

Valve-sparing aortic root replacement for extremely localized circumferential aortic dissection associated with intimo-intimal intussusception

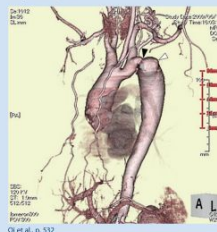
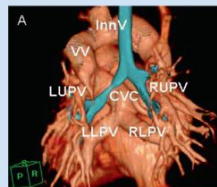
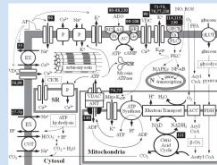
Yujiro Ito, Yoshitsugu Nakamura, Miho Kuroda, Yuki Endo, Yusuke Nakanishi & Takaki Hori

General Thoracic and Cardiovascular Surgery

ISSN 1863-6705

Gen Thorac Cardiovasc Surg
DOI 10.1007/s11748-017-0806-9

平成28年9月10日発行 (毎月10日発行) Volume 61 Number 9
国際標準化された刊行物の発行
ISSN 1863-6705



 Springer



General Thoracic and Cardiovascular Surgery



Official Publication of
The Japanese Association for
Thoracic Surgery



Official Publication of
The Japanese Association for
Chest Surgery



Affiliated Publication of
The Japanese Society for
Cardiovascular Surgery


The 66th Annual Scientific Meeting of
The Japanese Association for Thoracic Surgery
Sendai, October 16–19, 2013

<http://www.jpats.org/>

Your article is protected by copyright and all rights are held exclusively by The Japanese Association for Thoracic Surgery. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your article, please use the accepted manuscript version for posting on your own website. You may further deposit the accepted manuscript version in any repository, provided it is only made publicly available 12 months after official publication or later and provided acknowledgement is given to the original source of publication and a link is inserted to the published article on Springer's website. The link must be accompanied by the following text: "The final publication is available at link.springer.com".

CASE REPORT

Valve-sparing aortic root replacement for extremely localized circumferential aortic dissection associated with intimo-intimal intussusception

Yujiro Ito¹  · Yoshitsugu Nakamura¹ · Miho Kuroda¹ · Yuki Endo¹ · Yusuke Nakanishi¹ · Takaki Hori¹

Received: 26 March 2017 / Accepted: 20 July 2017
© The Japanese Association for Thoracic Surgery 2017

Abstract Circumferential dissection is a rare clinical condition of aortic dissection, which is also known as intimo-intimal intussusception. In patients with type A aortic dissection with intimo-intimal intussusception, disruption and prolapse of the intimal flap into the left ventricle may occur and cause severe aortic regurgitation or blockage of the coronary artery ostium. A 43-year-old man presented with sudden dyspnea. Echocardiography revealed severe aortic insufficiency. Acute coronary syndrome was also suspected, but coronary angiography showed normal coronary arteries. After medical treatment, elective surgery was performed. The distal aorta beyond the circumferential dissection was intact, and only the aortic root was dissected. The aortic valve could be preserved, because there was little degeneration of the cusps. Here, we report the case of a patient who underwent successful valve-sparing aortic root replacement for extremely localized aortic dissection with intimo-intimal intussusception.

Keywords Intimo-intimal intussusception · Circumferential · Aortic dissection · Valve-sparing

Introduction

Circumferential dissection is a rare clinical condition of aortic dissection. Disruption and prolapse of the intimal flap into the left ventricle may occur and cause severe aortic insufficiency (AI) or blockage of the coronary artery ostium, which is also known as intimo-intimal intussusception [1]. Because of the critical hemodynamic state, timely diagnosis and emergent surgery is required in most cases, which carries a high risk. We report the case of a patient who underwent successful valve-sparing aortic root replacement for extremely localized aortic dissection with intimo-intimal intussusception.

