ACTA OTORHINOLARYNGOLOGICA ITALICA 2016;36:149-152; doi: 10.14639/0392-100X-192913

CASE SERIES AND REPORTS

Traumatic intra-sphenoidal pseudoaneurysm lodged inside the fractured sphenoidal sinus

Pseudoaneurisma di origine traumatica localizzato in un seno sfenoidale fratturato

P. PELLICCIA[1,2], M. BARTOLOMEO[1], G. IANNETTI[2], A. BONAFÉ[3], M. MAKEIEFF[1]

[1] Department of Head and Neck Surgery, CHU, Montpellier, France; [2] Department of Maxillo-Facial Surgery, University of Rome La Sapienza, Rome, Italy; [3] Department of Neuroradiology, CHU, Montpellier, France

SUMMARY

We describe a case of traumatic intra-sphenoidal right internal carotid artery pseudoaneurysm lodged inside the fractured sphenoidal sinus that developed in a patient with a previous history of frontal and skull base fractures involving the sphenoid sinus and walls of the carotid canal, but with normal intracranial findings at early CT angiography. The patient presented two episodes of massive life-threatening delayed epistaxis before successful endovascular treatment combining the use of coils and an uncovered stent was instituted. This case report highlights that patients with head trauma who present sphenoid sinus fractures with or without massive epistaxis should be evaluated for the development of traumatic internal carotid artery pseudoaneurysm as soon as possible. If the first angiographic evaluation reveals normal findings, repeated epistaxis should prompt a second angiographic evaluation because psudoaneurysm takes time to develop. Early treatment with uncovered stent of the aneurysm can be a life-saving therapeutic approach.

KEY WORDS: Epistaxis • Delayed epistaxis • Pseudoaneurysm • Head injuries • Sphenoidal sinus fracture • Endovascular procedures

RIASSUNTO

Descriviamo il caso di un pseudoaneurisma di origine traumatica dell'arteria carotide interna destra localizzato all'interno di un seno sfenoidale fratturato che si è sviluppato in un paziente che aveva riportato delle fratture dell'osso frontale e della base cranica che coinvolgevano le pareti del seno sfenoidale e il canale della carotide malgrado l'angio-TC precoce fosse negativa. Il paziente ha presentato due episodi di epistassi ritardata massiva potenzialmente letale prima di essere trattato con successo con tecniche endovascolari utilizzanti spirali metalliche e uno stent non ricoperto. Questo caso sottolinea il fatto che i pazienti con trauma cranico che presentano fratture nel seno sfenoidale con o senza epistassi massiva dovrebbero essere studiati il più presto possibile alla ricerca dello sviluppo di uno pseudoaneurisma postraumatico della carotide interna. Se la prima angio-TC è negativa, un'epistassi ricorrente dovrebbe condurre alla realizzazione di una seconda angio-TC poiché lo pseudoaneurisma richiede tempo per svilupparsi. Un trattamento endovascolare precoce con uno stent non ricoperto può impedire il decesso del paziente.

PAROLE CHIAVE: *Epistassi • Epistassi ritardata • Pseudoaneurisma • Trauma cranico • Frattura del seno sfenoidale • Procedure endovascolari*

Acta Otorhinolaryngol Ital 2016;36:149-152

Introduction

A false aneurysm (pseudoaneurysm) corresponds histologically to an external lumen that develops into a surrounding haematoma following disruption of all layers of the vessel wall [1-5].

Post-traumatic pseudoaneurysms of the intracranial portion of the internal carotid artery (ICA) are uncommon [2]. They represent a rare complication of head injury, especially in adults [3 4 7]. Mortality is high (up to 50%) [2 4 6 8]. These lesions may appear in the petrous, cavernous, or supraclinoid portions of the internal carotid artery. Most frequently, they are located in the cavernous portion [1-5].

The patients may present with massive epistaxis due to the rupture of the pseudoaneurysm into the sphenoid sinus. Epistaxis appears at variable times after trauma, usually less than 6 months afterwards; however, in a previous review of 100 cases from the literature, in 7 cases epistaxis appeared later than 6 months after trauma [5]. In some cases, recurrent episodes of epistaxis can occur before diagnosis is reached [5]. The likelihood of exsanguination increases with each subsequent episode of epistaxis [5].

Case

A 22-year-old man suffered from non-penetrating head and neck injury with loss of consciousness due to a car accident. He was admitted to the Emergency Department of the nearest primary care hospital in France. At admission, the patient had regained consciousness and complained of

headache and neck pain. Neurological examination was normal. CT scan of the head and the neck showed frontal and skull base fractures involving the right sphenoid sinus and walls of the right carotid canal (Fig. 1). Early vascular study performed by CT angiography showed normal findings on the vessels of the right side, whereas the left ICA was dissected and occluded in the neck. However, the patient did not develop cerebral ischaemic symptoms. The patient was referred to the Teaching Hospital of Montpellier, where conservative management of ICA dissection was preferred.

