TJVS Turkish Journal of Vascular Surgery

Turk J Vasc Surg.2025;34(3):254-57.
DOI: 10.9739/tjvs.2025.06.032

Available online at www.turkishjournalofvascularsurgery.org

Case Report

Navigating complications: Cerebellar ischemia following hybrid surgery on a dialysis loop graft

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Received: June 22, 2025 Accepted: October 02, 2025 Published online: October 27, 2025

Abstract

Intracranial embolization most commonly arises from the carotid arteries, the heart, the aorta, the vertebrobasilar circulation, or—less frequently—via retrograde embolization from the left distal subclavian artery. We report the case of a woman who developed acute right eye strabismus (exotropia), headache, and nausea, without additional neurological deficits, immediately after undergoing hybrid surgery (thrombectomy with angioplasty) for a subclavian arterio-arterial loop graft. This case represents a rare instance of postoperative intracranial ischemic infarction, potentially linked to an underlying thrombophilic state.

Keywords: Graft, hemodialysis, exotropia

INTRODUCTION

Approximately 11% of deaths around the world are due to strokes, making it the second most common cause of death [1]. In recent times, there has been a lot of emphasis on stroke prevention and early management protocols and this has led to a decrease in mortality rates across the world [2].

Intracranial embolism is an important etiology of stroke in young adults. Emboli often arise from the heart, another location within the arterial tree or as a paradoxical embolism [3]. Hypercoagulable states, such as those associated with protein C,S deficiency or antiphospholipid syndrome may cause arterial thrombosis and ischemic infarctions in young adults [4]. Rarely, retrograde flow of emboli from a diseased vessel to the vertebral or carotid arteries can occur, causing an ischemic infarct [5].

We report an unusual presentation of contralateral eye exotropia following hybrid surgery (thrombectomy with graftoplasty) of a chest wall arterio-arterial expanded polytetrafluoroethylene (ePTFE) graft used for hemodialysis. This case highlights that ischemic infarctions may occur as a consequence of subclavian embolization or an underlying thrombophilic disorder.

CASE REPORT

Pre-intervention

A woman in her 40s, known to have type 2 diabetes mellitus (on oral hypoglycemics), hypertension, and end-stage renal disease (ESRD) on regular hemodialysis, was referred from the renal dialysis unit (RDU) with a thrombosed left subclavian arterio-arterial ePTFE chest wall loop graft. The thrombosis occurred during the second cannulation attempt for hemodialysis, 25 days after graft creation under general anesthesia. The graft had been used once successfully.

On arrival, she was hemodynamically stable, fully conscious, and neurologically intact. Hemodialysis was performed via a previously inserted femoral permcath. Initial laboratory investigations, including complete blood count, coagulation profile, urea, and electrolytes, were all within normal limits. She was scheduled for hybrid surgery (graft thrombectomy, graftography ± graftoplasty) under monitored local anesthesia.

CITATION
Ghanem AA, Alm F. Navigating complications: Cerebellar ischemia following hybrid surgery on a dialysis loop graft. Turk J Vasc Surg.2025;34(3):254-57.

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Procedure details

Mid-graft exposure was performed at the chest wall, followed by proximal and distal graft control and transverse graftotomy. A 5F then 6F embolectomy catheter was advanced proximally (25 cm) with retrieval of significant thrombus and restoration of inflow. A similar maneuver distally (30 cm) produced the same findings. The graftotomy was closed with 6/0 Prolene.

Subsequently, graftography via a 5F sheath showed patent outflow and a possible inflow lesion. Percutaneous transluminal angioplasty (PTA) using a 7 × 40 mm plain balloon was performed, with no residual stenosis or balloon waist observed [Figures 1&2].

