

# Junctional Ectopic Tachycardia Following Aortic Balloon Angioplasty

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## INTRODUCTION

Junctional ectopic tachycardia (JET) is a rare arrhythmia resulting from increased automaticity of the AV node with variable retrograde VA conduction. It most commonly manifests following congenital cardiac surgery. JET can be challenging for the clinician as it resembles supraventricular tachyarrhythmias, but its treatment differs significantly.

## CASE PRESENTATION

- 8-week old male with Shone's complex characterized by a hypoplastic mitral valve with stenosis, hypoplastic aortic valve with long segment correction, patent ductus arteriosus (PDA), small left ventricle and atrial septal defect (ASD).
- On day of life 5, he underwent ASD closure, PDA ligation and arch augmentation
- Follow-up echocardiogram revealed moderate mitral stenosis and a "napkin ring" narrowing in ascending aorta with a peak gradient of 52mmHg (Figure 1).

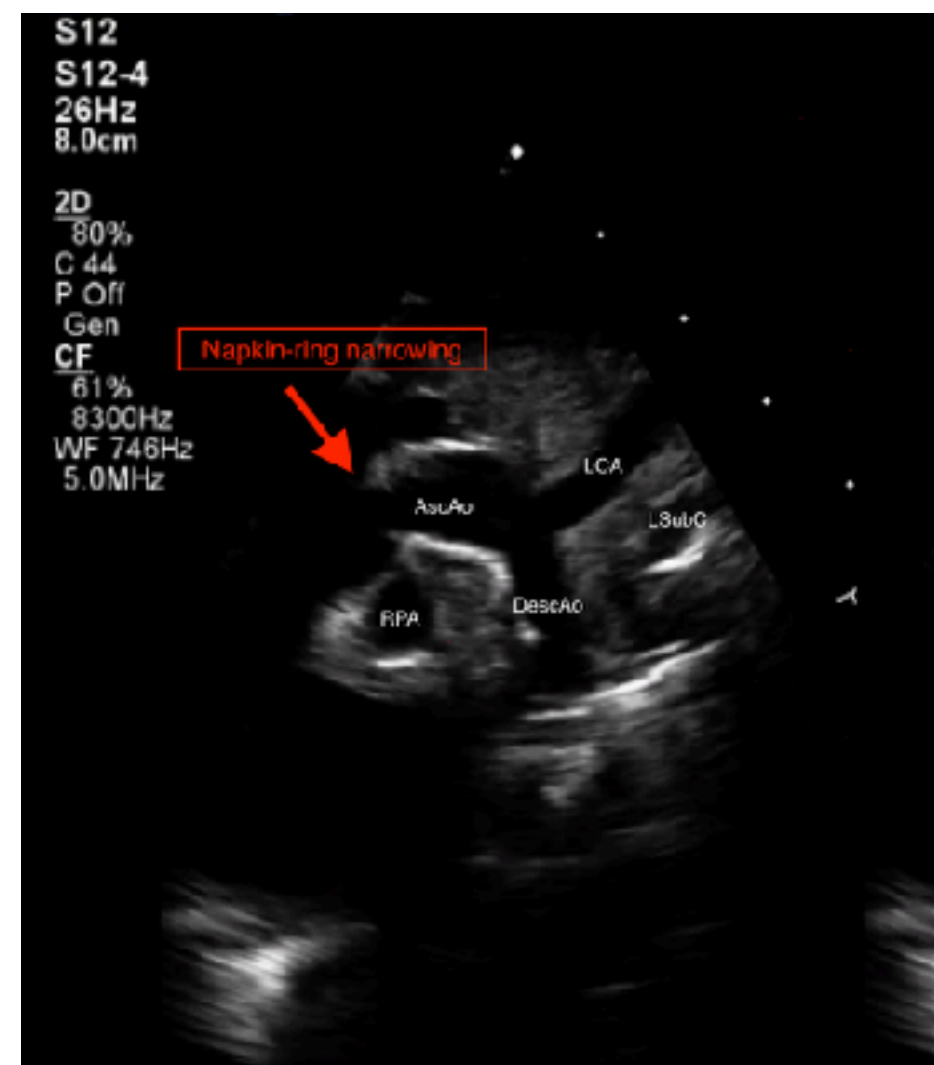


Figure 1. Transthoracic echocardiogram. Suprasternal view of aortic arch and supra-aortic great arteries. Note discrete narrowing in ascending aorta. AscAo, ascending aorta; DescAo, descending aorta; RPA, right pulmonary artery. LCA, left carotid artery; LSubC, left subclavian artery. Innominate artery not well-visualized.