During the hospital stay, he presented two episodes of massive life-threatening delayed epistaxis. The first occurred 20 days after trauma and was self-limiting. Apparently the hemorrhage was from both nostrils. Anterior rhinoscopy performed between the two episodes failed to identify an anterior source. Nasal endoscopy with a rigid endoscope found a septal deviation on the left side; clots were suctioned and no active bleeding was found. Laboratory tests (complete blood count with differential, bleeding time, prothrombin time, activated partial thromboplastin time) identified no underlying medical problems.

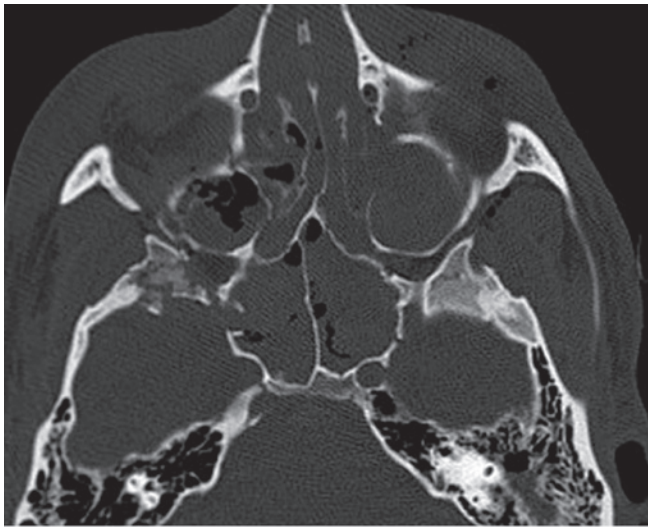


Fig. 1. CT scan of the head performed the day of the car accident (axial view) showing frontal and skull base fractures involving the right sphenoid sinus and walls of the right carotid canal.

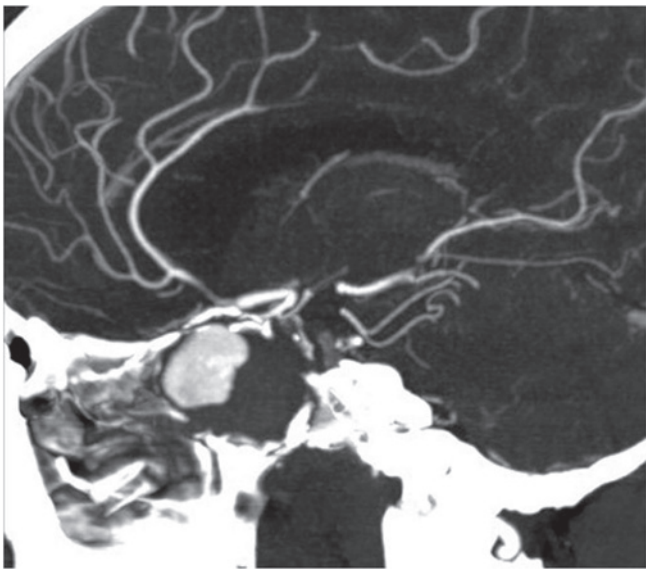


Fig. 3. Second CT angiography performed after the first episode of massive self-limiting delayed epistaxis. Sagittal view showed the saccular traumatic pseudoaneurysm of the right ICA lodged inside the fractured sphenoidal sinus.

