

## Clipped RCA: Anomalous Origin of RCA during Minimally Invasive ASD Closure

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### Reprints Requests

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### Abstract

Minimally invasive surgeries have influenced the field of surgeries in a variety of ways specially females and cosmesis. We present a case with a diagnosis of SV-ASD who underwent Right Mini-Thoracotomy ASD closure. Basic pre-operative investigations were done. During the course of surgery a vessel was clipped near the A-P window, post surgery she developed signs of right ventricular dysfunction. The clipped vessel turned out to be an important vessel when a conventional angiogram was done - an anomalous origin of RCA. Emergency coronary artery bypass was performed and patient recovered uneventfully. In a setting of decreased operating space, mapping of coronary vessels may provide us added information which may avert complications.

**Keywords:** Sinus Venosus; Atrial Septal Defect; High Origin Right Coronary Artery; Minimally Invasive Surgery.

### Introduction

Atrial septal defects are the most common adult congenital cardiac anomalies in India [1]. Minimally invasive surgical techniques include partial sternotomy, right mini thoracotomy and endoscopic repair. They have shown higher rates of successful closure rates, low morbidity, reduced hospital stay and better cosmesis [2]. But the limited access and visibility provides unnecessary strain during operations when surprises are met. Coronary artery anomalies has been described in literature to be 5.6% of the general population. They are often associated with congenital heart disease and most of them are asymptomatic [3]. Accidental injury to coronary artery can occur when anomalous course is present. No such incidences have been reported during minimally invasive surgery.

### Case Report

A young lady, aged 20 yrs was evaluated for recurrent upper respiratory tract infection,

palpitations and was found to have a Sinus Venosus-Atrial septal defect (SV-ASD)- superior vena cava type (SVC) through trans-thoracic two dimensional-echocardiogram (2D-Echo). Prompt referral to cardiothoracic surgery was done. Investigations revealed no abnormalities. Considering her age and absence of coronary risk factors, coronary angiogram was ignored. Patient consented for the procedure after explaining the risks and complications. Minimally invasive surgery was planned.

Patient was placed in left semi lateral position after securing the airway with a double lumen endotracheal tube for single lung ventilation. Right femoral artery was exposed, looped. A right sub-mammmary incision was placed measuring about 5cm to access the 4th inter costal space. Right SVC, IVC and Left SVC were identified. Right femoral artery, SVC and IVC were cannulated. Bypass was established successfully. During the dissection in the aorto-pulmonary area (for cross-clamping), bright red blood started to accumulate. Hemostasis was achieved by clipping the bleeder. Electrocardiogram (ECG) on the monitor did not reveal any abnormalities. Cross-clamp was applied and the

heart was arrested with cold St Thomas cardio-plegia II solution cooling the patient to 30°C. Left SVC was drained through coronary sinus. Intra-atrial baffling of SV-ASD was done using savage patch with re-routing of the pulmonary veins to left atrium. Total cross clamp time was 44 minutes. Patient was weaned off bypass uneventfully: without any inotropic supports. Immediate post operative course was smooth, 12 lead ECG showed no abnormalities (Figure 1a) and hence patient was extubated in the surgical recovery after four hours of observation. The next day, patient started complaining of severe fatigability and dizziness without any respiratory complaints after taking a few steps. Surprisingly, ST segment elevations were observed in inferior based leads- II, III, aVF which is unusual for an ASD closure case in ECG (Figure 1b). Cardiac enzymes were also elevated five times the normal limit (CPK-2142 U/L; CPK-MB-169 U/L).



Fig. 1a: Immediate post-op ECG

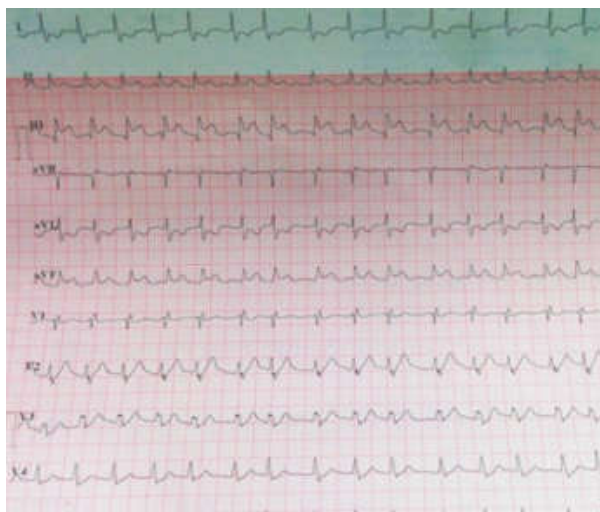


Fig. 1b: POD 1: ST-T abnormalities in inferior leads with atrial fibrillation

2D-echo was done which showed severe right ventricular (RV) dysfunction with regional wall motion abnormalities (RWMA) in inferior and posterior walls; moderate to severe tricuspid regurgitation (TR) was observed. Keeping in mind the clipped vessel, a conventional angiogram was done via right radial artery (Figure 2a). Total occlusion of Right coronary artery (RCA) at the origin with retrograde filling of right coronary system vessels from the left was reported (Figure 2b). Patient was hemodynamically stable throughout the angiogram procedure.

