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CASE REPORT

Successful recovery in a paediatric patient with polytrauma following multiple gunshot wounds: Case report and review of literature

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Abstract

Our case report evaluates a 2½ year old boy who presented to emergency care, following multiple gunshot injuries and was managed emergently using a multidisciplinary surgical approach at our center. The patient was unresponsive, had poor perfusion, bilaterally decreased air entry, a distended abdomen, and multiple entry and exit wounds. A multidisciplinary team including Paediatric Surgery, Cardiothoracic Surgery, Paediatric anaesthesiology team and Orthopaedic surgery were taken on board. Following effective immediate management and stabilization, the patient was admitted to the ward under careful observation. He was discharged on post-operative day 28 after a successful recovery and on his 6 month follow-up, the patient had shown significant improvement, with normal bowel and pulmonary function. Rapid intervention along with a multidisciplinary surgical approach helped ensure the success of the treatment. Prior permission from the patient's guardians was acquired before the preparation of this manuscript.

Keywords: Polytrauma, Gunshot Wound, Pediatric Trauma.

Introduction

Trauma remains the most common cause of mortality and morbidity in the paediatric population. While only 10% of paediatric patients with polytrauma present with penetrating injuries^{1,2} those who do, are at an increased risk of rapid deterioration. Gunshot wounds are the most common cause of penetrating injuries.³ Management for polytrauma via gunshot wound is dictated by the patient's general condition and injury extent, type, severity, location, trajectory and organ involvement.⁴ Previously, data from adult trauma studies used to set precedent for paediatric trauma care. However, recently, there has been an increasing number of studies describing management of colonic injuries. Safety of primary repair, as opposed to delayed repair, has been

established in the paediatric population.⁵⁻¹¹ In this report, we describe the successful management of a 2 year 6-month old boy who suffered polytrauma via multiple gunshot wounds with primary repair of gastrointestinal injuries.

Case Report

The following case report was written and submitted after obtaining informed consent from the parents of the minor and head of department approval. A 2 year 6-month-old boy presented to the Aga Khan University Hospital, Karachi, in March 2018, after sustaining 3 gunshot wounds to the thorax, abdomen and lower extremity, at close range. Total time lapse between the time of injury and the patient's presentation to the ED was 2 hours. On presentation, the child was unresponsive, had a pulse of 204 per minute, respiratory rate of 32 and blood pressure of 105/58 mm Hg. The patient had poor perfusion, a bilaterally decreased air entry, a distended abdomen, and multiple entry and exit wounds. The ED initially managed the patient according to ATLS protocols, and started resuscitation with crystalloids and blood products. The patient's Glasgow Coma Score on arrival was 6/15 and he was subsequently intubated. Laboratory investigations showed a Haemoglobin of 6.5 mg/dL. The patient did not respond well to the initial resuscitation efforts and was taken emergently to the operating room. A multidisciplinary team including Paediatric Surgery, Cardiothoracic Surgery, Paediatric anaesthesiology team and Orthopedic surgery were taken on board.

Upon exploration, the peritoneum had blood as well as gastric and enteric contents. There were multiple perforations along the fundus, greater curvature and the posterior wall of the stomach, these were primarily repaired; thirteen perforations in the jejunum, approximately 2 feet away from the Duodeno-Jejunal junction, 75 cm of the perforated jejunum was resected and end to end anastomosis performed. There were two perforations in the sigmoid colon with minimal contamination, debridement was done around these two perforations and the sigmoid colon was repaired primarily. The liver had a grade 1 laceration, while the

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Table: Differences in physiological responses to polytrauma in adults and children.

