

**DISCUSSION**

Congenital anomalies of the coronary arteries are usually of three categories: (1) origin of one or more coronary arteries from abnormal positions in the coronary sinus, including origin of the left main coronary artery from the right aortic sinus; (2) origin of the coronary arteries from the pulmonary artery; and (3) single coronary artery from the aorta.

These entities are rare and found in 0.3 percent to 1 percent of patients undergoing coronary angiography.¹ The anomalous origin of the left main artery from the right or anterior sinus of Valsalva has been associated with sudden death. The exact etiology and mechanism of sudden death are not known. However, the following hypotheses have been suggested: (1) the acute passage of the coronary artery between the aorta and the pulmonary trunk may predispose it to extrinsic compression ischemia with or without lethal arrhythmia; (2) spasm, torsion, or kinking of the aberrant left coronary artery on itself; (3) congenitally small left coronary artery system; and/or (4) an anatomic derangement at the takeoff of the anomalous vessel. As this entity is amenable to coronary revascularization surgery, early diagnosis is very important. In the past, coronary angiography or autopsy were the only ways that these conditions could be diagnosed in patients. However, now transesophageal echocardiography can diagnose this entity as well. Although transthoracic echocardiography has also been shown to demonstrate anomalous coronary arteries that course anterior but not posterior to the aorta,²³ in our hands transesophageal echocardiography was superior to the transthoracic study in diagnosing this anomaly. The presence of flow in the anomalous coronary artery by color flow Doppler has been shown previously to be a good diagnostic feature.⁷ The color flow images in our patient were, however, suboptimal.

In conclusion, transesophageal echocardiography can diagnose anomalous left coronary artery arising from the right or anterior aortic sinus.

**REFERENCES**


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**Unusual Complication of Retrograde Coronary Sinus Perfusion With Pulmonary Artery Catheter**

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A balloon-tipped catheter placed in the coronary sinus is used during cardiac surgery for retrograde cardioplegia and is secured by a purse string suture placed proximal to the atrioventricular groove in the lower right atrium. We report a complication of this procedure where a pulmonary artery catheter was sutured to the wall of the right atrium by the purse string suture in a patient scheduled for aortocoronary bypass grafting. Pulsatile resistance was noted when we attempted to withdraw the catheter indicating an attachment to the heart. The pulmonary artery catheter within the vascular space after atrial cannulation should be checked since the sheath-protected cannula will enable free mobility. (Chest 1993; 103:1618-19)

The retrograde perfusion of cardioplegic solution through a balloon-tipped catheter placed in the coronary sinus is used frequently for myocardial arrest and protection during cardiac surgery.¹² Other investigators²³ described retroperfusion of the coronary sinus by a needle placed in the right atrium after total cardiopulmonary bypass. We experienced a rare complication of this procedure in which a pulmonary artery catheter was attached to the wall of the right atrium by the purse string suture used to secure the retrograde perfusion cannula.

**CASE REPORT**

A 67-year-old woman with a history of hypertension, unstable angina, obstructive lung disease, and recurrent congestive heart failure was scheduled for aortocoronary bypass. Physical examination revealed bibasilar rales and a prominent S₂ gallop. Results of her laboratory examination were within normal limits. Cardiac catheterization revealed triple-vessel disease and a left ventricular ejection fraction of 35 percent.

A flow-directed oximetric pulmonary artery catheter was passed to 48 cm without difficulty through an 8.5 Fr introducer inserted into the right internal jugular vein. She was taken to the operating room and uneventful general anesthesia was induced and maintained with intravenous fentanyl, vecuronium, and 100 percent oxygen. Median sternotomy was performed and the aortic and atrial cannulas were placed. A 1-cm purse string suture using 4-0 polypropylene (Prolene) was placed in the proximal atrioventricular groove of the right atrium. An 11 blade scalpel was then used to make a small incision in the lower right atrium, and the retroplegia cannula (Research Medical Inc, Midvale, Utah) was placed in the coronary sinus by palpation. After successful heparinization, cardiopulmonary bypass was initiated. The pulmonary artery catheter was pulled back 2 cm without difficulty. Aortocoronary bypass was accomplished after an aortic cross-clamp time of 70 min. The patient was separated from cardiopulmonary bypass with stable hemodynamics, and heparin was antagonized with protamine.

