TJVS Turkish Journal of Vascular Surgery

Turk J Vasc Surg.2026;35(1):78-84
DOI: 10.9739/tjvs.2025.07.039

Available online at www.turkishjournalofvascularsurgery.org

Case Report

Left internal carotid artery fibromuscular dysplasia in a male patient: A case report and review of the literature

Fernando Bautista-Sánchez[1,3], David Bellido-Yarlequé[2], Rossi Ramos-Isidro[2], Juan Diego Cuipal-Alcalde[1], Carlos Zuñiga-Luna[1]

[1]Guillermo Almenara Irigoyen National Hospital, Vascular Surgery Unit, Lima, Peru
[2]Guillermo Almenara Irigoyen National Hospital, Cardiac Surgery Unit, Lima, Peru
[3]Cayetano Heredia University, Lima, Peru

Received: July 16, 2025 Accepted: December 05, 2025 Published online: March 04, 2026

Abstract

Fibromuscular dysplasia (FMD) is a non-atherosclerotic, non-inflammatory vascular disease that most commonly affects the renal, carotid, and vertebral arteries. We present the case of a 40-year-old male patient with a history of recurrent transient ischemic attack (TIA). Supra-aortic computed tomography (CT) angiography revealed >80% luminal stenosis of the left carotid bifurcation and left internal carotid artery (LICA). The affected arterial segment was resected and replaced with a PTFE graft. The surgery was uneventful, achieving adequate flow restoration between the reconstructed vessels. The patient was followed in the Vascular Surgery Unit with antiplatelet agents and ultrasound (US) monitoring every six months, demonstrating adequate flow in the interposed polytetrafluoroethylene (PTFE) graft. This case highlights the value of surgical repair in symptomatic carotid FMD when endovascular treatment is unsuitable.

Keywords: Fibromuscular dysplasia, carotid artery, vascular surgery

INTRODUCTION

Fibromuscular dysplasia (FMD) is a rare, non-atherosclerotic, and non-inflammatory vascular disease that most commonly affects the renal arteries (85%), followed by the carotid and vertebral arteries [1]. It was first described by Leadbetter and Burkland in 1938 [2]. The pathological classification proposed by Harrison and McCormack (1971) remains widely accepted [3].

FMD can result in stenosis, aneurysm, dissection, or occlusion. It may be asymptomatic or discovered incidentally during imaging for other conditions. Clinical symptoms depend on the affected vessel: renal involvement may cause hypertension, while carotid involvement can result in headache, tinnitus, TIA, or stroke [4,5]. The overall prevalence of FMD is low, estimated at 3.8% among renal angiogram donors [6]. We report a rare case of carotid fibromuscular dysplasia in a young man presenting with ischemic stroke, emphasizing its diagnosis and surgical management.

CASE REPORT

A 40-year-old man presented with recurrent TIA and a stroke two years prior, which caused right hemiparesis. He was readmitted to the emergency department due to worsening hemiparesis, new paresthesia in the right arm, and dysarthria.

On examination, the patient was alert and oriented (Glasgow Coma Scale [GCS] 15). Neurological evaluation revealed dysarthria and right brachio-crural hemiparesis (3/5). Head CT showed subacute infarction in the left parietal lobe and chronic lacunar

CITATION
Bautista-Sánchez F, Bellido-Yarlequé D, Ramos-Isidro R, Cuipal-Alcalde JD, Zuñiga-Luna C. Embolization of renal artery for arteriovenous fistula by cardiothoracic and vascular surgery in Gorontalo: A case report. Turk J Vasc Surg. 2026;35(1):78-84.

Corresponding Author: David Bellido-Yarlequé, Guillermo Almenara Irigoyen National Hospital, Cardiac Surgery Unit, Cayetano Heredia University, Lima, Peru
Email: david.bellido@unmsm.edu.pe

infarcts in the left corona radiata, external capsule, and lenticular nucleus. Routine labs, coagulation profile, echocardiogram, and chest CT were unremarkable. SARS-CoV-2 test was negative.

