Case Report

Atherosclerotic saccular aneurysm of the extracranial internal carotid artery: Surgical repair

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ABSTRACT

Introduction and importance: Extracranial carotid aneurysms (ECCAs) are relatively uncommon. Most of these lesions are due to atherosclerosis, trauma, infection, radiotherapy, previous surgery or iatrogenic event. Severe complications include rupture, dysphagia, respiratory symptoms and brain embolization.

Case presentation: We report a case of a large saccular aneurysm of the extracranial internal carotid artery (EICA) in a 83-year old asymptomatic woman without any apparent causative history. The patient underwent a successful repair of the aneurysm by aneurysmectomy and primary end-to-end anastomosis between the proximal and distal portion of the remaining vessel with continuity restored without tension.

Clinical discussion: ECCAs are rare with few cases reported in the most recent literature. There is little knowledge of their natural history and management. Both surgical and endovascular as well as medical treatments have been recommended depending on disease-location and comorbidities.

Conclusion: Although treatment should be individualized time by time by evaluating patient’s characteristics, the surgical repair could be a safe and effective solution to treat distal EICAs, especially for symptomatic and true growing lesions. The presentation, the diagnostic evaluation, and the successful surgical treatment are discussed.

1. Introduction

Extracranial carotid aneurysms (ECCAs) are a rare entity and their invasive treatment pertains to only 0.6–3.8% of all extracranial carotid interventions. The atherosclerotic etiology is the most common cause. Others include local infection, fibromuscular dysplasia, trauma, previous surgery or iatrogenic event. All segments of the carotid artery are susceptible, although the mid to distal EICA is the most commonly affected. Most frequently they present symptoms and signs which include painful pulsatile neck mass with potential related cranial nerve dysfunction and serious complications as brain embolization and rupture. Some cases remain clinically silent. Medical, surgical and endovascular treatment has been described despite the lack of proper guidelines. Although information regarding the best treatment is scarce and the use of endovascular solution is increasing, the open repair still remains a valuable option [1].

2. Presentation of the case

A 83-year-old woman former smoker was referred to our department for a pulsatile mass on the left side of her neck. The woman was previously healthy with no medical history. No family history of aneurysms was reported. The patient did not complain of pain but slight tenderness in the mass which was noted that it had been slowly increasing in size. The patient denied any antecedent trauma, infection or family history for arterial aneurysm. No other vascular abnormality was found at thorough physical examination. The patient underwent a duplex scan in the office, which showed a internal carotid aneurysm (38 × 40 mm in diameter, with mural thrombi and turbulent flow in the aneurysm). Duplex scans of abdominal aorta, iliac, femoral, and popliteal arteries were negative for aneurysm. CT angiography (CTA) confirmed the diagnosis. Additional findings showed aneurysm wall calcifications and patency of the internal carotid with a kinking of the distal extracranial segment of the vessel. The cranial CTA, anti-nuclear and anti-smooth muscle antibodies, c-reactive protein test (CRP) and blood culture were negative for aneurysm. CT angiography (CTA) confirmed the diagnosis. Additional findings showed aneurysm wall calcifications and patency of the internal carotid with a kinking of the distal extracranial segment of the vessel. The cranial CTA, anti-nuclear and anti-smooth muscle antibodies, C-reactive protein test (CRP) and blood culture were negative. After treatment options and risks were explained, a written informed consent was obtained from the patient who refused the regional anesthesia. Through a left lateral cervical incision, a careful surgical exposure and a selective clamping of the EICA, a fully trained surgeon performed aneurysm repair aneurysmectomy and primary end-
to-end anastomosis between the proximal and distal portion of the remaining vessel with continuity restored without tension (Fig. 1). The clamping time was of 180 seconds and the use of an arterial shunt was not required because the continuous transcranial cerebral oximetry monitoring system (INVOS™ 5100C, Somanetics Corporation, Michigan, USA) did not detect significant changes in the cerebral tissue saturation. Intraoperative duplex scanning confirmed both patency and a good flow signal in the EICA. The postoperative course was uneventful. The patient was discharged on postoperative day 2 with a mono antiplatelet therapy. Culture test and histological examination of the excised aneurysm wall revealed typical uncomplicated atherosclerosis with focal intima disruption and enlargement of the internal elastic lamina (hyaline deposits) without evidence of infection or other specific pathology. Neither ischemic nor functional neurological symptoms has been observed at one week after surgery. Duplex scan at 3 months demonstrated patency of the EICA and no residual aneurysm without any clinical complications (Fig. 2). This work has been reported in line with the SCARE 2020 criteria [2].