Case report

A 43-year-old man suffered from sudden dyspnea. He had been diagnosed with AI several years earlier; however, because he had no symptoms, no further examination was performed. On admission to the previous hospital, electrocardiography revealed ST depression and blood tests demonstrated increased creatinine kinase (CK) and CK-MB levels. Acute coronary syndrome (ACS) was suspected, but no significant stenosis or occlusion was seen on coronary angiography. Echocardiography revealed massive AI; hence, medical therapy was initiated. His symptoms at arrival, which were consistent with New York Heart Association (NYHA) class IV, showed improvement to class II of NYHA; therefore, he was discharged from the previous hospital and referred to our hospital at an

✉ Yujiro Ito
yujiroito@hotmail.com
Yoshitsugu Nakamura
ystgnkmr@gmail.com
Miho Kuroda
m.under.the8@gmail.com
Yuki Endo
s07-018ye@nms.ac.jp
Yusuke Nakanishi
ynakanishi13@me.com
Takaki Hori
hori@tokushima-cvs.ifo

¹ Department of Cardiovascular Surgery, Chiba-Nishi General Hospital, 107-1 Kanegasaku, Matsudo-chi, Chiba, Japan

outpatient basis for surgical treatment. He was hospitalized for surgical treatment 3 weeks after discharge. The patient had no significant family history. He had a height of 176 cm and weight of 119 kg. There was no indication of connective tissue disease based on his family history and bodily features.

A preoperative examination was performed, and coronary computed tomography (CT) revealed a flap-like lesion at the level of the aortic root; however, it was difficult to diagnose whether it was an intimal flap of the aortic dissection or an aortic valve. The aortic root was enlarged to 50 mm. There was no dilatation or flap at the ascending aorta (Fig. 1). Transesophageal echocardiography (TEE) revealed a localized aortic dissection of the aortic root. Moreover, the circumferentially dissected intimal flap was intussuscepting into the left ventricle. The flap appeared to be the cause of AI (Fig. 2).

Median sternotomy was performed. The ascending aorta appeared to be unaffected, and TEE revealed no obvious flap at the ascending aorta. Therefore, cardiopulmonary bypass was established by cannulation of the ascending aorta and right atrium. Because there was no need for circulatory arrest, the ascending aorta was cross clamped and myocardial protection was provided every 30 min with intermittent retrograde cold blood cardioplegia. The aorta was transected, and there was a circumferential intimal tear

just above the ST junction (Fig. 3a). The distal aorta beyond the dissection was intact, but the proximal aorta was circumferentially dissected, including all commissures. They were involved in the dissection and were partially inverted to the proximal side of the root. The dissection ended at the level of the coronary orifices, which were dissected but not extended to the coronary arteries. There was no thrombus in the dissected layer. The dissected layers in the aortic root were glued together using BioGlue (CryoLife Inc., Kennesaw, GA, USA), which eliminated the false lumen in the root. The non-coronary cusp (NCC) was slightly prolapsed, but there was no fenestration or thinning of the leaflet. There was little degeneration of the cusps of the aortic valve; therefore, valve-sparing root replacement with aortic valve re-implantation was planned. A 26-mm Vascutek® Gelweave Valsalva™ Graft (Vascutek, Terumo, Renfrewshire, Scotland) was used for the reconstruction. The prolapse of NCC remained after reconstruction; thus, two stitches of central plication were added. The operation time was 458 min, cardiopulmonary bypass time was 301 min, and aortic cross-clamping time was 277 min.

The patient's postoperative course was uneventful, and he was discharged on postoperative day 10 (Fig. 2b). Twenty-seven months have passed since the operation, but there is no recurrence of AI.

