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Shabih Manzar

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Case Report

Shocking the Racing Heart

Kirstin U. Mosley[1], MD¶ Shabih Manzar[2], MD*

[1]Pediatric Resident, Department of Pediatrics

2Attending, Division of Neonatology, Louisiana State University of Health Sciences (LSUHSC) Shreveport, LA

***Corresponding author:** Shabih Manzar, MD 1501 Kings Highway Shreveport, LA 71130 Telephone: 318-626- 1620 Fax: 318-698-4305.

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Summary:

We present a case of a term infant who developed refractory supraventricular tachycardia (SVT) that responded to a high dose of electrical shock. The exact cause for SVT remained obscure.

Case:

A term male infant was delivered to a 24 year old gravida 2, para 1,0,0,0, at 40 weeks of gestation. Pregnancy was complicated by maternal fever, maternal history of herpes simplex virus (HSV) infection and group B streptococcus (GBS) positive screen. Despite testing positive for HSV1/2 IgG during pregnancy, she has no history of lesions and had no lesions at delivery. She was treated with penicillin prior to delivery for GBS positivity. All other maternal prenatal labs including RPR, HIV, hepatitis B, sickle cell screen, chlamydia and gonorrhea were negative. Mother's blood group was O positive and coombs negative. Prenatal care was adequate. Mother was in a motor vehicle accident at 35 weeks and 5 days of gestation which did not cause maternal or fetal injury. She presented to hospital for scheduled, term, vaginal delivery induction.

Infant was delivered by vaginal delivery with Apgar scores of 8 and 9 at 1 and 5 minutes respectively. Infant was transferred to newborn nursery. Initial vitals in nursery were age appropriate. At 2 hours of life nurses notified on-call resident that infant's heart rate was steady at or above 220 BPM for about 20 minutes with tachypnea eventually up to 91 breaths per minute and oxygen saturations above 94%. Resident and neonatal nurse practitioner found infant to be pale and have thread radial pulses, with above vitals. Infant promptly transferred to NICU.

On examination in the NICU, weight was 3.9 kg, length of 51.4 cm and head circumference of 36 cm. Admission vital signs were: temperature 98.6 °F , heart rate 293, respiration 39-71, blood pressure 67/46, oxygen saturation (SpO_2) 97 % on 4 L, 25% O2. Head was normocephalic and anterior fontanelle was flat. Pupils were equal, round, and reactive to light. Cardiovascular exam showed tachycardia and no murmur able to be appreciated. Chest exam revealed tachypnea. Abdomen was soft without distention. Genitals were consistent gender and gestation. His tone was normal for age and skin was warm with no lesions. He was overall irritable.

Hospital Course:

While still in the newborn nursery, an electrocardiogram (ECG) was obtained that was consistent with a narrow QRS tachycardia with ventricular rate of 252 beats per minute (BPM), concerning for supraventricular tachycardia (SVT) and presumed atrial flutter. **Figure 1** display the Electrocardiogram (ECG) showing the above findings. Upon arrival to NICU, vagal maneuvers were attempted.

