

Endarterectomy and Aortic Valve Replacement in a Patient with Aortic Stenosis and Calcified Ascending Aorta

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A heavily-calcified, so-called, "porcelain" aorta may complicate aortic valve insertion and require an alternative method for valve replacement. Here we describe the case of a calcified ascending aorta and calcified aortic valve stenosis. The patient was a 65-year-old man who successfully underwent endarterectomy of the sinotubular junction and aortic valve replacement with a 19-mm St. Jude Medical prosthetic HP type valve while the ascending aorta was cross-clamped at the only area where it was not heavily calcified. This procedure may be an option in the management of patients with porcelain aortas and calcified aortic valves.

Key words: calcified aorta, porcelain aorta, aortic valve replacement, endarterectomy

Introduction

The operative management of the patient with a porcelain aorta can be difficult and complex. Endarterectomy of aortic root¹⁾, left ventricular apico-aortic valved conduit²⁾, replacement of the ascending aorta with a composite graft associated with coronary artery bypass grafting under deep hypothermic circulatory arrest^{3,4)}, relatively have been reported. However, some cases have a safe area in the ascending aorta that is disease-free and where aortic cross-clamping may be possible⁵⁾.

In this report, we described an approach of aortic valve replacement after endarterectomy of the sinotubular junction in a patient with calcified aortic valve stenosis and calcified ascending aorta in which the ascending aorta was cross-clamped in an area that was not heavily calcified.

Case

A 65-year-old man was admitted, complaining of a 4-month history of palpitation. He had a history of hypertension, which was medically controlled. A Levine III/VI systolic ejection murmur was most clearly heard in the third intercostal space along

the right border of the sternum. Chest radiography showed mild cardiomegaly with a cardiothoracic ratio of 56%, and electrocardiography showed left ventricular hypertrophy. Echocardiography revealed calcification of the aortic valve up to the ascending aorta (Fig. 1), with severe aortic stenosis and a peak pressure gradient of 110 mmHg. Computed tomography demonstrated severe calcification of the aortic valve, entire ascending aorta, and aortic arch (Fig. 2). Cardiac catheterization demonstrated severe aortic stenosis with a pressure gradient of 67 mmHg, and the calculated aortic valve orifice was 0.7cm². Coronary angiography showed no significant coronary artery stenosis, and left ventriculography revealed no asynergy, with an ejection fraction of 0.70.

Operation was performed on the 10th day after admission. Initially, aortic valve replacement under hypothermic circulatory arrest was planned for this patient with a porcelain aorta. Cardiopulmonary bypass was established using the superior vena cava and inferior vena cava for venous drainage, and the right femoral artery for arterial return.

By palpation, the ascending aorta was almost completely hard, but, there was small disease-free area in the ascending aorta. A cross-clamp could be placed obliquely in combination with lowering of the cardiopulmonary bypass flow rate. Hypothermic circulatory arrest was not needed. The ascend-

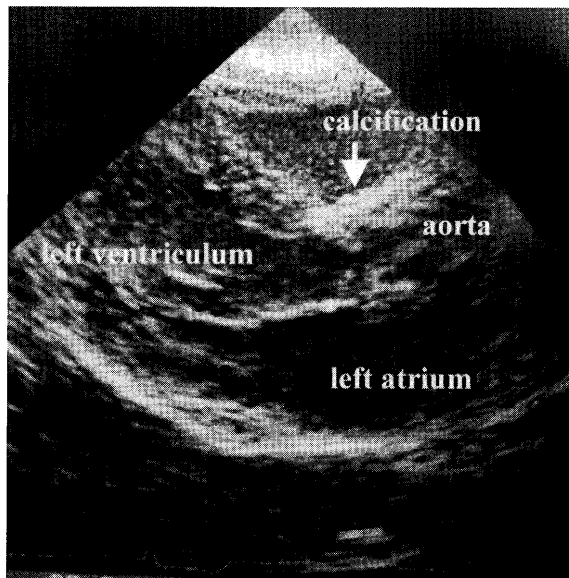


Fig. 1 Echocardiography reveals calcification of the aortic valve up to ascending aorta

ing aorta was opened transversely just proximal to the cross-clamping, and the aortic valve was inspected. The cusps and annulus were severely calcified. The three calcified leaflets were excised, and insertion of a 19-mm valve was attempted, but was not possible because the narrow calcified sinotubular junction would not allow passage of the valve.

