

CASE OF THE MONTH-AUGUST 2026

Title: Delayed rupture of an Iatrogenic Superficial Temporal Artery Pseudoaneurysm: A rare cause of Subacute Subgaleal Hematoma following Cranial surgery

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Word Count

for Abstract : 249

for the text : 948

Total number of pages: 7

Total number of tables: 1

Total number of photographs: 5

Source(s) of support: None

Presentation at a meeting: None

Organisation	None
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Place	None
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Date	-
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Conflicting Interest (If present, give more details):None

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Q. In a patient undergoing re-exploration after craniotomy, the superficial temporal artery (STA) is identified as the source of significant postoperative hemorrhage. Which of the following is the most appropriate surgical principle to minimize the risk of delayed STA pseudoaneurysm formation?

- A. Control bleeding with focal bipolar coagulation while preserving vessel continuity
- B. Apply local compression alone until hemostasis is achieved
- C. **Obtain proximal and distal control and definitively interrupt the injured arterial segment when STA preservation is not required**
- D. Observe the vessel if no further bleeding is seen intraoperatively then conservatively treat without coagulation or ligation

Delayed rupture of an Iatrogenic Superficial Temporal Artery Pseudoaneurysm: A rare cause of Subacute Subgaleal Hematoma following Cranial surgery

Abstract

Background: Superficial temporal artery (STA) pseudoaneurysm is an uncommon complication of cranial surgery and generally follows either an unrecognized arterial injury or an inadvertent injury with inadequate hemostatic control of the injured vessel during surgical exposure.

Observations: We report a 46-year-old man who underwent right pterional craniotomy and Simpson grade II excision of an olfactory groove meningioma. On the first postoperative day, he required re-exploration for a frontotemporal subgaleal and extradural hematoma. The STA was directly identified as the source of bleeding and treated with segmental bipolar coagulation; the offending vessel was not ligated and divided. After an uneventful interval of approximately five weeks, the patient developed sudden profuse bleeding from a small nodule at the inferior end of the incision. Ultrasonography demonstrated a 12 × 6 mm STA pseudoaneurysm with an adjacent superficial subgaleal hematoma. The pseudoaneurysm was excised after proximal and distal ligation using ligacrips of the STA pseudoaneurysm, with an uneventful recovery. Review of the published post-craniotomy literature did not identify a previous report documenting this complete sequence of known STA induced subgaleal and extradural haemorrhage post primary surgery, bipolar coagulation without vessel division during early post-operative re-exploration, delayed STA pseudoaneurysm formation, and its

rupture manifesting as focal subgaleal haemorrhage along with external bleeding in the subacute phase.

Lessons: This unusual case highlights the potential for delayed vessel wall weakening and pseudoaneurysm formation despite apparently satisfactory initial hemostasis and the need to consider definitive interruption of an STA induced early post-operative extensive subgaleal and extradural haemorrhage necessitating re-exploration.

Keywords: Superficial temporal artery; pseudoaneurysm; craniotomy; subgaleal hematoma; extradural hematoma

Introduction

Pseudoaneurysm of the superficial temporal artery (STA) is rare and most commonly follows blunt or penetrating trauma. Iatrogenic lesions are considerably less frequent and have been described after craniotomy, cranial fixation, external ventricular drainage, scalp retraction, and other procedures involving the temporal scalp^[1-4].

Post-craniotomy STA pseudoaneurysms usually present days to weeks after surgery as an enlarging pulsatile scalp mass^[1,2,5]. Rupture is uncommon but can result in significant wound hemorrhage, subgaleal hematoma, extradural hematoma, or intracranial extension^[5-8]. Tatano et al. identified only 16 post-craniotomy cases in their 2022 review, underscoring the rarity of this complication^[3].

We report an unusual case in which an STA responsible for an acute postoperative hemorrhage was directly identified and treated by segmental bipolar coagulation without vessel division, only to develop a delayed pseudoaneurysm with rupture approximately five weeks later.

Case Presentation

A 46-year-old man with history of chronic smoking, underwent a right pterional craniotomy with a trans-sylvian subfrontal approach and Simpson grade II excision of an olfactory groove meningioma (Figure 1).