Sequelae of Trauma	Adults	Children
Timing of Organ Failure	4-8-72 hours after injury	Immediately after injury
Organ Failure Sequence	Sequential	Simultaneous
Acute Lung Injury	High Risk	Low Risk
Systemic Inflammatory Response	Robust	Dampened
Local Inflammatory Response	Dampened	Robust
Death due to pelvic fracture	High Risk	Low Risk
Morbidity	Associated with pelvic fracture	Associated with organ injuries
Urological Injury	Low recovery rate	High recovery rate

Adapted from "Pandya NK, e. (2013). The paediatric polytrauma patient: current concepts".

spleen had a grade 2 laceration. The diaphragm had bilateral tears alongside extravasation of the gastric contents in the thoracic cavity. There was a right sided pulmonary contusion without any apparent penetrating injury. The team, hence, did a video-assisted thoracoscopy through the diaphragmatic tears, washing out the pleural cavity and repairing the tears. They placed bilateral chest tubes. The right tibial shaft had a stable fracture. The team surgically debrided the right knee wound and placed a right leg splint.

The surgical team also retrieved two bullets intra-operatively; one from the chest and another from the right lower extremity. Post operatively, they admitted the patient to the PICU, and extubated him on post-operative day (POD) 8. The primary care team started him on broad spectrum antibiotics and antifungals. There was radiological evidence of an esophageal perforation, which they managed conservatively. The patient underwent physical and respiratory therapy to ambulate and improve respiratory function. During his hospital stay, the patient also developed right leg MRSA osteomyelitis, which was treated with Vancomycin. Child psychiatry team evaluated him for psychological trauma. On POD 9, the patient started a liquid diet from a nasogastric tube, and he was able to tolerate oral feeding from POD 15. He was discharged on postoperative day 28 after having a prolonged hospital course. On his 6 month follow-up, he had a normal bowel and pulmonary function and stabilized mood.

Discussion

Polytrauma historically has been used to describe trauma involving several injuries, across multiple body parts and organ systems. Currently, polytrauma is defined as trauma having an ISS score of ≥ 16 . This is due to the correlation of an ISS score ≥ 16 with severe injury and carries a higher than 10% mortality risk.¹² Keeping into account the importance of bodyweight and airway diameter, a revised scoring system was developed for paediatric patients,

known as the paediatric trauma score (PTS).¹³

Contemporary treatment for polytrauma focuses on rapid prehospital treatment, addressing life threatening injuries at the site of injury, including immediate control of bleeding, preventing further injury and providing safe and timely transportation to a hospital setting.¹⁴ There have been numerous studies comparing the effectiveness of providing basic life support (BLS) compared to advanced life support (ALS) at the site of injury however the majority have failed to demonstrate a benefit of ALS over BLS,¹⁵⁻¹⁷ while a few have shown ALS to increase mortality rate.^{16,17}

Following prehospital treatment, patients have to be transferred to a well-equipped facility where the patient can be adequately taken care of, as polytrauma usually requires a multi-disciplinary approach, due to multiple organ systems being involved. In the case of children, transferring to patients to a unit where there is a skilled paediatric surgery team available to address the individual needs of paediatric patients is crucial, as there have been reports of a higher mortality rate of children transferred to an adult trauma facility compared to a paediatric trauma facility.¹⁸ Initial management includes the rapid identification of respiratory and circulatory compromise and correcting deficits in oxygenation, ventilation and perfusion, with the principal objective being to prevent acidosis hypothermia and coagulopathy.¹⁹

Further management for paediatric polytrauma is different compared to adult trauma. This is due to the differences in physiological responses to trauma within children and adults. The differences are summarized in Table-1 at the end of the article.

In terms of haemodynamic stability children differ from adults since they usually maintain a near normal blood pressure until they lose around 25-30% of their blood. Subtle changes in heart rate and extremity perfusion

provide a better indication of impending cardiorespiratory failure.²⁰ Anatomically children also vary from adults as their organs are more densely packed surrounded by pliable skeleton with less fat and more elastic connective tissue. Therefore, the force of impact is distributed in children and results in multi organ injury in around 50% of cases with severe trauma.²¹ Fracture fixation in children may be performed at an immediate basis, as early fixation in the first 72 hours after injury, reduced hospital stay, ICU stay, and ventilator support requirements. Patients who required prolonged immobilization had an increased rate of complications related to immobilization.¹⁹

Conclusion

We report a case of a paediatric polytrauma patient, a 2 ½ year old boy suffering from multiple gunshot wounds, who was treated successfully at our institution. Rapid intervention along with a multidisciplinary surgical approach helped ensure the success of the treatment.

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