

Pseudoaneurysm of the Superficial Temporal Artery Following Revision of a Middle Cerebral Artery Aneurysm Clipping: Case Report and Review of the Literature

Orta Serebral Arter Anevrizma Kliplenmesi Revizyonundan Sonra Oluşan Yüzeysel Temporal Arter Yalancı Anevrizması: Olgu Sunumu ve Literatürün Gözden Geçirilmesi

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ABSTRACT

Pseudoaneurysms of the superficial temporal artery are mostly traumatic in origin. Here, a case of a superficial temporal artery aneurysm that emerged following a craniotomy is presented. A 59-year-old woman was admitted with subarachnoid hemorrhage. She underwent a pterional craniotomy and clipping of a saccular aneurysm of middle cerebral artery bifurcation. A control digital subtraction angiography on the 3rd postoperative day revealed partial filling of the aneurysm and a revision was performed. The second control digital subtraction angiography on the 4th postoperative day of the revision showed a pseudoaneurysm of the left superficial temporal artery. The pseudoaneurysm was excised successfully under local anesthesia. In conclusion, pseudoaneurysm of the superficial temporal artery should be considered among the early postoperative complications of the surgical procedures at the superficial temporal artery territory. Although some conservative approaches are used, excision of the aneurysm is recommended for treatment.

KEYWORDS: Aneurysm, Craniotomy, DSA, Pseudoaneurysm, Superficial temporal artery

ÖZ

Yüzeysel temporal arter yalancı anevrizmaları çoğunlukla travması sonrası oluşurlar. Bu yazıda yinelenen kranyotomi sonrasında ortaya çıkan bir yüzeysel temporal arter yalancı anevrizması sunulmaktadır. 59 yaşındaki kadın hasta subaraknoidal kanama sebebiyle getirildi. Pteriyonel kranyotomi ile orta serebral arter bifurkasyon anevrizması kliplenmesi ameliyatı yapıldı. Postoperatif üçüncü günde yapılan kontrol dijital anjiyografi anevrizmada kısmi dolum kusuru gösterdiği için klip düzeltme ameliyatı yapıldı. Düzeltme ameliyatından sonraki 4. günde yapılan ikinci dijital anjiyografi incelemesinde sol yüzeysel temporal arterde bir adet yalancı anevrizma olduğu görüldü. Bu yalancı anevrizma lokal anestezi ile eksise edildi. Sonuçta, yüzeysel temporal arter bölgesindeki cerrahi girişimlerin erken komplikasyonlar arasında yalancı anevrizmaları da düşünmek gerekir. Yalancı anevrizmaların tedavisinde tutucu yöntemler kullanılsa da, tedavi için cerrahi çıkarım önerilmektedir.

ANAHTAR SÖZCÜKLER: Anevrizma, DSA, Kranyotomi, Yalancı anevrizma, Yüzeysel temporal arter

INTRODUCTION

Aneurysm of the superficial temporal artery (STA) is a well known pathology since Thomas Bartholin's first description in 1740 (4). Although some true STA aneurysms with congenital defect of internal elastic membrane of the artery are reported (3,17,28), most STA aneurysms are pseudoaneurysms. They can emerge either spontaneously (17,20), or as a complication of trauma (13,16), interventions (1,9) and injections (19). Pseudoaneurysms are rare complications of craniotomies (2,7,12,21-26). In this report, 59-year-old woman with a

pseudoaneurysm of STA which developed following a revision surgery is presented.

CASE REPORT

A 59-year-old woman admitted with a recent history of severe headache. The neurological examination was normal except mild neck stiffness. A spontaneous subarachnoidal hemorrhage was detected on cranial computerized tomography (CT). A digital subtraction angiography (DSA) revealed a left sided saccular aneurysm at middle cerebral

artery (MCA) bifurcation. She underwent left pterional craniotomy and aneurysm clipping. A control DSA in the 3rd day showed that aneurysm was partially filling. The patient was reoperated and the aneurysm was clipped successfully with two aneurysm clips. No extraordinary event happened or observed throughout the opening and closure steps of the wound during the reoperation. In the 4th day of the reoperation, a second control DSA was performed. The aneurysm had been clipped without any residue; however a newly-developed lesion, a pseudoaneurysm of the left superficial temporal artery, was demonstrated at the operation site (Figure 1A-D). A cranial CT showed the aneurysm as a round and hypodense lesion (Figure 2). The patient underwent a third operation and the pseudoaneurysm of STA was excised under local anesthesia (Figure 3A,B). The 3rd postoperative period was unremarkable and the patient was discharged without any complications.