Carotid duplex ultrasound (US) demonstrated marked stenosis of the LCCA and left internal carotid artery (LICA), with systolic peak velocity >200 cm/sec at the LICA. Supra-aortic CT angiography revealed >80% luminal stenosis at the carotid bifurcation and LICA. (Figure 1) Whole-body CT angiography showed no other vascular anomalies (Figure 2).

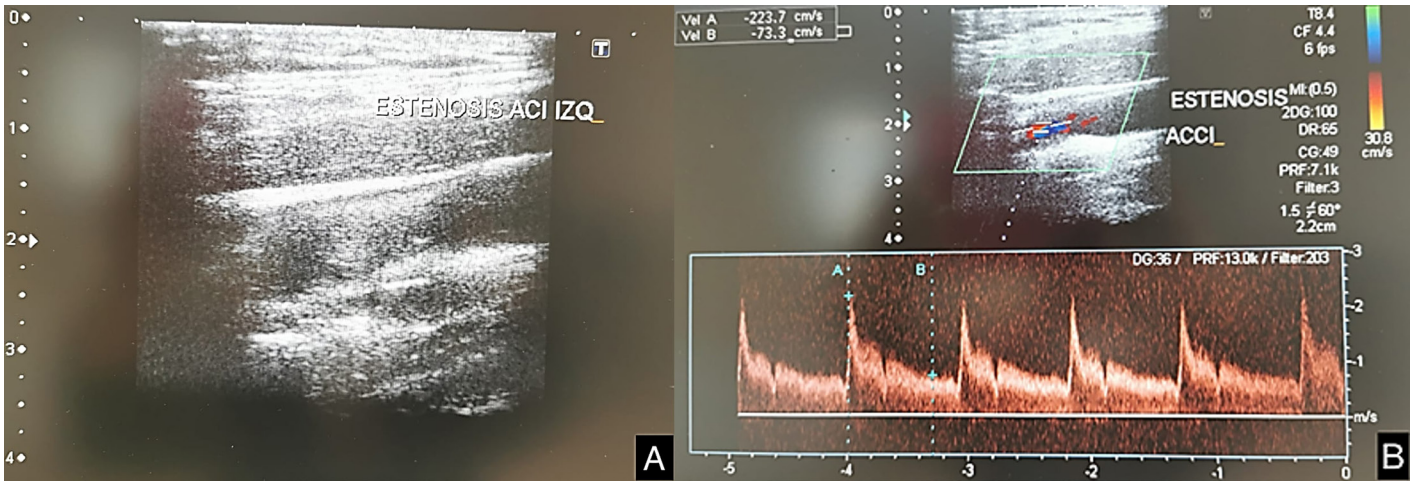

Figure 1. A) US of the left common carotid artery (LCCA) and left internal carotid artery (LICA) showing significant obstruction of its lumen. B) Doppler US of the LICA with significant velocities

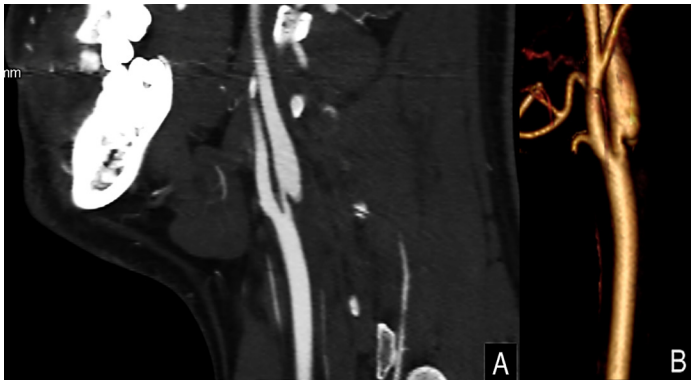

Figure 2. A) Supra-aortic CT angiography reconstruction, showing significant stenosis of the LICA B) 3D Supra-aortic CT angiography reconstruction of the LICA

