

An Alternative Aortotomy Technique for Aortic Valve Replacement in Porcelain Aorta

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ABSTRACT

Porcelain aorta is extensive calcification of the ascending aorta that can be completely or near completely circumferential. Here we report a case of severe aortic stenosis and left anterior descending coronary ostial stenosis in a patient with a porcelain aorta. In this paper an alternative aortotomy approach; reverse "T" letter aortotomy incision is described for Type IB porcelain aorta. Patient underwent aortic valve replacement in addition coronary bypass grafting via sternotomy. The surgery and the postoperative course were uneventful and she was discharged at 7th day. This aortotomy technique prevents unnecessary and risky manipulations of extensive calcificated porcelain aorta, provides perfect exposure, and can be closed securely via dacron patch after aortic valve surgery. By the help of the described aortotomy technique, AVR can be the preferred choice in patients with porcelain aorta and multiple cardiac comorbidities requiring additional procedures, such as coronary bypass.

Key words: Porcelain aorta; aortic stenosis; aortotomy.

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INTRODUCTION

Porcelain aorta (PA) is extensive calcification of the ascending aorta that can be completely or near completely circumferential. This entity is rare in the general population, but it has an increasing incidence in older patients and in patients with coronary artery disease (CAD) or aortic stenosis (AS).¹ The conventional approach for treatment of severe AS is surgical aortic valve replacement (AVR), but the procedure can be technically challenging when the aorta is severely calcified. PA is still obstacle to safely completing AVR. The aim of this study is to describe an alternative surgery approach in patients with PA who underwent AVR and coronary bypass grafting. This technique can be applied to provide a solution to approaching PA.

CASE REPORT

A 67-year-old female with severe aortic stenosis and CAD (Left anterior descending-LAD- ostial stenosis) was referred our institution for surgery. She had a history of dyspnea on exertion and angina pectoris for last three months. Type II Diabetes mellitus and hypertension were the comorbidities. There was no significant lab blood disorders except hyperlipidemia.

Chest X-ray showed cardiomegaly with extensive calcifications on ascending aorta. Severe and calcific AS with a mean 75 mmHg transvalvular gradient, grade II diastolic dysfunction and left ventricular hypertrophy were established via transthoracic echocardiography. Left ventricular ejection fraction was 50%. Aortic valve area was 0.77 cm²/m². Euroscore II logistic score was calculated as 4.17%. Ascending aorta was 3.7 cm in diameter. On cardiac catheterization, severe and calcific aortic stenosis (Figure 1A), significant LAD ostial disease (90% stenosis) and a porcelain aorta were observed (Figure 1B). CT angiogram showed extensive calcification of the ascending aorta from sinotubular junction to arcus aorta, also there was severe calcification of the left main coronary artery ostium (Figure 1C).

The patient was operated via median sternotomy. Left internal mammary artery graft was prepared. But graft was diffuse calcific and the flow was insufficient. Therefore saphenous vein graft prepared. A small portion of ascending aorta near to brachiocephalic truncus was enable to arterial cannulation. After right atrial venous and right superior pulmonary vein cannulation cardiopulmonary bypass was performed. Once temperature reached 28 C, a safe clamp site was identified and the ascending aorta was slowly clamped.

The aortotomy incision was started approximately 2 cm above the right coronary artery ostium transversly and continued up vertically at from half of the transvers aortotomy to cross clamp, like reverse "T" letter (Figure 2). This aortotomy technique prevents unnecessary and risky manipulations of extensive calcificated PA, provides perfect exposure, and can be closed securely via dacron patch after aortic valve surgery (Figure 3).

After the resection of severe calcific aortic valve, a reversed saphenous vein anastomosed to LAD. Then AVR was performed using 23 no mechanical aortic prosthesis valve. The transvers aortotomy was closed via dacron patch, vertical aortotomy was closed continue with two layer technique easily. The proximal anastomosis of the SVG was made on a decalcified site of ascending aorta under cross clamp.

Patient underwent an unremarkable postoperative recovery and was discharged home after 7 days. No neurological events and complications were observed.

