

Pseudoaneurysm of the Superficial Temporal Artery—Two Case Reports of a Rare Entity

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Abstract

Keywords

- ▶ embolization
- ▶ pseudoaneurysm
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- ▶ temporal vessels
- ▶ superficial temporal artery pseudoaneurysm
- ▶ STAP

In this paper, the authors present two case reports with patients who presented at different institutions for traumatic aneurysmal dilation of temporal vessels. The first case is a 18-year-old male who presented to plastic surgery following attempted excision by an outside provider after a fist fight. The second case is a 22-year-old male who presented to plastic surgery while inpatient after gunshot wound to the face. The differences in the cases are highlighted by the different approaches to the management of the lesions with direct incision and embolization respectively.

The plastic surgeon is often consulted for excision of benign forehead lesions including cysts, lipomas, and osteomas. While these diagnoses represent the majority of benign forehead lesions, the surgeon must have in mind a broad differential diagnosis as an unusual history may prompt consideration of a less typical pathology. Among those rare entities is the aneurysmal dilation of the superficial temporal vessels: superficial temporal artery pseudoaneurysm (STAP). STAP is a rare clinical diagnosis most commonly caused by blunt or penetrating trauma (75–95%) to the frontotemporal region of the skull.¹ First described by Bartholin in 1644, the etiologies of STAP have ranged from saber combat to hair transplantation reflecting the evolving times. Fist-fighting as a cause of STAP has remained one of the more common etiologies since the 17th century, while complications from Botox injection and punch hair grafting serve as more contemporary causes.^{2–6} The rich historical etiology of STAP and its potential for significant bleeding should the diagnosis be overlooked make discussion of this

condition worthwhile.⁷ Here we present two cases of aneurysmal dilatation from two separate institutions which resulted in two different approaches to management and a comprehensive review of the literature.

Case 1

A 18-year-old gentleman sustained a traumatic blow to the left temple resulting in a broken nose during a fist fight. Following the altercation, the patient developed a raised nodule on the left temple which was irritating but otherwise painless (▶ Fig. 1). The patient then presented to an outside clinic where the diagnosis of cyst was made and he was scheduled for excision of the nodule by a physician's assistant (PA). Upon incision of the skin, the PA encountered pulsatile bleeding for which she held pressure and immediately referred the patient to plastic surgery. Upon evaluation, the patient's incision was hemostatic and the nodule was found to have pulsatile and nonpulsatile components. The stable nature of the lesion over

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Fig. 1 A pulsatile mass 1.5 cm discovered during physical examination of a 18-year-old male.

several weeks increased suspicion for STAP and an ultrasound was ordered to visualize the lesion and determine presence of vascular flow. Ultrasound revealed a 1.5 cm wide-necked enlargement of the left temporal artery. Duplex Doppler sonography confirmed presence of arterial flow with a small region of probable clot. (►**Fig. 2**).

Interventional radiology was consulted regarding the possibility of thrombin injection; however, given the wide base of



Fig. 3 The patient in the supine position with the planned incision marked just superior to the equator of the nodule.

the lesion, the decision was made to proceed with excision of the pseudoaneurysm in the operating room under local anesthetic with light sedation and monitored anesthesia care (►**Fig. 3**). Following incision of the dermis, the lesion was apparent, splaying the fascicles of frontalis. A combination of careful sharp and blunt dissection allowed the lesion to be isolated from the surrounding soft tissues. Vessel loops passed around the proximal and distal aspects of the branch of the superficial temporal artery from which it arose (►**Fig. 4**). These were ligated and divided and the specimen was sent for permanent pathology (►**Fig. 5**). The patient's recovery was uneventful. Pathology revealed the lesion to be an intraluminal thrombosis. There was no evidence that the specimen was arterial in nature.

