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CASE REPORT

Axillofemoral bypass to improve congestive heart failure for atypical aortic coarctation complicating Takayasu arteritis

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Abstract

Atypical aortic coarctation is a rare condition associated with Takayasu arteritis, and is characterized by symptoms caused either by hypotension in the lower half of the body or secondary hypertension in the upper half of the body, and heart failure. We report a rare case of axillofemoral bypass to improve congestive heart failure for atypical aortic coarctation complicating Takayasu arteritis. Augmented vascular bed and retrograde renal blood flow after axillofemoral bypass surgery could achieve effective blood pressure control and improve renal function and cardiac function (LVEF: 30% → 55%, BNP: 2943 pg/mL → 128 pg/mL). There were two contributing factors for improvement of heart failure such as the increased vascular bed and the increase in retrograde renal blood flow. We believe that axillofemoral bypass is effective for Takayasu arteritis patients with refractory heart failure. In daily practice, careful attention should be paid to an impact of cardiorenal-aorta interaction in atypical aortic coarctation complicating Takayasu arteritis.

Keywords Takayasu arteritis; Axillofemoral bypass; Congestive heart failure; Resistant hypertension

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Introduction

Atypical aortic coarctation (AAC) is a rare condition associated with Takayasu's arteritis (TA), fibromuscular dysplasia, and atherosclerosis and is characterized by symptoms caused either by hypotension in the lower half of the body or secondary hypertension in the upper half of the body, and heart failure.[1] Surgical interventions have been performed to ameliorate complications that would adversely affect the quality of life or life expectancy of patients with AAC.[2] However, aorto-aortic bypass could be high risk for TA patients with steroid drugs.

Case report

A 48-year-old woman had a 20-year history of rheumatoid arthritis and received prednisolone, methotrexate, and salazosulfapyridine. She presented with a 2 year history of repeated congestive heart failure. Recently, her arm systolic blood pressure was 180–200 mmHg in spite of taking five drugs, and heart failure increasingly worsened. A chest X-ray showed cardiomegaly (cardiothoracic ratio [CTR]; 65%) (*Figure 1A*). A blood sample test revealed elevated serum brain natriuretic peptide (BNP; 2,943 pg/mL), and eGFR was 64 mL/min. An echocardiography showed low ejection fraction (EF 30%) with concentric hypertrophy, increased left atrial volume index (LAVI; 53 mL/m^2) (*Figure 1B* and Supporting Information, *Movie S1*), and elevated left atrial pressure (E/A 3.1, deceleration time [DT] 128 ms, i.e. restrictive pattern) (*Figure 1C*). Moreover, intrarenal venous flow pattern was monophasic pattern which suggests renal congestion[3] (*Figure 1D*). The ankle-brachial index (ABI) was 0.3 in both legs (*Figure 1E*). The contrast enhanced computed tomography (CT) revealed atypical aortic coarctation (AAC) of the descending thoracic aorta with near-total occlusion, occlusion or severe stenosis of major branch, and collateral circulation from bilateral internal mammary arteries (*Figure 2A–D* and Supporting Information, *Movie S2*). The

Figure 1 Preoperative examination. (A) A chest X-ray showed cardiomegaly (cardiothoracic ratio [CTR]; 65%). (B, C) An echocardiography showed the low ejection fraction (EF 30%), increased left atrial volume index (LAVI; 53 mL/m^2), and elevated left atrial pressure (E/A 3.1, deceleration time [DT] 128 ms, i.e. restrictive pattern). (D) The intrarenal venous flow pattern was monophasic pattern (yellow arrow) which suggests renal congestion. (E) The ankle-brachial index (ABI) was 0.3 in both legs.