On postoperative day 1, he developed a right frontotemporal subgaleal and extradural hematoma requiring re-exploration (Figure 2). During surgery, the STA was directly identified as the source of active arterial bleeding. The involved segment was coagulated using bipolar cautery. The coagulation was segmental, and the vessel was neither divided nor ligated. Satisfactory hemostasis was achieved and the hematomas were evacuated. The subsequent postoperative course was uneventful and patient was discharged.

Approximately five weeks later, after remaining clinically well, the patient developed sudden profuse bleeding from a small nodule at the inferior end of the previous temporal incision. The bleeding was controlled initially with local compression at another hospital, after which he was referred to our institution.

At the time of presentation in subacute setting, he was conscious and neurologically intact, with a Glasgow Coma Scale score of 15 and normal motor power in all four limbs. Local examination revealed a tender erythematous swelling measuring approximately 1×1 cm at the lower end of the previous incision. There was no active bleeding at the time of examination.

Ultrasonography demonstrated a 12×17 mm heterogeneous superficial collection consistent with subgaleal hematoma. Adjacent to it, was a well-defined 12×6 mm vascular lesion demonstrating an arterial pulsatile waveform with the classic "yin-yang" sign, consistent with an STA pseudoaneurysm (Figure 3). Repeat CT did not reveal any significant finding except localised subgaleal collection near STA trunk (Figure 4).

Given the preceding episode of significant hemorrhage and the risk of recurrent rupture, definitive surgical treatment was undertaken under local anesthesia. Proximal and distal control of the involved STA was obtained with ligaclips, following which the STA pseudoaneurysmal sac was excised (Figure 5). The postoperative bed had meticulous hemostasis (Figure 5). The postoperative course was uneventful and he was discharged on the same day and had an uneventful recovery.

Discussion

Post-craniotomy iatrogenic STA pseudoaneurysm is rare and usually follows occult arterial injury during scalp dissection, fixation, retraction, or closure^[1-4,7]. Most present days to weeks later as a pulsatile swelling, although rupture may produce wound hemorrhage, subgaleal or extradural hematoma, and rarely intracranial extension^[5,6,8-10].

Our case is distinctive because the arterial injury was directly documented. The STA was identified as the source of postoperative subgaleal and extradural bleeding and treated with segmental bipolar coagulation without division. Approximately five weeks later, the patient presented with sudden wound hemorrhage and an STA pseudoaneurysm. We found no prior report documenting this historical sequence of known STA induced subgaleal and extradural haemorrhage post primary surgery, bipolar coagulation without vessel division during early post-operative re-exploration, delayed STA pseudoaneurysm formation, and its rupture manifesting as focal subgaleal haemorrhage along with external bleeding in subacute phase.

Delayed formation after limited arterial injury is possible. Tatano et al. reported rupture on postoperative day 20 after an occult injury^[10] while Mangat et al. demonstrated pseudoaneurysm development between postoperative days 4 and 13, followed by rupture on day 21^[10]. In our patient, incomplete thrombosis, recanalization, or progressive wall injury after coagulation may have contributed, although causality cannot be established. Moreover the index case was a chronic smoker, which predisposes to increased inflammation in vessel walls, thus potentially increasing the risk of pseudoaneurysm formation following inadequately controlled intraoperative STA injury.

The patient presented with profuse bleeding from a small wound nodule rather than a typical pulsatile mass. Therefore, delayed focal swelling or unexplained bleeding along a craniotomy incision should prompt vascular evaluation before aspiration or local incision. Duplex ultrasonography is an effective first-line investigation^[10]. The yin-yang sign is a classical sign seen in colour Doppler ultrasound representing the ingress and egress of blood into the pseudoaneurysm with systole and diastole respectively visualised as a swirling circle of red and blue and is fairly specific for a pseudoaneurysm^[11].

Surgical proximal and distal control with excision remains a dependable treatment for ruptured and accessible lesions, although endovascular or percutaneous techniques are alternatives in selected cases^[2,4,12,13]. This case suggests that when a significantly injured STA causes substantial postoperative hemorrhage, coagulation alone while leaving the vessel in continuity may not always provide definitive exclusion.