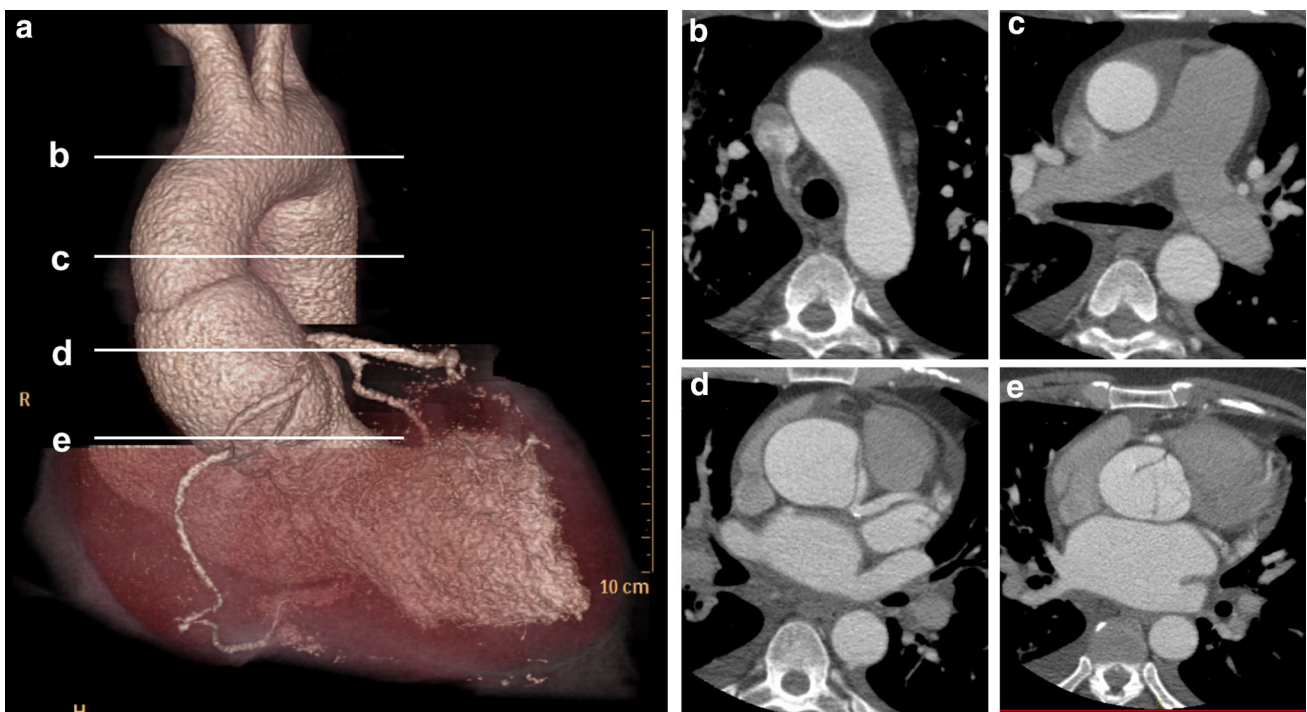


Fig. 1 a Preoperative three-dimensional computed tomography shows dilated aortic root and no dissection at the ascending aorta and aortic arch. b–e This image shows the transverse plane at the level of the *white lines* in a. The dissected intima is detected only at the aortic root

