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Case Report

Comprehensive multi-vessel reconstruction in a 49-year-old male with long-standing Takayasu arteritis

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Abstract

Takayasu arteritis (TAK) is a chronic granulomatous vasculitis of the aorta and its primary branches, typically affecting young women. Although less common, male patients often present with more aggressive and extensive vascular disease. We report a 49-year-old male with a 15-year history of TAK who presented with progressive orthostatic dizziness and transient visual obscurations. Imaging demonstrated complete occlusion of the right common carotid artery (CCA) and both subclavian arteries, severe in-stent restenosis of the left CCA, and bilateral internal carotid artery (ICA) stenosis. Previous endovascular revascularization had been performed, but further interventions were declined due to lesion complexity. The patient underwent comprehensive supra-aortic reconstruction, including bilateral ICA thromboendarterectomy with saphenous vein patchplasty and sequential bypasses from the ascending aorta to both CCAs and subclavian arteries using custom Y-configured ringed PTFE grafts. Postoperative computed tomography angiography confirmed complete graft patency. This case demonstrates the feasibility of individualized multi-limb supra-aortic reconstruction in advanced TAK with complex arch pathology.

Keywords: Takayasu arteritis; supra-aortic reconstruction; bypass; thromboendarterectomy

INTRODUCTION

Takayasu arteritis is a chronic, idiopathic, granulomatous large-vessel vasculitis that primarily involves the aorta and its major branches [1,2]. The disease shows a marked female predominance, typically affecting women in their second and third decades of life [1,2]. Male patients constitute a minority yet tend to present with more severe angiographic patterns and higher revascularization requirements [3].

The clinical course of Takayasu arteritis (TAK) may be indolent, and many patients remain stable on low-dose immunosuppressive therapy [4]. However, when progression leads to critical cerebrovascular or limb hypoperfusion, revascularization becomes necessary [5-7]. Endovascular approaches offer minimally invasive options, but restenosis rates remain high, particularly in long lesions and active disease [5,8].

We present a male patient with extensive supra-aortic occlusive disease due to long-standing TAK who underwent comprehensive supra-aortic reconstruction. This case highlights the importance of meticulous planning and continuous cerebral monitoring using near-infrared spectroscopy (NIRS) to maintain optimal perfusion during complex revascularization [9,10].

CASE REPORT

A 49-year-old male with a 15-year history of TAK presented with postprandial dizziness, transient visual dimming, and symptoms exacerbated by standing or walking.

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The patient also experienced recurrent postprandial and orthostatic syncope, upper-extremity claudication, dizziness, and visual disturbances. These symptoms significantly impaired daily activities, including walking and self-care, and the patient had become largely bedridden prior to admission due to severe cerebral and upper-extremity hypoperfusion symptoms. He was a chronic smoker and had been maintained on prednisolone 4 mg/day for Takayasu arteritis.

At the time of surgery, the patient was considered to be in a clinically inactive phase of Takayasu arteritis based on rheumatologic evaluation. The patient had been maintained on low-dose prednisolone (4 mg/day) without additional immunosuppressive therapy. The preoperative C-reactive protein level was 4.75 mg/L, and no clinical findings suggested active systemic inflammation.

Two years earlier, he had undergone angiography (Figure 1) with stenting of the left common carotid artery (LCCA) origin and left common iliac artery.



Figure 1. Pre-operative angiography to investigate the aortic arch and implant a stent into the left common carotid artery.

Despite this, he experienced progressive symptoms, and several cardiovascular surgeons and interventional radiologists declined further intervention due to the extent of vascular disease and high risk.

Pre-operative planning was based on computed tomography angiography demonstrating complete occlusion of the right common carotid and both subclavian arteries, severe bilateral internal carotid stenosis, and in-stent restenosis of the left common carotid artery (Figure 2). Further endovascular intervention was deemed unsuitable due to long-segment, multivessel disease and prior stent failure. The ascending aorta was selected as the proximal inflow site, and Y-configured 8-mm ringed PTFE grafts were planned to revascularize both common carotid and subclavian arteries. Bilateral internal carotid thromboendarterectomy with saphenous vein patchplasty was scheduled in the same session.



Figure 2. Pre-operative computed tomography angiography demonstrating complete occlusion of the right common carotid and both subclavian arteries, severe stenosis in bilateral internal carotid stenosis, and in-stent restenosis of the left common carotid artery.

Continuous intraoperative near-infrared spectroscopy monitoring and a predefined anastomotic sequence were planned to maintain adequate cerebral perfusion throughout the procedure.

