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Case Report

Supraventricular tachycardia requiring repeated cardioversion in a 32-day-old baby

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Introduction

Cardiac arrhythmia is not so uncommon in a young infant but recognition in neonate and infant is not easy. The management of cardiac arrhythmia with cardiogenic shock, non-responsive to pharmacological cardioversion in a young infant, can prove to be a challenge at peripheral hospital, owing to its life-threatening consequences. Delay in management may precipitate more fatal arrhythmias. We report a case of supraventricular tachycardia with haemodynamic compromise in a 32-day-old baby, presumably secondary to viral infection. Pharmacological and physiological methods could not revert arrhythmia to the sinus rhythm and the baby required repeated synchronised cardioversion. The aim of this case report is to highlight the importance of cardioversion to save the life of young infant from potentially fatal arrhythmia.

Case report

A young infant on 32nd day of life, was brought with complaints of watery loose stool, red eyes and increased respiratory rate with chest retraction for 6 hrs. Antenatal history was not relevant. Baby was born at term with birth weight of 3250 g by lower segment Caesarean section (LSCS) for previous LSCS. Mother was admitted in family ward for post-partum fever with the neonate as sick dependent, where many children were admitted with viral diarrhoea and upper respiratory tract infection. On auscultation, baby had bilateral wheeze and chest radiograph revealed hyper-inflated lung. Laboratory parameters were negative for bacterial infection. Electrolytes, calcium and blood sugar were normal. Baby was managed as a case of acute bronchiolitis. The baby was given 3% Saline and Adrenaline nebulisation. Baby was exhibited to

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mechanical ventilation for respiratory failure with intermittent sedation with Midazolam.

The baby developed tachycardia during the course of treatment. ECG showed narrow complex tachycardia (QRS duration – 0.06 s), and absence of P wave (supraventricular tachycardia) with heart rate up to 264/min. Injection Adenosine 50 µg/kg was administered, but there was no response even with increment of dose up to 250 µg/kg. Injection Amiodarone was given as a loading dose of 5 mg/kg and followed by continuous infusion of 5 µg/kg/min to a maximum of 15 µg/kg/min. However, baby did not show any improvement. In the next 2 hrs, peripheral pulses were faint, capillary refill time was prolonged and mean arterial pressure was not recordable. The arrhythmia was associated with haemodynamic compromise and the pharmacological cardioversion failed to revert the persistent abnormal rhythm. Synchronised cardioversion with 0.5 J/kg was administered and repeated with 1 J/kg. Post-cardioversion rhythm reverted to normal, heart rate reached a maximum of 140/min and peripheral pulses reappeared. ECG showed normal complex QRS with normal morphology of P wave. There was no evidence of δ (delta) waves in ECG when it reverted to sinus rhythm. Baby continued on ventilator support and Amiodarone infusion, but again had narrow complex tachycardia with haemodynamic instability after 1 hr, which required a repeat synchronised cardioversion with 2 J/kg, to revert it to sinus rhythm.

The baby was weaned off from ventilator after 72 hrs and remained asymptomatic for the next 5 days. A 2D echocardiography revealed a small patent foramen ovale with minimal left to right shunt. The baby was discharged after 8 days of admission. Antiarrhythmic medicines were not prescribed at the time of discharge, as the arrhythmia was assumed to be consequence of a respiratory infection.

The baby was readmitted after 36 hrs of discharge with complaints of irritability, feeding difficulties, vomiting and heart rate of 268/min. ECG initially showed supraventricular tachycardia and later converted to atrial flutter (Fig. 1). A loading dose of 5 mg/kg of Amiodarone and continuous infusion up to 15 µg/kg/min could not revert the cardiac activity to sinus rhythm. The baby was sedated with 0.05 mg/kg of Midazolam and synchronised cardioversion with 1 J/kg was administered. The baby remained asymptomatic for the next 4 hrs. The baby required three further cardioversions with increment of dose up to 2 J/kg within 12 hrs of admission despite continuous infusion of Amiodarone (Fig. 2). Amiodarone infusion was stopped after 24 hrs and the baby was switched to oral Amiodarone at 200 mg/1.73 m²/24 h. CK-MB level was done 24 hrs after the last cardioversion and it was 8 IU/L. The baby gradually improved and was subsequently transferred to a higher centre for consultation of the

cardiologist. Presently, the baby is asymptomatic and is on oral Amiodarone with a plan to continue the same drug till one year of age. Electrophysiological study has been planned for this baby at a later stage.

