Bentall operation in a patient with an anomalous left circumflex artery: Case report and review

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Anomalous origin of a left circumflex artery from the right coronary sinus represents a technical challenge in patients who require aortic valve/root procedures. This case report describes a patient who presented with bicuspid aortic valve, anomalous origin of the circumflex artery, severe aortic regurgitation, and aneurysm of the ascending aorta as well as aortic root that was safely managed following the Bentall procedure with the combined button technique.

Keywords: Anomalous origin of circumflex artery, Bentall procedure

Introduction

About 5% of patients undergoing coronary angiography are diagnosed with a variant of aberrant coronary artery. The most common anomaly diagnosed in adults is the ectopic right coronary artery from the left coronary sinus. A comparable specific anatomical malformation represents the anomalous left circumflex (LCX) artery with a separate ectopic ostium originating from the right sinus of Valsalva, although it usually has no clinical significance [1]. However, the incidence of coexisting coronary anomalies is more frequent in patients with a bicuspid aortic valve (BAV) morphology. Coronary artery anomalies and BAV have been described as risk factors for coronary complications after aortic valve/root procedures [2].

A review of the literature shows limited evidence regarding this entity and no recommendations on how to manage this specific anatomical aberration. We describe a case study of a successful Bentall operation with a composite button technique in a patient with concomitant aberrant LCX.

Case report

A 59-year-old male patient with paroxysmal atrial fibrillation was referred to our institute

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because of progressive dyspnea and New York Heart Association class III classification resulting from severe aortic valve insufficiency. The patient presented with a raphae between the left and right cusps (BAV), and thickened and moderately calcified cusps due to an ascending aorta and aortic root aneurysms of 5.5 and 4.5 cm, respectively. The patient was scheduled for elective prosthetic valve, ascending aorta and root replacement (Bentall operation), and a pulmonary vein isolation procedure.

Echocardiography revealed severe central aortic regurgitation due to cusp coaptation defect secondary to aortic root dilatation. Also, a left atrial dimension of 55 mm was noted. Preoperative coronary angiography visualized the anomalous LCX arising from the right coronary sinus although no signs of coronary artery disease were detected (Fig. 1A). Computed tomography angiography confirmed the aneurysm of the ascending aorta and aortic root (Fig. 1B).

The operation was conducted through a median sternotomy, and a mild hypothermic cardiopulmonary bypass was initiated with distal aortic and right atrial cannulation. After aortic cross-clamping and infusion of antegrade crystalloid cardioplegia, a transverse aortotomy at the sinotubular junction was performed. Exploration of the coronary sinuses confirmed the anomalous origin of the LCX from the right coronary sinus. A 1-mm coronary probe was placed into the assumed anomalous LCX originating from the right coronary sinus to verify the retroaortic course under the aortic ring between the aortic root and the left atrial roof (Fig. 2A). First, the pulmonary vein isolation procedure was performed with radiofrequency isolation of the pulmonary veins with the Medtronic Cardioblade BP 2 device (Medtronic Inc., Minneapolis, MN, USA). The left atrial appendage was not resected or clipped in order to avoid a possible injury to the anomalous LCX during the procedure. Later, the diseased ascending aorta, aortic root, and aortic cusps were excised, and two coronary buttons were created, one for the left coronary artery and a second composite button containing both ostia of the right

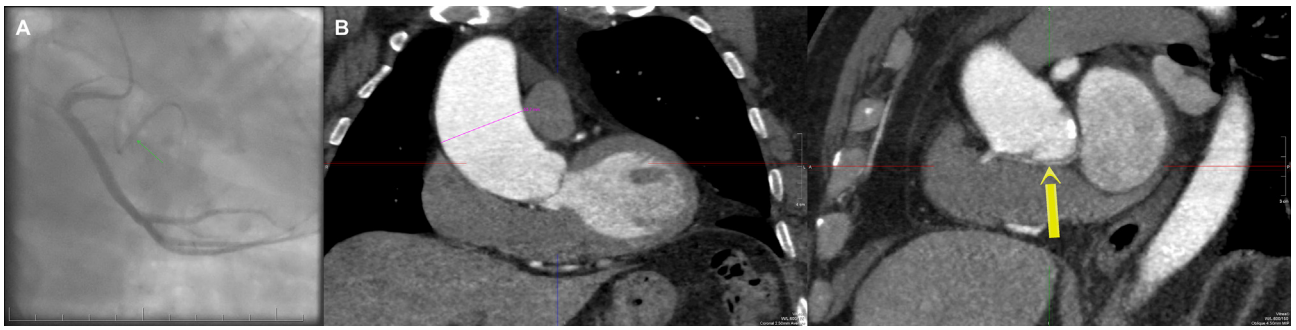

Figure 1. (A) Coronary angiography image of the anomalous left circumflex (LCX) arising from the right coronary sinus. (B) Computed tomography angiography showing the aneurysm of the ascending aorta and aortic root.