DISCUSSION

Aneurysms of the STA can present either as true or pseudoaneurysms. Trauma is the most common etiologic

factor for the formation of pseudoaneurysms. Trauma can be blunt or penetrating, minor or major (4,13,26), solitary or multiple (22) in character. In the past, swords and bloodletting were common mechanisms of the traumatic injury (27). Today, gunshot wounds, motor vehicle accidents, and sport related injuries are leading causes (13). Injection (19) or a connective tissue disease like subcutaneous angiolymphoid hyperplasia with eosinophilia (5) may be responsible for the STA aneurysms. The pseudoaneurysms of STA can also arise as a complication of a surgical procedure. These operations can be non-neurosurgical per se, like reconstruction of the frontal sinus via a coronal flap (15), temporomandibular arthroplasty (6) and skin graft coverage (9). Placement of external ventricular drainage (1), removal of a tumor (21), of a hematoma (23,23) and clipping of an intracranial aneurysm (2,7,12,25,26) are examples of neurosurgical procedures causing pseudoaneurysms of STA. However, a pseudoaneurysm formation following a revision craniotomy has not been reported before (Table I).

There are various pathophysiological mechanisms, possibly being responsible for pseudoaneurysm formation. There is a

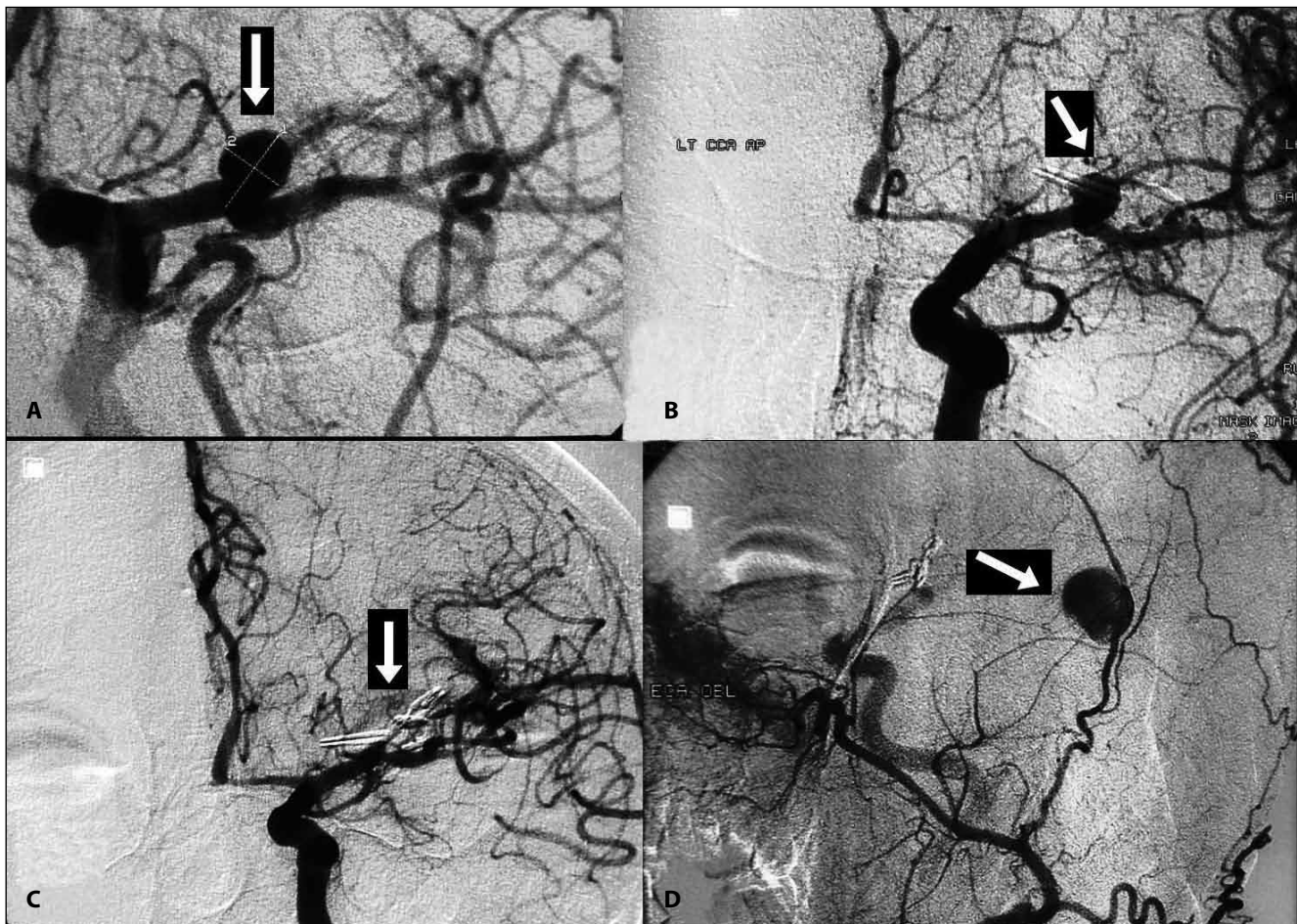


Figure 1: DSA images of the patient, **A)** Left MCA bifurcation aneurysm (arrow), **B)** Partial filling of the aneurysm (arrow) with slipping of the aneurysm clip, **C)** Completely clipped aneurysm (arrow) without any residue, **D)** Pseudoaneurysm (arrow) on left superior temporal artery.

consensus in the literature regarding occurrence of some kind of penetrating trauma during the surgery. The injury may be a partial transection of the artery or a severe contusion to it with resulting necrosis of the arterial wall (8). Fernández-Portales and et al. (7) suggested that a pin head-holder was the cause in