

## LETTER TO THE EDITOR

# Superficial Temporal Artery Pseudoaneurysm Following Trigeminal Nerve Stimulator Placement

## To the Editor:

First described by Thomas Bartholin in 1740, pseudoaneurysms of the superficial temporal artery (STA) are rare vascular lesions that present as a pulsatile mass in the fronto-temporal region (1–3). Although typically due to blunt or penetrating trauma, cases secondary to iatrogenic manipulation have been reported (4–10). Here we report the first case of STA pseudoaneurysm formation secondary to trigeminal nerve stimulator electrode placement. The utility of direct surgical excision without removal of the offending electrode is demonstrated.

## CASE REPORT

### Presentation and clinical evaluation

The patient is a 93-year-old man with a history of herpes zoster infection in the distribution of the left ophthalmic and maxillary divisions of the trigeminal nerve. His recovery was complicated by postherpetic neuralgia refractory to conservative therapy. Supraorbital and temporal electrodes were subsequently placed to effect trigeminal peripheral nerve stimulation with good results (Fig. 1).



**Figure 1.** Peripheral nerve stimulator electrodes. Lateral skull radiograph demonstrates the placement of the supraorbital and temporal electrodes of the trigeminal branch stimulator. Although the supraorbital electrode provided sufficient paresthesia coverage over the forehead, the second temporalis electrode was required to provide additional coverage along the temple.

Six weeks after electrode placement, the patient complained of a painless, pulsatile swelling on his left lateral forehead. On physical examination, the mass was associated with the distal tip of the temporal electrode. Ultrasound of the region revealed a  $6 \times 8$  mm pulsatile mass with blood flow presumed to be a pseudoaneurysm.

### Surgery and pathology

Surgical exploration revealed the pseudoaneurysm arising from the left frontal branch of the superficial temporal artery (Fig. 2). The afferent and efferent limbs of the STA were ligated and cut. Circumferential dissection of the pseudoaneurysm enabled complete excision. The sample was sent for pathologic analysis, which confirmed the clinical diagnosis (Fig. 3). The patient was discharged on the same day without further complication.

## DISCUSSION

STA aneurysms are uncommon, typically resulting from trauma to the temporal region. Iatrogenic injury of the STA following parotid gland surgery, hair grafting, external ventricular drain placement, craniotomy, head-pin fixation, and scalp injection have also been reported (2,3,10,11,12). However, we are not aware of a prior report implicating trigeminal nerve stimulator electrode placement as an etiology of STA pseudoaneurysm.

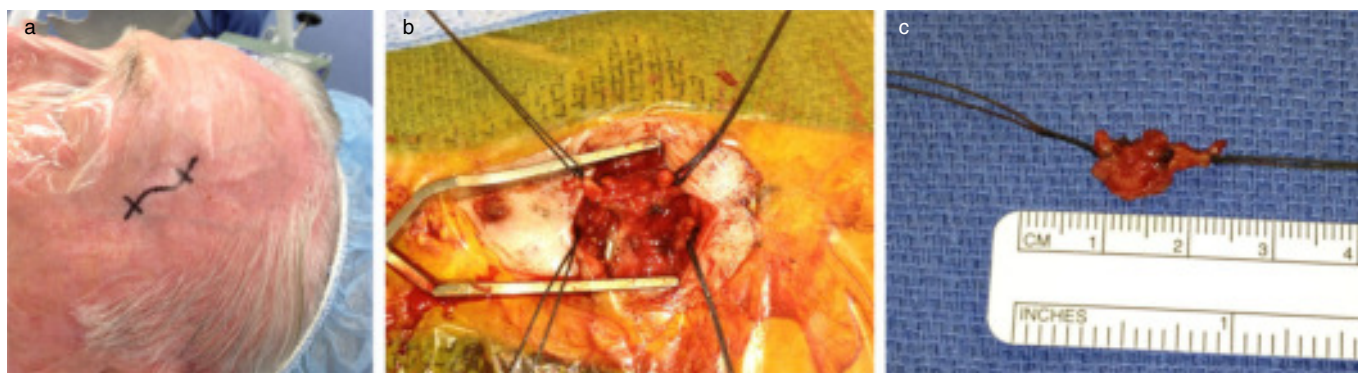
The STA is a terminal branch of the external carotid artery and supplies the lateral portion of the scalp. It arises near the superior border of the parotid gland and ascends anterior to the external auditory meatus. More superiorly, it typically divides into frontal and parietal branches. The frontal branch of the STA is particularly susceptible to blunt trauma in the fronto-temporal region just beyond the temporalis muscle where it lies, uncushioned, directly on periosteum (4,5,10,13). More pertinent to this case, the STA is tethered by its adventitia to the temporalis and the frontalis muscles, making