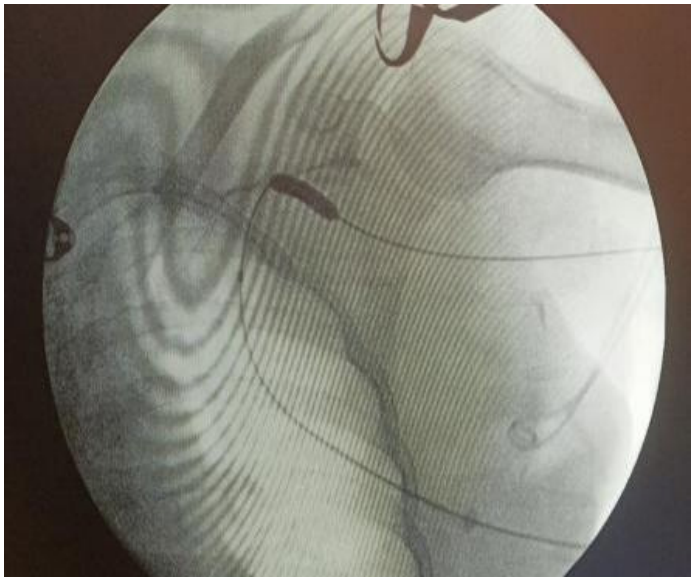

Figure 1. Angioplasty of the outflow segment of the PTFE graft

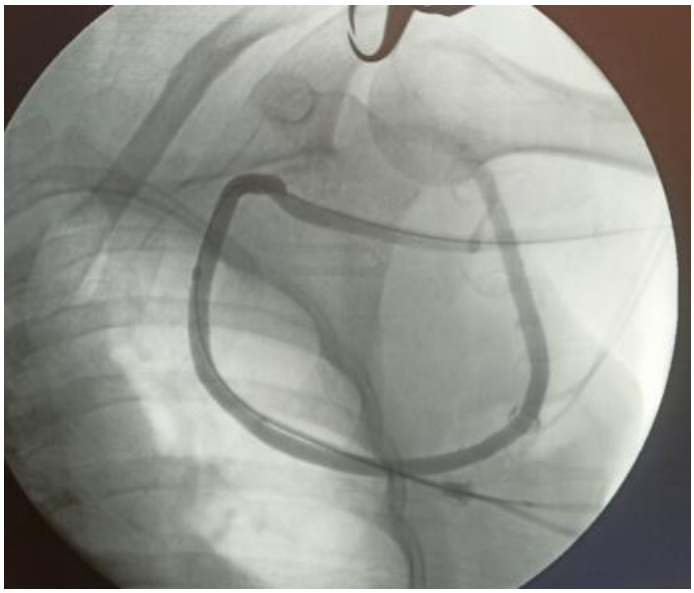

Figure 2. Completion graftography showing restored flow through the subclavian arterio-arterial PTFE graft

Post-intervention

The patient was transferred to the surgical ward on continuous intravenous high-molecular-weight heparin, titrated by activated partial thromboplastin time (APTT) according to vascular protocol. Twelve hours later, the graft was successfully used for hemodialysis. After dialysis, patient developed acute right eye strabismus with diplopia and nausea. These symptoms had begun immediately postoperatively but were missed initially, and by the time they were reported, the patient was outside the window for acute ischemic intervention.

The patient's vital signs, including blood pressure, remained stable. Heparin was stopped and computed tomography (CT) brain excluded hemorrhage but revealed bilateral basal ganglia chronic infarcts and a right cerebellar hypodensity. The ophthalmology team attributed her strabismus to a central cause, most likely third cranial nerve nucleus involvement.

Neurology team recommended initiation of dual antiplatelet therapy, cessation of heparin, and a comprehensive embolic workup, including transesophageal echocardiography (TEE), Holter electrocardiogram (ECG), carotid duplex, brain magnetic resonance angiography/magnetic resonance venography (MRA/MRA), and thrombophilia screening.

Magnetic resonance imaging (MRI)/ MRA/MRV demonstrated

- A sub-acute infarct in the anterolateral periaqueductal grey matter of the right midbrain.
- Bilateral cerebellar infarcts, larger on the right, without mass effect [Figures 3].
- Multiple old lacunar infarcts in supra- and infratentorial regions [Figures 4].