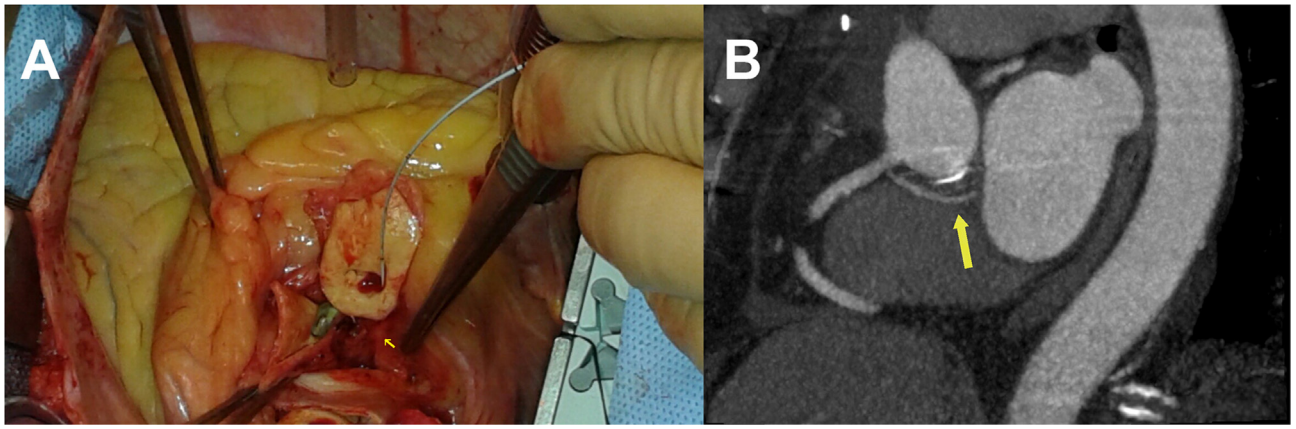

Figure 2. (A) Intraoperative image showing the anomalous left circumflex (LCX) originating from the right coronary sinus and the right coronary artery ostium. (B) Coronary computer tomography showing the normal position of the composite graft with a good function of both the coronary buttons.

and the anomalous LCX artery in the classical fashion. A 25-mm ON-X (CryoLife Inc., Kennesaw, GA, USA) composite graft was implanted in the annular plane, and both coronary ostia—first, the left coronary button and later the composite coronary button—were sutured to the composite graft using continuing polypropelene suture. The patient was weaned from the cardiopulmonary bypass in sinus rhythm.

The postoperative course was uneventful. The patient was placed on warfarin treatment, and on postoperative Day 10 he was discharged in stable condition. A postoperative echocardiography revealed normal left ventricular, normal prosthetic aortic valve function, and a coronary computer tomography showed normal position of the composite graft with a good function of both coronary buttons (Fig. 2B). Informed consent from the patient and institutional review board permission were obtained to present this case.

Discussion

An anomalous origin of the LCX from the right coronary sinus usually does not result in a dangerous entrapment of the coronary artery and has no clinical significance, although during aortic valve/root procedures this can result in severe complications. These include (1) coronary artery injury or obstruction of the ectopic coronary ostium, or the proximal course near the annulus by suture ligation; (2) compression by prosthetic ring; (3) injury during resection of the noncoronary sinus of Valsalva or suturing during one-sinus repair and (4) distortion of the artery during Bentall procedure with reimplantation of all three ostia [3]. In response, different surgical strategies were developed addressing these risks. In a cohort of six consecutive patients with BAV, Liebrich et al. [3]. proposed a strategy that follows precise mobilization of the anomalous LCX away from the aortic annulus in order to perform safe aortic valve/root surgery. Siepe et al. [4] recommended mobilizing the long vessel until it enters the oblique sinus and vanishes in the left atrioventricular groove just before the base of the left atrial appendage in order to prohibit later kinking during reimplantation of the circumflex artery. Nezic [5] suggested reimplantation of the right and left coronary ostia, and oversewing of the abnormal LCX ostium and left internal mammary graft to the circumflex artery.

In our patient we followed a method similar to the one described by Tourmousoglou [6]. We demonstrated that a Bentall procedure can be performed safely in patients where a composite button containing both ostia of right and circumflex coronary arteries is created; then, the two buttons—the composite and the left coronary one—are reimplanted to the aortic root using the classical method. Moreover, with our approach, the long mobilization and release of the artery from adhesions and possible injuries to the surrounding structures such as the aortic root, left atrium, and left ventricle are avoided.

Finally, as we have done for our patient, appropriate imaging prior to surgery and attention to the anatomic relationship of the anomalous arteries to the aorta are crucial and allow safe aortic root replacement [3,7].

In conclusion, a Bentall operation in a patient with a BAV and anomalous LCX from the right coronary sinus can be performed safely with the composite button technique as described in this report.

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