategy and management for multiple -traumatic patient.

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CASE REPORT

A 30-year-old man sustained multiple injuries in a major road traffic accident and had loss of consciousness with no spontaneous movement, no purposeful movement and no verbalization. Primary resuscitation was done at a local hospital. After 6 hours of resuscitation, he got oriented with speech, nonpurposeful movement, and makes an incomprehensible sound as his GCS was 9 out of 15. Patient had no nausea, vomiting, or hematuria. He was referred to West Chain Hospital after 48 hours from the time of the accident.

On admission, this patient was in a state of compensatory hemorrhagic shock and was found to have multiple injuries. His vitals were: blood pressure 100/75mmHg, 98-105 beats per minute, respiratory rate 22-27 per minute. According to Advance Trauma Life Support (ATLS) protocol, a Primary and Secondary assessment was done. Extended Focused Assessment Sonography (EFAST) for trauma) was done to exclude any source of visceral organ hemorrhage. On examination, the left elbow, left humerus, left midshaft forearm, the right wrist was swollen and tender on palpation with restricted motion. The left hip had pain on palpation and an attempt to move. The pelvis compression test was positive. CT and X-rays of affected parts were taken. The final diagnosis was made as:

Left Transverse Acetabulum fracture (AO62B) with Central Dislocation of Hip joint

Left Shaft of Femur fracture (AO:32B2)

Left Distal Humerus fracture (AO: 15C3)

Left Shaft of Ulna fracture (AO:22A1)

Right Distal Radius fracture (AO:23C3)

Right Superior Rami fracture (Nakatani classification type II)

Cerebral contusion with mild Subarachnoid hemorrhage
B/L Lung contusion

We performed manual reduction of the left hip joint and left tibia trabeculae skeletal traction. Temporary stabilization of the pelvis and acetabulum was achieved through the use of a pelvic sling. The fractured left arm and right wrist were splinted and braced. The estimated blood loss in femoral shaft and pelvis was 1500-2000ml. Hence, he was stabilized by 2 pints of whole blood and 2000ml fluid transfusion of ringer lactate and normal saline, intravenous broad-spectrum antibiotics, DVT prophylaxis, and other supportive measures. The Neurosurgery department was consulted immediately for the evaluation and treated accordingly. The patient was admitted to trauma ICU for closer observation. When intraperitoneal, intrathoracic, and intracerebral sources for bleeding have been excluded, attention was directed to stabilizing fractures.

Then, the patient was scheduled for three different operative procedure sittings at the gap of 8, 10, and 13

days dictated on the physiological recovery, inflammatory response, and resuscitative measures. Firstly, the femur shaft and acetabulum and were treated. The femur shaft was surgically corrected with minimal riming A2FN anterograde intramedullary nail. The anterior and posterior column of left acetabulum fractures was then operated with open reduction and internal fixation (ORIF) with reconstruction plates by posterior (Kocher-Langenbeck) approach.

The second operation was carried after 10 days. The Left Distal Humerus fracture (AO: 15C3) which was articular and multi fragmentary was surgically corrected with ORIF by the posterior triceps-on approach isolating the

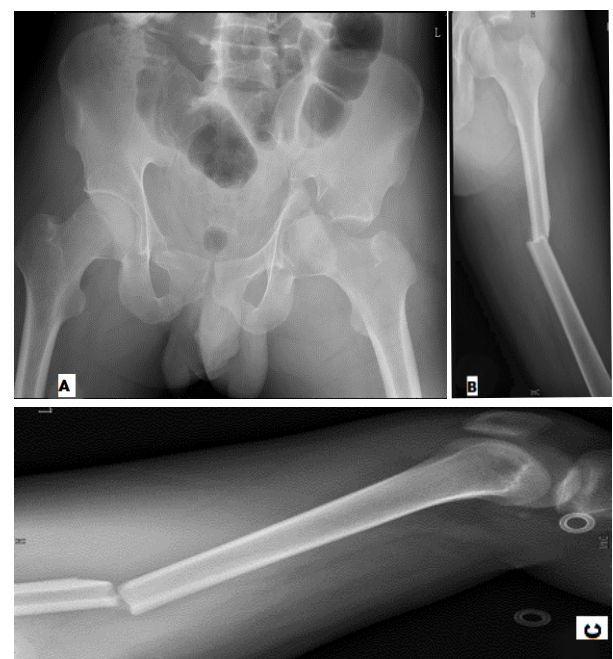


Figure 1. (A) X-ray pelvis Anteroposterior (AP) view showing left transverse acetabulum fracture with central dislocation of hip joint, right superior rami fracture. (B), (C) AP and lateral view showing left femoral shaft fracture.

ulna nerve. One plate lied on the crest of the medial column and the other lied on the posterior aspect lateral column, where two plates lied on the 90 degrees to each other that conferred good biomechanical stability. The left ulna shaft fracture (AO:22B2) was corrected with a compression plate via a standard ulna approach.

