The Heart Surgery Forum #2001-13389
5 (3):300–301, 2002

Online address: www.hsforum.com/vol5/issue3/2001-13389.html

# Anomalous Course of the Right Coronary Artery in the Right Atrial Wall : A Word of Caution

(#2001-13389 … July 10, 2001)

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## ABSTRACT

We report a case of anomalous course of the right cornary artery in the wall of right atrium which was encountered during cornary artery bypass surgery. As the stenotic lesion in the vessel was proximal, the large posterior descending branch of the right coronary was grafted. Such an anomalous course of the right coronary artery has not been previously described in the literature and lack of knowledge of such an abnormal course may result in inadvertant damage during cannulation of the inferior vena cava or coronary sinus.

## INTRODUCTION

The right coronary artery normally lies in the subepicardial plane of the right ventricle. The documented abnormal variations in this position include intra-mural , intracavity and the so called aerial position when it lies above the ventricular surface. We operated upon a patient in whom it was lying in the right atrial wall about one and half centimeter away from the atrioventricular groove. To our knowledge this anomalous course has not been described previously . We report the clinical and operative summary of this case and provide an overview of the anomalies of right coronary artery.

## CASE REPORT

A 58 years old male patient with chronic stable angina was admitted for an elective coronary bypass surgery. The coronary angiogram demostrated a 95 % stenosis of proximal right coronary artery (RCA), 95 % stenosis of left antrior descending coronary artery (LAD), 99 % stenosis of diagonal branch of LAD and 90 % stenosis of proximal circumflex coronary artery. The coronary angiogram did not suggest any abnormality in the course of the vessel. The operation was performed using standard cardiopulmonary bypass with an aortic and a two stage venous cannula. Dissection was first carried out in the atrioventricular groove. However, the right coronary artery was not seen. A thorough examination in the area showed that the vessel was in the right atrial wall (see Figures 1 and 2, ◉) about one and a half centimeter from the atrio-ventricular groove . The abnormal course of the vessel was confirmed by advancing a probe retrograde through the arteriotomy in the posterior descending artery . As the lesion located proximally in the RCA, we grafted its large posterior descending branch. The rest of the operative procedure was uneventful and the post-operative recovery was satisfactory.

## DISCUSSION

Isolated congenital anomalies of the coronary arteries are found in 0.3-1.3% of patients undergoing coronary angiography [Kimbris 1978]. These anomalies may involve the origin and/or the course of a coronary artery. The five frequently described anomlies of coronary arteries include : i) the origin of the left coronary artery from the pulmonary artery, ii) the left coronary artery arising from inappropriate sinus, iii) the right coronary artery arising from the left aortic sinus, iv) the circumflex coronary artery arising from the the right aortic sinus or right coronary artery and v) the origin of the first septal branch from the right coronary artery [Nugent 1990]. Most of these anomalies remain unnoticed except those which produce severe ischemia. Various descriptions of these anomalies can be found in the literature. Although it is difficult to classify all such anomalies, there are a few classifications which attempt to cover both the anatomic nature of these anomalies and their clinical behaviour [Roberts 1986, Jalal 1998].

The right coronary artery arises from the right aortic sinus and runs forward and to the right. Its initial course is between the root of pulmonary trunk and right atrial appendage. It then runs in the atrioventricular groove, curves around the acute margin of the heart and reaches the posteior end of the posterior interventricular sulcus (Figure 2). Here it terminates by dividing into posterior descending branch and the left ventricular branch.

Various anomalies has been documented in the origin as well as course of the right coronary artery. In about 50% cases it arises by two ostia, one for the right main coronary artery itself and other for its branch, the conus artery [Walmsley 1972]. The abnormal origin of right coronary artery has surgical significance in Konno's procedure where the incision must be placed to the left of its ostium [Konno 1975].

The normal location of RCA like any other coronary artery is in the subepicardial plane on the surface of ventricle.

*Submitted July 3, 2001; accepted July 10, 2001.*

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Figure 1. Photograph showing course of the RCA in the right atrial wall (big arrow). The probe is advanced retrograde through arteriotomy in PDA and a suture sling (small arrow) is placed around the RCA.

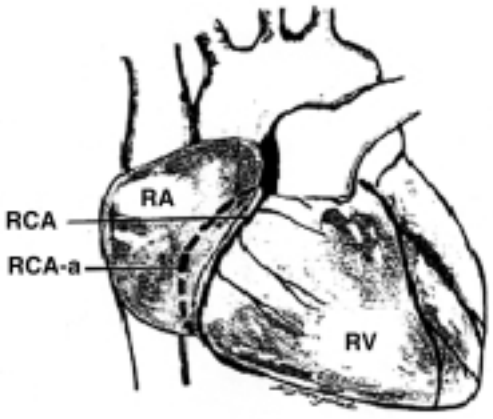


Figure 2. The course of right coronary artery. RCA : Normal course; RCA-a : Abnormal course in the right atrial wall as observed in our case; RV: Right ventrical RA: right atrium.

There are three abnormal locations documented in the literature which include mural, aerial and intracavity. Technically, for coronary bypass grafting , the aerial location would not cause any major difficulty. However, the intramural and intracavity positions can cause difficulties, both in locating and grafting the vessel. The intra cavity position occurs either in right ventricle or in the right atrium. Its incidence has been described as 0.1% in normal hearts [McAlpine 1975]. Oschner et al. [Oschner 1984] have described in detail, the special techniques for grafting these intracavity coronary arteries.

The location of the right coronary artery in the right atrial wall is a matter of concern for two reasons. Firstly it is at risk of being damaged during indirect cannulation of inferior vena cava for cardiopulmonary bypass or the coronary sinus for the retrograde delivery of cardioplegia. Secondly, the right atriurm can be entered while dissecting it for grafting. As two stage single cannulation in the right atrium is used widely to establish cardiopulmonary bypass in isolated coronary artery bypass procedures, inadvertant entery into the right atrium would lead to suction of air into the right atrium causing airlock of the cardiopulmonary bypass circuit. Thus a prior knowledge of such an abnormal course can prevent such hazards. Unfortunately, it is difficult to identify such an abnormal course on coronary angiogram.

We therefore recommend to rule out this abnormality by careful visual examination of the atrial wall as well as palpation of the site of cannulation. In cases of coronary bypass grafting if such an abnormality is encountered one should graft, whenever possible, a distal branch as we did in our case. However, if the grafting of a distal branch is not possible, inadvertant suction of air into the atrium can be avoided by using bicaval cannulation with caval snares.

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