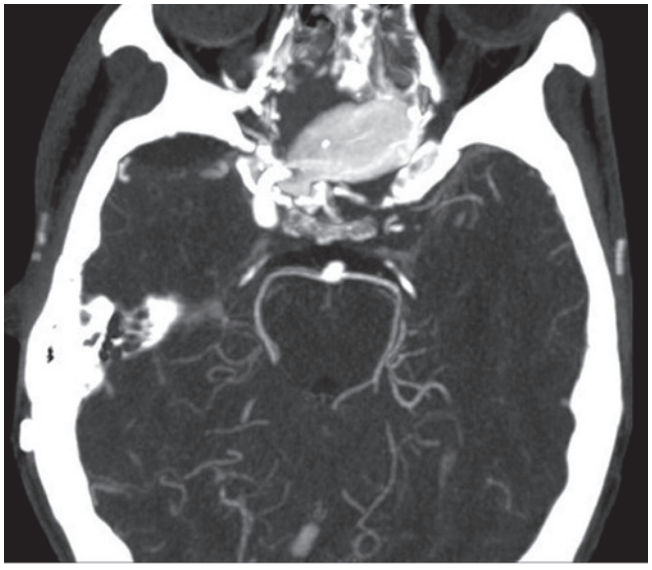
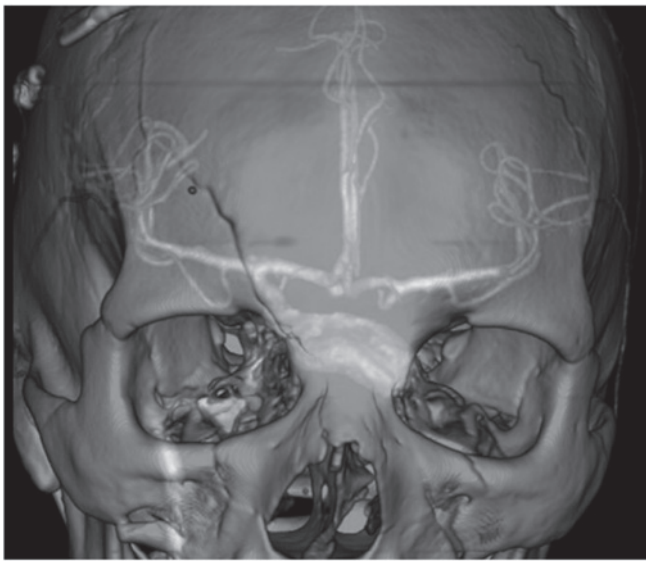


Fig. 2. Second CT angiography performed after the first episode of massive self-limiting delayed epistaxis, 20 days after the trauma. Axial view revealed a saccular traumatic pseudoaneurysm of the right ICA. The dissected left ICA was occluded, but the patient did not develop cerebral ischaemic symptoms.



Figu. 4. Processed image of second CT angiogram with volume rendering reconstruction (anterior view) showing the right ICA pseudoaneurysm. The left ICA was dissected and occluded.

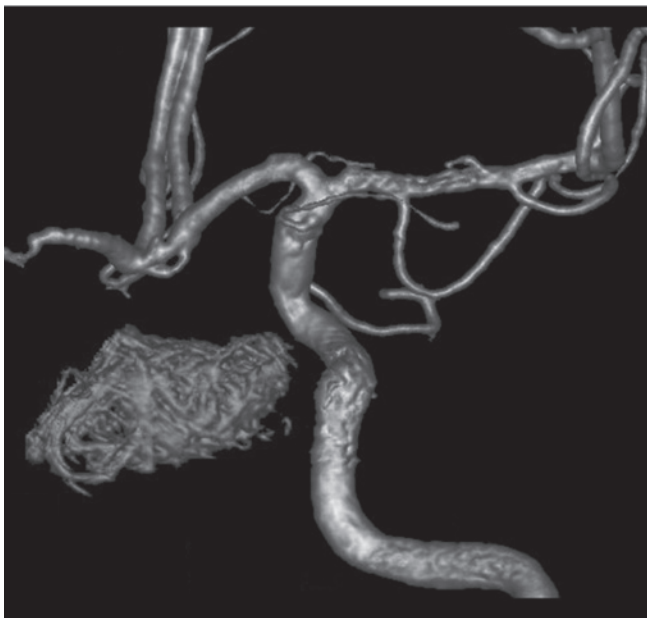


Fig. 5. Final angiogram performed after endovascular treatment of the pseudoaneurysm showing subtotal exclusion with residual opacification of the proximal sac near the ICA orifice.

Another CT angiography was performed just before the second episode (Figs. 2 and 3: axial and sagittal views, respectively). Angiographic evaluation revealed a saccular traumatic pseudoaneurysm of the right internal carotid artery (ICA) lodged inside the fractured sphenoidal sinus. Figure 4 shows a processed image of a CT angiogram with volume rendering reconstruction (anterior view).

Few minutes after the exam the patient presented a massive haemorrhage that required bilateral nasal packing with inflatable balloon devices. The patient was then treated using a stent-assisted endovascular technique under general anaesthesia. The right ICA pseudoaneurysm sac was outlined in multiple projections using a diagnostic biplane and interventional angiography imaging system (Neurostar T.O.P.; Siemens, Erlangen, Germany). It measured 30x20x18 mm, was pear-shaped and had an anterior, inferior and medial orientation. The neck was situated a few mm below the ophthalmic artery. Most of the sac opacification was observed in late arterial and early venous phases, with marked contrast stagnation. An Echelon™ 0.014-inch microcatheter (ev3 Inc., Plymouth, MN, USA) was used to selectively catheterize the pseudoaneurysm. Next, two concentric nitinol auto-expandable stents (Enterprise™ 4.5x28 mm and 4.5x22 mm, Cordis Corp., Warren, NJ, USA) were deployed in the targeted arterial segment. The pseudoaneurysm was treated with 15 detachable coils in a single session: three MicroPlex-10 Compass Complex and 12 helical 0.014-inch HydroCoils™ (MicroVention Inc., Tustin, CA, USA). The final angiogram showed a subtotal exclusion with residual opacification of the proximal sac near the ICA orifice (Fig. 5). There was no procedure-related complication and the epistaxis definitively stopped.