## CASE PRESENTATION (cont.)

- Patient taken to cardiac catheterization lab for angiography, possible balloon angioplasty of ascending aorta.
- General anesthesia was initiated via inhalational induction. A 24G PIV was placed and 1mg/kg rocuronium, 2mcg/kg fentanyl were administered.
- Patient was intubated with Miller 1, grade 1 view, size 3.0 ETT.
- Case proceeding uneventfully on 0.5% MAC isoflurane and 0.5mcg/kg/hr dexmedetomidine.
- Angiography confirmed focal narrowing of ascending aorta (Figure 2a and b), and decision was made to balloon dilate the stenosis.
- During balloon dilation of the ascending aorta, rhythm abruptly changed from normal sinus rhythm (NSR) at a rate of 120bpm to a narrow complex tachycardia at a rate of 200bpm (Figure 3).
- Adenosine was administered and resulted in decreased rate of atrial p waves without a change in ventricular rate.
- Based on this pathognomonic response, rhythm was diagnosed as junctional ectopic tachycardia (JET) with complete AV block.
- Patient treated with ice packs to actively cool and methylprednisolone to reduce edema from potential trauma to conduction tissue.
- Within 1 hour, patient returned to NSR where he remained.

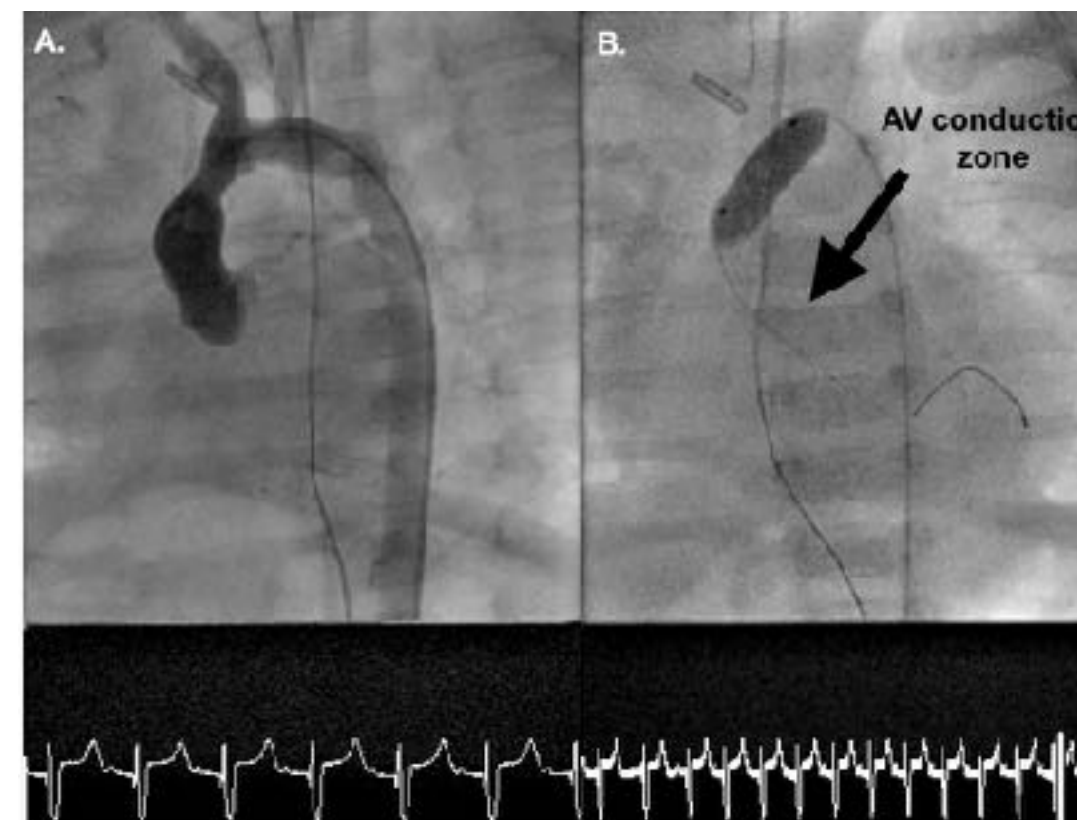


Figure 2. A. Ascending aorta with contrast demonstrating focal stenosis. Sinus rhythm present on EKG. B. Balloon fully inflated. EKG demonstrates tachyarrhythmia. Images courtesy of Dr. Dana Janssen, Vanderbilt Children's Hospital.

