

## Traumatic superficial temporal artery pseudoaneurysm & management following mandible fracture

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### ABSTRACT

A traumatic pseudoaneurysm of the superficial temporal artery is a rare vascular lesion that typically occurs after blunt trauma to the temporal region. It accounts for only 1% of all traumatic aneurysms. These pseudoaneurysms need to be appropriately diagnosed and treated without delay as the patient can experience resulting symptoms of severe headache, facial nerve palsy, arterial bleeding, and/or bone erosion. Diagnosis can typically be made with history of trauma along with physical examination followed by confirmation with ultrasound or computer tomography angiogram. The treatment of choice is ligation and resection. We present a case of a 20-year-old male with identified pseudoaneurysm following facial trauma and mandibular fracture repair treated with multiple trials of sclerotherapy. In addition, this report will review additional management options and diagnosis techniques for superficial temporal artery (STA) pseudoaneurysms.

### Introduction

A traumatic pseudoaneurysm of the superficial temporal artery (STA) is a rare vascular lesion that can occur following blunt facial trauma, especially to the temporal region. Overall, it only accounts for 1% of all traumatic aneurysms [1,2]. Since the 17th century, there has been a documented total of approximately 400 cases of pseudoaneurysm involving the STA. In the facial region, the STA is the most prone to lesion development due to long and unprotected course over the face. Most of these lesions present as innocuous subcutaneous lumps or a large pulsatile mass with ability to hemorrhage if a delay in identification [3]. Patients will predominately complain of a painless and/or pulsatile mass that has increased in size or have overlying neuropathic changes following facial blunt trauma [4,5]. Herein, we present a case of traumatic STA pseudoaneurysm in a patient following a motor vehicle accident with overlying mandibular fracture with TMJ dislocation.

### Case report

A 20-year-old male who presented to the hospital as a trauma alert after being involved in a motor vehicle accident. The patient was able to self-extricate from the vehicle in an embankment, found in a field where he was muttering words. The patient was found to have

