

CASE REPORT

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Hyperglycemia and base deficit as prognostic markers in blunt abdominal trauma: a case report from an emergency department setting

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Abstract

A 22-year-old female with an alleged history of a road traffic accident presented with a history of abdominal pain, which was sudden, diffuse, dull aching, aggravated by movements. At the time of presentation, her Primary survey was intact except for her blood pressure, which was 100/70 mmHg, pulse – 100 bpm. She also had a high blood glucose level. Fluid resuscitation was done with intravenous fluids and blood transfusions. The Extended Focused Assessment with Sonography in Trauma (E-FAST) was suggestive of fluid collection in the right hepatorenal pouch. Later on, the patient was hemodynamically unstable, and she was shifted to the operating theater. Blunt abdominal trauma presents with different presentations at the emergency department. The patient can present with mild abdominal pain with stable vital signs at initial presentation, but later experiences deterioration. Over 90% of all trauma patients may not be allocated correctly into the shock classes suggested by ATLS. Only 9.3% of patients are classified into shock classes. Early identification of hypovolemic shock in blunt abdominal trauma is crucial in the emergency department. High blood glucose and high base deficit can predict the prognosis in the emergency department.

Keywords: Base Deficit; Blunt Abdominal Trauma; Hyperglycemia; Primary Survey; Road Traffic Accident

INTRODUCTION

Road Traffic Accident (RTA) is defined as an accident that takes place on the road between two or more objects, in which one is any kind of moving vehicle and the other is another vehicle, pedestrian, animal, or stationary object.¹ In developing countries, trauma is one of the leading causes of death, especially among people under the age of 45.² Trauma-related injuries are the 3rd leading cause of morbidity and mortality in Nepal.³ Blunt abdominal trauma can cause damage to the internal organs, resulting in internal bleeding, cause contusions, or injuries to the bowel, spleen, liver, and intestines.¹ The variability in clinical findings makes it difficult to diagnose blunt abdominal trauma with hypovolemic shock in the emergency department.⁴ A reasonable alternative is “thinking outside of the ATLS box”.⁵ Elevated blood glucose levels and a significant base deficit are indicative of increased severity in trauma patients.^{5,6} A patient with blunt abdominal trauma may have mild abdominal pain and stable vital signs at first, but later can deteriorate. This case report highlights the importance of blood glucose level and base deficit measurement in the emergency department to identify the severity of patients with blunt abdominal trauma.

CASE REPORT

A 22-year-old female with an alleged history of a road traffic accident as the scooter rider, involving a collision with a tractor. She was brought to the emergency department 40 minutes after the incident by her relatives in a public vehicle. On her primary survey, the Airway was patent with no cervical spine tenderness. Her oxygen saturation was 98% on room air, respiratory rate 18 bpm, with bilateral equal chest air entry. Her pulse was 100 bpm, blood pressure 100/70 mmHg, and capillary refill time (CRT) was less than 3 seconds. Her Glasgow Coma Scale was 14/15 (E4V5M6). Bilateral pupils were round, regular, and reactive, and there was no focal neurological deficit. General random blood sugar level (GRBS) was 239 mg/dl, and random blood sugar was 236mg/dl. She had a temperature of 97.2 degrees Fahrenheit, and no gross injuries were noted. Fluid resuscitation was done with III-pint crystalloids (IVF Ringer’s Lactate), and relevant investigations, along with cross-matching, were sent. E-FAST was performed, suggesting fluid collection in the right hepatorenal pouch. Her hemoglobin level was 10/1g/dl. On reassessment, her blood pressure was 100/60 mmHg. As her blood pressure was low, one pint of whole blood was transfused to improve her circulation and to stabilize her condition. Later on, Contrast-Enhanced Computed Tomography (CECT) of the abdomen and pelvis was done, which was suggestive of Grade IV liver injury (Figure 1).