3. Discussion

ECCAs are rare with few cases reported in the most recent literature. There is little knowledge of their natural history and management. The majority of ECCAs are due to an atherosclerosis site, which is seen in 37%–42% of aneurysms, although few histologically proven true aneurysm have been reported. Trauma is the second most common cause of ECCAs (35%–51%). Pseudoaneurysms arising at prior endarterectomy or iatrogenic events have accounted for 26%–57% of aneurysms in other series. Other etiologies include local infection, collagen vascular disease, fibromuscular dysplasia, irradiation, Behcet’s disease and Takayasu’s arteritis [3]. One of the interesting aspects in this case is that, although the saccular shape of the lesion can persuade to suspect a non-atherosclerotic etiology, the pathological reports ruled out this possibility. One reason could be the fact that atherosclerosis may lead to pseudoaneurysm formation through a process involving weakening of the vessel wall eventually causing ulceration. [4] Therefore, the histopathological analysis should be given in any case to confirm the diagnosis of EICA in absence of a clear cause. The clinical presentation can vary considerably with a substantial portion of the ECCAs which remain

Fig. 1. (A-B) An anterior and posterior view of the three-dimensional reconstruction of the EICA aneurysm which shows the kinking of the distal segment of the vessel and wall calcifications. C) A coronal plane of the CT angiography shows saccular aneurysm of the extracranial internal carotid artery (EICA) with angulation of the vessel at the level of the aneurysm mouth. (D) Intraoperative pictures shows an end-to-end anastomosis between the proximal and distal segment of the EICA with continuity restored without tension.
clinically silent. However, in addition to signs and symptoms such as pulsatile painful mass, tenderness and itching, these lesions may lead to secondary evolutive life-threatening entities, as a consequence of the aneurysm, including neurological symptoms (transient ischemic attacks, stroke) and rupture. Therefore, we believe that a preventive therapy should be recommended although the optimal treatment choice remains debatable. Indeed, a recent review of the Literature shows the difficulties to define precise repair indications due to the low quality of studies and confounding by indication. Some Authors report that, in patients with symptomatic and true growing ECCAs, the surgical repair is still the treatment of choice and the surgical decision-making is straightforward. Regarding patients with pseudoaneurysms, the current trend suggests to consider an endovascular solution. Nonoperative treatment, which comprises antithrombotic treatment and regular follow up, is safe in selected asymptomatic patients even though it is unclear which is the proper size and shape threshold to intervene [5]. This depends on the fact that no clear definition of EICA is present in the literature. In fact, excluding the distal ICA aneurysms, a dilation of the carotid bulb is sometimes evaluated as physiological [4]. To overcome this potential misinterpretation, we believe that the definition of ECCAs as a bulb dilation greater than 200% of the diameter of the ICA or 150% of the diameter of the common carotid artery, proposed by deJong, is still an appropriate criteria for intervention [6]. In the present case, the surgical approach was considered the best technical solution for some considerations. First, the big size of the lesion, the angulation of EICA at the level of the aneurysm mouth and the kinking of the distal segment suggested an high risk of complications such as migration or endoleaks in the event of an endovascular approach. Secondly, although the risk of stroke and cranial nerve damage were taken in consideration, the surgical access seemed to be safer with a reduction of the risk of cerebral embolization obtained by the direct carotid clamping in comparison to facing the same risk by using the guidewires and catheter maneuvers in a large partially thrombosed aneurysm sac. Finally, the saccular shape of the lesion supported the choice of performing the removal of the lesion with an open resection without need of arterial replacement with an interposition graft which could have increased the risk of infectious complications. Regarding the type of anesthesia, in this case, after evaluation of both the extension of the lesion and the height of the carotid bifurcation as well as the patient’s preference, we chose general anesthesia. We believed this improved both the surgical access and the ischemic tolerance during carotid clamping even with delayed shunt insertion as previously reported.

4. Conclusion

Although recommendations for diagnosis and treatment are not uniform and still under discussion, this paper suggests that the surgical repair could be a safe and effective solution to treat distal EICAs, especially for symptomatic and true growing lesions. Currently, treatment should be individualized time by time by evaluating patients’ symptoms, comorbidities and aneurysm conformation. Further larger studies are needed to reveal the optimal management.

Sources of funding

- Authors did not receive any funding for this work

Ethical approval

- This is not a research study.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

- Alessandro Robaldo: Author
- Federica Persi: Coauthor and Surgeon who performed the procedure
- Andrea Trucco: Coauthor
- Alberto Davì: Coauthor; image processing
- Dimitri Apostolou: Study concept and Surgeon who performed the procedure

Registration of research studies

1 Name of the registry:
2 Unique Identifying number or registration ID:
3 Hyperlink to your specific registration (must be publicly accessible and will be checked):

Guarantor

Alessandro Robaldo
Declaration of competing interest

- All Authors agree to publication if paper is accepted.
- The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.102321.

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