The Perceval S Aortic Valve Implantation in Patients with Porcelain Aorta; is this Ideal Option?

Abstract

We would like to present in this paper a patient with severe aortic valve stenosis referred to our department for surgical aortic valve replacement. In this patient, it was intraoperatively detected an unexpected heavily calcified porcelain ascending aorta. We present the treatment options in this situation, the difficulties affronted intraoperatively, the significance of the preoperative chest computed tomography scan and the use of the Perceval S aortic valve as ideal bioprosthesis implantation. This is a self-expanding, self-anchoring, and sutureless valve with a wide indication in all patients requiring aortic bioprosthesis.

Keywords: *Aortic valve replacement, aortic valve stenosis, perceval, porcelain aorta, self-expanding perceval valve, sutureless aortic valve, transcatheter valve implantation*

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Introduction

We would like to present in this paper our experience in porcelain ascending aorta and the successful implantation of the Perceval S aortic valve. In the presence of a porcelain ascending aorta, traditional aortic valve replacement (AVR) becomes a challenging intervention because of the impossibility of a safe manipulation of the aorta[1,2] and the difficulties of the suturing the prosthesis in the aortic annulus. Several strategies have been proposed to overcome these difficulties, including AVR with total hypothermic circulatory arrest, with or without replacement of the ascending aorta with a tube graft, the use of aortic endoclamps and extensive ascending aortic endarterectomy.[1,2] In case of an unexpected intraoperative finding of heavily atheromatous ascending aorta, the switching to transcatheter aortic valve implantation (TAVI) could be unfeasible, because usually, the surgical units do not dispose a transcatheter technology or a hybrid operating room to perform TAVI.[2] According to the bibliography,[3-5] the Perceval S, a sutureless, self-expanding and self-anchoring aortic valve is a safe and hemodynamically efficacy valve with a wide indication in patients with aortic valve stenosis and mixed aortic valve disease.[4-6] In the present paper, we would like to stress the option of treatment of the severe and symptomatic aortic valve stenosis in the presence of porcelain ascending aorta by the use of a sutureless implantable bioprosthesis.

Case Report

We present a case of a 76-year-old man with severe symptomatic aortic valve stenosis requiring replacement of the valve. He had a preoperative examinations including trans-thoracic echocardiography (TTE), chest X-ray but not computed tomography (CT) of the thorax. His aortic valve area was 0.7 cm^2 with mean and peak pressure gradient (PG) 95 and 47 mmHg, respectively. His EuroSCORE was 11; noncandidate for TAVI. After a full median sternotomy and the pericardial opening, we found an unexpected heavily calcified (porcelain) ascending aorta. We did not perform an epiaortic ultrasound to quantify the calcification and to discover an area less calcified for cannulation because we do not dispose. With the palpation, it has been found only a restricted safe area in proximity of the aortic arch. In this, we were able to cannulate the aorta and put a cross-clamp. We discussed the option of TAVI, but we had not a hybrid room for this procedure. The only solution was

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the surgical AVR. Then we had difficulties in aortic cross clamp; we used two clamps to occlude the aorta due to calcification with the risk of embolism. This was a really very risky action for cracking atherosclerotic plaques and induces a multifocal and severe stroke. We perform the aortotomy very high to avoid the ascending aorta. The aortic annulus was extremely calcified and small (21 mm) with an aneurysmatic dilatation of the ascending aorta (40 mm) extremely calcified. This dilatation was known from the preoperative TTE examination. In the preoperative chest X-ray, we could see also this dilatation, but all these indications of aortic dilatation and the suspicions of porcelain aorta where underestimated. The valve of choice was a sutureless Perceval S valve to manipulate as less as possible the aorta and perform a "rapid" intervention. We were able to implant this valve of the size: Medium. Closure of the aortotomy with the use of Teflon felt in two layers. Myocardial protection was obtained with cold blood cardioplegia delivered mainly retrogradely and then selectively in the calcified ostium of the right coronary artery. The postoperative was uneventful. He extubated in the intensive care unit 10 h later and he discharged in the 6th postoperative day. The correct position of the valve was confirmed with the postoperative chest X-ray [Figure 1] and TTE. The TTE 15 days later, showed a perfect aortic valve function without any paravalvular leak. Transvalvular blood velocity was 2.65 m/s, mean PG 15 mmHg, peak PG 28 mmHg and left ventricle ejection fraction 60%. He underwent also in a CT of the chest without contrast medium in order to image better the valve position and its relationships with the annulus and the ascending aorta. We can see the extremely calcification of the whole aorta [Figure 2]. The aortic root and ascending aorta are porcelain while the aortic arch and the descending aorta are also calcified. In this image we can observe the calcification of the coronary arteries; the coronary angiography discovered calcification but not hemodynamically significant for coronary artery bypass grafting. In Figure 3, a reconstructed CT image, we can see the correct position of the valve, the porcelain ascending aorta and the calcification of the aortic arch and descending aorta. The patient has recovered well, and he is completely asymptomatic.