DISCUSSION

Calcification of aorta reduces the aortic elastance and causes severe morbidity and mortality. The severity and the extend of calcification indicate the atherosclerotic burden and is an independent predictor of cardiovascular morbidity and mortality.²

PA was found to be associated with atherosclerosis, aging, hypertension, smoking, dyslipidemia, diabetes, chronic kidney disease, mediastinal ra-

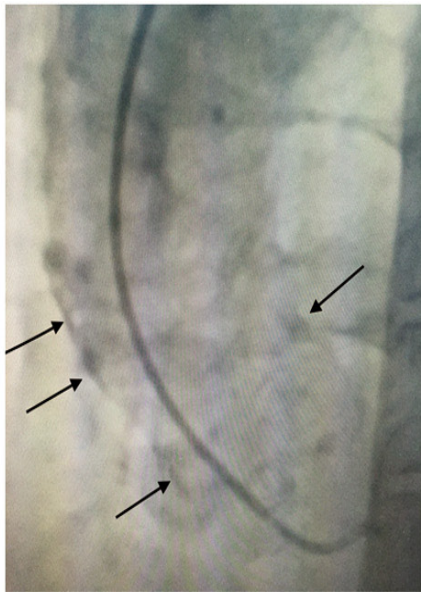


Fig. 1A



Fig. 1B

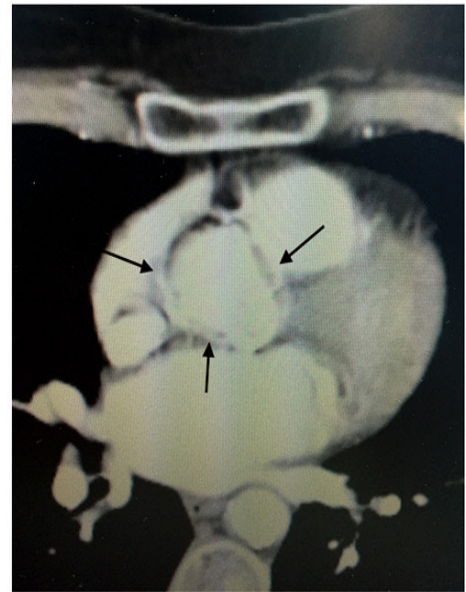


Fig. 1C

Figure. 1A: Angiogram with catheter in the ascending aorta demonstrating the calcific aorta and calcific coronary artery.

Figure. 1B: Left anterior descending coronary stenosis.

Figure. 1C: Ct angiogram showed extensive calcification of the ascending aorta from sinotubular junction to arcus aorta, also there was severe calcification of the left main coronary artery ostium (Double layer image).

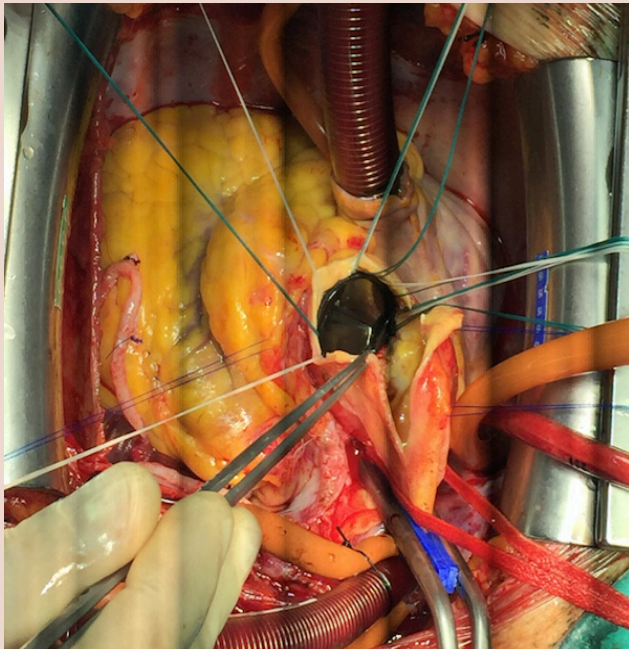


Figure 2: The aortotomy incision was started approximately 2cm above the right coronary artery ostium transversely and continued up vertically at from half of the transvers aortotomy to cross clamp.

