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Technical Notes & Surgical Techniques

Emergency endovascular treatment of petrous carotid artery false aneurysm ☆

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ABSTRACT

Introduction: The management of ruptured intracranial false aneurysms (IFAs) might be tricky as any kind of treatment modality, surgical or endovascular, is burdened with significant challenges. A case report of the endovascular treatment of IFA in emergency setting is presented to provide more understanding of its pathophysiology as well as of the best operative work-up for petrous carotid artery reconstruction.
Methods: Technical notes from a left sided skull base abscess, involving and eroding the carotid canal and petrous carotid artery (PCA) resulting in an IFA are shown and analyzed.
Results: Balloon-assisted low viscosity Onyx embolization seems an effective method for the emergency treatment of IFA. Indications, technical nuances, and peri- and post-procedural complications are thoroughly discussed. A flow chart for the management of IFA is also proposed.
Conclusions: The combination of parent artery balloon protection and low viscosity Onyx embolization can provide an effective occlusion of the IFA while maintaining parent artery patency. Normal distal filling of the parent artery, and optimal obliteration of the IFA are easily achievable.

Introduction

Intracranial false aneurysms (IFAs) are rare lesions, accounting for <1% off all intracranial aneurysms; almost any intracranial arterial compartment might be affected, nevertheless the majority of cases involve the petrous carotid artery (PCA). In the latter cases clinical presentation is usually characterized by otorrhagia, epistaxis and sudden sensory neural hearing loss; noteworthy the bleeding may be so massive to cause hemodynamic shock and progressive neurological deterioration [1–3]. Several potential causes leading to the development of IFA were so far described in the scientific literature, including traumatic (following blunt or penetrating brain traumas), infectious (osteomyelitic, mycotic- or arteritis-related artery degeneration), iatrogenic (following surgical or endovascular treatments), neoplastic (associated with any type of skull base tumor), genetic (i.e. related to Cystic Necrosis or Marfan syndrome) and degenerative (due to arteriosclerosis or fibro-muscular dysplasia) diseases [3–12].

Often called pulsating hematomas, IFAs share a common feature: in contrast to the physical structure of a true aneurysm, which has all anatomical layers (intima, media and adventitia), and independently from their specific nature, all IFAs lack a formal arterial wall. In fact, following its disruption blood extravasation is confined by the adventitia or the surrounding tissues only, and progressively undergoes fibrous organization to become the sac of a pseudoaneurysm. Historically, surgical intervention was the method of choice, but because the histopathological features of these lesions make them largely unsuitable for clipping, trapping or excision was often described as the only surgical option. However, due to the high rate of patency loss of the parent artery with standard surgical approaches, in more recent years treatment strategies have focused toward the rise of endovascular techniques, which became the mainstay on elective cases [8,13–16].

In cases of massive, life-threatening bleedings the best management of those lesions is still a matter of debate. We present a case report of the endovascular treatment of IFA in emergency setting and propose an interventional management regimen for petrous carotid artery reconstruction.

Case description and management

To provide the readers with a detailed description of the endovascular management of PCA IFA in the emergency setting an exemplificative case of a left sided skull base abscess, involving and

Abbreviations: IFA, intracranial false aneurysms; PCA, petrous carotid artery; BTO, balloon test occlusion; ACT, activated clotting time; AVMs, artero-venous malformations.

☆ Ethical Standards and Patient Consent: We declare that this manuscript does not contain clinical studies or patient data.