Case 2

A 22-year-old male sustained a gunshot wound with a 0.22 caliber firearm to the face resulting in a small subarachnoid hemorrhage accompanied by right lateral wall and orbital

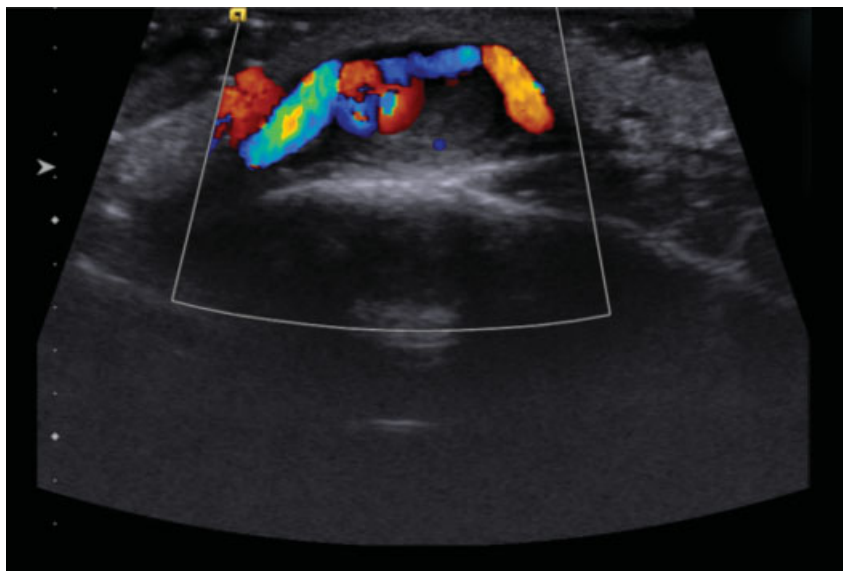


Fig. 2 Ultrasound image of left temporal lesion.



Fig. 4 A 1 × 1 cm mass in the superficial temporal artery revealed by surgical exploration.

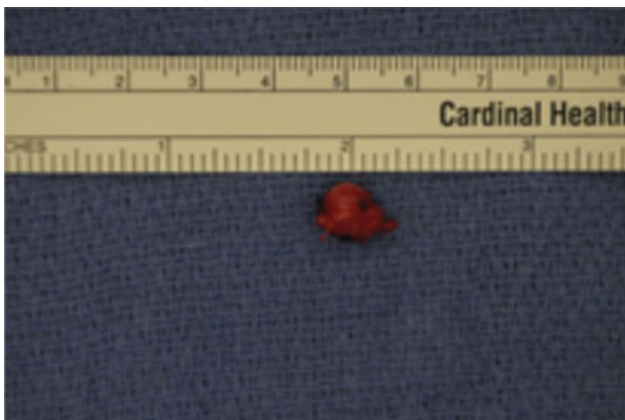


Fig. 5 Specimen prior to being sent for permanent pathology.

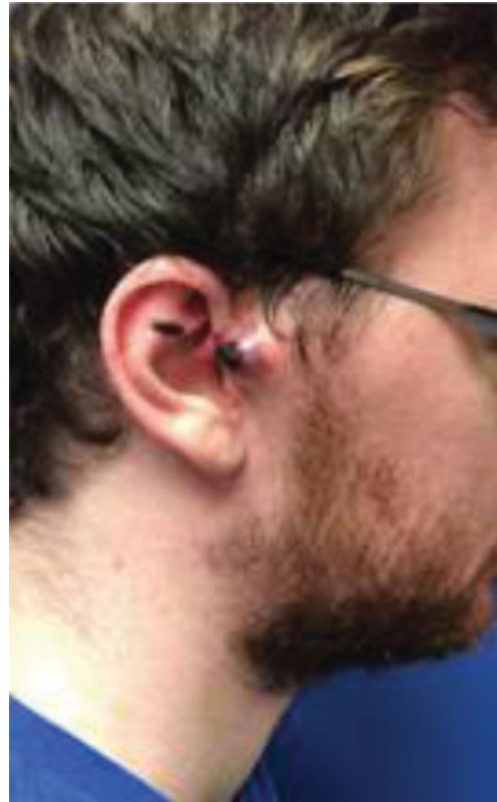


Fig. 7 Presentation of pulsatile periauricular mass in clinic.

roof fractures, zygomatic fracture, and maxillary sinus fracture with a retained bullet fragment which was removed during this admission (► **Fig. 6A** and **B**).