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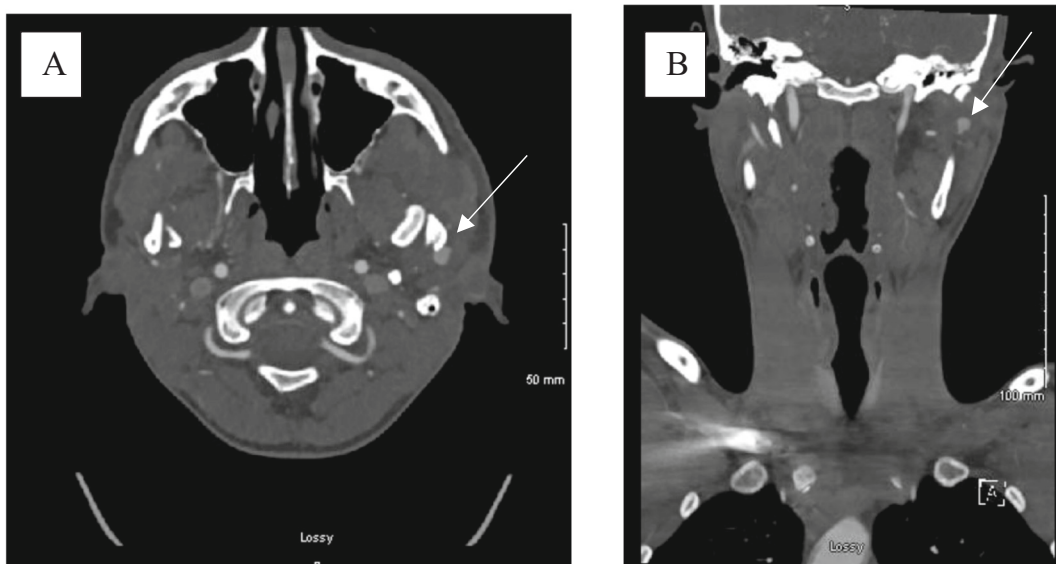
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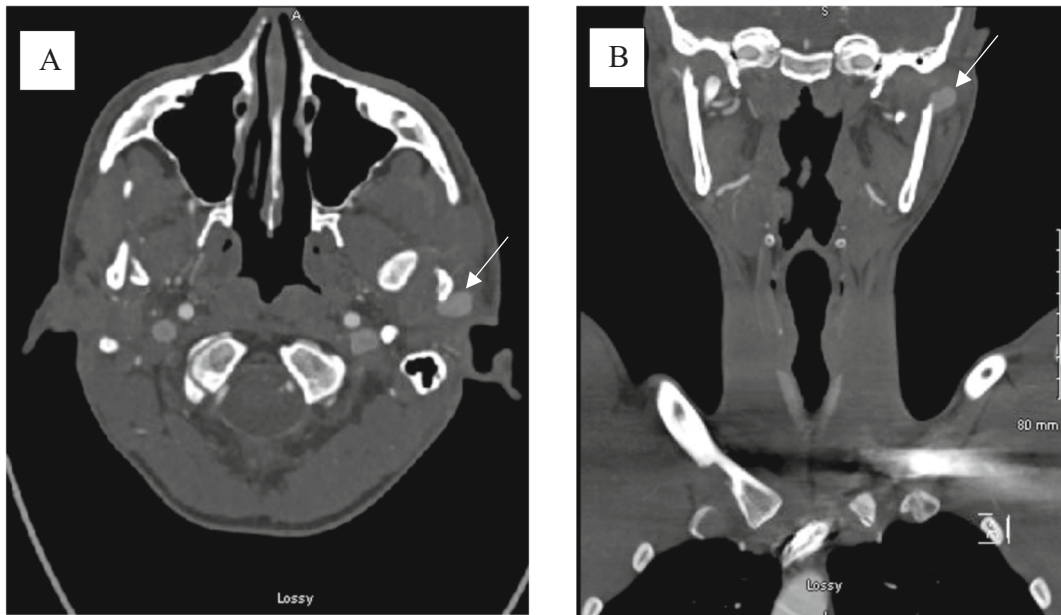
a right sided subdural and subarachnoid hemorrhage in addition to bilateral mandibular fracture and TMJ dislocation. The patient was evaluated by Plastic & Reconstructive surgery for the mandibular fracture. He was taken to the operating room the following day for an open reduction and internal fixation of symphyseal fracture and reduction of the left TMJ dislocation. Following the procedure, the patient was recovering appropriately but has a persistent TMJ dislocation. On post-operative day 3, the patient was noted to have additional pain with swelling and ecchymosis over the left mandible. The patient was noted to have an audible bruit on auscultation of the swelling region. The patient underwent a computer topography angiogram displaying a  $10 \times 6$  mm pseudoaneurysm of the left superficial temporal artery (Fig. 1). The initial plan was for the patient to undergo repeat imaging with a two week follow up in the vascular surgery office as the patient had a recent operative fixation of the jaw and the level of tissue swelling was worrisome for possible injury when performing a ligation. The patient was discharged home but returned to the emergency department two days later for worsening pain in the right temporal region. The patient underwent repeat imaging showing an increase in overall size of the pseudoaneurysm to  $13 \times 17$  mm (Fig. 2). At the time of his re-admission, interventional radiology was consulted for thrombin injection of the pseudoaneurysm to attempt sclerotherapy. The patient had successful occlusion of the pseudoaneurysm performed by interventional radiology on the day following re-admission. The patient was noted to have improvement in the pain overlying the region. The patient underwent additional angiography on the day following the thrombin injection which showed decrease in size of the pseudoaneurysm to  $7 \times 6$  mm (Fig. 3). The patient returned to the interventional radiology suite for additional injection of thrombin. During re-admission, the patient had evaluation of his jaw which appeared to be healing appropriately and maintaining appropriately alignment through multiple imaging studies. The patient was discharged home following the additional thrombin injection. The patient followed up in the vascular clinic approximately 1 week after the thrombin sclerotherapy. The patient underwent a carotid duplex study to evaluate for continued pseudoaneurysm of the left superficial temporal artery. The imaging was able to show occlusion of the STA at the level of the mandibular and thrombosed aneurysm measuring  $7.2 \times 7.9$  mm. Due to the nature of occlusion and thrombosis of the aneurysm, the patient had no further indication for intervention and was recommended to follow up with the vascular surgery service if any future issues were to arise. The patient had initial post-operative follow up with plastic surgery where he reported good dental occlusion with minor discomfort associated with arch bars and mild left sided jaw pain that had significantly improved. The patient had removal of the arch bars approximately two months after initial placement. The patient had subsequent follow up with plastic surgery that revealed significant improvement in mouth opening and appropriate functional healing jaw. His pain has overall significant improvement. The patient was to have additional follow up in the clinic which was cancelled by the patient without rescheduling and has had no further evaluation (Fig. 4).

