Coarctation of the aorta in an adult with a concurrent large-size aortic arch aneurysm

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November 13, 2023

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Abstract

Aortic arch aneurysms (AAA) are rare, especially contrasting with the relative prevalence of coarctation of the aorta. These aneurysms can expand rapidly, presenting a greater risk of rupture compared to some other types of aneurysms. Also AAA is linked to other serious complications such as valvular insufficiency or dissection. While a consensus on the best treatment approach is still lacking, extra-anatomic ascending-to-descending aortic bypass grafting via a posterior pericardial approach through a median sternotomy provides a viable alternative. This technique facilitates simultaneous intracardiac repair. We report a case involving a 45-year-old man with coarctation of the aorta and an aortic arch aneurysm. He underwent successful extra-anatomic ascending-to-descending aortic bypass grafting, employing a posterior pericardial approach via a median sternotomy and cardiopulmonary bypass (CPB). This case underscores the feasibility and success of surgical intervention in a patient with coarctation of the aorta and a concurrent, substantial AAA. The use of an extra-anatomical bypass, an innovative surgical technique, has proven to be effective and beneficial in this kind of disease.

KEYWORDS

Aortic arch aneurysms; Coarctation of the aorta; Aortic bypass grafting.

1 — INTRODUCTION

Diffuse aortic dissection or medial degenerative disease involving the entire aortic arch can lead to the formation of exceptionally large aneurysms[1]. Coarctation of the aorta affects individuals across all age groups and presents with a range of clinical symptoms, either in isolation or in conjunction with other cardiac defects[2]. The combination of an AAA and coarctation of the aorta is a uncommon and serious cardiac malformation, often associated with critical complications such as sepsis, dissection, and aneurysm rupture. Without surgical intervention, patients with coarctation of the aorta face a serious prognosis, with an average life expectancy of only 34 years and a mortality rate of 75% by the age of 43 [3]. Currently, there

is a lack of extensive reports and no established consensus on managing this severe condition. In this report, we describe the management of a 45-year-old man with coarctation of the aorta and a significant aortic arch aneurysm.

2—Case report

A 52-year-old man presented to our department with hypertension, recording 180/70 mmHg in the right upper limb and significantly lower blood pressure, 90/50 mmHg, in both lower limbs. Transthoracic echocardiography revealed a bicuspid aortic valve, mild aortic valve regurgitation, coarctation of the aorta, and a large aortic arch aneurysm adjacent to the left common carotid artery (FIGURE A and B). Computed tomography confirmed these findings and additionally showed the left subclavian artery originating from and being deformed by the 5.1×4.8 cm aneurysm (FIGURE C and D). Consequently, surgical intervention was advised.

During the surgery, cardiopulmonary bypass and deep hypothermic circulatory arrest were established. The aneurysm originating from the aortic coarctation was confirmed after opening the chest. A longitudinal incision in the posterior pericardium exposed the descending aorta. After partial clamping, a 22-mm Dacron tube-graft was end-to-side anastomosed to the descending thoracic aorta. The graft was then routed along the heart's left margin towards the ascending aorta. Following the release of the aorta descendens clamp and removal of air from the graft, it was proximally clamped (FIGURE E and F)."

3—Discussion

While surgery repair remains the first choice of treatment for coarctation of the aorta in infant and children, endovascular approaches like balloon angioplasty and stenting are increasingly employed in adult patients [4]. However, we did not recommend endovascular treatment for several reasons in this patient. Firstly, the patient's twisted artery presented challenges in advancing a flexible guidewire across the coarctation. Secondly, this case involved not only aortic coarctation but also a concurrent aortic arch aneurysm, elevating the risk of rupture. Additionally, to minimize bleeding and maintain lower body blood supply, we opted for an extra-anatomical bypass instead of excising the coarctation and performing an end-to-end anastomosis.

Since Crafoord first surgical intervention to correct aortic coarctation in 1944[5], there have been significant advancements in surgical techniques, enhancing treatment quality and patient outcomes. Despite reduced mortality and morbidity rates, surgeries for aortic coarctation still pose considerable risks, including adverse events and patient morbidity. The presence of a concomitant aortic arch aneurysm in patients with aortic coarctation is exceedingly rare. Therefore, individualized patient assessments and meticulous planning are imperative for determining the most appropriate treatment strategy before undertaking such high-risk surgeries.

A major advantage of the extra-anatomic surgical approach is the durability in providing substantial distal blood flow to the mesentery and lower extremities. In a single-institution series of 50 patients undergoing ascending-descending aortic bypass for coarctation, there was no incidences of graft occlusion or pseudoaneurysm formation over an average follow-up of 33 months, with imaging evaluations conducted on 74% of the grafts[6].

4—Conclusion

We herein reported a novel surgical technique for managing coarctation of the aorta accompanied by a substantial concurrent aortic arch aneurysm. We advocate for this approach as the preferred option for patients with complex coarctation combined with aortic arch aneurysm.

AUTHOR CONTRIBUTIONS

All authors were involved in the conception and design, critical revision, manuscript writing, final approval, and agreed to be accountable for all aspects of the work.

FUNDING INFORMATION

No funding was required in the preparation of this case report.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this published article.

ETHICS STATEMENT

This study is in compliance with the declaration of Helsinki.

CONSENT

Written informed consent was obtained from the patient for publication of this case report in accordance with the journal's patient consent policy.

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Figure 1:Multimodal imaging of aortic arch aneurysm with a concurrent coarctation of the aorta.

LV, left ventricle; LA, left atrium; CoA, coarctation of aorta; Aneu, aneurysm; AA, ascending aorta; DA, descending aorta; Asterisk, dacron graft in Bentall procedure; BPG, bypass graft.