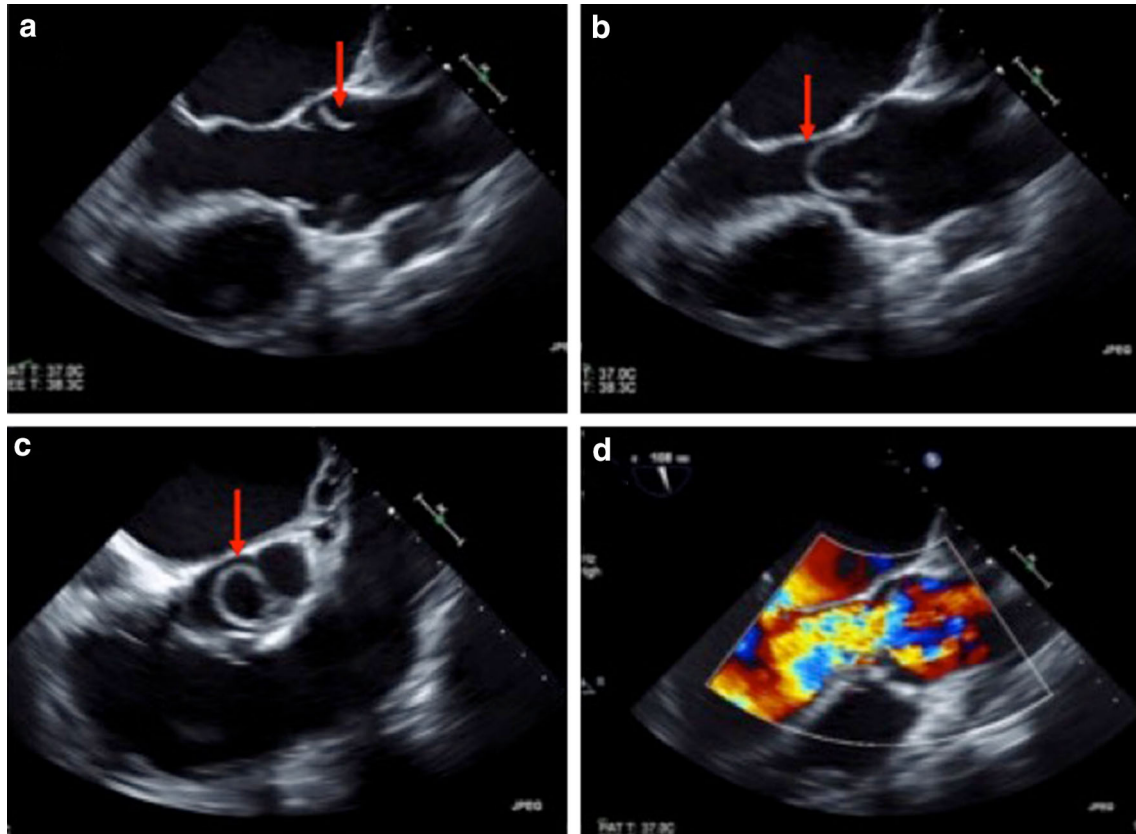
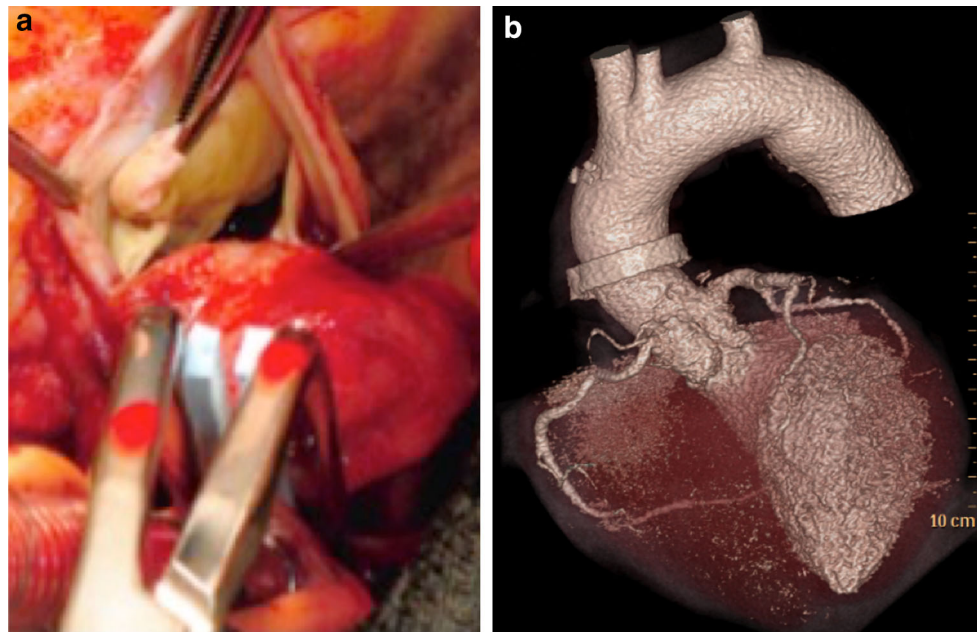


Fig. 2 **a** There was a flap-like lesion, which differed from the aortic valve above itself at systolic phase. **b** Dissected intimal was intussuscepting into the left ventricle in the diastolic phase. **c** Intima

was completely circumferentially dissected. **d** There was a massive AI, and the circumferentially dissected intima seemed to be the cause of AI

Fig. 3 **a** Intimal was circumferentially dissected, which included the commissure. **b** Postoperative CT showed a successful valve-sparing root replacement and an intact remaining aorta, which had no dissection



Discussion

Intimo-intimal intussusception was first described by Hufnagel and Conrad in 1962 [1]. Several reports have been published, but it remains to be a rare condition. A circumferentially dissected intimal flap of the ascending aorta may prolapse either distally into the aortic arch or proximally into the left ventricle. The flap can obstruct the aortic arch vessels, which may cause cerebral malperfusion or massive AI or may obstruct the ostium of the coronary arteries, which may cause coronary malperfusion.

As reported by most case reports, diagnosing this very rare condition is difficult. The presenting symptoms are similar to those of ACS, with sudden onset of chest pain and dyspnea. Coronary angiography may be difficult because of the flap obstructing the ostium of the coronary arteries. Angiography provides important information for diagnosing aortic dissection; however, it is not sufficiently accurate for differentiating the flap from the aortic valve. CT is reliable for detecting aortic dissection, but in the present case, the dissection area was too limited to be diagnosed by ordinary CT. ECG gated coronary CT could detect the dissection and separate the intimal flap from the aortic valve at the aortic root. TEE is considered to be the most practical and reliable technique for diagnosing intimo-intimal intussusception. Dissection in the ascending aorta presents an unusual echocardiographic appearance, with a thick flap intussuscepting into the left ventricle [2]. As these examinations may not be routinely performed preoperatively, sudden onset of chest pain, and normal left ventricular wall motion or normal coronary arteries with elevated CK-MB levels would help reaching diagnosis.

