Case report

Acute aortic dissection after off-pump coronary artery surgery

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Abstract

Iatrogenic aortic dissection has been described, albeit infrequently, after coronary artery surgery performed under cardiopulmonary bypass. Since the advent of beating heart coronary surgery, several authors have described an apparent increase of this complication related to the application of a lateral clamp on the ascending aorta to perform the proximal anastomosis. We describe the case of a 70 years old patient who presented aortic dissection, with immediate paraplegia, 7 days after off-pump coronary surgery.

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1. Introduction

Aortic dissection complicating heart surgery under cardiopulmonary bypass (CPB) has been reported in 0.12–0.16% of cases, the incidence being higher (0.6%) after aortic valve replacement [1,2]. The mortality even after early recognition and treatment is about 50% of cases, and accounts for 3–5% of the total mortality after cardiac operations [1].

Since the advent of less invasive surgery, the performance of coronary artery bypass graft (CABG) surgery on the beating heart (off-pump coronary artery bypass or OPCAB surgery), has been linked by several authors to an apparent increase of postoperative aortic dissections [2,3].

The main contributing factor could be the application of a side-biting clamp on the ascending aorta under full pressure to perform the proximal anastomoses, without the benefit of CPB that allows the surgeon to temporarily lower the blood pressure and the aortic pulsatility.

We describe the case of a 70-year-old patient who presented an acute aortic dissection 7 days after OPCAB surgery including one proximal anastomosis on the aorta.

2. Case description

A 70-year-old hypertensive patient was referred for unstable angina 3 days after an acute anterior infarct.

The coronary angiogram showed several stenoses of the mid portion of the left anterior descending (LAD) artery, with possible intraluminal clotting, and a tight ostial lesion of the right coronary artery (RCA). The ventriculogram showed an akinetic anterior wall, the ejection fraction was 30%.

A double coronary bypass was performed on the beating heart, with the aid of a mechanical stabilizer. A saphenous vein was sutured distally to the RCA, and proximally to the aorta after application of a side-biting clamp. A left internal mammary graft was anastomosed to the LAD. The operation was uneventful, as was the immediate postoperative period.

The preoperative antihypertensive treatment was resumed. The patient was fully rehabilitated and ready to leave the hospital 6 days after surgery.

In the early morning of the seventh postoperative day, while standing, he experienced sudden posterior thoracic pain, and functional impotence of both legs causing him to collapse on the ground. An emergency CT-scan showed an aortic dissection from the ascending aorta to the iliac arteries, with right kidney hypoperfusion. Transoesophageal echocardiography showed a massive aortic insufficiency.

His was operated under hypothermic CPB with femoral
canulation and retrograde cerebral perfusion. The ascending aorta was markedly enlarged and ecchymotic, and the dissection seemed to originate from the right graft anastomosis. Under hypothermic circulatory arrest, the ascending aorta was resected and a 32 mm Gelweave® graft (Sulzer Vascutek, Inchinnan, G.B.) was inserted after application of biological glue. The aortic valve was resuspended. The saphenous graft was reimplemented in the prosthesis.

The postoperative course was complicated by persistent neurologic deficit of the lower body. The patient was discharged to a rehabilitation facility after 1 month.

Examination of the resected aorta (Fig. 1) showed a dissection starting at the proximal anastomotic site of the bypass. There were no intrinsic histologic alterations of the aortic wall.

3. Discussion

Perioperative aortic dissection (AD) after coronary bypass surgery under CPB is a rare but severe complication.

In a review of 14,877 patients operated during a 10 years period, Still identified 24 patients (0.16%) presenting AD, most (20/24) being recognized intraoperatively [4]. The majority included at least one coronary bypass (21/24).

The aortic cannulation site was the most common site of injury (ten patients), followed by the aortic cross-clamp site (eight patients), and the partial occlusion clamp site (seven patients).

The mortality of this complication was 20% when diagnosed intraoperatively, and 50% in late postoperative presentation.

In a more recent series of 109 patients operated for AD after a previous cardiac operation, Hagl et al. identified 21 patients who had isolated CABG as their first operation [5]. The mean interval between operations was 53 months. In contrast to the previous paper, the partial occlusion clamp site accounted for the majority of intimal tears.

Chavanon et al. described a significant increase of acute AD after OPCAB surgery when compared to coronary surgery under CPB [2]; three among 308 patients operated without CPB against one among 2723 with CPB ($P < 0.00001$).

In OPCAB surgery, side-biting clamp application is the more frequent way of performing proximal venous anastomoses. Other options include exclusive use of bilateral pedicled mammary arteries, construction of Y or T grafts, or use of subclavian vessels as proximal anastomotic site, when direct manipulation of a diseased aorta is to be avoided. In the case described, the tight ostial lesion of the right coronary artery could have been grafted by a right mammary artery. Connector systems to create venous anastomoses without aortic side-clamping have recently been made available, and are under clinical investigation. The advantages include a reduction of embolism of wall debris, a shortened anastomotic time and the use in minimal access surgery. A recent study by Eckstein reported an initial satisfactory experience in 43 patients [6]. Interestingly, Cohen mentioned in the discussion of this paper three personal cases of fatal AD after OPCAB surgery, all attributed to the application of a side-biting clamp.

OPCAB surgery introduces technical modifications in the performance of proximal saphenous anastomoses. Even if the aortic pressure can be temporarily decreased during side-clamp application, the aortic pulsatility is still present during the whole period of suturing, and can account for an increased risk of aortic wall injury. Also, gradual clamp slippage can occur when the aortic pressure is not adequately controlled, and thus increase the technical complexity of the procedure. Thus, ideally, any aortic manipulation should be avoided in OPCAB surgery.

In the case described, the dissection seemed to originate from the site of anastomosis, and not from the partial occlusion clamp area. Whether this results from aortic wall fragility induced by the side clamp or from a technical inadequacy in suturing is speculative. Of note, this complication was never encountered in our practice of CABG surgery under CPB.

We conclude that side clamping in OPCAB surgery should be used under strict control of aortic pressure and pulsatility to avoid an increased risk of dissection.

References

[1] Pappas D, Hines GL, Gennaro M, Hartman A. Delayed iatrogenic aortic dissection from coronary bypass managed with extra anatomic bypass. J Thorac Cardiovasc Surg 1998;115:947–9.
[2] Chavanon O, Carrier M, Cartier R, Hébert Y, Pellerin M, Pagé P, Perrault LP. Increased incidence of acute ascending aortic dissection with off-pump aortocoronary bypass surgery? Ann Thorac Surg 2001; 71:117–21.
[3] Cartier R, Blain R. Off-pump revascularization of the circumflex artery:
technical aspects and short-term results. Ann Thorac Surg 1999;68: 94–9.
[4] Still RJ, Hilgenberg AD, Akins CW, Dagget WM, Buckley MJ. Intraoperative aortic dissection. Ann Thorac Surg 1992;53:374–80.
[5] Hagl C, Ergin MA, Galla JD, Spielvogel D, Lansman S, Squitieri RP, Griepp RB. Delayed chronic type A dissection following CABG: implications for evolving techniques of revascularization. J Card Surg 2000;15:362–7.
[6] Eckstein FS, Bonilla LF, Englberger L, Immer FF, Berg TA, Schmidli J, Carrel TP. The St Jude medical symmetry aortic connector system for proximal vein graft anastomoses in coronary artery bypass grafting. J Thorac Cardiovasc Surg 2002;123:777–82.