The affected arterial segment was resected and replaced with an 8x5 mm PTFE graft via end-to-end anastomosis between the LCCA and LICA. The left external carotid artery was reimplanted using an end-to-side technique (Figure 3). PTFE was selected because of inadequate vein diameter (<2 mm) in both limbs. Intraoperative findings revealed fibroelastic tissue obstructing the carotid bifurcation, extending into the proximal external carotid, along with two enlarged cervical lymph nodes. The resected tissue and nodes were sent for pathology (Figure 4).

Histopathological examination of the resected carotid segment revealed structural changes characteristic of FMD. The tunica media showed alternating zones of fibromuscular thickening and thinning with replacement of smooth muscle by collagen and elastic fibers, producing a fibro-elastic pattern consistent with medial fibroplasia. The internal elastic lamina was focally disrupted, while the intima was preserved without atheromatous or inflammatory changes. Lymph nodes showed reactive hyperplasia without malignancy.

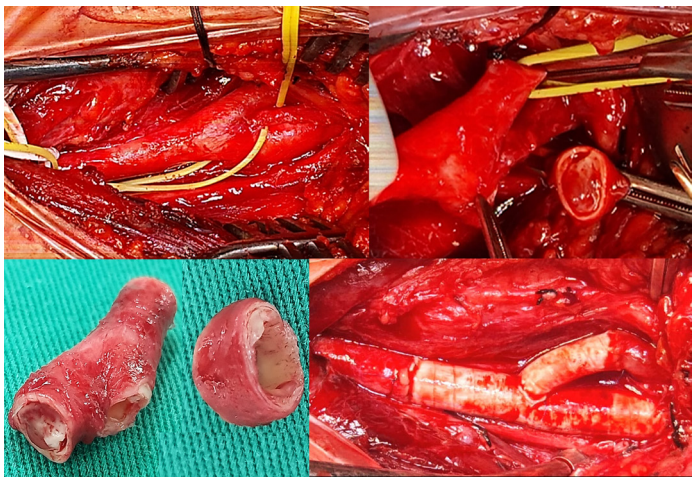

Figure 3. A) LCCA, LICA and left external carotid artery (LECA) B) Cross section of LICA with evidence of endoluminal tissue. C) excision of compromised arterial segment that includes LCCA, LICA and LECA. D) Arterial reconstruction with PTFE graft