DISCUSSION

There are a paucity and disarray about the management of polytraumatic patients and its surgical innervation.³ Polytrauma injuries consist of serious head injuries, abdominal, thoracic, elementary or multiple fractures, vascular injuries. However, existing data is often debatable and controversial when the patient sustains polytrauma. Patients require adequate resuscitation to the maintenance of hemodynamics, vitals stabilization, and intracranial pressure monitoring when suffers



Figure 2: X-rays (A) Lateral views showing left intraarticular distal humerus fracture (B) Left ulna shaft fracture. (C) lateral view showing distal radius fracture.

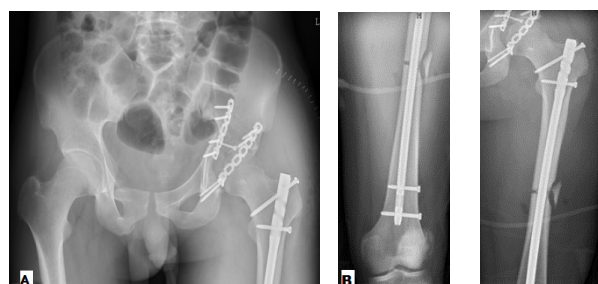


Figure 3: (A) X-rays anteroposterior (AP) view showing left acetabulum anterior and posterior column fracture treated with reconstruction plate by open reduction and internal fixation. (B) Left femoral shaft fracture corrected with A2FN anterograde intramedullary nail.

long bone combined with the pelvis, head injury, and pulmonary. Therefore, polytraumatic patients need timely resuscitation, ICU care, and an optimal time window for osteosynthesis.

The early era consists of early stabilization of major skeletal injuries (Early Total Care, ETC). After the '90s, the Damage Control Orthopedics (DOC) begun which emphasized temporary stabilization of unstable fractures allowing hemodynamic stability.^{4,5} The polytraumatized and hemodynamically unstable patient who is not fit for the definitive surgery might need skeletal traction, temporary external fixation, or splintage as a part of DOC. It generally stabilizes the long bone and unstable pelvis or acetabulum fractures with dislocation. Immediate definitive management of pelvis and long bone would cause a higher prevalence of "secondary



Figure 4: (A) X-rays showing left distal humerus fracture and ulna fracture with anatomical osteosynthesis in situ



Figure 5: (A) X-rays intramedullary screw-in retrograde manner with a minimally invasive technique in the right superior pubic rami. (B) ORIF with double plating using a dorsal radial approach on left distal radius fracture



Figure 6: Functional outcome of hip, elbow and wrist after 3 months from operative treatment.

hit" resulting in fat embolization, multiple organ failure, and ARDS.⁶ This allows patients to recover from the systemic inflammatory reaction to trauma. While several inflammatory mediators and coagulative parameters such as interleukin-6(IL-6), IL-1, IL-8, IL-10, tumor necrosis factor- α (TNF- α), IL-1 β are raised. In contrast, IL-6 and IL-8 are markers that are magnitude of acute systemic inflammation and determinant of postinjury mortality.⁷ These remains elevated for more than 5 days in traumatic patients with high ISS scores.^{8,9}

Therefore, current evidence of Damage Control Orthopedics (DOC) should be the primary focus on stabilizing the condition of unstable hemodynamic and multi- bone fracture patients. Aftermath definitive fixation procedure proceeds in a staged way manner by giving priority to the femoral fracture over pelvis or

acetabulum fracture.¹⁰ Deep Vein thrombosis is also equally important to monitor dynamically throughout the three elective surgeries with laboratory values of D-Dimer, Colour Doppler USG for lower extremities, and regular anticoagulant therapy. Therefore, the open reduction and internal fixation (ORIF) of acetabulum and left femoral shaft intramedullary nailing was done on the eight-day by choosing the best window period.

The second staged osteosynthesis of left distal humerus fracture and ORIF for ulnar shaft was delayed for 10 days after the first elective surgery. In the review of 4134 patients undergoing surgery, Multiple Organ Failure (MOF) was avoided when the second procedure was delayed until post-injury day six.¹¹ Studies suggested that by day six, there would be normalization of IL-6 and abnormal laboratory values which would avoid the "Secondary Hit".¹²

CONCLUSION

The principle of prioritizing resuscitation, operative timing, and strategy are essential to sustain the inflammatory state for improvement of a multi-traumatic patient for better functional recovery and to escape the systemic complications.¹³ Management of multi-trauma patients requires a multi-disciplinary approach that must initially ensure stabilization of general condition and vital function. The limitation of this case lacks a wide variety of trauma and only an individualized treatment strategy. Thus, Orthopaedic surgeons should have a dynamic role in decision making regarding the best surgical window, surgical approaches, and primarily resuscitation.

