

Embolitic strokes in a patient with a large floating thrombus in the ascending aorta

Christou N, Gourgiotis I, Dakis K, Liasidis C

Department of Neurology, Ippokratio General Hospital of Thessaloniki, Greece

Abstract:

Background: A floating thrombus in the ascending aorta is a rare finding that may cause multiple ischemic strokes with catastrophic consequences. The treatment algorithm for such lesions is yet to be defined.

Case report: We report the case of a 50-year-old patient with multiple cerebral ischemic strokes due to a sizeable floating thrombus (25 x 15 x 13 mm) in the ascending aorta. Conservative management utilizing anticoagulants was chosen due to the patient's high estimated perioperative risk.

Conclusion: An anticoagulation treatment strategy may be feasible, safe, and effective in patients with large mobile thrombus in the aorta who are not eligible for thrombectomy. HIPPOKRATIA 2021, 25 (3):172-174.

Keywords: Thrombus, ascending aorta, embolism, stroke

Corresponding author: Nasia Christou, MD, 49 Konstantinoupoleos str., Thessaloniki, Greece, tel: +306994155408, e-mail: nasia1992@hotmail.com

Introduction

Floating aortic thrombi are a rare finding. A literature review shows a few reported cases of floating aortic thrombi in non-aneurysmal and non-atherosclerotic arteries. As a result, these lesions carry a potential risk for multiple embolic events with catastrophic consequences. A floating thrombus in the ascending aorta may be an incidental finding; however, in some cases, it may cause multiple embolic events, both cerebral and non-cerebral^{1,2}. The origin of thrombus in the aorta can be thromboembolism or atheroembolism³.

Current treatment options emanated from the sparse available literature are anticoagulation, surgical thrombectomy, and open or, in certain cases, endovascular therapy^{4,7}. We present a rare case of a giant floating thrombus in the ascending aorta, causing multiple cerebral ischemic strokes.

Case report:

A 50-year-old Caucasian male patient presented to the Emergency Department due to a sudden weakness in his left upper limb. The onset of his symptom occurred 5 hours before his arrival. Neurological examination revealed palsy of the left facial nerve (lower face), palsy of the left hypoglossal nerve, left upper limb paresis, and left homonymous hemianopsia. The Medical Research Council (MRC) muscle strength scale of the left upper limb was two, while the National Institutes of Health Stroke Scale (NIHSS) score of the patient was eight. An urgent brain computer tomography (CT) scan was performed, which showed normal CT findings.

The patient had a long medical history of arterial and venous thrombosis throughout the preceding years. Over the past decade, he underwent surgical enterectomy and bi-

laterally stenting of the femoral arteries, both consequences of arterial thrombosis. The patient has been prescribed novel oral anticoagulants (NOACs) since then, but he was not fully compliant with his medical regimen. His social history included heavy smoking (30 pack-year) and alcoholism (consuming more than four drinks per day).

Intravenous thrombolysis was not the treatment of choice due to the patient's intake of NOACs and excess of the therapeutic window. A brain CT scan was repeated 24 hours later and revealed multiple embolic strokes in the right middle cerebral artery (MCA) territory. Similar findings were observed on brain magnetic resonance imaging (MRI) 48 hours later (Figure 1).

A CT angiography (CTA) of the intracranial and extracranial arteries was performed and revealed thrombi in the aortic arch, the brachiocephalic artery, and the right common carotid (with 70 % stenosis) as well as in branches of the right external carotid artery (Figure 2).

Taking all of the above into consideration, further investigation of the thrombus was mandated; therefore, transoesophageal echocardiography (TEE) was performed, which revealed a floating thrombus in the ascending aorta measured 25 x 15 x 13 mm (Figure 3). The thrombus was located five cm peripheral to the aortic valve. The artery wall underlying the thrombus had no evidence of intimal abnormalities.

Due to his high estimated perioperative risk, the thoracic surgeons recommended conservative treatment using enoxaparin in therapeutic dosage (1 mg/kg bd calculated at 80 mg twice daily subcutaneously). The surgery was characterized as a high risk due to the thrombus location within the aortic arch and its motility which could cause multiple organ embolisms during the surgical pro-