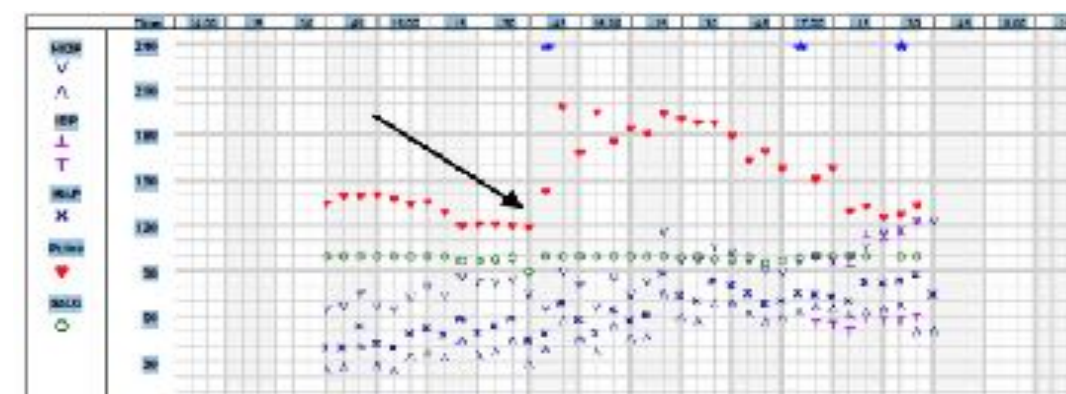


Figure 3. Electronic anesthesia record during angioplasty. Arrow indicates balloon inflation and abrupt change in heart rate.

## DISCUSSION

### JUNCTIONAL ECTOPIC TACHYCARDIA (JET)

- JET is a rare arrhythmia that results from increased automaticity of the AV node with variable retrograde VA conduction.
- Antegrade conduction continues over normal conduction system, resulting in narrow complex QRS.
- There is atrioventricular dissociation, with variable degree of conduction.
- At times, 1:1 VA conduction pattern may make it difficult to distinguish JET from supraventricular tachycardia (SVT).

### DEVELOPMENT OF JET

- JET may be congenital in nature, however, more commonly, the acute onset of JET may be caused by manipulation within the crux of the heart causing edema or mechanical injury during cardiac procedures.
- In this case, acute JET occurred during a supra-aortic balloon angioplasty, without direct manipulation of the conduction system.
- One hypothesis is that the stiff wire placed through the aortic valve could result in enough irritation of the nearby His-Purkinje conducting fibers to induce increased automaticity of the AV node.

### TREATMENT OF JET

- Dexmedetomidine may decrease rates of JET following pediatric cardiac surgery.
- Conservative therapy including avoidance of hyperthermia appropriate pain control and minimizing inotropic agents has been shown to control JET in 24% of patients.
- Second line therapy includes atrial pacing, active cooling and anti-arrhythmic agents, such as amiodarone.
- Systemic corticosteroids may be given to reduce edema, however, treatment effect may be delayed.
- For refractory or hemodynamically unstable JET, ablation or extracorporeal membrane oxygenation (ECMO) may be required.
- Adenosine may help differentiate JET from SVT or AVNRT, as it reduces conduction at the AV node, but it will be unsuccessful at treating JET.

## CONCLUSIONS

- Distinguishing between JET and atrial tachyarrhythmias is critical as the management differs substantially.
- Treatment of JET includes atrial pacing, active cooling, amiodarone, and systemic corticosteroids.
- JET is refractory to cardioversion and most anti-arrhythmic agents and can be a rare but challenging complication following percutaneous cardiac procedures.

## REFERENCES

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