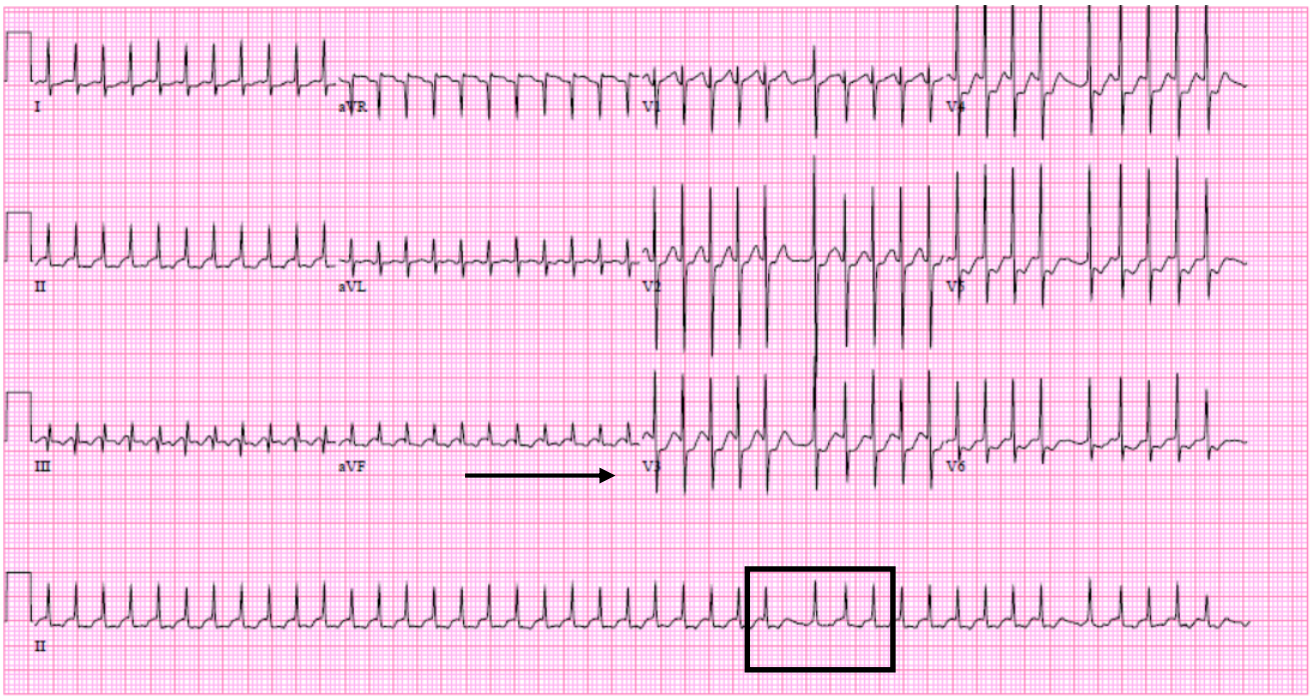

Figure 1: Electrocardiogram showing supraventricular tachycardia (SVT) Black box displays Atrial flutter

A bag of ice water was applied over the face for at least 20 seconds with no response. Ice to face repeated a second time, with no response. Gag maneuvers were also tried twice with no response. Decision made with neonatologist and pediatric cardiologist to initiate adenosine treatment. Team was unable to obtain peripheral IV access after multiple tries, therefore umbilical venous catheter (UVC) was placed, followed by chest x-ray to determine placement. (Figure 2&3).

IV adenosine was then given at neonatal dose of 0.05mg/kg via rapid IV push, followed by no improvement in heart rate. Five minutes later, a second, higher dose of 0.1mg/kg was given with no response. A third administration of adenosine at 0.15mg/kg was given, with again, no response. Patient at this time requiring 4 liters of supplemental oxygen due to increased work of breathing and mild desaturations down to 82%. Pediatric cardiology advised synchronized cardioversion. Patient given light sedation using versed and fentanyl. First shock administered with 5J (about 1.2 J/kg) with no response. Second shock was advised and given at 8J (about 2 J/kg) with subsequent decrease in heart rate to 172. A follow-up ECG was obtained that revealed successful conversion to sinus rhythm. Figure 4 displays the ECG after the second shock. Conversion to sinus rhythm complete at about 4 hours of life. Patient did exhibit a continued oxygen requirement and was stable on 4 liters of supplemental high flow nasal cannula oxygen at 25%.

Patient was also started on IV ampicillin and gentamicin for septic precaution due to maternal concerns for chorioamnionitis related to mother's post- delivery temperature of 100.8 Fahrenheit. Septic workup and basic laboratory work, obtained prior to the above events, were unremarkable. Feeds were held and infant was started on dextrose solution. The following morning, an echocardiogram was obtained to evaluate possible sources of arrhythmia. The echocardiogram showed a small mid-muscular ventricular septal defect with bidirectional shunt, small patent ductus arteriosus with mostly left to right shunt but cannot rule out trivial right to left shunt, patent foramen ovale with left to right shunt and hypertrophy of RV apex.

Infant transitioned well and was discharge home on day 3 of life with follow up with Pediatric cardiology.

Discussion:

Supraventricular tachycardia (SVT) is the most common symptomatic arrhythmia in childhood that can be a recurrent and persistent condition. The reported SVT incidence in neonates is 1 in 200 to 250 for neonates. [1,2] Treatment of SVT range from apply ice to the face, use of medications to cardioversion.[3-5]

Most of the SVT respond to adenosine but that was not the case in the infant presented above. The plausible reasons could be

a) Umbilical Venous Catheter was not in good position making adenosine go through the liver and metabolized. Adenosine has a very short half-life, thus it should be given rapidly and it should reach the heart within second without the first by-pass.

b) AV node not is involved in atrial flutter. Figure 3 depict the atrial flutter in the infant that's why adenosine did not work.