Endarterectomy was performed using a No. 15 surgical knife to shave calcified intima from the media at the aortic root (Fig. 3). After removal of the calcium and intima, we irrigated the area and suctioned the irrigation fluid to remove as much potential embolic material as possible, and checked for free flaps in the endarterectomized aorta. At this point, the 19-mm St. Jude Medical Hemodynamics Plus valve was inserted. The aorta was closed with 4-0 Prolene (Ethicon, Sommerville, NJ) using a continuous suture buttressed with Teflon felt. Weaning from cardiopulmonary bypass was uneventful.

The postoperative course was uneventful. Postoperative aortography demonstrated an appropriately attached valve, without aortic dissection or aneurysm (Fig. 4). Postoperative echocardiography showed a peak pressure gradient of 30mmHg for

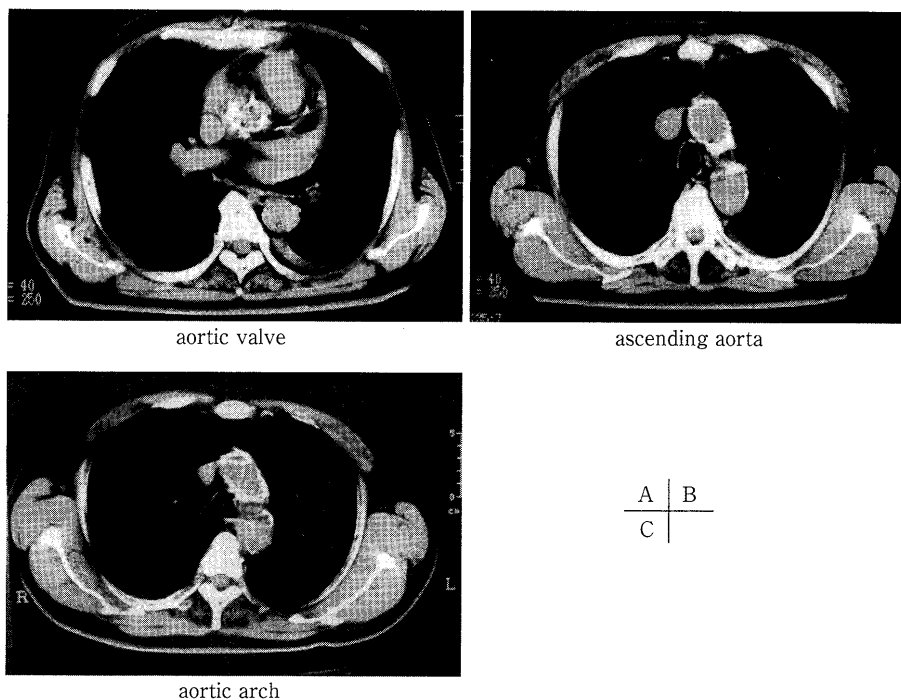


Fig. 2 Computed tomography shows severe calcification of the aortic valve (A), entire ascending aorta (B), and aortic arch (C).