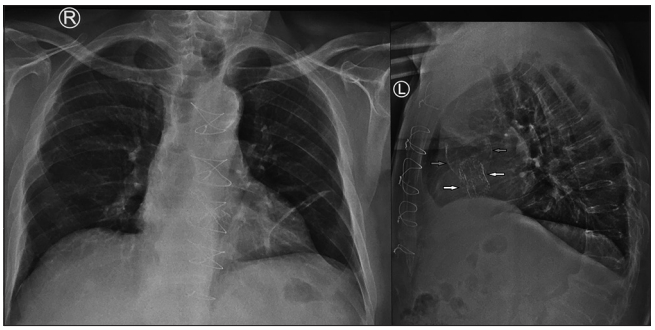

Figure 1: Postoperative chest X-ray. The Perceval S valve is shown with its metal cage anchored in the aortic root (white arrows). The dilatation and the calcification are well marked in this figure (red arrows)

Figure 2: The calcified ascending aorta at the postoperative chest computed tomography scan (white arrows). The Perceval S valve is also shown (black arrows)

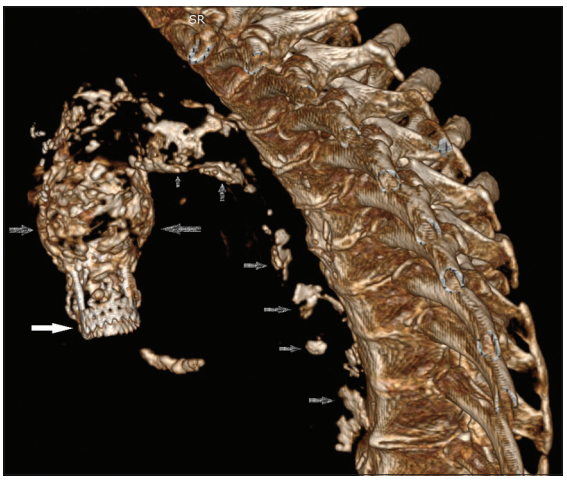

Figure 3: A reconstructed computed tomography. The porcelain ascending aorta and the calcification of the whole aorta (gray arrows) other than the correct position of the Perceval S valve (white arrow) are well recognized

Conclusion

AVR in the presence of an atheromatous ascending aorta has always been a difficult surgical challenge.[1] The impossibility of safely cannulating and clamping the ascending aorta due to the risk of cracking atherosclerotic plaques has generated several techniques to minimize aortic manipulation.[1,2] Although the porcelain aorta could be an intraoperative finding detected with the routine use of epiaortic ultrasonography scanning, clearly greater efforts should be done in the preoperative investigations of the aorta.[1,2] We had some suspicions of this finding in our case but unfortunately, we did not perform preoperatively the CT of the chest. However, it is common experience that there are some extreme cases in whom even the transcatheter procedures could be ineffective or

dangerous, such as in the presence of a concomitant severe coronary artery disease.[1,2] In all these cases, the sutureless Perceval S valve is the option of choice according to our experience and our opinion. This valve requires less manipulation of the ascending aorta and no manipulation of the aortic annulus except of the calcified aortic valve removal.[5,6] There are many bibliographic data about the safety and the hemodynamic efficacy of this valve.[4-6] This is a sutureless self-expanding and self-anchoring bioprosthetic valve indicated in every patient candidate for biological valve implantation. This valve is absolutely indicated in "difficult" cases like this, above described or other cases described in the literature.[7] The main indications of the Perceval S valve implantation are old patients with comorbidities, patients with porcelain aorta, and patients with small aortic root avoiding in this way the aortic root enlargement.[8] The points of this paper are the ideal option of the use of the sutureless Perceval S aortic valve in porcelain aorta and then, the importance of the preoperative CT scan of the chest.[1] This second issue is of mainly significance in order to be fully informed preoperatively about the anatomy of the patients and ready to affront the difficulties or in other cases, change the operative plan or avoid an intervention if there are prohibitions.

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Conflicts of interest

There are no conflicts of interest.

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