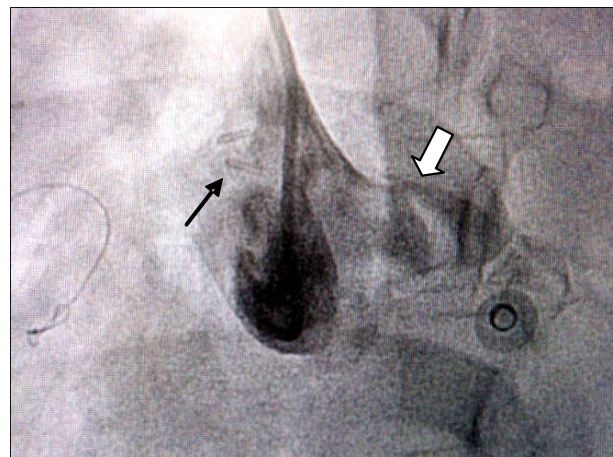


Fig. 2a: Angiogram: Empty right coronary sinus with catheter, Normal left main coronary artery (white arrow), clipped RCA (black arrow)

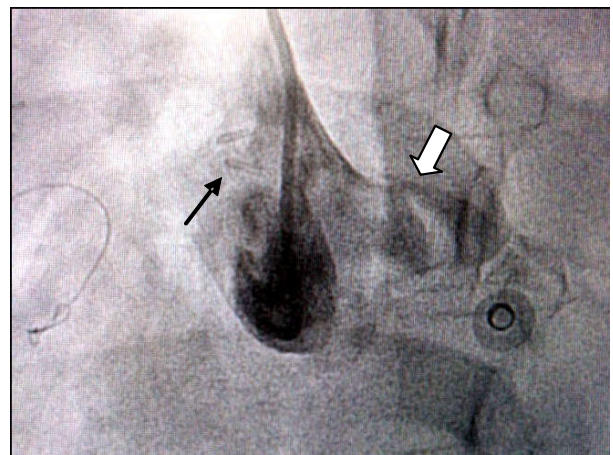


Fig. 2b: Angiogram: faintly opacifying RCA retrogradely (white arrows) to the clips (black arrow)

Emergency off pump coronary artery bypass was performed with 2cm reversed vein graft from aorta to proximal RCA via the midline sternotomy. The anomalous course of the RCA was noted with origin from posterior aspect of aorta coursing from posterior to anterior and supplying the RV. ECG showed regression of the ST segment elevations in inferior leads sometime after bypass grafting was completed.

Trans-esophageal echocardiography also showed progressive improvement of RWMA and reduction in the amount of TR. Recovery was uneventful and patient was extubated six hours post surgery. Routine 2D-Echo revealed no RWMA, mild TR, no RV dysfunction. Cardiac enzymes also returned to normal. Patient was discharged on post operative day 7 with anti-platelets. Follow up after 6 months and 12 months were satisfactory. We could not obtain a follow up angiogram due to unwillingness of the patient to undergo the procedure.

### Discussion

Congenital coronary artery anomalies were described systematically by Angelini et al<sup>3</sup>. During coronary angiographic studies, the incidence of an anomalous right coronary artery ranges from 0.09% to 0.92% [3,4]. High origin of RCA is defined as origin of RCA 2cm above the sino-tubular junction; others take the reference of pulmonary valve [5,6,7].

Upon retrospection, we suspected high origin of RCA and committed the patient for angiography post surgical clipping of the bleeding vessel in the A-P window. We also noted collaterals from the left system filling the RCA retrogradely hence masking the ECG finding on the day of surgery. The probable reasons for collateralization in a non atherosclerotic RCA may be due to the high origin of right coronary ostium which is susceptible for coronary hypoperfusion, as the sinus of Valsalva facilitating the diastolic perfusion is lost [8] or slit like orifice or acute angulations of the artery [7]. Anomalous right coronary artery courses between aorta and pulmonary artery to its normal position which can explain angina due to mechanical compression which was not evident during pre-operative evaluation even upon exertion [9]. Cross clamping of aorta below the high origin of the right coronary artery will lead to unsuccessful delivery of cardioplegia and hence leading on to inadequate myocardial protection [6].

Repair of ostium secundum or sinus venosus ASD can be performed safely via mini thoracotomy with similar outcomes as sternotomy [10]. But the need for routine coronary mapping (i.e, either conventional or CT) is still a question mark/ doubt among the surgeons when planning cardiac surgeries. Here was

an example of an anomalous RCA described during surgery to prevent further such iatrogenic complication.

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