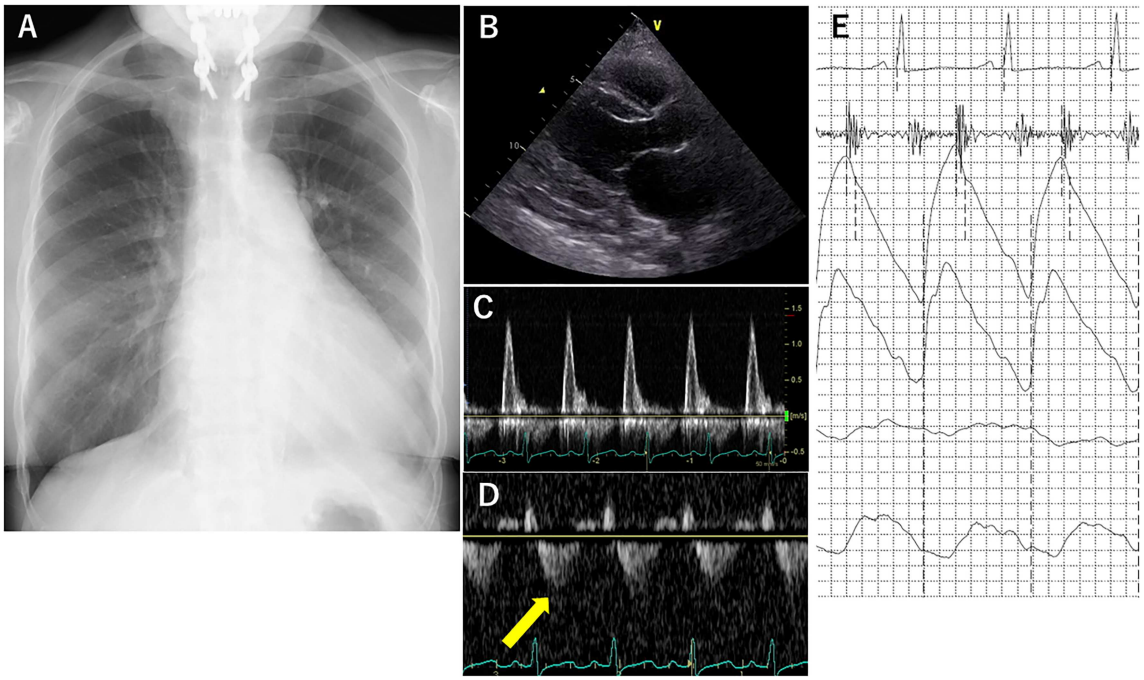
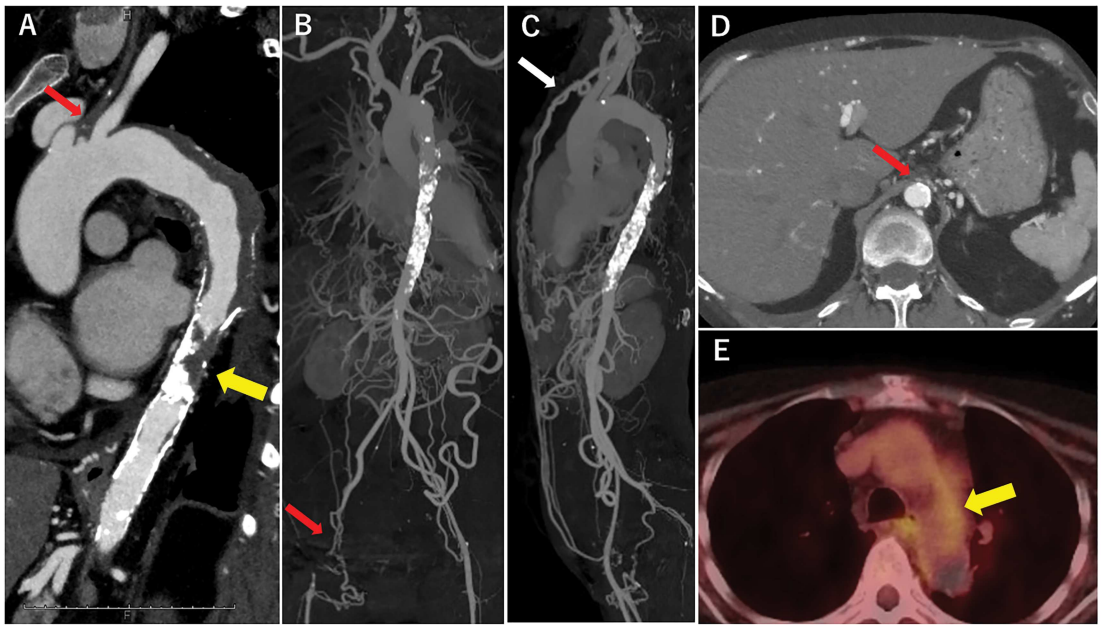


Figure 2 Atypical aortic coarctation complicating Takayasu's arteritis. (A) The contrast enhanced computed tomography (CT) revealed atypical aortic coarctation (AAC) of the descending thoracic aorta (yellow arrow). (A–D) The CT also showed occlusion of left common carotid artery, right external iliac artery, superior mesenteric artery, and celiac artery (red arrows), and collateral circulation from bilateral internal mammary arteries (white arrow). (E) The positron emission tomography revealed partial accumulation in the aortic arch (yellow arrow), and the patient was diagnosed with Takayasu's arteritis (TA).