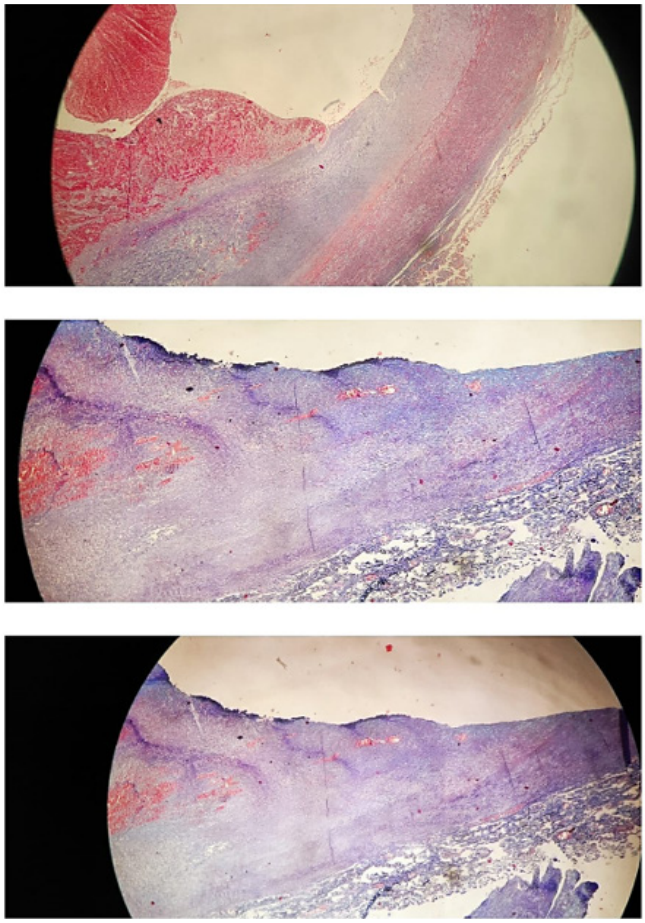

Figure 4. Histopathological examination (H&E stain) showing alternating fibromuscular thickening and thinning of the tunica media with focal disruption of the internal elastic lamina, consistent with medial fibroplasia

The patient recovered uneventfully, with mild residual right hemiparesis and no new neurological events. Functionally, his modified Rankin Scale (mRS) improved from mRS 3 preoperatively to mRS 1 at the three-year follow-up, indicating full independence in daily activities. He was discharged on aspirin and followed with duplex ultrasound every six months. At three-year follow-up, CT angiography demonstrated normal graft patency and no recurrence (Figure 5).

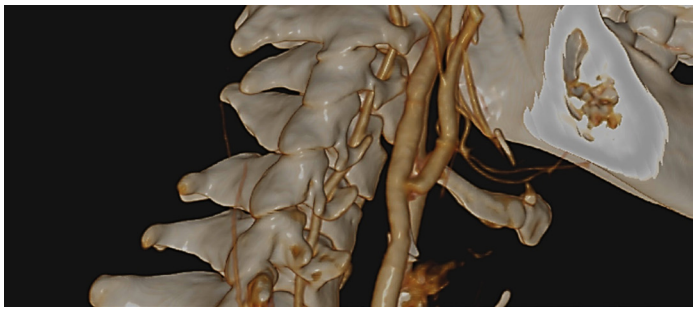

Figure 5. Supra-aortic CT angiography control of the PTFE graft at the third year of follow-up

DISCUSSION

FMD is an idiopathic, segmental, non-atherosclerotic and non-inflammatory disease of the arterial wall, leading to stenosis of small and medium-sized arteries. It is recognized as a rare disorder by the National Organization for Rare Disorders (NORD) [7]. Diagnosis requires the exclusion of arterial spasm, genetic syndromes, or vasculitis. The most frequently affected arteries are renal (60–75%), cervical-cranial (25–30%), visceral (9%), and peripheral limb vessels (5%) [4].

A focused literature search was performed using PubMed, Scopus, and Google Scholar (1965–2025), using the terms “fibromuscular dysplasia”, “carotid artery”, “surgical repair”, and “case report”. We included English-language case reports or series describing carotid FMD managed surgically, endovascularly, or conservatively. Extracted variables included demographics, presentation, vascular segment, management, and outcomes (Table 1).

Medial fibroplasia is the most common subtype (75–80%), characterized by alternating areas of fibromuscular thickening and thinning, resulting in a beaded appearance and predisposition to aneurysm formation. Intimal fibroplasia affects intracranial arteries and presents with long segments of narrowing. [3,5,8].

In our case, histopathological analysis confirmed medial fibroplasia. The arterial wall exhibited irregular thickening of the tunica media with alternating zones of smooth-muscle hyperplasia and attenuation. Collagen and elastic fibers partially replaced the muscular layer, and the internal elastic lamina showed focal fragmentation without inflammatory infiltrate or lipid deposition. These findings are consistent with a non-atherosclerotic, non-inflammatory fibroelastic arteriopathy and correlate with the characteristic “string-of-beads” angiographic appearance of fibromuscular dysplasia. Recognition of these microscopic features is essential to distinguish FMD from vasculitis or atherosclerotic lesions.