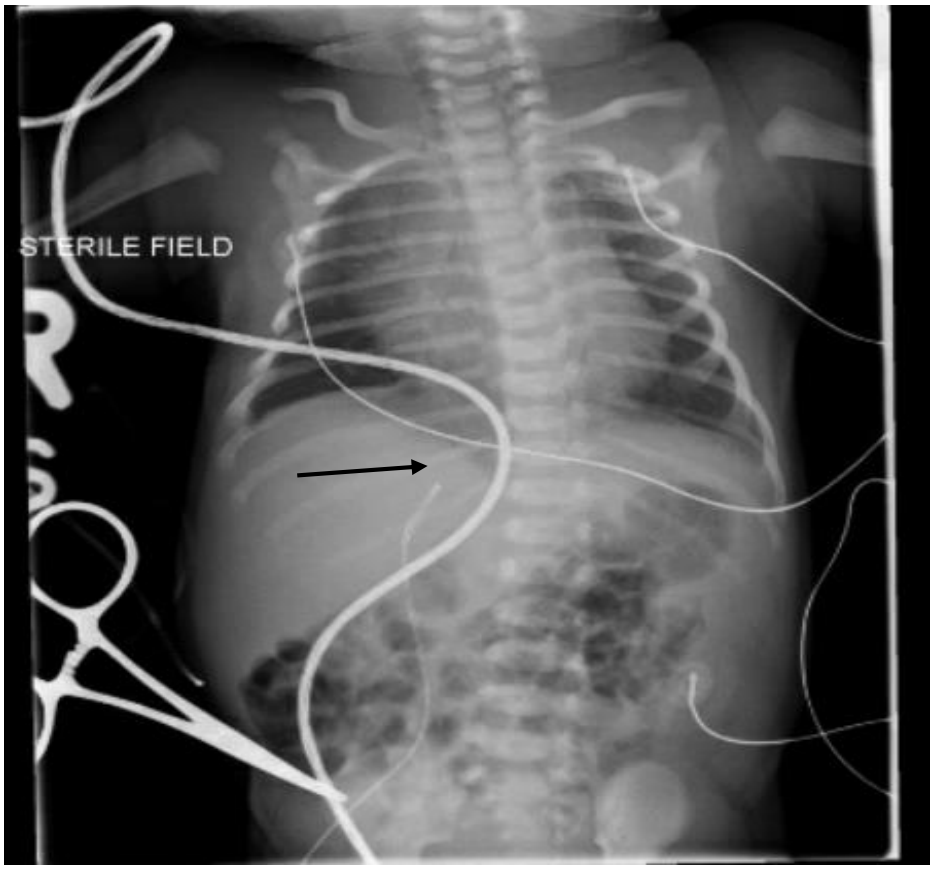

Figure 2: Chest X-Ray (CXR) take after inserting umbilical venous catheter (UVC) Black arrow showing UVC in livers