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positron emission tomography revealed partial accumulation in the aortic arch, and she was diagnosed with Takayasu's arteritis (TA) (*Figure 2E*).

The axillobifemoral bypass was performed to augment vascular bed and retrograde renal blood flow (*Figure 3A–C*) and reduce cardiac afterload. After surgery, effective blood pressure control was achieved (140 mmHg), ABI increased to 0.6 (*Figure 4E*), and renal function improved to eGFR 110 mL/min. Moreover, congestive heart failure subsided, CTR decreased to 53% (*Figure 4A*), and BNP remarkably decreased to 128 pg/mL. An echocardiography showed increased EF (55%), decreased LAVI (26 mL/m^2), and improved left atrial pressure (E/A 0.5, DT 229 ms, i.e. abnormal relaxation pattern) (*Figure 4B,C* and Supporting Information, *Movie S3*). In addition, intrarenal venous flow pattern improved to continuous pattern which suggests no renal congestion (*Figure 4D*). The midgraft velocity was 200 cm/s.

3Discussion

In this case, while the patient had received steroid drugs for refractory rheumatoid arthritis, undiagnosed TA had potentially progressed. Because of marked calcification and stenosis of the descending thoracic aorta and occlusion of major branches, her vascular bed decreased, cardiac afterload increased, and she suffered from repeated congestive heart failure. The axillobifemoral bypass dramatically improved heart failure.

We supposed there were two contributing factors for improvement of heart failure. The first factor was the increased vascular bed. She had suffered from refractory hypertension in the upper half of the body for a long time. The echocardiography showed elevated left atrial pressure (E/A 3.1), which improved after the operation (E/A 0.5). These findings may reflect the decrease in systemic arterial resistance by axillobifemoral bypass, which could lead to the reduction of cardiac afterload. The second factor was the increase in retrograde renal blood flow. The contrast enhanced CT after the operation showed occlusion of descending aorta just above renal arteries, and the doppler ultrasound revealed excellent retrograde blood flow in left common femoral artery from anastomosis site directed to the abdominal aorta (*Figure* 3).

Approximately 20% of TA patients are resistant to any kind of treatment. Surgical treatment is generally warranted for, especially AAC, because the prognosis is poor when left untreated.[4] Among surgical treatments, an aorto-aortic bypass has been the most frequent choice.[5] However, aorto-aortic bypass has the possibility to hurt the collateral circulation around the stenotic site, and it is high risk for TA patients with steroid drugs. Although endovascular stent graft insertion is not very invasive, it was reported that

Figure 3 The contrast enhanced computed tomography and ultrasonography after axillobifemoral bypass. (A, B) The axillobifemoral bypass was performed to augment vascular bed and retrograde renal blood flow (yellow arrows). (C) The doppler ultrasound revealed excellent retrograde blood flow in left common femoral artery from anastomosis site directed to the abdominal aorta.