FMD has two angiographic subtypes: multifocal ("string-of-beads appearance"), seen in approximately 85% of cases, predominantly in women (9:1) between ages 45–55; and focal, which shows a more balanced gender distribution, tends to occur earlier, and often presents with more severe symptoms [9].

Carotid FMD is frequently asymptomatic; however, when symptoms occur, they typically include TIA, stroke, headache, amaurosis fugax or migraine. Our patient’s presentation with multiple TIA and a stroke is consistent with other rare cases of symptomatic carotid FMD reported in the literature. Ismail et al. described a 53-year-old male patient with extracranial FMD of the right internal carotid artery, who experienced cerebrovascular symptoms requiring open surgical intervention with a bypass procedure [10].

Table 1. Summary of reported cases of carotid fibromuscular dysplasia (1967 – 2025)

Patient	Type of Research	Year of publication	Age/ Average Age	Gender	Number of Patients	Anatomical Location	Sign and Symptoms	Perioperative Morbidity	Treatment	Reference
1	Case Report	1967	57-year-old	Female	1	Bilateral Internal Carotid Artery	Dizziness Hypertension	Transient hypoglossal nerve paresis	GID	Ehrenfeld et al.
2	Case Series	1968	59 years	10 Females 2 Males	12	Internal Carotid Artery	Headache Carotid bruit Transient weakness	Transient hypoglossal nerve paresis – 2 cases	GID	Morris et al.
3	Case Series	1974	50.8 years	15 Females	15	Internal Carotid Artery	Carotid bruit Dizziness Headache	Carotid artery thrombosis – 1 case Limited ICA dissection – 2 cases	GID Open Surgery Graft interposition	Stanley et al.
4	Prospective Review	1979	57.7 years	65 Females 3 Males	68	Internal Carotid Artery	Carotid bruit Dizziness	TIA – 7 cases Neurological Deficit – 2 cases	GID	Effeney et al.
5	Prospective Review	1980	NR	NR	79	Internal Carotid Artery	NR	TIA – 8 cases Stroke – 3 cases	GID	Effeney et al.
6	Prospective Review	1981	60 years	18 Females	18	Internal Carotid Artery	Dizziness Carotid bruit	None	GID	Collins et al.
7	Prospective Review	1981	58 years	19 Females 6 Males	25	Internal Carotid Artery	TIAs Amaurosis fugax Asymptomatic bruit	ICA occlusion – 1 case	GID Open surgery	Starr et al.
8	Case Series	1984	NR	7 Females	7	Internal Carotid Artery	NR	Transient hemiparesis – 1 case	GID ICA Angioplasty	Levien et al.
9	Prospective Review	1993	NR	NR	58	Internal Carotid Artery	NR	Transient neurological disorders due to dissection – 12 cases TIA – 1 case	GID Saphenous vein graft interposition Endarterectomy (CE)	Moreau et al.

CE: carotid endarterectomy, GID: graded intraluminal dilation, ICA: internal carotid artery, NR: not reported, PTFE: polytetrafluoroethylene graft, TIA: transient ischemic attack

DOI: 10.9739/tjvs.2025.07.039

Table 1. Summary of reported cases of carotid fibromuscular dysplasia (1967 – 2025)

