Management of anomalous right coronary arteries encountered during aortic valve surgery

Yoshio Misawa*, Tsutomu Saito, Shin-ichi Oki, Katsuo Fuse
Department of Cardiovascular Surgery, Jichi Medical School, 3311-1 Yakushiji, Minami-kawachi, Tochigi 329-0498, Japan

Received 21 August 2001; received in revised form 9 October 2001; accepted 14 October 2001

Abstract

We experienced three cases with anomalous right coronary arteries during aortic valve surgery. By rotating a Freestyle bioprosthesis by a subcoronary technique, the anomalous artery was secured in one patient. The anomalous artery was injured during the routine aortotomy incision in another patient; a saphenous vein graft was interposed between the ascending aorta and the separated artery. In the third patient, a subannular prosthetic valve was chosen to avoid obstructing the anomalous orifice. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Anomalous coronary artery; Freestyle valve; Aortic valve replacement; Aortic valve disease; Aorto-coronary bypass; Coronary angiogram

1. Introduction

Recommended guidelines for cardiac catheterization and angiography in aortic valve diseases have been published by the American College of Cardiology and American Heart Association [1]. In summary, coronary angiography before aortic valve surgery is both useful and effective in patients at risk for ischemic coronary artery disease. Anomalous coronary arteries [2] may lead to unpredicted alterations of surgical procedure during aortic valve surgery. In this study, another aspect of the usefulness and effectiveness of coronary angiography before aortic valve surgery and surgical management related to the anomalous arteries are discussed based on our experiences.

2. Case reports

2.1. Case 1

An 80-year-old man was admitted to our hospital for progressive dyspnea. An echocardiographic study revealed advanced left ventricular enlargement with severe aortic valve regurgitation. The preoperative coronary angiogram showed an elongated right coronary artery and no apparent anomalous origin (Fig. 1). An aortic valve replacement operation was performed under moderate hypothermic cardiopulmonary bypass. Cardiac arrest was obtained with antegrade and subsequent retrograde blood cardioplegic solution. The left coronary artery arose normally from the left posterior coronary sinus of Valsalva. The right coronary artery also arose from the same sinus. The degenerative aortic valve was replaced by a subcoronary technique with a Freestyle aortic root bioprosthesis (Medtronic Inc., Minneapolis, MN). Each commissural post of the bioprosthesis was secured carefully to avoid obstruction of the anomalous right and the normal left coronary ostia by rotation of the prosthesis (Fig. 2). The proximal suture line was placed in a subannular position with interrupted sutures, and the distal suture line was placed with running sutures starting at the bottom of the left sinus and working up each side toward the commissures. The patient’s postoperative course was uneventful with excellent cardiac and prosthetic valve function.

2.2. Case 2

A 56-year-old woman was transferred to our hospital because of recurrent congestive heart failure. Preoperative echocardiogram showed severe mitral and aortic valve regurgitation. Selective coronary angiography was not performed on the judgment of her physician. The patient had no prior history to suggest coronary artery disease. At operation, an oblique aortotomy was chosen for routine aortic valve surgery. The left coronary artery ostium was recognized at its normal anatomical position, but the right ostium could not be seen in the right sinus of Valsalva. The right coronary artery was found to arise anomalously from the left sinus of Valsalva. The artery coursed along the left
anterolateral wall of the ascending aorta and had been cut during aortotomy where it crossed the aortotomy line. The degenerative aortic and mitral valves were replaced with Bicarbon prosthetic valves (Sorin Biomedica Cardio, Saluggia, Italy) in the usual manner. The anomalous right coronary ostium was closed, and a saphenous vein graft was interposed between the ascending aorta and the separated right coronary artery. The patient recovered uneventfully.

2.3. Case 3

A 69-year-old man was admitted because of recurrent congestive heart failure due to aortic valve stenosis and regurgitation. The coronary angiogram showed intact coronary arteries with no clear indication of an anomalous origin of the right coronary artery. During the valve replacement operation, the ascending aorta was incised obliquely. Direct visualization confirmed that both the left and right coronary artery ostia arose from the left coronary sinus of Valsalva. The right ostium was close to the left–right commissure. To avoid interfering blood flow to the anomalous orifice, a subannular type prosthesis (Bicarbon valve) was chosen and implanted in the routine manner. The patient recovered without any complications.

3. Discussion

Anomalous coronary arteries are usually an incidental finding during conventional coronary angiography, with an incidence of 0.17–2%, and the commonest anomaly is an aberrant origin of the main left or right coronary artery from the wrong sinus of Valsalva [3–5]. Aberrant origins of coronary arteries may interfere with valve replacement when the Freestyle aortic root bioprosthesis is used. In Case 1, the abnormal origin of the right coronary artery was not initially noted on angiography, although the elongation of the coronary artery may indicate abnormal origin of the artery. By carefully positioning the prosthesis, the artery was secured from torture or occlusion. In Case 2, the aberrant right coronary artery ran along the ascending aorta, and it was injured accidentally during the routine aortotomy incision. In Case 3, the anomalous artery was secured by a subannular prosthetic valve implantation.

Preoperative coronary angiograms should be performed to assess coronary ischemia in patients suspected of having coronary artery disease [3]. Thus, coronary angiography is missed in some patients. When cardiac surgeons are aware of such abnormalities of the coronary arteries, they can avoid injuring the aberrant arteries by changing the location of aortotomy incisions and prosthetic valve selection [3]. A preoperative selective coronary angiogram would probably have disclosed the possible risk of injury to this artery if a routine incision were to be made in Case 2, who did not undergo a preoperative selective coronary angiogram since there was no suspicion of having coronary artery disease. Both cardiologists and cardiac surgeons should recognize the possible risk of injury to abnormal coronary arteries during aortic valve surgery. Therefore, coronary angiography should be recommended in all patients with aortic valve disease. In case of anomalous origins of the right coronary artery, recognizing the anatomy of the anomaly allowed proper incision of the ascending aorta and prosthetic valve selection. Longitudinal incision of the aorta can avoid anomalous vessels along the aorta. A prosthetic valve of supra-annular type might interfere with coronary blood flow because aberrant orifices often exist near the commissures.

Some patients with anomalous origins of the right coronary artery from the left sinus of Valsalva can have an increased risk of ischemic heart attack, notably in young populations [4,5]. The preoperative coronary angiograms from Case 1 revealed no coronary artery obstructions. Can elongation such as that reported in Case 1 cause circulatory obstruction? Do all right coronary arteries with anomalous origins from the wrong sinus of Valsalva require correction? None of our three patients showed any signs of ischemic
heart disease pre- or postoperatively. Further studies must be performed to determine the definite indications for repair of anomalous right coronary arteries originating from the wrong aortic sinus.

References