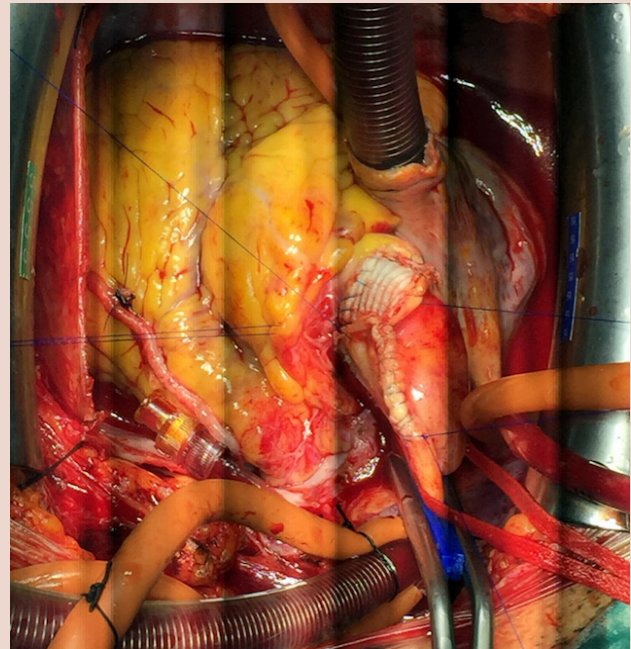


Figure 3: This aortotomy technique prevents unnecessary and risky manipulations of extensive calcificated PA, provides perfect exposure, and can be closed securely via dacron patch after aortic valve surgery.

diation and systemic inflammatory diseases such as Takayasu arteritis, SLE, RA.³ In our case age, female sex, hypertension and diabetes on insulin may have a role in PA.

Patients with aortic stenosis at risk for calcific aortic disease should be screened with cross-sectional imaging preoperatively. Chest CT is the most effective method to diagnose calcification of the PA. There is a classification of PA according to the Amorim *et al.* If circumferential calcification is present in the ascending aorta: Type I (IA: no possibility to clamp, IB: clamping possible), and Type II; if circumferential calcification is located in the aortic arch or descending aorta. In this direction, our case can be classified as Type IB. Also they emphasized the importance of preoperatively chest CT to detect calcification and PA.⁴ Aortic cross-clamping in patients with PA is associated with high mortality and morbidity. Therefore cannulation into the axillary or femoral artery can be used. Nishi and colleagues reported that the aorta could be clamped safely when calcification was less than 75% of its circumference.⁵ The present case (Type IB PA) did well with surgical AVR under favour of our described approach.

Recently, transcatheter aortic valve replacement (TAVR) has emerged as a less invasive and feasible treatment option in patients at high risk for conventional AVR.⁶ Thus TAVR can be a safe and efficient option for high risk patients with severe symptomatic aortic stenosis and PA. Idress *J et al* reported that both surgical aortic valve replacement and transcatheter aortic valve replacement are safe and effective options after aborted sternotomy in patients with porcelain aorta.⁷

CONCLUSION

In summary, we report an alternative aortotomy technique in a patient with type IB porcelain aorta. This technique prevents unnecessary and risky manipulations of extensive calcified PA, provides perfect exposure, and can be closed securely via dacron patch after aortic valve surgery. By the help of the this described aortotomy technique, AVR can be the preferred choice in patients with porcelain aorta and multiple cardiac comorbidities requiring additional procedures, such as coronary bypass.

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None to declare.

CONFLICTS OF INTEREST

The authors of this manuscript have no conflicts of interest to disclose as described by the Journal of Cardiovascular Disease Research.

ABBREVIATIONS USED

PA: Porcelain aorta; CAD: Coronary artery disease; AS: Aortic stenosis; AVR: Aortic valve replacement; LAD: Left anterior descending coronary artery; SVG: Saphenous vein graft; SLE: Systemic lupus erythematosus; RA: Rheumatoid arthritis; TAVR: Transcatheter aortic valve replacement.

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