Surgical Technique

The patient was brought to the operating room, intravenous access was established, general anesthesia was induced, and the patient was endotracheally intubated. A right dorsalis pedis arterial line and a right femoral central venous catheter were inserted. Following skin preparation with povidone-iodine and sterile draping, the operation began with a right cervical incision. The right common carotid artery (CCA), internal carotid artery (ICA), and external carotid artery (ECA) were identified and looped. The right ICA was noted to be markedly narrowed and atherosclerotic.

A left cervical incision was then performed, and the left CCA, ICA, and ECA were exposed and looped. The left ICA also demonstrated atherosclerotic plaques. The distal saphenous vein from the left leg was harvested and prepared as patch material.

Through a right supraclavicular incision, the right subclavian artery (SCA) was exposed and looped. A left supraclavicular incision was used to identify and loop the left SCA. Subsequently, an upper J-shaped median sternotomy was performed. The pericardium was opened and suspended, and the ascending aorta was prepared as the proximal inflow site.

After appropriate measurements, Y-configured grafts were constructed using 8-mm ringed PTFE (Gore-Tex) conduits to allow sequential bypass from the ascending aorta to the carotid and subclavian arteries. The graft limbs were passed through their respective anatomic tunnels. Systemic heparinization was achieved, and a side clamp was applied to the ascending aorta. The proximal anastomoses of the Y-grafts were performed in an end-to-side fashion.

One limb of the right-sided graft was anastomosed end-to-side to the right SCA. An arteriotomy was then made from the right CCA into the right ICA. Thromboendarterectomy was performed, and the arteriotomy was closed with a saphenous vein patch. The carotid limb of the ringed PTFE graft was then anastomosed end-to-end to the reconstructed right CCA, and the proximal native right CCA was ligated.

The left SCA limb of the second graft was anastomosed end-to-side to the left SCA. The left ICA, CCA, and ECA were clamped. With continuous NIRS monitoring showing no decrease in cerebral oximetry, an arteriotomy from the CCA into the ICA was performed, followed by thromboendarterectomy. The arteriotomy was reconstructed with a saphenous vein patch. The carotid limb of the 8-mm ringed graft was then anastomosed end-to-side to the reconstructed left CCA.

Hemostasis was secured. Hemovac drains were placed in the cervical and supraclavicular tunnels, and two Jackson-Pratt drains were positioned in the mediastinum. The sternum was closed with steel wires, and the subcutaneous tissues and skin were closed in layers. The patient was extubated on the table with no neurological deficits and transferred to the intensive care unit in an extubated and stable condition.

Throughout the procedure, cerebral oximetry (NIRS) was used for real-time intraoperative cerebral monitoring.

Baseline cerebral oxygen saturation (rSO_2) values were 56% on the right and 68% on the left. After completion of the right carotid bypass, rSO_2 increased to 67% on the right and 69% on the left. Following completion of the left carotid reconstruction, values were 66% on the right and 71% on the left, demonstrating stable and improved cerebral perfusion during reconstruction.

At the conclusion of the operation, bilateral carotid and upper-extremity arterial pulses were palpable.

Postoperative Course

The postoperative course was complicated by pneumonia, which was treated with antibiotic therapy and supportive care. Prednisolone therapy (4 mg/day) was maintained during this period according to rheumatology recommendations, and no dose escalation was required. Pulse steroid therapy was not administered perioperatively.

The patient also experienced postoperative hyperglycemia. Preoperative glucose levels had already been elevated; therefore, hyperglycemia could not be attributed solely to steroid therapy. Temporary insulin therapy was initiated to achieve glycemic control. As the patient's clinical status and mobility improved, blood glucose levels became easier to control, and oral antidiabetic therapy (empagliflozin) became sufficient.

The patient was discharged on dual antiplatelet therapy in good condition. At postoperative week 2, CTA demonstrated full patency of all grafts, with no evidence of stenosis, kinking, or technical failure. The postoperative course was complicated by a minor superficial wound infection on the right side of the neck, which was treated with debridement and antibiotic therapy.

The patient has been followed for three months postoperatively and remains asymptomatic with complete resolution of preoperative symptoms. Follow-up computed tomography angiography performed at three months confirmed continued patency of all grafts (Figure 3).