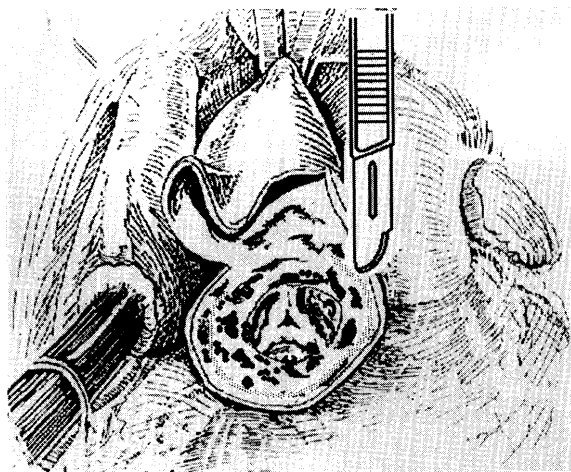


Fig. 3 Illustration showing the operative finding. Endarterectomy was performed using a No. 15 surgical knife to shave calcified intima from the media of the aortic root.

this prosthesis. At 6 months, computed tomography revealed no dilatation or dissection of the ascending aorta.

Discussion

A porcelain ascending aorta complicates aortic valve replacement because the aorta is difficult to open, repair sutures are difficult to insert, and the risk of stroke or myocardial infarction from embolic materials is increased.

This case supports the use of endarterectomy of the aortic root and ascending aorta as an option in selected patients with a porcelain aorta who require aortic valve replacement.

We were fortunate in being able to find a narrow area of uncalcified aorta for placement of the clamp after establishing cardiopulmonary bypass. Sometimes, it is easier to find out whether there is an uncalcified band after cardiopulmonary bypass has been established than before. Alternatively we could have used a balloon internal clamp. With the aorta clamped, endarterectomy enabled us to insert the valve without the need for a much more extensive and invasive procedure, involving hypothermic circulatory arrest and aortic root and valve replacement³⁻⁷⁾ or even apico-aortic conduit insertion²⁾.

A relatively small prosthetic valve was implanted to fit a small aortic root. Renzulli et al⁸⁾ reported that long-term clinical results of using the 19-mm St.



Fig. 4 Postoperative aortography demonstrating an appropriately attached valve, without aortic dissection or aneurysm.

Jude Medical heart valve in patients with a body surface area less than 1.7 m² were excellent, and this patient's body surface area was 1.62 m². The St. Jude Medical Hemodynamics Plus valve provides 25% more orifice area, better hemodynamics⁹⁾, and better hydrodynamic function¹⁰⁾ than the standard intraannular 19-mm St. Jude Medical heart valve.

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狭小弁輪に石灰化上行大動脈を合併した大動脈弁狭窄症に対して 血管内膜切除術および弁置換術を施行した1例

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高度に石灰化した大動脈 porcelain aorta と狭小弁輪を伴う大動脈弁狭窄症の合併における手術療法において、大動脈を非遮断下に行う方法や有効弁口面積を確保するための様々な方法が報告されている。今回我々は、porcelain aorta および狭小弁輪大動脈弁狭窄症の合併症例に対して一部石灰化の及んでいない健常部の大動脈を遮断し、sinotubular junction を血管内膜切除術後、19-mm St. Jude Medical prosthetic HP 弁を挿入し良好な結果を得たので報告する。症例は65歳、男性。胸部CTで大動脈弁輪から弓部にかけて全周性の石灰化を認め、心臓カテーテル検査で大動脈圧較差は67mmHgの大動脈弁狭窄症を認めたが、冠動脈および左室の壁運動に異常は認めなかった。手術は超低体温循環停止下で大動脈の非遮断による方法を考慮していたが、人工心肺の確立後一部石灰化の及んでいない健常部の大動脈を触診で見出すことができたため中等度低体温下で大動脈を遮断した。sinotubular junction の高度石灰化のため19-mmのサイザーが通過せず、そのため15番メスで石灰化した内膜および中膜を全周性に血管内膜切除術を施行し19-mm St. Jude Medical prosthetic HP 弁を挿入した。その後の人工心肺からの離脱は容易であり、術後経過は順調で退院した。術後6ヵ月の胸部CTで血管内膜切除術に伴う大動脈の拡大や解離は認められていない。本術式を選択することで拡大かつより侵襲のある手術を避けることが可能であり、合併症も認めず有用であった。