



# Endovascular Management of Iatrogenic Pseudoaneurysm of Internal Maxillary Artery after Dental Extraction

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## Abstract

### Keywords

- ▶ internal maxillary artery pseudoaneurysm
- ▶ endovascular management
- ▶ coiling
- ▶ dental extraction complication

Pseudoaneurysm developing from the internal maxillary artery is a rare but potentially fatal condition. We describe a case of iatrogenic pseudoaneurysm of the internal maxillary artery developed during dental extraction and successful endovascular closure of the feeder artery. At 2-month follow-up, the patient remained well with persistent thrombosis of pseudoaneurysm.

## Introduction

Pseudoaneurysms from the branches of the external carotid artery (ECA) are relatively rare because the branches of the ECA are protected from injury in most locations by an adequate buffer of soft tissue. The most affected branches are the superficial temporal artery (STA), internal maxillary artery (IMA), and distal facial artery (FA). They are normally affected where they pass over a bony structure.<sup>1–4</sup> We report an interesting case of iatrogenic pseudoaneurysm of the internal maxillary artery and successful endovascular closure of the feeder artery in our institution.

## Case Report

A 60-year-old male patient presented with painful swelling of the right cheek for 1.5 months after tooth extraction of the upper right molar tooth and recent episodes of intermittent

bleeding in the nose and mouth for 7 days. The man was a known diabetic and also had an addiction to chewable tobacco (with lime) for 35 years. On examination, asymmetry of the face with a relatively defined soft right cheek swelling with a smooth overlying surface was noted. On examination of the oral cavity, a slightly elevated ulceroproliferative lesion (~1 cm × 1 cm) in the buccal mucosa overlying the right maxillary alveolus in between the right pre-molar and second molar tooth region was seen. The attending surgeon decided to take a biopsy of the oral lesion but pre-procedure aspiration from the right cheek swelling revealed frank blood and the patient was referred for CT angiography of the face. CT angiography showed a well-defined contrast-filled outpouching, measuring ~3 × 3.5 cm in the right infratemporal fossa arising from the second part of the right internal maxillary artery (IMAX2), suggestive of pseudoaneurysm (▶ **Fig. 1**). Moreover, there was complete thrombotic occlusion of the right internal carotid artery extending from the cervical to the terminal

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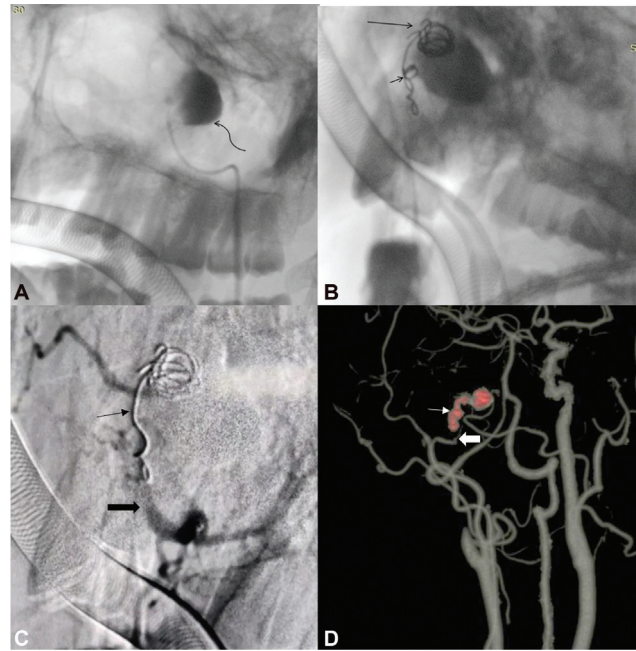
**Fig. 1** (A) CT Angiography axial image showing a well-defined contrast filled outpouching, measuring  $\sim 3 \times 3.5$  cm in the right infratemporal fossa arising from second part of right internal maxillary artery (IMAX2), suggestive of pseudoaneurysm (white arrow). (B) Volume-rendered reconstructed image showing the pseudoaneurysm (white arrow) arising from the right internal maxillary artery (white curved arrow). Also, there is nonopacification of the right internal carotid artery (ICA) suggestive of thrombotic occlusion. Note that the left ICA is normal (small arrows).

segment. The right middle and anterior cerebral arteries and the rest of the cervical and intracranial arteries were normally opacified. There was no CT evidence of a mass lesion occupying the gingivobuccal sulcus.

Endovascular closure of the iatrogenic pseudoaneurysm under general anesthesia was planned. The procedure was performed under general anesthesia. A transfemoral approach was used and the right external carotid artery was catheterized using 5F H1 catheter (Cook®). Angiography of the ECA confirmed the pseudoaneurysm of the feeder artery from the second branch of the internal maxillary artery (IMAX2). A Progreat™ microcatheter (Terumo®) was navigated into the parent artery coaxially as close to the pseudoaneurysm as possible, and selective angiography of the injured artery was performed (→ Fig. 2A). Micronester® coils were deployed within the lumen and subsequently the neck of the lesion. Hilal™ embolization microcoils were deployed in the feeding artery (→ Fig. 2B,C). Post embolization contrast run demonstrated complete obliteration of the pseudoaneurysm. The patient was kept under monitored care for 1 day and was discharged on the next day. Follow-up lateral radiograph of the skull and CT angiography was performed after 3 days, which showed obliteration of the pseudoaneurysm lumen with coils placed in situ (→ Fig. 2D). The patient was referred back to the oral and maxillofacial surgery department for the evaluation of the oral ulceroproliferative lesion. Biopsy of the lesion was performed that revealed a fungal lesion and was successfully treated with medical therapy. At 2-month follow-up, the patient remained well with persistent thrombosis of pseudoaneurysm.