Patient	Type of Research	Year of publication	Age/ Average Age	Gender	Number of Patients	Anatomical Location	Sign and Symptoms	Perioperative Morbidity	Treatment	Reference
10	Case Report	1994	26-year-old	Female	1	Left Internal Carotid Artery	Amaurosis fugax Marfan Syndrome Carotid Artery Dissection	Death due to thoracoabdominal aneurysm	NR	Schievink et al.
11	Case Report	2005	19-year-old	Female	1	Anterior cerebral artery	Polyphagia Hypersomnia Headache	None	Conservative	Birnbaum et al.
12	Case Report	2007	52-year-old	Male	1	Right Internal Carotid Artery	Left Homonymous Hemianopsia	None	NR	Poppe et al.
13	Case Report	2008	39-year-old	Female	1	Right Internal Carotid Artery	Diplopia Headache	None	Conservative	Bhuriya et al.
14	Case Report	2019	86-year-old	Female	1	Left Internal Carotid Artery	Right-sided facial droop Dysarthria	Recurrent severe ICA stenosis	Endarterectomy (CE) ICA Angioplasty Stent placement	Al-Nouri et al.
15	Case Report	2021	44-year-old	Female	1	Left Internal Carotid Artery	Aphasia Right Upper Limb motor deficit	None	Open Surgery Saphenous vein graft interposition	Bilman et al.
16	Case Report	2022	53-year-old	Male	1	Right Internal Carotid Artery	Left upper limb weakness Recurrent TIAs	None	Open Surgery	Ismail et al.
17	Case Report	2025	40-year-old	Male	1	Left Internal Carotid Artery	Recurrent TIAs Stroke	None	Open Surgery PTFE graft interposition	Our study

CE: carotid endarterectomy, GID: graded intraluminal dilation, ICA: internal carotid artery, NR: not reported, PTFE: polytetrafluoroethylene graft, TIA: transient ischemic attack

DOI: 10.9739/tjvs.2025.07.039

Similarly, Bilban et al. reported a 44-year-old female with symptomatic left internal carotid FMD managed with open reconstruction using a saphenous vein graft [11]. In both cases, as in ours, patients presented with neurological deficits attributable to FMD and underwent successful surgical repair. These reports reinforce the clinical significance of symptomatic carotid FMD and support surgical intervention in selected patients with recurrent or progressive symptoms.

The management of FMD depends on its clinical presentation and the anatomy of the affected arterial segment. As highlighted by Olin et al., a conservative approach is recommended for asymptomatic patients, including regular monitoring and antiplatelet therapy, typically with aspirin. Invasive procedures such as angioplasty or surgery are reserved for patients with symptoms or hemodynamically significant lesions [1].

Surgical management is indicated for symptomatic carotid FMD and varies according to lesion complexity and patient anatomy. Endovascular treatment—particularly balloon angioplasty without stenting—is considered the first-line therapy for most patients with symptomatic FMD, especially when lesions are focal or multifocal and located in accessible vessels such as the renal or carotid arteries [9,12,13]. Table 1 summarizes previously published cases.

In contrast, open surgical treatment—including bypass grafting, resection with interposition grafts, or reimplantation—is reserved for patients with complex vascular anatomy, such as marked tortuosity, kinking, dissection, aneurysm formation, or failure of endovascular therapy. Several case reports and surgical series [10,11,12] have demonstrated favorable long-term outcomes following surgical repair in such cases. Therefore, while endovascular treatment remains the standard for most, open surgical intervention remains a valid and sometimes necessary option in patients with challenging anatomy or recurrent symptoms. PTFE or vein grafts are selected based on vessel size and availability; in our case, PTFE was used due to insufficient vein caliber [14,15].

In our patient, open surgery was selected over endovascular repair due to the complex vascular anatomy involving the carotid bifurcation and the proximal segment of the external carotid artery. The fibroelastic nature of the lesion and the extension across the carotid bifurcation posed technical limitations for balloon angioplasty and an increased risk of arterial dissection or incomplete dilation. Therefore, resection with interposition grafting was considered the safest and most effective strategy to achieve durable flow restoration.

In terms of neurological recovery, the patient demonstrated sustained functional improvement, with the modified Rankin Scale (mRS) improving from mRS3 preoperatively to mRS1 at long-term follow-up, reflecting mild residual hemiparesis but full independence in daily activities.

Although previous reports, such as those by Ismail et al. and Bilman et al., have described carotid FMD in male patients, histopathological confirmation and long-term postoperative follow-up are seldom documented. Our case contributes additional evidence by providing pathological confirmation of medial fibroplasia and demonstrating durable graft patency over three years, reinforcing the role of open surgical repair as a valid option in selected patients.