Conclusion

Post-craniotomy STA pseudoaneurysm is rare but may present with severe delayed hemorrhage. In the present patient, the STA had been directly identified as the source of postoperative subgaleal and extradural bleeding and treated with **segmental bipolar coagulation without vessel division**. After an apparently uneventful interval of approximately five weeks, a pseudoaneurysm developed and ruptured.

To the best of our knowledge, this protracted natural history has not been previously documented. When a substantially injured STA requires surgical hemostasis, definitive interruption of the damaged arterial segment may warrant consideration. Equally importantly, delayed swelling, a new wound nodule, or unexplained bleeding next to the STA territory after craniotomy should prompt early vascular imaging with a high index of suspicion.

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TABLE

Table 1 : Selected reported post-craniotomy/iatrogenic STA pseudoaneurysms.

Study	Neurosurgical setting	Presentation	Proposed mechanism	Treatment
Lee et al., 2002 ^[1]	Craniotomy	Delayed scalp mass	Unrecognized operative STA injury	Excision
Bobinski et al., 2004 ^[2]	Aneurysm surgery	POD17; tender pulsatile mass	Operative injury	US-guided thrombin injection
Terterov et al., 2012 ^[4]	Aneurysm surgery with induced hypertension	POD22; enlarging mass with bruit	Operative injury with hemodynamic amplification	Coil and Onyx embolization
Honda et al., 2013 ^[6]	Craniotomy	Rupture	Postoperative STA injury	Emergency treatment
Madhusudan et al., 2015 ^[7]	Craniotomy for intracranial tuberculoma	Delayed; extradural hematoma	Iatrogenic STA injury	Surgical treatment
Zheng et al., 2021 ^[8]	Craniectomy for extradural hematoma	POD1 scalp lesion	Scalp-hook penetration	Excision
Shields et al., 2021 ^[9]	Craniotomy for CSF leak repair	POD14; rupture	Unrecognized operative injury	Emergency surgery
Tatano et al., 2022 ^[3]	Frontal craniotomy for ICH	POD20; rapid swelling and wound hemorrhage	Occult operative injury	STA ligation and hematoma evacuation
Mangat et al., 2026 ^[10]	Craniotomy, ICH evacuation and MCA aneurysm clipping	Absent POD4; present POD13; rupture POD21	Galeal-hook injury	STA resection and hematoma evacuation
Present case	Pterional craniotomy; POD1 re-exploration for subgaleal and extradural hematoma	5 weeks; sudden external hemorrhage	Known bleeding STA treated by segmental bipolar coagulation without division	Proximal and distal ligacip application and excision

Figure Legend

Figure 1: Preoperative contrast enhance MRI brain showing extent of planum sphenoidale meningioma in A) T2 axial B) T1+C axial C) T1+C coronal and D) T1+C Sagittal sequences

Figure 2: Comparative image showing NCCT head in A) immediate postoperative period with a right fronto-temporal subgaleal and extradural bleed and B) following EDH evacuation. Note the development of venous infarct over right basifrontal lobe as a result of mass effect from the extradural hematoma.

Figure 3: Illustration showing A) right STA-pseudoaneurysm in USG B-mode with a breach in the wall with blood dissecting out of the lumen along with B) yin-yang sign seen in colour Doppler .

Figure 4: NCCT head showing subgaleal and subcutaneous hematoma around anatomical location of right STA trunk around the lower part of previous surgical wound. Note the resolved right basifrontal venous infarct from previous event of extradural bleed.

Figure 5: Image showing A) excised pseudoaneurysm sac and B) clean post-operative bed following hematoma evacuation with clipped proximal and distal ends (using ligaclips) of superficial temporal artery trunk (marked by white circles).