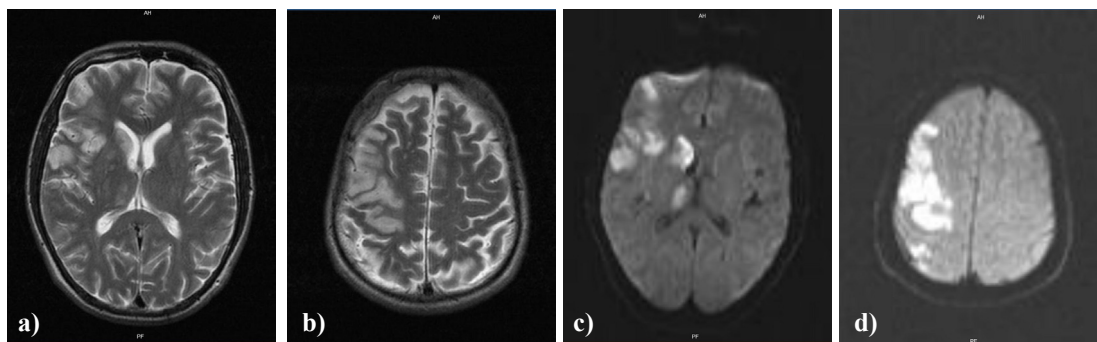


Figure 1: Axial images of brain magnetic resonance imaging showing multiple embolic strokes in the right middle cerebral artery territory; a) and b) T2-weighted sequence, c) and d) diffusion-weighted sequence.



Figure 2: Coronal image of computed tomography angiography showing multiple thrombi in the ascending aorta, brachiocephalic artery, and right common carotid artery (arrows downwards to upwards).

cedure. Subsequent bridging with an oral Vitamin K antagonist (Warfarin) was planned in due course.

The patient underwent further laboratory examination to detect any underlying pathological prothrombotic entities, such as Antithrombin III deficiency, protein S and C deficiency, activated protein C (APC) resistance-V, elevated levels of Factor VIII, Syphilis TP antibodies, and the presence of antiphospholipid antibodies (anti-cardiolipin antibodies, lupus anticoagulant, $\beta 2$ GPI antibodies IgG, IgM) that were within normal values. In addition, his immunological blood test returned negative [antinuclear antibodies (ANA), autoantibodies to extractable nuclear antigens (anti-ENA), Ra, Lo]. Furthermore, a full-body CT scan failed to identify any neoplasm.

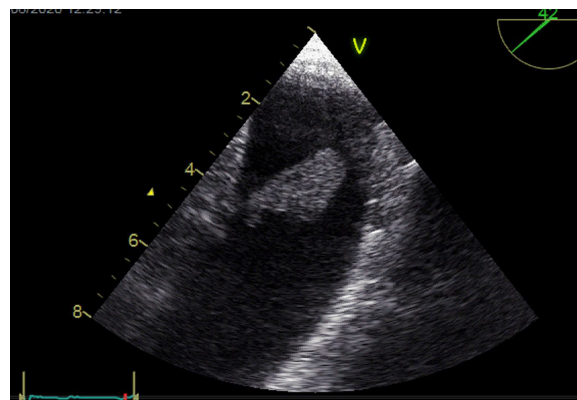


Figure 3: Transoesophageal echocardiography image demonstrating a floating thrombus in the ascending aorta (sized 25 x 15 x 13mm), five cm distal to the aortic valve.

Meanwhile, the patient was found to be homozygous for the methylenetetrahydrofolate reductase (*MTHFR*) gene C677T mutation.

CTA repetition ten days after the beginning of anticoagulation treatment with enoxaparin showed a complete response (Figure 4). Dissolution of the thrombus in the right common carotid artery (RCCA), right external carotid artery (RECA), and the aforementioned sizeable thrombus in the ascending aorta.

The proposed therapeutic algorithm was a stepwise bridging on a Vitamin K antagonist (Warfarin), with an international normalized ratio (INR) target between 2-3. The exact duration of the anticoagulation therapy still needs to be well documented. However, long-term anticoagulation treatment was recommended due to his history of multiple thromboembolic events.

Discussion

The floating thrombus in the ascending aorta can be the cause of multiple cerebral ischemic strokes and visceral infarctions. CTA and TEE are applicable imaging methods, with the TEE offering excellent visualization of the ascending aorta and the aortic arch⁸.

All patients with thrombus in the aorta should be screened for significant predisposing factors for hypercoagulation, such as neoplasms, thrombophilia, angiitis, various collagen diseases, and drugs. Our patient was



Figure 4: Coronal image of computed tomography angiography showing resolution of the thrombus in the ascending aorta, brachiocephalic artery, right common carotid artery, and right external carotid artery.

found to be homozygous for the *MTHFR C677T* mutation, often causing hyperhomocysteinemia responsible for blood clot formation and arterial wall damage. Moreover, an aortic thrombus can be caused by the rupture of atheromatic plaque or the presence of an aneurysm.