Discussion

Narrow complex tachycardia, mainly the supraventricular tachycardia, are the most common among children of all age groups, including neonate.¹ Supraventricular tachycardia is commonly seen in babies who have some congenital heart disease, metabolic disorders, infections or it may be idiopathic in more than 50% of cases.² Cardiac arrhythmia followed by viral infection may require antiarrhythmic drugs. Banjac et al. have described atrial tachycardia after enterovirus infection in a neonate, which required antiarrhythmic drug to convert it to normal sinus rhythm.³ A retrospective study done by Seslar et al. found that propranolol is the most commonly prescribed antiarrhythmic drug in the neonate and infant age groups.⁴ The choice of drug for maintenance therapy is largely determined by electrophysiological study and response to treatment.

Supraventricular tachycardia in paediatric age group is almost always re-entrant in nature involving either an accessory atrioventricular pathway or atrioventricular node or it may be automatic tachycardia.⁵ Vagal manoeuvres can be tried only in stable neonates. Application of an ice water bag to the face is an accepted method to elicit the diving reflex in the neonate and infant age groups. Carotid sinus massage may compromise cerebral circulation and also compresses the airway. This method is not recommended even in stable neonate, but can be tried in older children. Older children can also be made to blow through a narrow straw. Direct pressure over the eyes can result in retinal detachment.⁶ Management of arrhythmia accompanied with haemodynamic instability, which is not responding to pharmacological cardioversion, is a challenging issue. Haemodynamic instability is a major concern while treating arrhythmias and largely determines the method of cardioversion.

American Heart Association guidelines 2010 for paediatric cardiopulmonary resuscitation recommend an initial adenosine dose of 0.1 mg/kg in infants and children. In this case, Adenosine 0.05 mg/kg was administered as initial dose with an increase in dose up to 0.25 mg/kg.^{7,8} Repeat doses of Adenosine have not reverted the abnormal rhythm. It would have been appropriate to begin with the initial dose of 0.1 mg/kg of Adenosine.

This baby had only a small patent foramen ovale with left to right shunt, which may not have attributed to rhythm

Fig. 1 – ECG showing atrial flutter.

Fig. 2 – ECG showing normal sinus rhythm after cardioversion with 2 J/kg.

abnormality.⁹ All relevant investigations were done to rule out the secondary causes of rhythm abnormality. In second admission, this baby developed atrial flutter, which was not responsive to pharmacological cardioversion. It required repeated electrical cardioversion for termination of atrial flutter (Fig. 2). Gulletta et al. have described a case of atrial flutter in neonate, which required multiple external electrical cardioversions.¹⁰ The safe upper and effective lower limit of energy level for defibrillation in paediatric age group is not known. It is recommended to start with 2 J/kg and a higher energy level up to 10 J/kg can be considered.⁶ Drug-resistant tachyarrhythmias with breakthrough SVTs and haemodynamic instability may further require electrophysiological study and radiofrequency ablation.¹¹

Low-dose repeated cardioversion has proved to be safe in this case (normal CK-MB level). Trop T test would have been more sensitive and specific test than CK-MB to identify the damage that may have occurred to cardiomyocytes due to repeated cardioversion.

The aim of this case report is to highlight the need for prompt recognition and management of cardiac arrhythmia with haemodynamic instability to prevent life threatening consequences. Synchronised cardioversion is the only life-saving measure in management of supraventricular tachycardia, when pharmacological cardioversion has failed.

Conflicts of interest

The authors have none to declare.

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