Discussion

Fracture of the lateral wall of the sphenoid may lead to the formation of a pseudoaneurysm in the sphenoid sinus. Rarely, traumatic ICA pseudoaneurysms present similar to an asymptomatic sphenoid sinus mass lesion. Massive bleeding can occur if a biopsy of the mass by nasal endoscopy is attempted [9].

Traumatic pseudoaneurysms are fragile and prone to rupture. Death is three times less likely if the pseudoaneurysm is diagnosed before it has ruptured, compared with diagnosis after rupture [10]. Consequently, early diagnosis with cerebral angiography and prompt treatment are essential.

Unilateral blindness (absent in this case) is often present and its association with massive delayed epistaxis after severe craniofacial trauma should indicate diagnosis. Of this classic clinical triad, epistaxis was a constant finding in a previous review of 100 cases from the literature, whereas unilateral blindness appeared in 73 patients; a history of fracture occurred in 77 of 88 patients [5].

The loss of unilateral vision that occurs immediately after trauma is often the result of either a direct lesion to the optic nerve, injury to the ophthalmic artery or compression by a lesion such as a pseudoaneurysm. In some cases, the loss of vision may appear late. Traumatic pseudoaneurysms of the cavernous portion of the carotid artery may also produce symptoms related to compression of the cranial nerves in the cavernous sinus or symptoms secondary to a carotid cavernous fistula (proptosis, loss of visual acuity, or homonomous hemianopsia) [10].

Traumatic carotid cavernous fistula concomitant with pseudoaneurysm in the sphenoid sinus is extremely rare but has been documented; the cases reported in the literature mostly resulted from penetrating head trauma and motor vehicle accidents [10]. In this setting, the intracavernous high pressure of carotid cavernous fistula is presumed to further destroy the fractured sphenoid sinus wall [10].

Since angiography is no longer a routine examination for head injury, traumatic ICA pseudoaneurysms tend to be underdiagnosed [1 4 6]. A high level of suspicion is necessary to detect such lesions early on. CT or conventional angiography may be used, but the latter remains the gold standard for exploration. The typical image is an irregular-shaped dilatation of the injured branch without a well-defined neck and located elsewhere than at a branch point [2 4] It is best seen on late arterial or early venous phases of the angiogram and empties slowly [3 4].

If a diagnostic angiogram is performed early, it may or may not reveal the presence of a pseudoaneurysm, because it takes time to develop. Chambers et al. have indicated that a second angiogram, which must be performed

in 2 to 3 weeks, may then show the traumatic aneurysm [5]. However, it is not safe to postpone angiography in patients with a high risk of traumatic intracranial pseudoaneurysm, such as the one reported in the present report. The high mortality associated with this entity underlines the importance of early angiography to confirm diagnosis. A follow-up angiogram should be obtained if the initial study was negative [2].

Many methods have been reported to treat intracavernous pseudoaneurysm, including endovascular stent and coils, endovascular covered stent, detachable balloons, direct surgical repair the internal carotid, trapping procedures, etc. [2-6]. In our institution, we prefer to treat these lesions by combining the use of coils and an uncovered stent.

In conclusion, pseudoaneurysm of internal carotid artery is an uncommon, but potentially fatal cause of epistaxis. Optimal management demands rapid recognition and treatment to give the best functional outcome. High suspicion and carotid arteriography are essential for diagnosis. In differential diagnosis of patients with intractable epistaxis and isolated sphenoid sinus lesions, ICA pseudoaneurysm should be considered, even in patients with normal findings at urgent vascular study. Early treatment with an uncovered stent of the aneurysm can be a life-saving therapeutic approach.

Patients with head trauma who present with sphenoid sinus fractures with or without massive epistaxis should be evaluated for the development of traumatic ICA pseudoaneurysms as soon as possible. If the first angiographic evaluation reveals normal findings, recurrent epistaxis should prompt a second angiographic evaluation.

Current treatment of traumatic ICA pseudoaneurysm involves the occlusion of the main artery or exclusion of the pseudoaneurysm through the use of endovascular techniques. Patients who do not tolerate test occlusion require extracranial-to-intracranial bypass surgery.

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Received: September 18, 2013 - Accepted: September 23, 2013

Address for correspondence: Pierfrancesco Pelliccia, Service ORL et Chirurgie Cervico-Faciale CHU Montpellier, 80, Avenue Augustin Fliche, 34295 Montpellier, France. Tel. +33 650071394. Fax +33 490492682. E-mail: pierfrancesco.pelliccia@hotmail.it