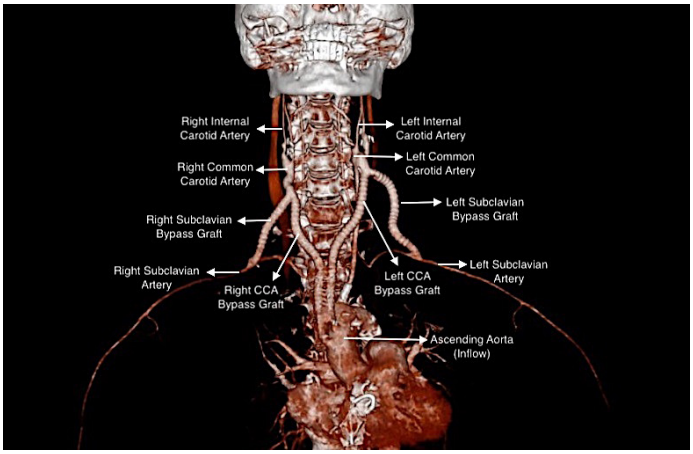


Figure 3. Postoperative 3-month control computed tomography angiography demonstrating complete supra-aortic reconstruction. Arrows indicate the ring-reinforced PTFE graft limbs and their anastomoses to the native carotid and subclavian arteries.

DISCUSSION

Takayasu arteritis involving long-segment supra-aortic occlusions presents significant challenges for both diagnosis and treatment [6,7,11]. Although predominantly affecting women, male patients often demonstrate more aggressive disease progression [3], as in our case. Despite immunosuppressive therapy and previous endovascular intervention, the patient developed worsening bilateral carotid and subclavian occlusions.

Endovascular therapy is increasingly used; however, in TAK, it is associated with high restenosis rates exceeding 50%, particularly following stenting [5,8].

Open surgical reconstruction is often the only durable solution for patients with multilevel occlusions and failed endovascular therapy [7,11]. Our surgical strategy—ascending aortic inflow with Y-configured PTFE grafts—mirrors modern supra-aortic debranching principles.

Notably, Ugurlucan and colleagues have described cerebral protection techniques and debranching strategies that closely parallel the physiological goals of our reconstruction. Their temporary crossover external carotid bypass technique allows preservation of continuous perfusion during arch debranching [12], and subsequent series have demonstrated favorable mid-term outcomes following cervical debranching with perfusion-preserving strategies [13]. Additionally, their work on debranching to facilitate endovascular repair highlights the importance of customized proximal inflow planning in complex arch pathology [14].

These studies align conceptually with our approach, in which the anastomotic sequencing and inflow design are aimed to maintain uninterrupted cerebral perfusion.

Cerebral protection remains a critical component of supra-aortic reconstruction, especially in the presence of bilateral ICA stenoses. Continuous NIRS monitoring provided immediate feedback regarding hemispheric perfusion adequacy during clamping and reconstruction, consistent with the findings of Pennekamp and Radak [9,10]. The rise in cerebral saturation after right carotid revascularization demonstrated effective restoration of flow.

Bilateral carotid thromboendarterectomy with vein patchplasty was performed to optimize both inflow and outflow. Patch angioplasty is known to reduce restenosis and improve luminal geometry [15], and its incorporation contributed to the successful technical outcome.

Early postoperative CTA confirmed full graft patency, yet long-term success in TAK additionally depends on continued immunosuppression and strict risk-factor management [4,7].

The surgical strategy in this case differs from commonly reported approaches. While most supra-aortic reconstructions utilize a single Y-shaped graft originating from the ascending aorta, we constructed two separate graft bodies from the ascending aorta, each subsequently branched to the carotid and subclavian arteries. Because these grafts were tunneled through cervical and supraclavicular regions, ring-reinforced PTFE grafts were selected to reduce the risk of compression or kinking. This configuration allowed multivessel supra-aortic revascularization to be safely performed in a single operative session.

This case illustrates that even with advanced multivessel occlusion, an individualized strategy integrating supra-aortic debranching concepts [12-14], careful anastomotic sequencing, and real-time cerebral monitoring [9,10] can achieve excellent neurologic and hemodynamic outcomes.

CONCLUSION

Comprehensive supra-aortic reconstruction using ascending aorta inflow and Y-configured PTFE grafts can be performed safely in complex Takayasu arteritis. The operative strategy, particularly the anastomosis sequence and NIRS-guided cerebral protection, is conceptually aligned with the debranching and cerebral perfusion techniques described by Ugurlucan and colleagues [12-14], and contributed to our patient's favorable neurological outcome.

Patient Consent for Publication: The patient consent is taken prior to the operation.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: All authors contributed equally to the article.

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