## Discussion

Pseudoaneurysm of the external carotid artery (ECA) or one of its branches is rare. In a series of more than 8000



**Fig. 2** (A) Angiography of the right internal maxillary artery showing the pseudoaneurysm (curved arrow). (B) Endovascular coils placed within the lesion (long arrow) and the feeding artery (short arrow). (C) Postcoiling external carotid artery run shows the coil (black arrow) in the right internal maxillary artery (solid arrow) and non-filling of the aneurysm (D) Follow-up CT angiography was performed after 3 days that showed obliteration of the pseudoaneurysm lumen with coils placed in situ (white arrow) in the right internal maxillary artery (solid white arrow).

aneurysms, only 21 pseudoaneurysms of the ECA were described, 19 of which occurred after the surgery in the region of the carotid artery.<sup>5</sup> There are many causes of pseudoaneurysm from the ECA are but most are commonly associated with blunt or penetrating trauma. Other causes include iatrogenic origins, inflammation, infection, vasculitis, tumor, and arteriosclerosis; however, there are also cases of unknown origins.<sup>6</sup> The cause of pseudoaneurysm in the present case was iatrogenic trauma during dental extraction. Although a coexisting ulcerative buccal mucosal lesion was also present due to fungal infection, it was far from the site of pseudoaneurysm, precluding the possibility of mycotic pseudoaneurysm. Pseudoaneurysm from the ECA is most commonly seen in the superior thyroid (STA), internal maxillary, or facial arteries. With the evolution of orthognathic surgery, IMA is one of the most common sites of pseudoaneurysm from iatrogenic origins.<sup>7-9</sup> Among varying orthognathic procedures, the literature on pseudoaneurysm following dental extraction is scarce. The life-threatening pseudoaneurysm of the facial artery after dental extraction has been reported by Lucas et al.<sup>10</sup> Another report<sup>11</sup> described a case of wisdom teeth extraction leading to facial artery pseudoaneurysm. Osteotomy during pterygomaxillary separation risks injury to the IMA and branches at this juncture.

The diagnosis of pseudoaneurysm can be obtained by CT or MR angiography, although superficial lesions can also be evaluated through doppler sonography. A high degree of suspicion is required to promptly refer for radiological

evaluation in any cases of pulsatile swelling or those associated with intermittent bleed. Delay in diagnosis and treatment can potentially lead to a fatal consequence.<sup>12</sup>

Therapeutic options include conservative management as well as surgical and endovascular options. Conservative options observation and Compression. Compression can be achieved manually or by injection of glue. Although data suggest that pseudoaneurysm may resolve spontaneously but it will also invite various complications including a gradual or abrupt increase in size leading to rupture and presenting as epistaxis and or oral bleed. It may also cause mass effects compressing adjacent nerves or vessels, mostly veins leading to thromboembolism. USG-guided glue injection could be another option but it enables poor control overdispersion of the thrombin is poorly controlled and may lead to complications such as distal embolization, compression of surrounding structures, and skin necrosis. Surgical resection should be avoided as a first option because of the difficult accessibility of deep structures, increased damage to the nerves, increased hospital stays, cosmetic effects, prolonged recovery time, and other serious life-threatening postoperative complications. Traditional surgical treatment is invasive and is often associated with significantly higher morbidity and mortality rates.<sup>13</sup>

Coils embolization of pseudoaneurysm from the ECA is a safe, effective, and useful alternative to the standard surgical ligation of the affected artery. Endovascular techniques have a lower complication rate in the treatment of visceral pseudoaneurysms than does surgical management.<sup>14</sup> Wang et al<sup>15</sup> retrospectively reviewed reported 17 patients of head and neck pseudoaneurysm who were treated with the obliteration of the feeding artery or the pseudoaneurysm by detachable coils or fibered coils, or both. Catheter-based embolization is a safe, quick, and effective technique for the treatment of pseudoaneurysm. Numerous agents can be used for embolization therapy, including metallic coils, polyvinyl alcohol particles, n-butyl cyanoacrylate, and absorbable gelatin sponge. The strength of endovascular approaches lies in their ability to provide rapid access to surgically inaccessible vessels. Other advantages of an endovascular approach include superior cosmetics by preventing a facial scar and wound-related complications. Coils embolization relies both on the mechanical action of the coils mass itself and a thrombogenic action of clot formation within the coils pack. Moreover, complications associated with endovascular procedures including coils such as intraoperative rupture of pseudoaneurysm, recanalization, migration, and extrusion, although reported, are a rarity.

## Conclusion

We describe a rare case of internal maxillary artery pseudoaneurysm developed after dental extraction, which was managed successfully managed by endovascular closure. Among all

the available options, endovascular treatment should be chosen as the primary treatment modality. It is a useful alternative to standard surgical repair and avoids the necessity for surgical exposure of the face and the neck with its inherent morbidity and increased hospital stay.

## Conflict of Interest

None declared.

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