## Discussion

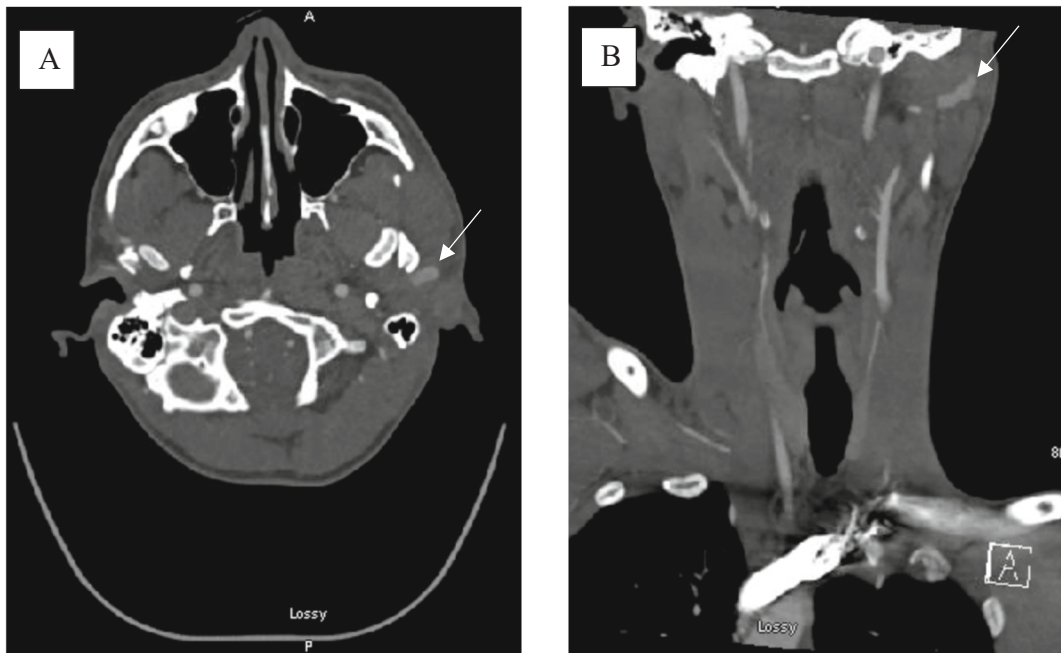
Documentation has shown that traumatic pseudoaneurysm of the STA can occur from a few days up to several months post-trauma. Overall, aneurysm can be classified into one of three categories: true, false, or dissecting. A true aneurysm involves all three layers of the arterial wall while a false aneurysm (pseudoaneurysm) is an abnormal dilation or collection of blood from a vessel contained by tunica adventitia or surrounding perivascular soft tissue. Pseudoaneurysms account for less than 1% of the total lesion occurrence while pseudoaneurysms of the STA are extremely rare with first description by Bartholin in 1740 [3]. Majority of these cases, approximately 75–80%, are associated with blunt trauma but documented cases with penetrating injuries, use of traction devices and



**Fig. 1.** A: Initial axial computer tomography angiogram highlighting  $10 \times 6$  mm pseudoaneurysm of the left superficial temporal artery. B: Initial coronal computer tomography angiogram highlighting  $10 \times 6$  mm pseudoaneurysm of the left superficial temporal artery.



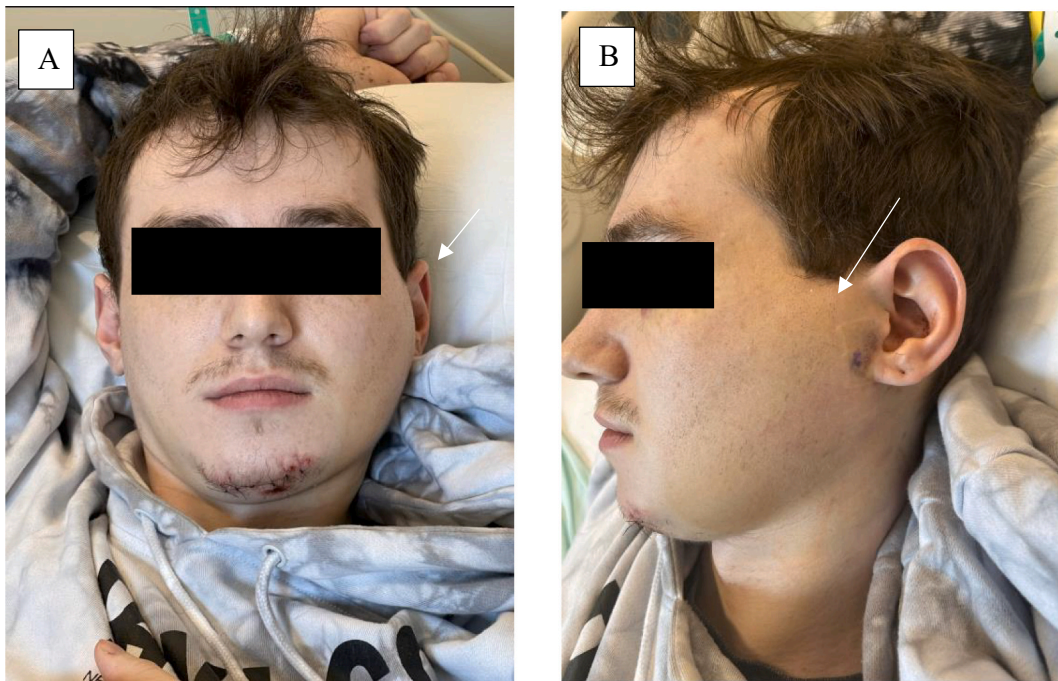
**Fig. 2.** A: Secondary axial computer tomography angiogram upon patient return to the hospital due to worsening pain with noted pseudoaneurysm increase to  $13 \times 17$  mm.  
 B: Secondary coronal computer tomography angiogram upon patient return to the hospital due to worsening pain with noted pseudoaneurysm increase to  $13 \times 17$  mm.