Two weeks following discharge, the patient presented to clinic with pain in the right preauricular area and a pulsatile mass with overlying eschar (► **Fig. 7**). A compression dressing was placed and the patient was taken to the operating room for

exclusion of traumatic pseudoaneurysm of the right temporal region. Intraoperatively, the pulsatile mass was found to be further enlarged toward the pretragal region causing concern for difficult hemostasis due to the anatomical course of the STA: the vessel dives underneath the parotid lobe in close vicinity to the facial nerve and poses a risk of communication with the internal maxillary artery (► **Fig. 8A** and **B**). Surgery was aborted in favor of embolization of the 2.4 cm STAP by interventional radiology. Ultimately, there was no connection to the internal maxillary artery and there were no immediate complications post-procedure (► **Fig. 9A** and **B**).

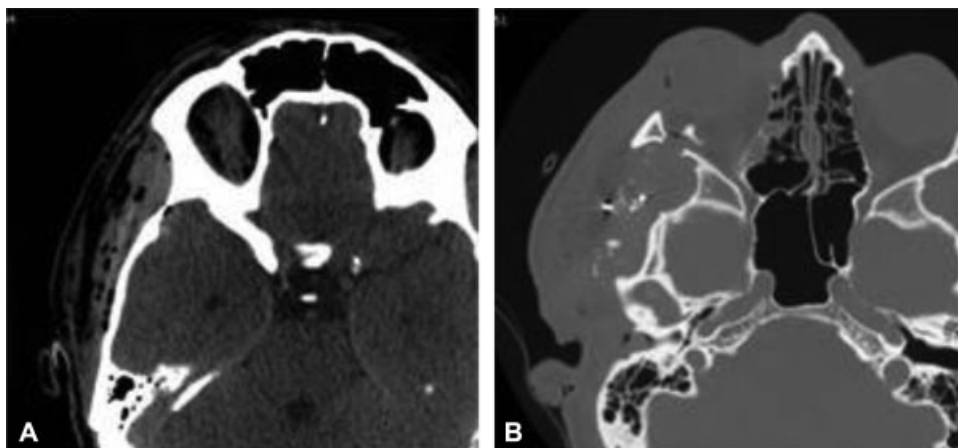


Fig. 6 (A and B) Computed tomography maxillofacial imaging demonstrates a metallic fragment traversing the R zygomatic body, residing in orbit. Lateral wall and orbital roof/floor fractures, minimally displaced.



Fig. 8 (A and B) Intraoperative presentation of enlarging pulsatile mass.