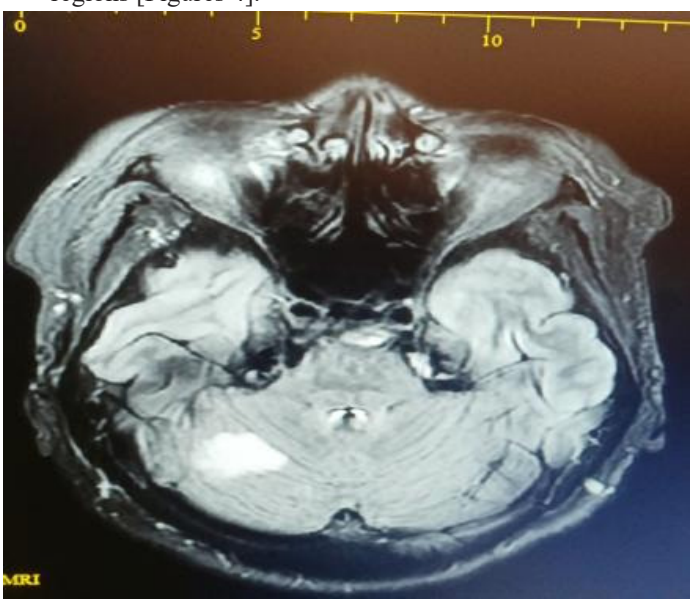

Figure 3. MRI brain (axial view) demonstrating subacute infarct in the right cerebellar hemisphere

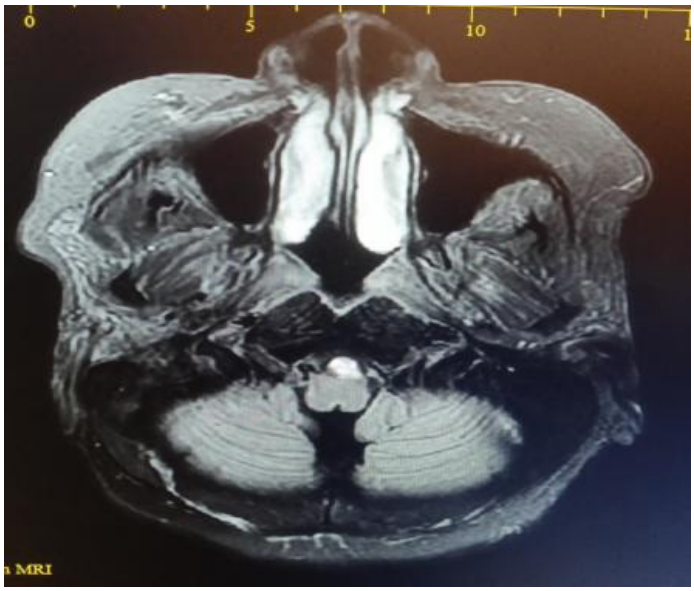

Figure 4. MRI brain (axial view) showing multiple supra and infratentorial lacunar infarcts

The patient's ocular and neurological symptoms gradually improved. However, on day 4, the graft re-thrombosed. Repeat thrombectomy and graftography were performed, and intravenous heparin infusion was restarted after multidisciplinary consultation with neurology team. By postoperative day 6, strabismus, nausea, and headache had fully resolved.

Trans-esophageal echocardiography (TEE) revealed

A 5 × 10 mm immobile thrombus at the IVC–RA junction.

An 8 × 13 mm thrombus attached to the tip of the permcath in the right atrium.

Moderate aortic regurgitation.

These findings were reviewed in a multidisciplinary meeting (vascular surgery, cardiology, and cardiothoracic surgery), and the patient was started on oral warfarin with target inernational normalized ratio (INR) 2–3.Carotid duplex demonstrated normal carotids but elevated resistive indices in both vertebral arteries, with a dominant left vertebral artery. Thrombophilia screening was negative (though testing occurred while on heparin).