**Fig. 3.** A: Axial computer tomography angiogram after initial attempt for thrombin injection to treat STA pseudoaneurysm. Noted to have persistent pseudoaneurysm measuring  $7 \times 6$  mm.  
 B: Coronal computer tomography angiogram after initial attempt for thrombin injection to treat STA pseudoaneurysm. Noted to have persistent pseudoaneurysm measuring  $7 \times 6$  mm.

previous craniotomies are found in the literature.

Numerous case reports have documented the occurrence of pseudoaneurysms of the STA over the last 10 years. Yang et al. described three STA pseudoaneurysm cases that were caused by blunt and compressive trauma [6]. Skaf et al. and Prado et al. reported



**Fig. 4.** A: Coronal photograph of the patient showing swelling along the left side of the face after first attempted thrombin injection. B: Sagittal photograph of the patient showing swelling along the left side of the face after first attempted thrombin injection.

independent cases of pseudoaneurysm arising following Botox injection [7,8]. Takemoto et al. were able to document the first association between atherosclerosis and spontaneous STA pseudoaneurysm formation [9].

The superficial temporal artery is the most likely to form a pseudoaneurysm following trauma due to the superficial position over the frontal bone with only temporalis and frontalis muscle providing protection. In between the areas of the muscle, the artery lies directly against the bone. Patients normally present with a compressible, pulsatile mass that may or may not be tender in the temporal region following trauma. Patients may complain of visual disturbances, dizziness, hemorrhage, throbbing headache, ear pain, and/or facial nerve deficits. On physical exam, a palpable thrill may be appreciated while proximal compression can result in reduction of the pulse reduction.

Differential diagnosis to consider include but are not limited to lipoma, cyst, abscess, simple hematoma, neuroma of supraorbital nerve, meningocele, encephalocele, or angiofibroma. Noninvasive techniques, such as Doppler ultrasonography, can show turbulent flow and vessel dilation within pseudoaneurysm. Arteriography is the diagnostic tool of choice with ability to confirm the diagnosis and exclude other lesions. STA pseudoaneurysms should be treated to reduce the risk of hemorrhage from trauma, relieve any headache or pain, as well as for cosmetic issues. Typically, surgical ligation and resection of the lesion are the treatment of choice [10]. Alternatives for treatment include embolization with usage of coils or thrombin injection for obliteration.

Due to the recent surgical intervention with the significant level of localized inflammation, we elected to perform a thrombin injection that was initially unsuccessful, but a second injection led to successful thrombosis of the pseudoaneurysm. Reviewing the case, if the patient would not have had recent surgery, our treatment of choice was surgical ligation and resection.

Any patient experience blunt trauma to the face with associated mandibular or maxillary fractures should be closely monitored for possible pseudoaneurysm development. These patients needed to be treated promptly to prevent possible rupture as well as symptomatic side effects that may develop.

## Conclusion

Blunt facial trauma with associated mandibular or maxillary fractures should lead to close evaluation for possible superficial temporal artery pseudoaneurysm. These pulsatile, tender/nontender masses should be treated with caution. CT angiography should be used to confirm diagnosis while surgical resection of mass with ligation of proximal and distal aspects of the artery are treatment of choice.

## Conflicts of interest, sources of funding, and patient publication consent

This case report did not receive any funding support from any organization. The authors declare that there are no conflicts of interest regarding the publication of this paper. This paper has previously been presented as a poster in May 2022 at Duke Lifepoint

Conemaugh Memorial Medical Center Regional Research Symposium. This paper has been written with the consent from the patient involved in this case.

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