



CASE REPORT

Supraventricular Tachycardia Due to Blunt Abdominal Trauma in a Pediatric Patient

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Abstract

Patients presenting to the Emergency Department (ED) with traumatic injuries constitute one of the leading causes of morbidity and death, mainly due to hemorrhagic shock. Whether due to penetrating or blunt injury, management of hemorrhagic shock, usually presenting initially as sinus tachycardia, remains the priority in the ED. Although there may be other causes for tachycardia following trauma, it is important to recognize and treat hemorrhagic shock immediately and efficiently. In this case study, a unique pediatric case of blunt abdominal trauma and splenic injury with supraventricular tachycardia (SVT) presented to the ED of the Bahrain Defense Force Hospital (BDF). Hemorrhagic shock with tachycardia followed a handlebar injury to the abdomen, and continued persistent tachycardia was observed despite the aggressive management of hemorrhagic shock. An electrocardiogram (ECG) was done to confirm the diagnosis of SVT, following which the case was appropriately managed and reverted to normal sinus rhythm.

Keywords: Supraventricular tachycardia; Emergency department; Hemorrhagic shock; Tachycardia

Introduction

Trauma is the leading cause of death among children between the ages of 1 and 18 years in the United States, with injuries accounting for more than 8 million annual emergency department (ED) visits. Abdominal trauma is a major cause of death in the United States, following head and thoracic injuries as the primary causes. Blunt trauma accounts for more than half of all abdominal injuries in the pediatric population.¹

In the Arabian Gulf region, blunt trauma accounted for 72.8% of all injuries among the pediatric populace in Riyadh.² Another study conducted by Bener *et al* in Al-Ain, United Arab Emirates (UAE) showed that 42% of all injuries presenting to the ED were related to traffic accidents, with 38.7% being blunt trauma injuries.³ In the pediatric population, the most common presenting sign following trauma was sinus tachycardia, considered to be one of the first features of shock. It is vital to recognize

hemorrhagic shock early and manage it promptly and aggressively in order to prevent morbidity and mortality.

Even though there are several causes for tachycardia, the most important differential diagnosis, especially in the ED setting following trauma, is hemorrhagic shock. A wider differential diagnosis should always be considered, especially in patients who do not respond adequately to management or patients with other underlying conditions or other suggestive history. Having said that, recognizing the rhythm of tachycardia is crucial for the diagnosis and specific management of the other conditions that may present to the ED.

Case presentation

A 10-year-old schoolboy, who was previously well, presented to the Emergency department (ED) of the Bahrain Defence Force Hospital (BDF) following a Motor Vehicle Collision (MVC). An initial history revealed he was riding his bicycle and suffered a hit by a low speed car to the front of the bicycle, sustaining a handlebar injury to the abdomen following which he started complaining of abdominal pain.

His neonatal and developmental history was normal, and he had no known chronic or underlying illness. On initial physical examination in the ED, his vital signs showed a heart rate (HR) of 180 bpm, blood pressure (BP) of 113/61 mmHg, temperature of 36.5°C, respiratory rate (RR) of 26 breaths per minute and an oxygen saturation of 98% in room air. The patient was awake and had mild abdominal pain. He had epigastric and left upper quadrant tenderness with no visible bruises. He did not complain of chest pain, difficulty in breathing and on examination, there was no chest tenderness or bruise that could suggest a chest trauma or possible cardiac contusion. There were no skin lacerations or open wounds and his urine was clear with no hematuria. The rest of the systemic examination was normal.

Aggressive resuscitation was begun, as the patient had persistent tachycardia. Hemorrhagic shock was the first concern, especially followed by a blunt abdominal trauma (as in case of trauma, tachycardia alone without drop of blood pressure

can indicate internal hemorrhage). Patient received two boluses of fluid (Ringer's lactate 20 ml/kg IV bolus) but blood transfusion was not required. In the meantime, ongoing evaluation of his persistent tachycardia continued. Initially, it was thought that the tachycardia was secondary to internal bleeding (as he complained of abdominal pain and there was abdominal tenderness on examination), but with tachycardia persisting, the differential diagnosis became wider (as tachycardia could be secondary to cardiac injury), due to pain and anxiety or unknown cardiac disease.

Despite resuscitation with fluids, the patient continued to have tachycardia. An electrocardiogram (ECG) was immediately done to identify any abnormal rhythms, which demonstrated a rhythm with absent P waves and tachycardia suggestive of supraventricular tachycardia (SVT) with a heart rate of 250 bpm with normal QRS axis (Figure 1).