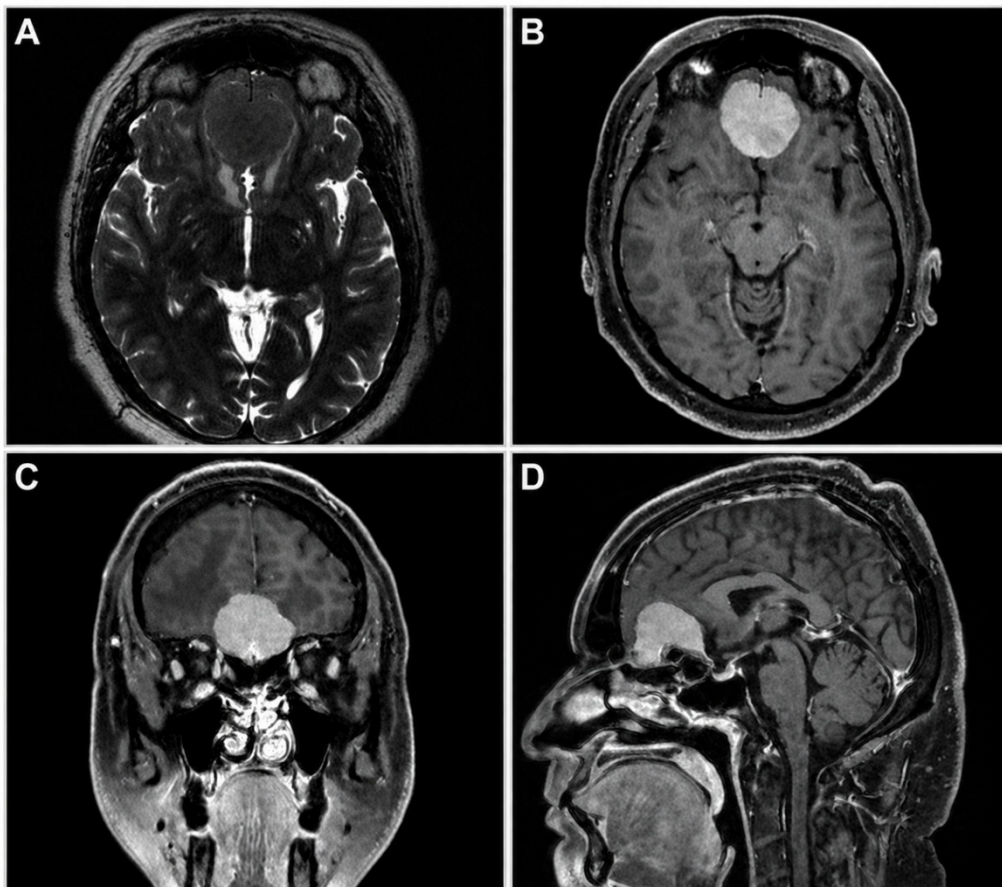


Figure 1 PREOPERATIVE CEMRI BRAIN

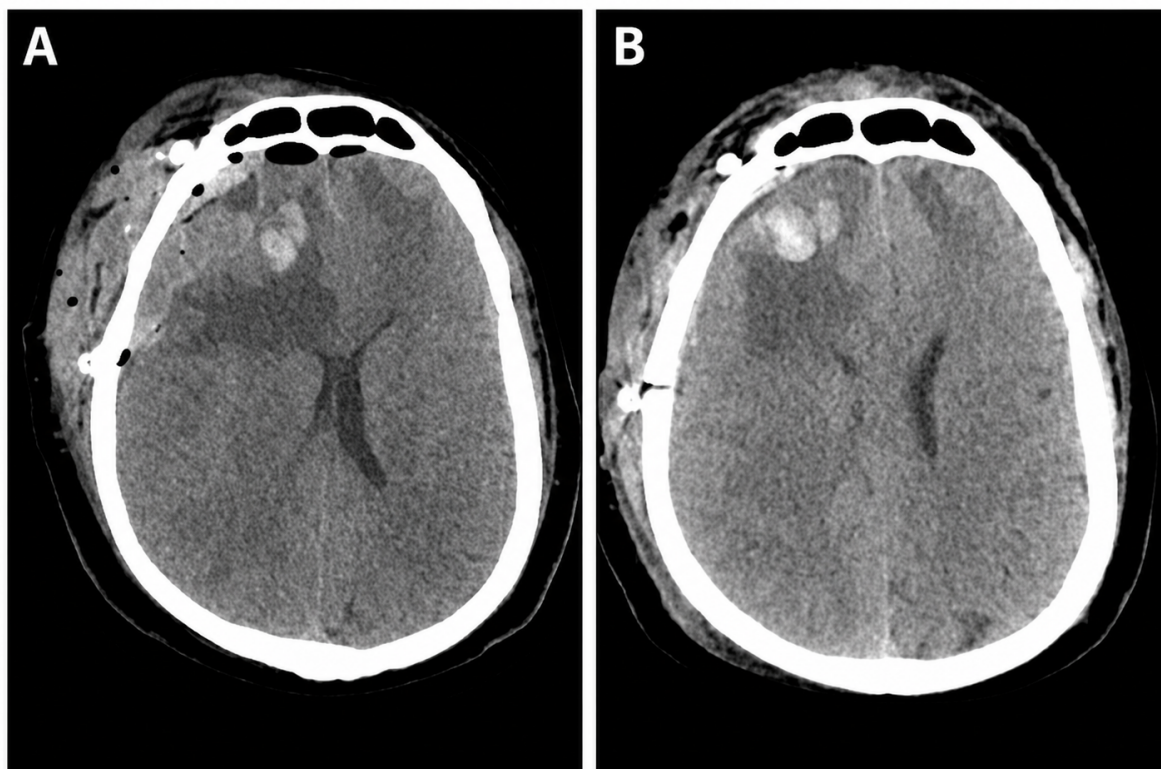


Figure 2 COMPARATIVE SCAN BEFORE AND AFTER EVACUATION OF POSTOPERATIVE EDH

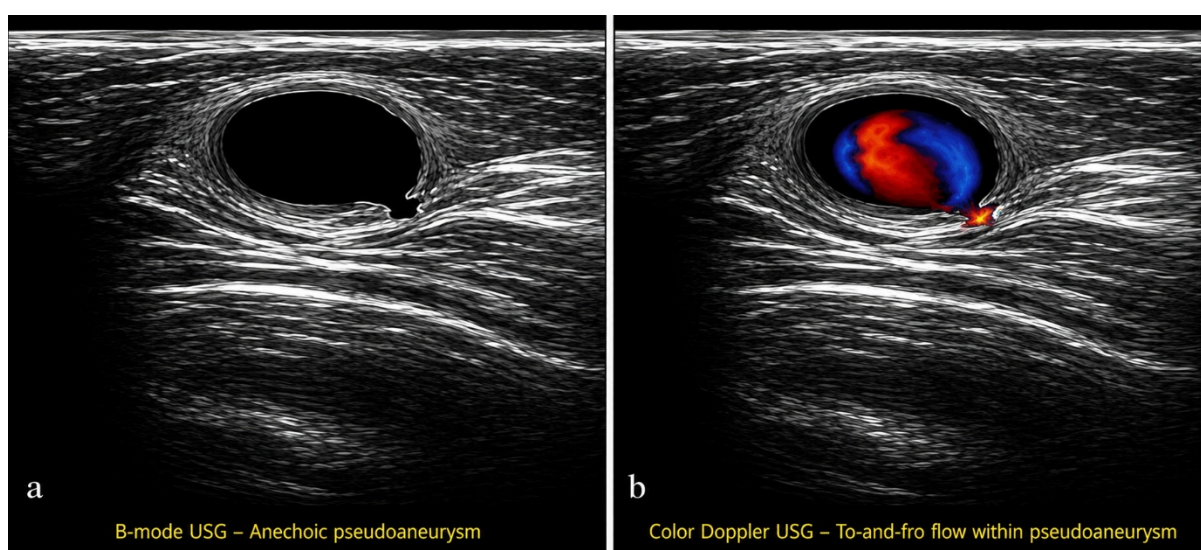


Figure 3 Illustration showing a Right STA pseudoaneurysm with yin-yang sign



Figure 4 NCCT head following development of pseudoaneurysm of Right STA



Figure 5 EXCISED PSEUDOANEURYSM SAC AND POSTOPERATIVE BED SHOWING CLIPPED PROXIMAL AND DISTAL SEGMENT OF STA