CONCLUSION

This case report holds clinical value not only because FMD of the internal carotid artery is a rare vascular disorder, but also because it provides histopathological confirmation and long-term follow-up in a symptomatic male patient successfully treated with open surgical repair. It emphasizes the importance of considering FMD in the differential diagnosis of young male patients presenting with cryptogenic stroke or recurrent transient ischemic attacks and highlights that individualized surgical decision-making remains crucial, as open reconstruction continues to be a durable option for patients with complex anatomy or when endovascular treatment is not feasible. Early recognition of carotid FMD—particularly in younger male patients with otherwise unexplained ischemic symptoms—can direct timely, anatomy-guided revascularization and favorable long-term outcomes.

Patient Consent for Publication: Informed consent was obtained, and procedures followed institutional ethical standards.

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.

REFERENCES

1. Olin JW, Sealove BA. Diagnosis, management, and future developments of fibromuscular dysplasia. J Vasc Surg. 2011;53:826-36.
2. Leadbetter WF, Burkland CE. Hypertension in unilateral renal disease. J Urol. 1938;39:611-26.
3. Harrison EG, McCormack LJ. Pathologic classification of renal arterial disease in renovascular hypertension. Mayo Clin Proc. 1971;46:161-7.
4. Begelman SM, Olin JW. Fibromuscular dysplasia. Curr Opin Rheumatol. 2000;12:41-7.
5. Stanley JC, Gewertz BL, Bove EL, Sottiurai V, Fry WJ. Arterial fibrodysplasia: histopathologic character and current etiologic concepts. Arch Surg. 1975;110:561-6.

6. Blondin D, Lanzman R, Schellhammer F, Oels M, Grotemeyer D, Baldus SE, et al. Fibromuscular dysplasia in living renal donors: still a challenge to computed tomographic angiography. Eur J Radiol. 2010;75:67-71.

7. National Organization for Rare Disorders. Fibromuscular Dysplasia. https://rarediseases.org/ Accessed February 01, 2017.

8. Lüscher TF, Lie JT, Stanson AW, Houser OW, Hollier LH, Sheps SG. Arterial fibromuscular dysplasia. Mayo Clin Proc. 1987;62:931-52.

9. Gornik HL, Persu A, Adlam D, Aparicio LS, Azizi M, Boulanger M, et al. First international consensus on the diagnosis and management of fibromuscular dysplasia. Vasc Med. 2019;24:164-89.

10. Ismail M, Al-Ageely TA, Alzerkani MAA, Al-Khazaali YM, Salih HA, Al-Khafaji AO, et al. Extracranial carotid localized fibromuscular dysplasia: a case report and literature review. Surg Neurol Int. 2022;13:498.

11. Bilman V, Apruzzi L, Baccellieri D, Sanvito F, Bertoglio L, Chiesa R. Symptomatic internal carotid artery dissection and kinking in a patient with fibromuscular dysplasia. J Vasc Bras. 2021;20:e20243.

12. Olin JW, Froehlich J, Gu X, Bacharach JM, Eagle K, Gray BH, et al. The United States Registry for Fibromuscular Dysplasia: results in the first 447 patients. Circulation. 2012;125:3182-90.

13. Brott TG, Halperin JL, Abbara S, Bacharach JM, Barr JD, Bush RL, et al. 2011 ASA/ACCF/AHA guideline on the management of patients with extracranial carotid and vertebral artery disease. Circulation. 2011;124:489-532.

14. Moreau P, Albat B, Thevenet A. Fibromuscular dysplasia of the internal carotid artery: long-term surgical results. J Cardiovasc Surg (Torino). 1993;34:465-72.

15. Ehrenfeld WK, Wylie EJ. Fibromuscular dysplasia of the internal carotid artery: surgical management. Arch Surg. 1974;109:676-81.