Due to the high risk of massive systemic embolization, immediate treatment of aortic thrombi is indicated. Their ideal treatment is not well defined, and there is still no consensus⁹.

The treatment of choice depends on the patient's characteristics, medical comorbidities, and perioperative risk. The treatment of choice should be made on a case-by-case basis¹⁰. Furthermore, there are currently no data on the safety of thrombectomy of a large floating aortic arch thrombus^{10,11}.

Anticoagulation therapy alone is an effective therapy associated with high rates of thrombus resolution¹². It is a safe treatment with low rates of adverse hemorrhagic events¹². In a patient with significant medical comorbidities and high estimated perioperative risk using anticoagulation as a first-line treatment appears to be reasonable. Undoubtedly there is a crucial knowledge gap about the use of NOACs in patients with large thrombus and their effectiveness^{4,12}. It is irrefutable that further studies could reveal the role of NOACs in patients with thrombus in the aorta and its branches. Open or endovascular surgical treatment could be reserved in cases of thrombi persistence despite anticoagulation treatment or as salvage therapy after confirming embolic complications^{13,14}.

Conclusions

In our case, anticoagulation treatment was preferred due to the high estimated perioperative risk and was indeed proven effective as it resulted in the complete dissolution of the arterial thrombi¹. After discussion in our case, the drawbacks of this major operation outweighed the benefits. Conservative treatment of thrombi with anticoagulation (enoxaparin in therapeutic dosage) in patients with a highly estimated perioperative risk is an effective treatment. Overall, managing floating thrombi of the aorta is critical because of the high risk for embolic events. To conclude, an in-depth case-by-case evaluation is needed in each situation.

Conflict of interest

The authors report no conflicts of interest.

References:

1. Wang B, Ma D, Cao D, Man X. Huge thrombus in the ascending aorta: a case report and literature review. *J Cardiothorac Surg.* 2019; 14: 157.
2. Adrio B, Souaf S, Al-Hamwy Z, García J, L Fernández A. Floating thrombus in the ascending aorta causing repeated arterial embolisms. *Rev Port Cir Cardiothorac Vasc.* 2018; 25: 95-98.
3. Tunick PA, Kronzon I. Embolism from the Aorta: Atheroemboli and Thromboemboli. *Curr Treat Options Cardiovasc Med.* 2001; 3: 181-185.
4. Weiss S, Bühlmann R, von Allmen RS, Makaloski V, Carrel TP, Schmidli J, et al. Management of floating thrombus in the aortic arch. *J Thorac Cardiovasc Surg.* 2016; 152: 810-817.
5. Tigkropoulos K, Karamanos D, Tympanidou M, Saratzis N, Lazaridis I. Aortic Arch Floating Thrombus Complicated by Distal Embolization in a Patient with Malignancy. *Case Rep Vasc Med.* 2018; 2018: 2040925.
6. Stöllberger C, Kopsa W, Finsterer J. Resolution of an aortic thrombus under anticoagulant therapy. *Eur J Cardiothorac Surg.* 2001; 20: 880-882.
7. Yang P, Li Y, Huang Y, Lu C, Liang W, Hu J. A giant floating thrombus in the ascending aorta: a case report. *BMC Surg.* 2020; 20: 321.
8. Crawford J, Alam M, Butler M, Ghafari G, Shepherd A. Systemic embolization by a thrombus in a apparently normal aorta detected with transesophageal echocardiography. *J Am Soc Echocardiogr.* 1997; 10: 569-572.
9. Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). *Eur Heart J.* 2014; 35: 2873-2926.
10. Koutroulou I, Tsigoulis G, Rafailidis V, Psoma E, Kouskouras K, Fotiadis P, et al. Off-label intravenous thrombolysis for early recurrent brain embolism associated with aortic arch thrombus. *Neurol Res Pract.* 2021; 3: 4.
11. Noh TO, Seo PW. Floating thrombus in aortic arch. *Korean J Thorac Cardiovasc Surg.* 2013; 46: 464-466.
12. Bowdish ME, Weaver FA, Liebman HA, Rowe VL, Hood DB. Anticoagulation is an effective treatment for aortic mural thrombi. *J Vasc Surg.* 2002; 36: 713-719.
13. Kolvekar SK, Chaubey S, Firmin R. Floating thrombus in the aorta. *Ann Thorac Surg.* 2001; 72: 925-927.
14. Labsaili H, Bouaggad A, Alami AA, Rama A, Leprince P. Surgical treatment of a floating thrombus of the ascending aorta causing repeated arterial embolisms. *Ann Vasc Surg.* 2015; 29: 1021.e5-1021.e7.