Figure 1. CECT (A+P) suggestive of hypodense areas involving almost all segments of the left lobe of the liver deep lacerations leading to the devascularization of the left hepatic lobe; non-opacification of the left hepatic artery, left portal vein, and left hepatic vein. Features are of American Association for the Surgery of Trauma (AAST) grade IV liver injury with gross hemoperitoneum

After 2 hours of emergency care, she was transferred to the surgical ICU under the care of the Gastrosurgery department. At the Surgical Intensive Care Unit (SICU), Arterial blood gas analysis (ABG) was suggestive of high base deficit (-6.8), pH 7.34, PaCO₂ 30.2, PaO₂ 90, HCO₃ 18.9, anion gap – 13, which is class III hypovolemic shock. A high base deficit is suggestive of metabolic acidosis, and this parameter has been incorporated into the ATLS shock classification. High blood glucose is due to the release of catecholamines in response to trauma stress.⁷ The higher the blood glucose level, the more severe the severity.⁶ Her urine acetone was negative, and there is no history of high blood glucose levels in the past. As there was persistent tachycardia and low blood pressure despite 2 pints of whole blood and inotrope support, the patient was shifted to the operating theater for emergency laparotomy.

Intra-op findings suggestive of gross hemoperitoneum, approximately 3000ml, with complete transection of the left intrahepatic vein, the left hepatic artery, and the left portal vein, with active bleeding from the hepatic artery, portal vein, and hepatic vein. There were multiple lacerations and parenchymal disruption present, with avulsion of the left lobe of the liver.

Damage control resuscitation was done. Despite reasonable effort, the patient went into bradycardia, and CPR was started in the operating theater. After achieving return of spontaneous circulation, the patient was shifted to SICU. Later on, the patient was declared dead after 8 hours of hospital stay. The cause of death was grade VI liver injury with gross hemoperitoneum and hypovolemic shock secondary to a road traffic accident.

DISCUSSION

This is the case of a Road traffic accident with blunt abdominal trauma with grade VI liver injury. Early recognition of hypovolemic shock and early fluid

resuscitation with crystalloids in the emergency department is crucial. Traditional shock parameters, such as heart rate, systolic blood pressure, and the Glasgow Coma Scale (GCS), as well as newer indices, such as the Shock Index, often fail to predict actual blood loss in the emergency room.⁸ Over 90% of all trauma patients may not be correctly assigned to the ATLS shock classes when the combination of three vital signs heart rate, systolic blood pressure, and Glasgow Coma Scale —is assessed; only 9.3% are correctly assigned.⁷ A reasonable alternative, when “thinking outside of the ATLS box,” may be a system based on alterations in base deficit (BD).⁵ BD may be superior to the current ATLS classification of hypovolemic shock for identifying hypovolemic shock and risk-stratifying patients who need early blood product transfusion.⁹ Excessive catecholamine secretions in response to trauma stress lead to a rise in blood sugar level and hyperglycemia. The increase in blood glucose level in trauma patients can be a good predictor of trauma severity, which may be related to early blood loss and poor outcomes.¹⁰

Bochicchio GV, et al., divide blood glucose levels in three categories in trauma patients: low (0-139mg/dL), medium (140-219mg/dL), and high (>220mg/dL).¹¹ Patients with blood glucose concentrations more than 200mg/dl had a significantly increased number of ventilator days and length of stay, as well as increased infection and mortality rates.⁶ High levels of blood glucose in trauma patients are due to the release of catecholamines, which will increase the release of steroids. In our case, the blood glucose level was 239mg/dL, which is above 220mg/dL.¹¹ High blood glucose in non-diabetic trauma patients may be the clue for early recognition of deterioration. Jat AA, et al., clearly mentioned the contributing factors of preventable deaths in trauma patients. The major contributing factors were inadequate pre-hospital care, inappropriate interhospital transfer, limited hospital resources, and the absence of integrated and organized trauma care.¹²

CONCLUSION

Early recognition of hypovolemic shock and early fluid resuscitation in trauma patients is crucial in the emergency department. High base deficit and high blood glucose can predict the prognosis in traumatic patients in the emergency department. However, further studies are required.

DECLARATIONS

Acknowledgement

None

Conflict of Interest

None

Funding

None

Ethical Clearance

Ethical clearance from IRC was not required in this case.

Consent of the Study

Informed consent was obtained from the patient regarding the publication of the case report.

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