Intraoperative coronary angiography in the management of patients with acute aortic dissection and endocarditis

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Early surgical intervention is vital for the treatment of acute aortic dissection and acute aortic valve endocarditis, because interventional delay is associated with increased mortality. Although heart operations should not be performed without knowledge of the current coronary status, preoperative coronary angiography may delay the procedure and entails additional risks for the patient.¹ Furthermore, patients who have aortic valve endocarditis with floating bacterial structures on the valve cusps face an increased risk of coronary ostia embolism during coronary angiography.² Preoperative catheterization in patients with acute aortic dissection may also affect the false lumen or aggravate the dissection, thus increasing perioperative risk.³

We report here the successful use of intraoperative coronary angiography to detect coronary disease in high-risk patients with acute aortic dissection or acute endocarditis.

Clinical Summary

Seven patients with acute aortic dissection of Stanford A type ($n = 2$) or acute aortic valve endocarditis with valvular vegetations ($n = 5$) were urgently scheduled for surgical intervention. After establishment of cardiopulmonary bypass and aortic crossclamping, the proximal ascending aorta was opened for aortic valve replacement in the patients with endocarditis or to replace the dissected portions of the ascending aorta in the others. Cardioplegic solution was applied under visual control by intubating the coronary ostia separately. After injection of nitroglycerin (0.2 mg) to avoid coronary spasm, the contrast dye (iopromide) was delivered through the cardioplegic solution catheters to the already arrested heart. Coronary angiography with a digital fluoroscopic device (BV Pulsera; Philips Nederland BV Medical Systems, Eindhoven, The Netherlands) was then performed.

The rotating angle of 135° of the C-arm and the ability to counterrotate the operating table allowed us to achieve both left anterior oblique and right anterior oblique depictions of the coronary system under sterile conditions with a reduced time lapse. This approach resulted in changes in the surgical procedure in 2 of our 7 patients. In

the first case, we detected coronary artery disease in a 45-year-old patient with aortic valve endocarditis who had not previously undergone angiography because of vegetations next to the coronary ostia. Our intraoperative angiography showed stenoses in both the left anterior descending coronary artery and a diagonal branch (Figure 1). After rinsing the coronary arteries with saline solution, we anastomosed a venous bypass to the left anterior descending coronary artery and continued uneventfully with the aortic valve replacement.

Our second modification after angiography involved a 56-year-old patient with dissection of the ascending aorta. A further dissection into the left main stem, which had been unclear in the computed tomographic (CT) scan done before the operation, was seen on intraoperative angiography, resulting in a bypass procedure to the left anterior descending coronary artery. Weaning from cardiopulmonary bypass, electrocardiographic monitoring, and the postoperative period were uneventful.

The mean operative delay for the 7 patients caused by the angiographic examination was 12 minutes (range 8–17 minutes). The consumption of contrast medium was on average 11 mL (range 8–22 mL), and the radiation dose was 0.0344 Gy (range 0.0087–0.0931 Gy), or 2.40 Gy/cm² (1.81–9.61 Gy/cm²). In-hospital survival of our patients was 100%.

Figure 1. Right anterior oblique projection showing left coronary artery branches. Stenoses in left anterior descending coronary artery and diagonal branch are marked (arrows). Asterisk indicates venous cannula for cardiopulmonary bypass placed in right atrium, seen on left side.

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Discussion

Early surgical intervention is critical for the treatment of acute aortic dissection and acute aortic valve endocarditis, because the mortality increases from the onset of symptoms.² Diagnostic imaging, however, including CT, echocardiography, and coronary angiography, along with preparation for operative correction, usually takes longer than 4 hours, increasing the patient's risk.¹ Although surgical repair should only be performed after coronary diagnostic imaging to avoid ischemic complications, coronary angiography is often a high-risk procedure for these patients.⁴

To circumvent this problem, we propose a simplified approach involving intraoperative angiography. This diagnostic tool was initially used to evaluate the grafts after coronary artery bypass grafting.⁵ This method showed a high accuracy in the identification of coronary lesions without adverse effects on either the cardiac function or histologic appearance of the coronary arteries.^{3,4} Multislice CT could be an alternative diagnostic tool for the preoperative screening of coronary disease. CT presents some limitations relative to intraoperative angiography, however, such as 2-fold higher radiation doses (approximately 34 mGy versus approximately 80 mGy) and 10-fold higher contrast medium consumption (about 10 mL iopromide vs about 100 mL). This difference may be of relevance, especially for patients with aortic valve endocarditis and impaired renal function.

In our patients, intraoperative angiography allowed us to detect coronary anomalies that could be surgically corrected in 2 of 7 cases. In our opinion, aortic root angiography may reliably demonstrate coronary artery lesions in patients who undergo heart surgery without preoperative catheterization.

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Novel use of an aortic endograft in the closure of a Fontan circuit leak

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Unintended residual interatrial communications or baffle leaks after the lateral tunnel Fontan operation have been well described.¹ Such unintended communications have the potential to result in hypoxemia, cyanosis, exercise intolerance, and paradoxical embolization.² Surgical eradication of these leaks has the attendant risks of reoperative sternotomy and cardiopulmonary bypass. Therefore, transcatheter approaches are now commonly used. No ideal device exists for this task. Gian-

turco coils (Cook Medical, Bloomington, Ind), Amplatzer septal occluders (AGA Medical, Plymouth, Minn), and CardioSEAL VSD occluders (NMT Medical, Boston, Mass) have been used with varying degrees of success. These devices often prove ineffective because of their inability to conform to the complex atrial anatomy. Balloon-expandable covered stents have been used to exclude leaks and intentional fenestrations with good success.³ However, balloon-expandable covered stents of sufficient size are not available in the United States. We describe the novel use of a commercially available adult-size, self-expanding aortic stent graft to seal a large, symptomatic Fontan baffle leak.

Clinical Summary

A 15-year-old male with dextrocardia, bilateral superior vena cavae, common atrium, and unbalanced atrioventricular canal defect had undergone multiple cardiothoracic surgeries culminating in a fenestrated lateral tunnel Fontan. He presented with exercise intolerance. Exercise testing demonstrated resting saturations of 91% to 96%. Saturations decreased to 63% at peak exercise. Cardiac catheterization demonstrated right-to-left shunting (Qp:Qs 0.7) via both the fenestration and a large baffle leak. The baffle leak could not be

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