Address correspondence to: Jason A. Ellis, MD, Department of Neurological Surgery, Columbia University Medical Center, Neurological Institute of New York, 710 West 168th Street, New York, NY 10032, USA. Email: jae2109@columbia.edu

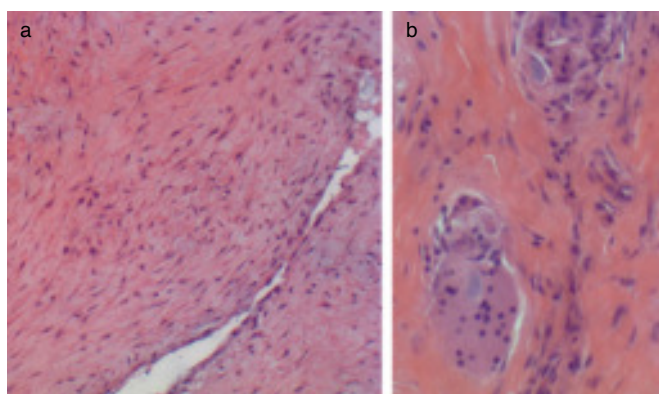
Financial Support: None.

For more information on author guidelines, an explanation of our peer review process, and conflict of interest informed consent policies, please go to <http://www.wiley.com/bw/submit.asp?ref=1094-7159&site=1>

**Conflict of Interest:** The authors reported no conflict of interest.



**Figure 2.** Superficial temporal artery (STA) pseudoaneurysm excision. The left anterior temporal skin incision was marked as shown (a). After dissection through the subcutaneous tissues, the afferent and efferent limbs of the STA were ligated and cut (b). Circumferential dissection from surrounding tissues revealed an approximately 7 mm pseudoaneurysm (c).



**Figure 3.** Superficial temporal artery pseudoaneurysm histopathology. Hematoxylin and eosin-stained micrographs demonstrate intimal hyperplasia (a) as well as reactive giant cells (b) suggestive of vessel inflammation.

it relatively immobile. Thus, any incidental movement of the temporal electrode after implantation would pierce rather than deflect the STA, resulting in pseudoaneurysm formation. Alternatively, tunneling of the electrode may have primarily violated the arterial wall.

A focused history and physical examination is usually sufficient to diagnose an STA pseudoaneurysm. In cases of blunt trauma, patients usually present two to six weeks after the initial injury (14). As in our case, the pulsatile mass may be painless but sharp pain or tenderness is sometimes reported (5,10,11). A bruit may be auscultated and digital compression may lead to cessation of the pulsations (13).

While catheter angiography is the gold standard imaging modality for diagnosing STA pseudoaneurysms, this invasive modality is typically unnecessary unless there is clinical suspicion for alternative vascular lesions such as arteriovenous fistula. Computed tomographic angiography or even ultrasound, as used in this case, will usually suffice.

Treatment options for STA pseudoaneurysm include compressive therapy, thrombin injection, endovascular embolization, or surgical excision (9,12,15,16). We favored surgical excision in this case, as it is a very low morbidity, outpatient procedure that offers a direct and immediate cure. Compressive therapy and thrombin injection have delayed responses or may not work, while endovascular occlusion carries a theoretical risk of recurrence and does not immediately address cosmetic deformity due to mass effect.