We noted that the pulmonary artery could not be occluded, and no air returned from the balloon to the syringe after unsuccessful

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attempts at inflation. We assumed the balloon had ruptured, and we planned to replace the catheter at the end of the procedure. The chest was closed after adequate surgical hemostasis was obtained. An attempt was made to aspirate through the balloon inflation port and free return of blood was noted. Pulsatile resistance was encountered on attempting to remove the catheter. The surgeon was informed, and opted to continue withdrawal pressure hoping to loosen the catheter, since it may have been snared by the purse string. Eventually, it broke free and was removed. The patient became hypotensive, and electromechanical dissociation developed. A large volume of dark-colored blood appeared in the mediastinal tube and collection system. Vigorous volume resuscitation began and the chest was surgically reexplored immediately. A 2-cm hole was noted in the right atrium, in the area of the retrograde catheter purse string. The defect in the right atrium was oversewn, the chest was closed, and the patient was transferred to the cardiac surgical unit without further incident. Examination of the pulmonary artery catheter revealed the purse string suture to have pierced the catheter at the 26-cm mark where it was still attached (Fig 1).

**DISCUSSION**

Myocardial perfusion and preservation can be achieved by the administration of cardioplegic solution through the coronary sinus by a balloon-tipped catheter passed through the right atrium into the coronary sinus. The retrograde cannula includes the occlusion balloon and infusion lumen, as well as an additional port through which coronary sinus perfusion pressure can be monitored continuously. Cardioplegic flow rate is adjusted to maintain the perfusion pressure less than 40 mm Hg. The cannula is anchored by a purse string suture placed in the low atrium, proximal to the atrioventricular groove. Hence, the potential exists for the pulmonary artery catheter to be caught by the purse string.

In comparison, the earlier method of retroperfusion necessitated total cardiopulmonary bypass with cannulation of both venae cavae, and a needle was inserted into the right atrium for infusion of the cardioplegic solution. This technique has the potential for right heart damage from overdistention, and it is ineffective in patients with atrial septal defects. In addition, a larger volume of cardioplegia is used because of the need to fill the right atrium, right ventricle, and proximal pulmonary arteries.

In our case, the pulmonary artery catheter was sutured to the atrial wall by the purse string, which had pierced the balloon inflation lumen. There was no change in the pulmonary artery tracing since the lumen of the distal port had not been occluded, as described by Eliasen and Vejlsted. The pulmonary artery occlusion pressure tracing could not be obtained after bypass, and no air returned from the balloon to the syringe. We assumed the balloon had ruptured and planned to replace the catheter. However, pulsatile resistance was noted when we attempted to withdraw the catheter at the end of the procedure, indicating an attachment to the beating heart. In this case, the catheter was effectively tethered to the right atrium, instead of being caught around the suture. The pierced inflation lumen allowed the injected air to leak through the needle hole. This was not immediately obvious and became clear only after the pulmonary artery catheter was removed.

We present a case in which the pulmonary artery catheter was sutured to the right atrial wall during placement of the purse string for retrograde cannulation. We recommend that free mobility of the pulmonary artery catheter be ascertained within the vascular space after atrial cannulation in cardiac operation. The sheath-protected cannula allows sterile repositioning to ensure that the catheter has not been snared by a surgical suture, and the catheter should be checked prior to closing the chest.

**REFERENCES**


**Pleural Effusion Masquerading as Myocardial Infarction**

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**Figure 1.** Purse string suture at 23 cm piercing the balloon inflation lumen.