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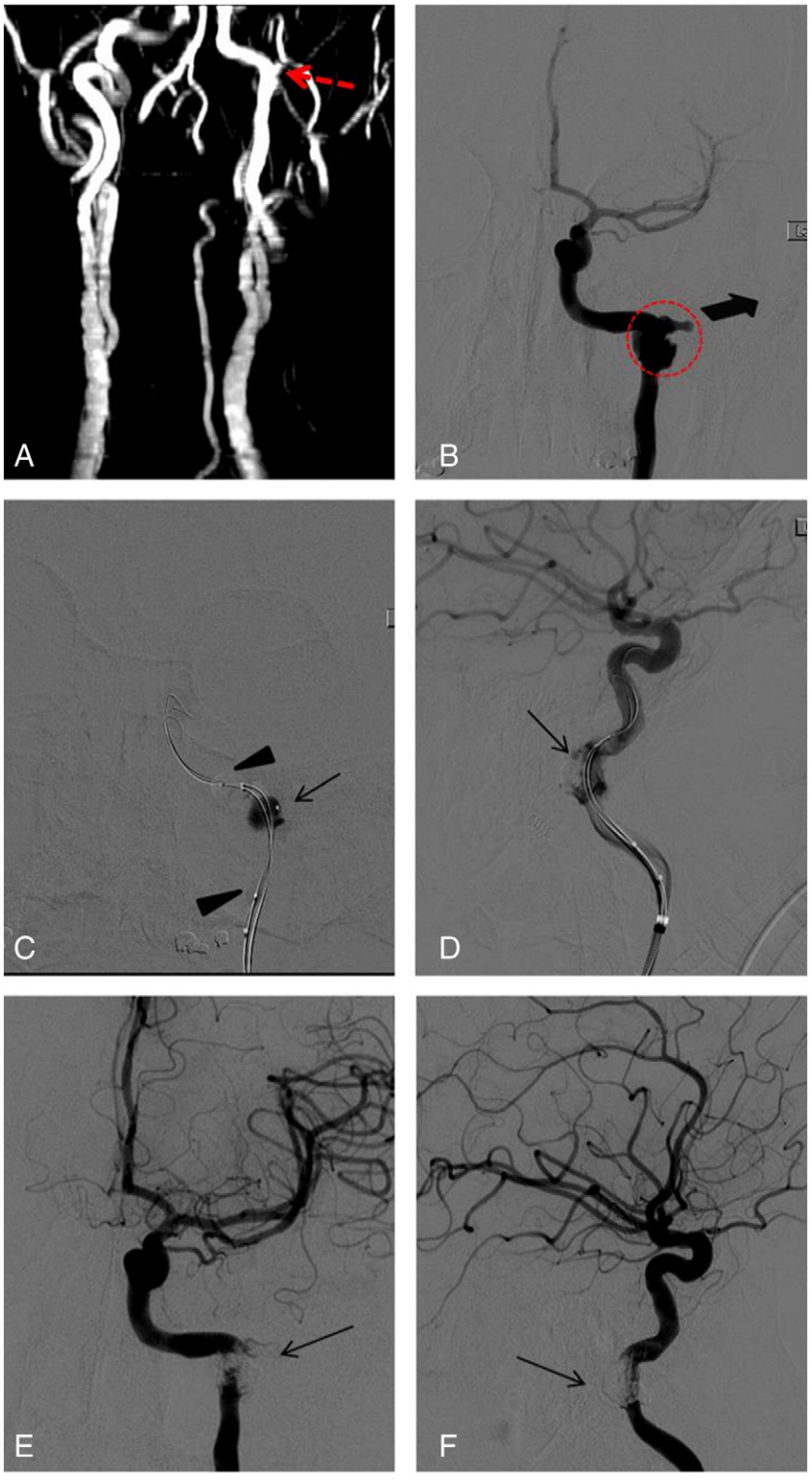

Fig. 1. MRA and DSA. A: Pre-operative MRA shows a large and irregular false aneurysm of the internal carotid artery at its entrance into the petrous bone (red dotted arrow). B: DSA, left ICA, antero-posterior view. The false aneurysm (red dotted circle), points postero-laterally towards the middle ear (thick arrows). C: DSA, left ICA, antero-posterior view. Seal test. Two hyper glide balloons (4 × 7 mm and 4 × 20 mm, arrowheads) were advanced across the false aneurysm (arrowhead). A small amount of contrast was injected trough an Echelon 10 microcatheter after balloon inflation. A good seal test, depicting no extravasation of the contrast along the left petrous ICA and no flow into and out of the lesion (thin arrow), was confirmed. D: DSA, left ICA, lateral view. Reperfusion with partial balloon deflation during Onyx embolization. E, F: DSA, left ICA, antero-posterior and lateral view respectively. The final follow-up angiography shows the 95% obliteration of the false aneurysm (thin arrow) with preservation of the parent artery.