REFERENCES

1. Willett K, Al-Khateeb H, Kotnis R, Bouamra O and Lecky F. Risk of mortality: the relationship with associated injuries and fracture treatment methods in patients with unilateral or bilateral femoral shaft fractures. *The Journal of trauma*. 2010; 69: 405-10. <https://doi.org/10.1097/ta.0b013e3181e6138a> [PubMed] [Google Scholar]
2. Fulkerson EW and Egol KA. Timing issues in fracture management: a review of current concepts. *Bulletin of the NYU hospital for joint diseases*. 2009; 67: 58-67. <https://cutt.ly/Fnp9pP4> [Google Scholar] [PubMed] [Google Scholar]
3. Vaishya R, Agarwal A-K, Gupta N and Vijay V. Bilateral segmental pelvic and femoral fractures in a young female: A rare case report. *Chinese journal of traumatology = Zhonghua chuang shang za zhi*. 2016; 19: 286-9. <https://doi.org/10.1016/j.cjtee.2016.01.017> [PubMed] [Google Scholar]
4. Scalea TM, Boswell SA, Scott JD, Mitchell KA, Kramer ME and Pollak AN. External fixation as a bridge to intramedullary nailing for patients with multiple injuries and with femur fractures: damage control orthopedics. *The Journal of trauma*. 2000; 48: 613-21; discussion 21-3. <https://doi.org/10.1097/00005131-200409001-00002> [PubMed] [Full Text]
5. Giannoudis PV, Abbott C, Stone M, Bellamy MC and Smith RM. Fatal systemic inflammatory response syndrome following early bilateral femoral nailing. *Intensive care medicine*. 1998; 24: 641-2. <https://doi.org/10.1007/s001340050631> [PubMed] [Google Scholar]
6. Pape H, Schmidt R, Rice J, et al. Biochemical changes after trauma and skeletal surgery of the lower extremity: Quantification of the operative burden. *Critical Care Medicine*. 2000; 28: 3441-8. <https://doi.org/10.1097/00005131-200409001-00004> [PubMed] [Google Scholar]
7. Sears BW, Stover MD and Callaci J. Pathoanatomy and clinical correlates of the immunoinflammatory response following orthopaedic trauma. *The Journal of the American Academy of Orthopaedic Surgeons*. 2009; 17: 255-65. <https://doi.org/10.5435/00124635-200904000-00006> [PubMed] [Google Scholar]
8. Qiao Z, Wang W, Yin L, et al. Using IL-6 concentrations in the first 24 h following trauma to predict immunological complications and mortality in trauma patients: a meta-analysis. *European journal of trauma and emergency surgery : official publication of the European Trauma Society*. 2018; 44: 679-87. <https://doi.org/10.1007/s00068-017-0880-9> [PubMed] [Google Scholar]
9. Partrick DA, Moore FA, Moore EE, Biffl WL, Sauaia A and Barnett CC, Jr. Jack A. Barney Resident Research Award winner. The inflammatory profile of interleukin-6, interleukin-8, and soluble intercellular adhesion molecule-1 in postinjury multiple organ failure. *American journal of surgery*. 1996; 172: 425-9; discussed 9-31. [https://doi.org/10.1016/s0002-9610\(96\)00252-8](https://doi.org/10.1016/s0002-9610(96)00252-8) [PubMed] [Full Text]
10. Pape HC, Giannoudis P and Krettek C. The timing of fracture treatment in polytrauma patients: relevance of damage control orthopedic surgery. *American journal of surgery*. 2002; 183: 622-9. [https://doi.org/10.1016/s0002-9610\(02\)00865-6](https://doi.org/10.1016/s0002-9610(02)00865-6) [Google Scholar] [PubMed] [Full Text]
11. Pape H, Stalp M, v Griensven M, Weinberg A, Dahlweit M and Tscherne H. [Optimal timing for secondary surgery in polytrauma patients: an evaluation of 4,314 serious-injury cases]. *Der Chirurg; Zeitschrift für alle Gebiete der operativen Medizin*. 1999; 70: 1287-93. <https://doi.org/10.1007/s001040050781> [PubMed] [Google Scholar]
12. Nowotarski PJ, Turen CH, Brumback RJ and Scarboro JM. Conversion of external fixation to intramedullary nailing for fractures of the shaft of the femur in multiply injured patients. *The Journal of bone and joint surgery American volume*. 2000; 82: 781-8. <https://doi.org/10.2106/00004623-200006000-00004> [PubMed] [Google Scholar]
13. Lavini F, Carita E, Dalloca C, et al. Internal femoral osteosynthesis after external fixation in multiple-trauma patients. *Strategies in Trauma and Limb Reconstruction*. 2007; 2: 35-8. <https://doi.org/10.1007/s11751-007-0012-x> [PubMed] [Google Scholar]