Surgical treatment comprises the reduction of the intimo-intimal intussusception by returning the dissected intima into the ascending aorta. AI can be controlled by resuspension of the aortic valve [3, 4]. However, in some cases, the aortic valve cannot be preserved because of its damaged structure after reducing the intussuscepted dissection flap from the left ventricle. The main issue is whether the completely dissected aortic root should be left as is or replaced. Given that the aortic valve was anatomically normal and the aortic root was not dilated, a supracoronary ascending aortic replacement could have been performed. In most type A aortic dissections, the aortic root is involved in the dissection, but mostly, a part of the circumference is dissected. Supracoronary ascending aortic replacement could be performed in these cases but not in completely circumferentially dissected cases that include the coronary ostium. Nishida et al. stated their indications for aortic root operation for acute type A aortic dissection as an intimal tear in the aortic root, extensive involvement of coronary arteries, rupture of the aortic root, and an aortic root diameter of ≥ 45 mm. Among patients who did not undergo

aortic root operation, dissection of more than two sinuses of Valsalva was an independent predictor of a late aortic root event [5]. Moreover, Tarık Kızıltan stated that if the aortic circle around the coronary ostia is extensively involved in the dissection process, a supracoronary ascending aortic replacement would be a less than satisfactory procedure [6]. In the present case, the aortic root was not only circumferentially dissected but also dilated to 50 mm; therefore, there was no doubt for replacing the aortic root. However, we would consider the same procedure for young, low-risk patients even if the aortic root was not dilated to prevent late aortic root events.

In cases of intimo-intimal intussusception, the commissures are dissected in most cases; therefore, firmly fixing the commissure would be the technical key. The dissected commissure should be precisely and firmly attached to the graft. We used several pledgeted sutures for this purpose. The use of BioGlue might be unnecessary for valve-sparing root replacement, but we routinely use BioGlue to obliterate the false lumen in all cases with root dissection. This helps in the assessment of the aortic valve and makes it easy to trim and attach the aorta or coronary buttons. We measured the size of the diameter of the annulus with TEE and CT scan and selected the graft that was 3 mm larger than the size of the annulus.

Conclusion

Intimo-intimal intussusception is a rare but critical condition; therefore, physicians should be aware that such dissection can cause a hemodynamic collapse and necessitate surgery. Moreover, in this case, the range of the dissection was extremely localized at the aortic root; therefore, we could perform graft replacement without circulatory arrest.

It would depend on whether the aortic root is dilated, but the aortic valve is anatomically normal in most cases of acute aortic dissection, and can be preserved. Valve-sparing aortic root replacement can be considered, especially for young patients.

Compliance with ethical standards

Informed consent Informed consent was obtained from the patient in this case report.

Conflict of interest Yujiro Ito, M.D.; Yoshitsugu Nakamura, M.D.; Miho Kuroda, M.D.; Yuki Endo, M.D.; and Yusuke Nakanishi, M.D. declare that they have no conflict of interest.

References

1. Hufnagel CA, Conrad PW. Intimo-intimal intussusception in dissecting aneurysms. *Am J Surg.* 1962;103:727–31.

2. Lajevardi SS, Sian K, Ward M, Marshman D. Circumferential intimal tear in type A aortic dissection with intimo-intimal intussusception into left ventricle and left main coronary artery occlusion. *J Thorac Cardiovasc Surg.* 2012;144:e23–5.
3. Touati G, Carmi D, Trojette F, Jarry G. Intimo-intimal intussusception: a rare clinical form of aortic dissection. *Eur J Cardiothorac Surg.* 2003;23:119–21.
4. Lijoi A, Scarano F, Canale C, Parodi E, Dottori V, Passerone GC, et al. Circumferential dissection of the ascending aorta with intimal intussusception. Case report and review of the literature. *Tex Heart Inst J.* 1994;21:166–9.
5. Nishida H, Tabata M, Fukui T, Takanashi S. Surgical strategy and outcome for aortic root in patients undergoing repair of acute type A aortic dissection. *Ann Thorac Surg.* 2016;101:1464–9.
6. Kiziltan HT, Tiras M, Idem A, Camsari R, Toktas S, Bozkurt A. Intimal intussusception in aortic dissection and coexisting coronary artery disease. *Ann Thorac Surg.* 2014;97:698–700.