OUTCOME AND FOLLOW-UP

After 14 days of hospitalization, the patient was discharged home on oral warfarin therapy. At discharge, she had achieved complete recovery of her right eye strabismus and maintained a functioning arterio-arterial chest wall graft for hemodialysis. She was scheduled for multidisciplinary follow-up in hematology, cardiology, neurology, nephrology, and vascular surgery clinics.

DISCUSSION

We report on a case of cerebellar ischemic infarctions following subclavian arterio-arterial graft hybrid surgery.

Protein S is a vitamin K-dependent plasma protein that serves primarily as a co-factor for activated protein C and plays a vital role in regulation of blood coagulation and fibrinolysis [4]. Protein S deficiency manifests most commonly as superficial and deep venous thrombosis, but less commonly as arterial thromboses, such as femoral, cerebral, subclavian, and axillary artery thromboses, which have been described [1].

Our patient had multiple brain territories infarctions that can be explained by thrombophilia. Also the event of second graft re-thrombosis after stopping of IV heparin may support causal relationship between thrombophilia and ischemic infarcts even with normal laboratory results for thrombophilia screening (samples were sent and the patient already started on heparin infusion, so that may give false negative results in some mutant prothrombotic genes). Thrombophilia and coagulopathy are further supported by thrombotic events outside the brain, including graft re-thrombosis and intracardiac thrombosis.

Although subclavian arterial graft thrombosis complicated by intracranial thromboembolism is uncommon, a number of case studies have reported on intracranial embolism from a subclavian artery thrombotic pathology [5]. The pathogenesis of infarcts in the vertebrobasilar and carotid distribution is generally believed to be due to propagation or retrograde embolism from a subclavian artery thrombus [5]. However, distal subclavian artery occlusion, not proximal artery occlusion, as the source of cerebral infarction would still be very uncommon [1].

Cerebral embolism may complicate lesions of the subclavian arteries or aortic isthmus distal to the origins of the vertebral or carotid arteries [6]. This may be due to retrograde propagation of occlusive thrombus. In other cases, the vessels are patent but there are periods of reverse blood flow, creating a potential for reflux of embolic material to the ostia of the neck vessels [6].

This rare case of multiple intracranial ischemic infarctions as a complication of subclavian arterio-arterial graft thrombectomy, possibly associated with passing of embolectomy catheter centrally towards arterial inflow causing embolization to ipsilateral vertebral artery or contra-lateral carotid artery is uncommon.

The mechanism of intracranial embolization in this case remains challenging to determine. Potential sources include graft-related thrombus formation, perioperative manipulation, or underlying thrombophilia. Sources of embolizations related to catheters have also been reported in the literature [7]. Hemodialysis catheters are typically positioned in the venous circulation, and for them to act as a source of intracranial emboli, the presence of an arteriovenous shunt or right-to-left cardiac communication would be required [7].

Our patient reported eye strabismus to physicians 12 hours post occurrence of symptoms although those symptoms appeared immediately post operative and were missed to be witnessed immediately upon appearance by treating team (out of window for ischemic stroke intervention) but fortunately there was a complete recovery from central symptoms after 6 days of their onset.

CONCLUSION

We report a patient who developed acute right eye exotropia immediately after hybrid surgery of a left subclavian arterio-arterial ePTFE chest wall graft for hemodialysis—an exceptionally rare presentation. We postulate that the associated cerebellar infarctions may have resulted either from embolization or an underlying thrombophilic state. Determining the precise source of cerebral infarction in such cases is often challenging; nevertheless, the possibility of coagulopathy should always be considered.

Ethical Approval: Ethical approval was granted by the institutional review board of the Ministry of Health under reference number MOH/CSR/CR/24/20.

Patient Consent for Publication: Informed and written consents were obtained and signed by the patient.

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.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

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