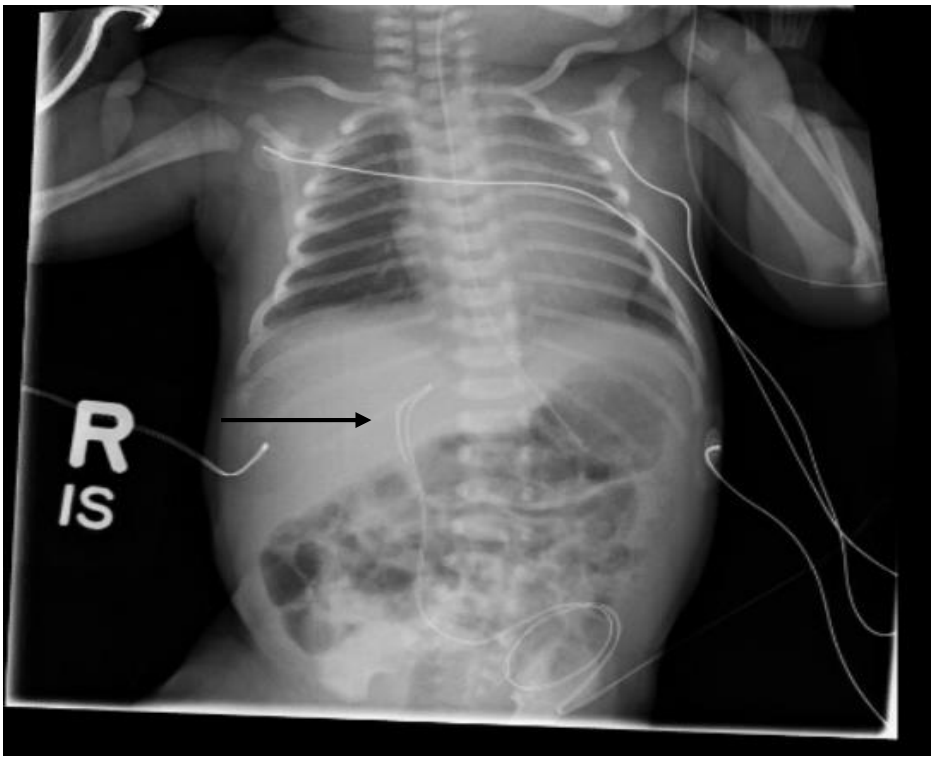

Figure 3: Chest X-Ray (CXR) taken after inserting umbilical venous catheter (UVC) Black arrow showing UVC coiling in liver

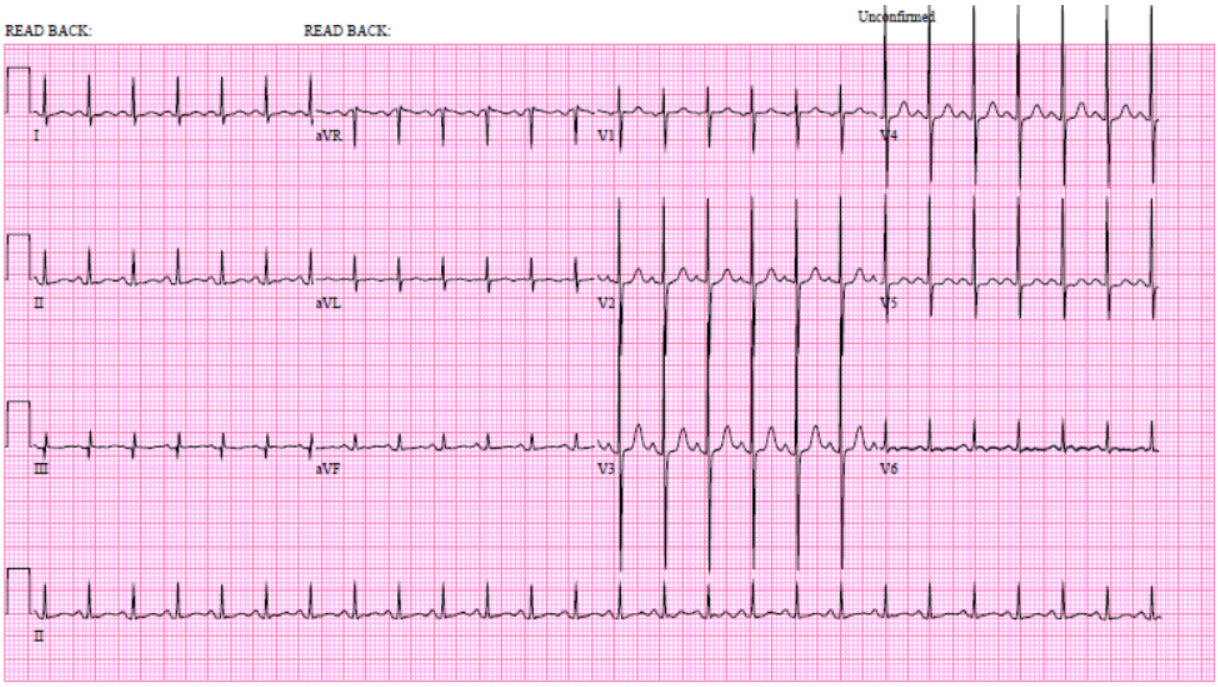

Figure 4: Electrocardiogram showing sinus rhythm

Conclusion:

Any neonate presenting with tachycardia, a special focus should be given to maternal history. A good clinical examination should be carried out. An ECG should be obtained promptly and if SVT is noticed that should be treated adequately. If SVT is not responding to

medications, shocking the heart early will prevent the infant from cardiac decompensation.

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Suggested reading:

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