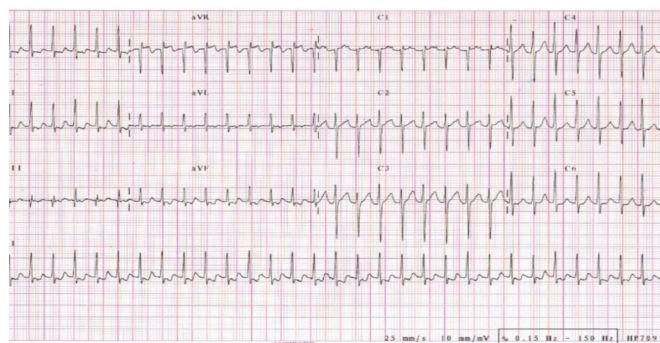


Figure 1: The Electrocardiogram showing supraventricular tachycardia with a heart rate of 250 bpm

He was then given intravenous adenosine at a dose of 0.1 mg/kg, following which the rhythm reverted to normal sinus rhythm (NSR) (Figure 2).

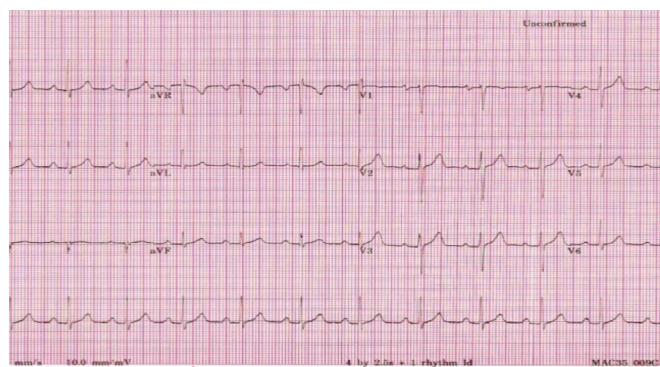


Figure 2: The 12-lead Electrocardiogram showing normal axis and sinus rhythm after adenosine administration.

A repeat observation of vital signs following treatment showed a HR of 108 bpm, BP of 112/60 and RR of 24 breaths per minute. Laboratory findings including electrolytes, renal and liver function tests were within normal limits. Creatine kinase (CK) was 1406 IU/L (normal: 20-200 IU/L) and troponin was 0.0 ng/ml (normal: 0-0.4 ng/ml). A computerized tomography (CT) scan of the chest and abdomen revealed an isolated splenic subcapsular hematoma and grade 1 laceration with no peritoneal bleed.

The patient was initially admitted to the Intensive care unit (ICU) for one day for further observation and monitoring, and then shifted to the trauma service ward. During his hospitalization, serial ECGs and Holter monitoring did not reveal any arrhythmias and the patient remained vitally stable and in good condition throughout his stay. The patient was seen by the pediatric cardiologist who planned further follow ups for evaluation as an outpatient. He was discharged on the third day after admission with follow ups in the surgery trauma clinic and the pediatric cardiology clinic.

Discussion

A unique case of SVT is presented for the first time in a 10-year-old boy following blunt abdominal trauma. This case presented a diagnostic challenge as the cause of tachycardia in trauma patients is often difficult to establish and is usually related to the injury and hemorrhagic shock. In pediatrics, trauma is the leading cause of morbidity and mortality. Management of pediatric trauma patients in the ED setting is considered a challenging task. The initial care must always focus on airway, breathing and circulation to identify major life-threatening injuries.⁴

In case of pediatric trauma, tachycardia is the first sign of hypovolemia and its early recognition and treatment are critical during trauma resuscitation.⁵ There is a previously reported case by Menoch *Metal*, of a 17-year-old patient with a facial laceration who developed an SVT following trauma without chest injury. Although this patient did not have any history or signs of chest injury and normal imaging findings, he developed SVT secondary to hemorrhagic shock.⁶

The association between chest trauma and cardiac arrhythmias is well documented in the literature. An interesting case published by Kyle Ota *et al*, is of atrial fibrillation in a young teenage boy secondary to chest trauma, a unique case as the patient did not have any structural heart defect and his arrhythmia resolved spontaneously.⁷ Dr. Hayrullah Alp and his colleagues reported the case of a healthy adolescent with supraventricular tachycardia, associated with blunt chest trauma due to a football strike to her chest, which was the only trigger for her abnormal heart rhythm.⁸

Compared to the literature reviewed, the patient with whom the current authors dealt with did not have any signs of cardiac injury and was not in shock initially, which made this case all the more unique and challenging to diagnose in the ED.^{9,10,11} In addition, cardiac dysrhythmias have been frequently reported as a complication of thoracic and blunt cardiac injury, however, no case report has ever been reported of cardiac dysrhythmias after blunt abdominal injury, as was observed in the present case.¹²

It is important to remember that trauma patients may present with tachycardia secondary to causes other than hemorrhagic shock. Initially, the patients should be resuscitated with bolus of fluids (a fluid bolus of 20 mL/kg of warmed normal saline or Ringer's lactate should be rapidly given over 10 to 15 minutes). Another bolus of fluids could be repeated, if tachycardia is persistent. If the second bolus of fluids also does not resolve tachycardia, the wider differential diagnosis of tachycardia should be thought of in these patients. Furthermore, to exclude the other causes, it is important to reassure the patient and provide him with analgesia to decrease the anxiety and pain, perform an ECG to exclude cardiac dysrhythmias (which could be fatal if not treated), perform a chest x-ray to exclude pneumothorax, exclude cardiac injuries (through an echocardiogram) and look for other non-traumatic causes, like ingestion of drugs.