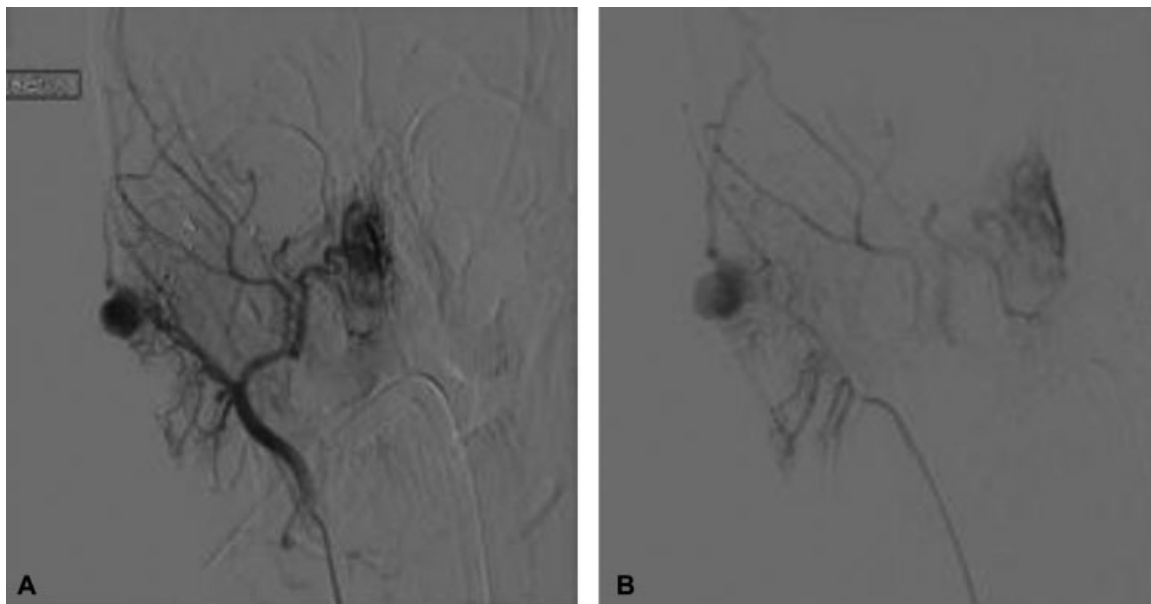


Fig. 9 (A and B) Angiogram demonstrating embolization of superficial temporal artery by interventional radiology.

Three weeks after embolization, the patient presented to clinic with a 1×1 cm wound in the right preauricular area with extrusion of onyx coiling material and limited jaw excursion to 16 mm despite participation in range of motion exercises. He was taken back to the operating room for excision and debridement of the preauricular area with possible ligation of the STA (**–Figs. 10 and 11**). Despite curettage of the aneurysmal sac, there was no bleeding. The facial nerve was identified during dissection but due to its proximity to the aneurysmal sac in the absence of bleeding, further dissection was abandoned due to risk of nerve injury. Coronoidectomy was performed on the right side with immediate improvement in jaw excursion to 30 mm. The patient tolerated the procedure well and healed without complication. The open wound was covered with local tissue rearrangement in the form of a limited facelift dissection.



Fig. 10 Intraoperative exposure of extruded onyx.

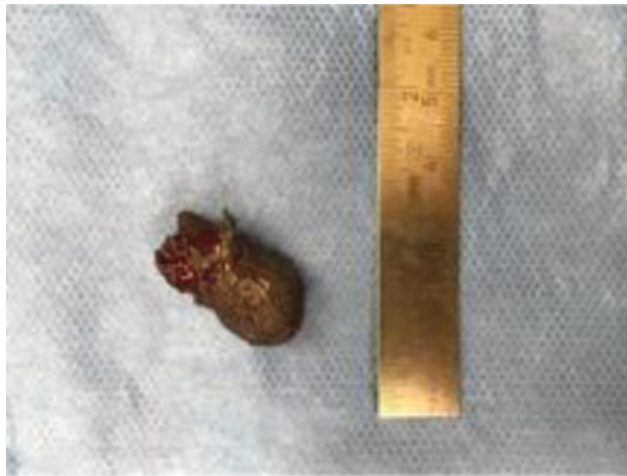


Fig. 11 Onyx excised from periauricular region.

Discussion

Superficial temporal artery pseudoaneurysm is an important example of a clinical diagnosis that should be suspected upon presentation of a painless mass in a patient with a history of blunt or penetrating head trauma.⁸ The slow development of the lesion is ascribed to the pathophysiology of pseudoaneurysm where initial intimal bleed is contained within a formed fibrous capsule followed by thrombolysis with eventual progression to vessel dilation.⁹ STAP accounts for only 1% of all traumatic aneurysms, but it is the most commonly involved (85%) branch of the external carotid, largely related to its anatomical course.¹⁰ Other vessels involved with less frequency are the internal maxillary and facial arteries.¹⁰ The superficial temporal artery originates from a terminal branch of the external carotid artery anterior to the helix before diverging into two branches: anterior and posterior. As the anterior branch crosses medial to the temporalis and lateral to the frontalis muscles, it is situated directly over the calvarium without soft tissue protection. Additionally, the anterior branch at this location is adhered to the underlying fascia limiting mobility that reduces blunt forces.¹¹