## CONCLUSION

STA pseudoaneurysm may be a rare complication of trigeminal nerve stimulator electrode placement. Surgical resection is the definitive, immediate cure for this lesion. In patients such as this, cure may be effected without peripheral nerve stimulator electrode removal.

Jason A. Ellis, MD\*; Brian J. Gill, BS\*; David Pisapia, MD†; Christopher J. Winfree, MD\*

\*Department of Neurological Surgery, Columbia University Medical Center, New York, NY, USA; and†Department of Pathology and Cell Biology, Columbia University Medical Center, New York, NY, USA

## Institutional Review Board Approval Statement

The records of this patient were reviewed in accordance with Columbia University Medical Center Institutional Review Board rules and regulations.

## Authorship Statement

Drs. Ellis, Winfree, and Gill designed and conducted the study, including patient recruitment, data collection, and data analysis. Drs. Ellis and Gill prepared the manuscript draft with important intellectual input from Drs. Winfree and Pisapia. All authors approved the final manuscript.

## REFERENCES

- Ahn HS, Cho BM, Oh SM, Park SH. Traumatic pseudoaneurysm of the superficial temporal artery in a child: a case report. *Childs Nerv Syst* 2010;26:117–120.
- Levisianos I, Sood V. Traumatic aneurysm (pseudoaneurysm) of the superficial temporal artery. *Emerg Med J* 2008;25:239–240.
- Conner WC, 3rd, Rohrich RJ, Pollock RA. Traumatic aneurysms of the face and temple: a patient report and literature review, 1644 to 1998. *Ann Plast Surg* 1998;41:321–326.
- 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 (5 Suppl):S286–S288.
- Angevine PD, Connolly ES, Jr. Pseudoaneurysms of the superficial temporal artery secondary to placement of external ventricular drainage catheters. *Surg Neurol* 2002;58:258–260.
- Bernstein JM, Bury RW, Nigam A. Superficial temporal artery pseudoaneurysm: first reported case after parotid surgery. *J Laryngol Otol* 2010;124:441–442.
- Nordstrom RE, Totterman SM. Iatrogenic false aneurysms following punch hair grafting. *Plast Reconstr Surg* 1979;64:563–565.

8. Terterov S, McLaughlin N, Martin NA. Postcraniotomy superficial temporal artery pseudoaneurysm in the setting of triple H therapy: a case report and literature review. *Surg Neurol Int* 2012;3:139.
9. Skaf GS, Domloj NT, Salameh JA, Atiyeh B. Pseudoaneurysm of the superficial temporal artery: a complication of botulinum toxin injection. *Aesthetic Plast Surg* 2012;36:982–985.
10. Lee HS, Jo KW, Lee SH, Eoh W. Traumatic pseudoaneurysm of the superficial temporal artery due to Gardner traction. *J Korean Neurosurg Soc* 2010;48:291–293.
11. Choo MJ, Yoo IS, Song HK. A traumatic pseudoaneurysm of the superficial temporal artery. *Yonsei Med J* 1998;39:180–183.
12. Partap VA, Cassoff J, Glikstein R. US-guided percutaneous thrombin injection: a new method of repair of superficial temporal artery pseudoaneurysm. *J Vasc Interv Radiol* 2000;11:461–463.
13. van Uden DJ, Truijers M, Schipper EE, Zeebregts CJ, Reijnen MM. Superficial temporal artery aneurysm: diagnosis and treatment options. *Head Neck* 2013;35:608–614.
14. Kim SW, Jong Kim E, Sung KY, Kim JT, Kim YH. Treatment protocol of traumatic pseudoaneurysm of the superficial temporal artery. *J Craniofac Surg* 2013;24:295–298.
15. Hong JT, Lee SW, Ihn YK et al. Traumatic pseudoaneurysm of the superficial temporal artery treated by endovascular coil embolization. *Surg Neurol* 2006;66:86–88.
16. Mann GS, Heran MK. Percutaneous thrombin embolization of a post-traumatic superficial temporal artery pseudoaneurysm. *Pediatr Radiol* 2007;37:578–580.

**Keywords:** Electrode, peripheral nerve stimulator, pseudoaneurysm, superficial temporal artery, trigeminal neuropathy