In the present case, persistent tachycardia was observed despite the patient being given two boluses of fluids and medication for pain management. The attending physician obtained an ECG with

suspicion of possible arrhythmia, and an SVT was identified. Recognition of the arrhythmia is important in the management of tachycardia due to trauma, as it is different from the management of dysrhythmias.

Supraventricular tachycardia (SVT) is most common among children.¹³ These patients should be treated according to their initial stability. Unstable children (unconscious, in shock or heart failure) require immediate intervention. Cardioversion (synchronous, 0.5 to 2.0 mg/kg) is the definitive management in unstable patients. While preparing for cardioversion, adenosine may be given if readily available, but cardioversion should not be delayed.¹³ In the case of stable patients, vagal maneuvers could be considered, and if this fails, adenosine (0.1 mg/kg rapid IV/IO first dose; maximum dose, 6 mg) should be administered. As in the presented case, the patient was vitally stable except for the tachycardia (showing SVT on the ECG), and after one dose of adenosine the rhythm reverted to sinus rhythm. However, the side-effects of adenosine must be watched for, as they include chest pain, bronchospasm, apnea, nausea/vomiting, arrhythmia (other atrial or ventricular), or a long asystolic pause.

In summary, while it is essential to rule out hemorrhagic shock in trauma patients presenting with tachycardia, excluding the other differential diagnoses for tachycardia is crucial. Diagnosing and managing supraventricular tachycardia (SVT) in the setting of trauma is different from managing sinus tachycardia with shock and this reflects the importance and uniqueness of the presented case.

References

- Centers for Disease Control and Prevention (CDC): Injury prevention & control: data & statistics (WISQARS). Available at: <www.cdc.gov/injury/wisqars/index.html>.
- Alnasser A, Othman A, Mobaireek, O, et al. Epidemiology of pediatric trauma at a tertiary hospital in Riyadh, Saudi Arabia. *J Nat Sci Biol Med.* 2018;9:247-51.
- Bener A, Al-Salman K, Pugh R. Injury mortality and morbidity among children in the United Arab Emirates. *Eur J Epidemiol.* 1998;(14): 175–178.
- ATLS Subcommittee; American College of Surgeons' Committee on Trauma; International ATLS working group. ATLS - Advanced Trauma Life Support, Student Course Manual, 9th edition. *J Trauma Acute Care Surg.* 2013.
- Richard E. Klabunde. Cardiovascular Physiology Concepts. <https://www.cvphysiology.com/Blood%20Pressure/BP031> [Accessed on 4/28/2014]
- Menoch M1, Hurst D, Fischbach P, et al. Supraventricular tachycardia in the pediatric trauma patient: a case report. *Pediatrics.* 2013;131(5):1654-8.
- Ota K, Bratincsak A. Atrial fibrillation induced by commotio cordis secondary to a blunt chest trauma in a teen age boy. *Pediatrics.* 2015;135(1):199-201.
- Alp H, Baysal T, Karaarslan S. Supraventricular tachycardia due to blunt chest trauma in an adolescent. *Ulus TravmaAcilCerrahiDerg.* 2014;20(3):211-3.
- Ismailov R.M, Ness R.B, Redmond C.K, et al. Trauma associated with cardiac dysrhythmias: results from a large matched case-control study. *J Trauma.* 2007; 62(5):1186-91.
- Van As AB, Manganyi R, Brooks A. Treatment of thoracic trauma in children: literature review, Red Cross War Memorial Children's Hospital data analysis, and guidelines for management. *Eur J Pediatr Surg.* 2013;23(6):434-43.
- Duron V, Burke R.V, Bliss D, et al. Survival of pediatric blunt trauma patients- Presenting with no signs of life in the field. *J Trauma Acute Care Surg.* 2014;77(3):422-6.
- Ismailov R.M, Ness R.B, Redmond C.K, et al. Trauma associated with cardiac dysrhythmias: results from a large matched case-control study. *J Trauma.* 2007;62(5):1186-91.
- Carla R Hanash and Jane E Crosson. Emergency diagnosis and management of pediatric arrhythmias. *J Emerg Trauma Shock.* 2010;3(3):251–260.