On physical examination, the mass may or may not be pulsatile to digital palpation; clinical diagnosis may be confirmed with initial imaging such as duplex ultrasound to rule out other differential diagnoses such as hematoma, cyst, abscess, or lipoma.^{9,12,13} The need for imaging prior to needle aspiration or biopsy is of critical importance as the consequence of hemorrhage is significant. Other imaging modalities include computed tomography angiography and digital subtraction angiography, but these are more expensive and carry the risks of radiation and increase in risk of stroke with digital subtraction.^{8,14} Magnetic resonance angiography is useful for evaluating involvement of nearby soft tissue but is considerably more expensive. A surgeon may opt for more detailed radiography in the setting of a suspected pseudoaneurysm with potential involvement of the parotid gland or facial nerve to decide between surgical excision or interventional embolization.¹⁰

While patients are typically concerned with the cosmetic deformity of an aneurysmal dilatation of temporal vessels, potential for enlargement of the lesion or hemorrhage serves as the primary indication for resection.^{13,15} Studies have shown that 89% of pseudoaneurysms self-resolve within 5 to 90 days; however, medical management is not recommended as the risks of hemorrhage, progressive symptomology, and poor cosmesis cannot be understated.⁴ Primary excision of the lesion with distal and proximal vessel ligation remains the most conservative and popular approach to surgical management as it can be accomplished under local or general anesthetic with good outcomes and minimal morbidity.¹⁶ While arterial repair has also been described as an alternative approach in favor of optimizing blood supply to the face, further evidence is needed to assess the clinical significance of repair versus excision.¹ Moreover, vessels with complex injury do not lend themselves to be good candidates for repair, limiting the utility of this approach. In cases of severe facial trauma or risk of bleeding, embolization may be considered but only as a second-line treatment given the risks of complication ranging from local inflammation and extrusion of foreign material to pulmonary emboli.¹⁷

While the intraluminal lesion in Case 1 cannot be defined as a “pseudoaneurysm” as the term strictly refers to an intramural clot, it is worth carefully reviewing this type of traumatic aneurysmal dilatation as the mechanism of injury to a vessel is similar. Pseudoaneurysm differs from a true aneurysm in that it does not involve all three layers of the arterial wall; it develops as a result of trauma to the arterial intima with subsequent extravasation and formation of a hematoma which recanalizes to expand the artery.¹⁸ With regard to the face, the anterior branch of the STA is most susceptible to trauma at two locations: first, as it superficially crosses the bony zygomatic arch and second, at the superior temporal line of the skull.^{15,18,19} The complex anatomy of this region due to the proximity of the STA to the facial nerve and parotid can influence approaches to management as seen in Case 2 when the plan switched from excision to endovascular embolization. Furthermore, an intimate understanding of the anatomy of the STA and its course through the parotid and its proximity to the facial nerve is imperative to avoid an intraoperative situation where profuse bleeding can only be controlled by blind suture ligation.

These two cases highlight the importance of including aneurysmal dilatation of temporal vessels, although rare, in the differential diagnoses when a lesion presents with a history of head trauma. Duplex ultrasound provides an efficient and cost-effective measure to confirm aneurysmal dilatation, avoid iatrogenic injury to the lesion, and plan for appropriate management.