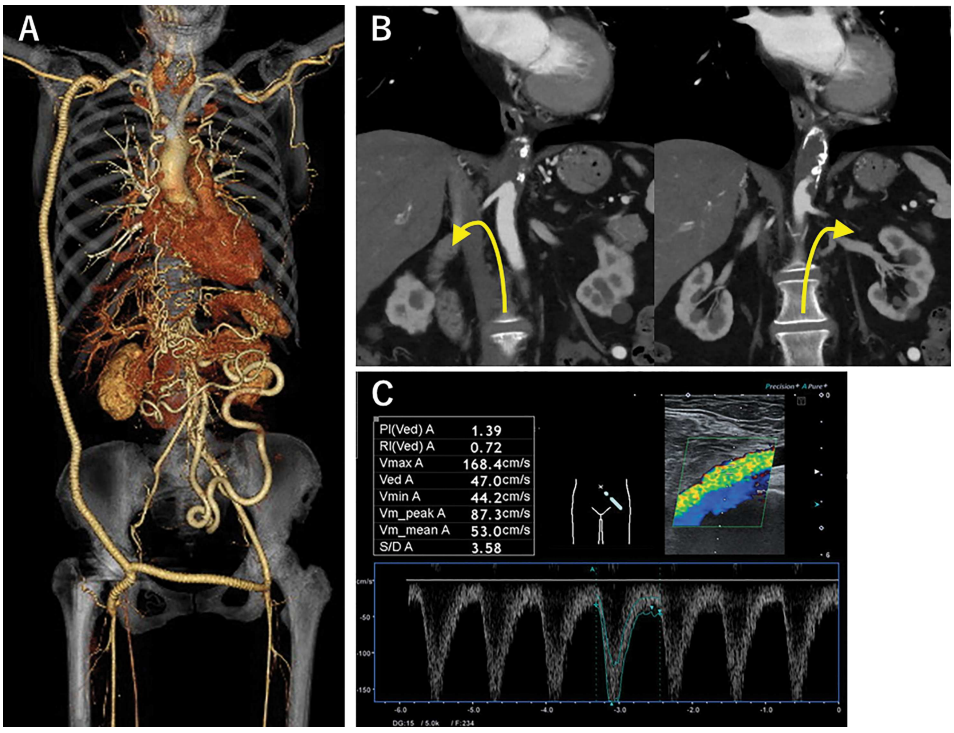

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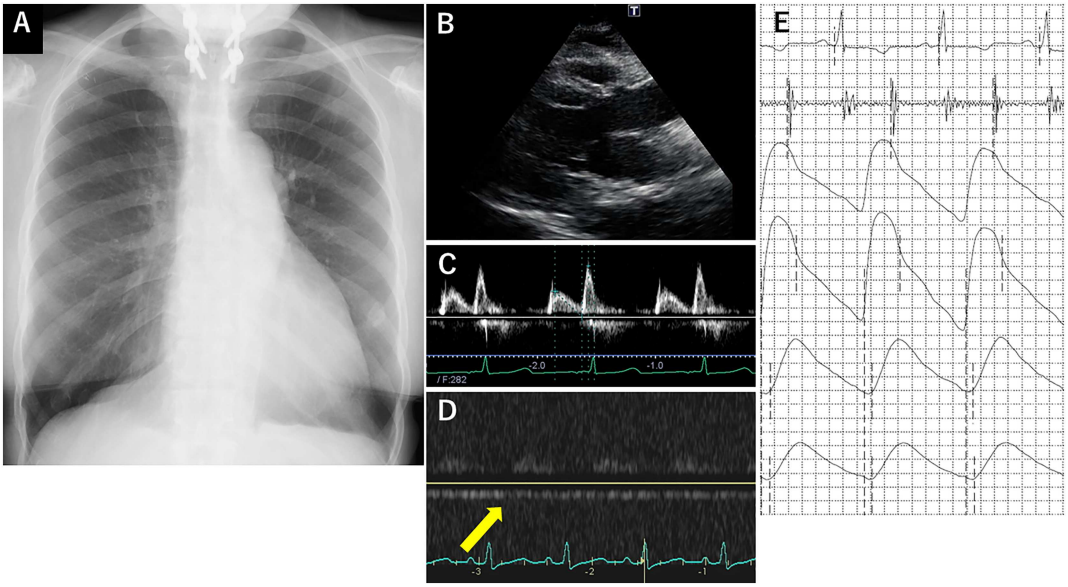
Figure 4 Postoperative examination. (A) The CTR decreased to 53%. (B, C) An echocardiography showed increased EF (55%), decreased LAVI (26 mL/m^2), and improved left atrial pressure (E/A 0.5, DT 229 ms, i.e. abnormal relaxation pattern). (D) The intrarenal venous flow pattern improved to continuous pattern (yellow arrow) which suggests no renal congestion. (E) ABI increased to 0.6.



surgical repair was associated with low mortality and morbidity compared with endovascular repair especially in TA patients.[4] In highly calcified lesions, under-dilatation, fracture, and rupture of stent grafts were expected. Therefore, we chose extra-anatomical axillobifemoral bypass. On the other hand, it was proposed that the patency of axillofemoral bypass graft was not high enough. A previous study showed that midgraft peak systolic velocities <80 cm/s were significantly correlated with thrombosis.[6] In this patient, midgraft velocity was 200 cm/s. We believe that axillofemoral bypass is effective for TA patients with refractory heart failure. In daily practice, careful attention should be paid to an impact of cardiorenal–aorta interaction in atypical aortic coarctation complicating Takayasu arteritis.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Movie S1. Echocardiography showed severely reduced cardiac function with 35% of left ventricular ejection fraction.
Movie S2. The contrast enhanced computed tomography revealed marked calcification of the descending thoracic aorta with near-total occlusion, and occlusion or severe stenosis of major branch.
Movie S3. Echocardiography showed improvement in cardiac function and improved left ventricular ejection fraction from 35 to 55% after operation.

Conflict of interest

None declared.

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