References

- 1 Ayling O, Martin A, Roche-Nagle G. Primary repair of a traumatic superficial temporal artery pseudoaneurysm: case report and literature review. *Vasc Endovascular Surg* 2014;48(04):346–348
- 2 Conner WC III, Rohrich RJ, Pollock RA. Traumatic aneurysms of the face and temple: a patient report and literature review, 1644 to 1998. *Ann Plast Surg* 1998;41(03):321–326

- 3 Webber CM, Wind GG, Burton RG. Pseudoaneurysm of the superficial temporal artery: report of a case. *J Oral Maxillofac Surg* 1997;55(02):166–169
- 4 Skaf GS, Domloj NT, Salameh JA, Atiyeh B. Pseudoaneurysm of the superficial temporal artery: a complication of botulinum toxin injection. *Aesthetic Plast Surg* 2012;36(04):982–985
- 5 Evans CC, Larson MJ, Eichhorn PJ, Taylor RS. Traumatic pseudoaneurysm of the superficial temporal artery: two cases and review of the literature. *J Am Acad Dermatol* 2003;49(05, Suppl):S286–S288
- 6 Cheng CA, Southwick EG, Lewis EC II. Aneurysms of the superficial temporal artery: literature review and case reports. *Ann Plast Surg* 1998;40(06):668–671
- 7 Madhusudan HV, Krishnamoorthy N, Suresh PK, Subramaniam V. Superficial temporal artery pseudoaneurysm presenting as extradural hematoma: a case report and review of literature. *Asian J Neurosurg* 2015;10(02):63–65
- 8 Park IH, Kim HS, Park SK, Kim SW. Traumatic pseudoaneurysm of the superficial temporal artery diagnosed by 3-dimensional CT angiography. *J Korean Neurosurg Soc* 2008;43(04):209–211
- 9 Jenq KY, Panebianco NL, Lee PA, Chen EH, Dean AJ. Diagnosis of a facial artery pseudoaneurysm using emergency bedside ultrasound. *J Emerg Med* 2010;38(05):642–644
- 10 Payami A, Montazem AH. Surgical treatment of facial artery pseudoaneurysm following blunt trauma: report of a case. *J Oral Maxillofac Surg* 2017;75(02):362.e1–362.e5
- 11 Lohn JW, Penn JW, Norton J, Butler PE. The course and variation of the facial artery and vein: implications for facial transplantation and facial surgery. *Ann Plast Surg* 2011;67(02):184–188
- 12 Choo MJ, Yoo IS, Song HK. A traumatic pseudoaneurysm of the superficial temporal artery. *Yonsei Med J* 1998;39(02):180–183
- 13 Tracy A, Klinge P, Morrison J, Jayaraman MV, Kriz PK. Traumatic superficial temporal artery pseudoaneurysm in a helmeted lacrosse player. *Curr Sports Med Rep* 2016;15(01):13–15
- 14 Walker MT, Liu BP, Salehi SA, Badve S, Batjer HH. Superficial temporal artery pseudoaneurysm: diagnosis and preoperative planning with CT angiography. *AJNR Am J Neuroradiol* 2003;24(01):147–150
- 15 Touil LL, Gurusinghe AD, Sadri A, Hunt D, Dhital SK. Superficial temporal artery aneurysm: beware of the lump with a thump. *J Plast Reconstr Aesthet Surg* 2014;67(08):e210–e211
- 16 Ribeiro-Ribeiro AL, de Melo Alves Junior S, de Jesus Viana Pinheiro J. Traumatic pseudoaneurysm of the facial artery: late complication and effects on local blood flow. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;112(01):e4–e9
- 17 Peick AL, Nichols WK, Curtis JJ, Silver D. Aneurysms and pseudoaneurysms of the superficial temporal artery caused by trauma. *J Vasc Surg* 1988;8(05):606–610
- 18 Weller CB, Reeder C. Traumatic pseudoaneurysm of the superficial temporal artery: two cases. *J Am Osteopath Assoc* 2001;101(05):284–287
- 19 Rubio-Palau J, Ferrer-Fuertes A, García-Díez E, García-Linares J, Martí-Pagès C, Sieira-Gil R. Traumatic pseudoaneurysm of the superficial temporal artery: case report and review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2014;117(02):e112–e114