their case. The sharp point pins injured the scalp vessel during the rotational fixation. According to Angevine and et al (1), sharp instruments like a trocar that used during the operation can easily lead to a hemorrhage by perforating a few millimeters of the artery wall. In that report, cauterization of these injured vessels was thought very important for preventing pseudoaneurysms formation. Lee and et al. (12) also suggested that the pseudoaneurysm formation was the result of an inadvertent damage of a segment of STA, possibly with electrocautery in fashioning the scalp flap. Tsutsumi and et al (25) mentioned a suture needle traumatizing the STA

and removal of the thread causing hemorrhage at the injury site, ending up with formation of pseudoaneurysm. Shimoda (22) reported that coagulopathy would be important in these cases. In the presented case, there was neither coagulopathy, nor a pin head-holder fixation device or no new incision. The thread was also kept in their position. The time duration for development of a pseudoaneurysm in the literature ranged in between 10 days (14) to 3 years (26), however, in the presented case it took just 4 days for formation of the aneurysm.

A through history and physical examination are very important for diagnosis of these lesions. A STA pseudoaneurysm mostly presents as a mass lesion in the territory with a history of trauma (15). These masses can be painful (11), "uncomfortable" (16), indolent (25), pulsatile (13,18,26), enlarging (14), tender (2,13), non-tender (26) rubbery (1), erythematous (2) or without any cutaneous erythema (12) and bruit can be appreciable on auscultation (18). A pulsating mass that is easily compressible with digital pressure and bruit on auscultation are very discriminating features (13,18).

Imaging studies for accurate diagnosis of STA pseudoaneurysm can be either invasive or noninvasive; sonography (2,3), contrast enhanced CT scanning (11,16), CT angiography (10,11,16,26), 3-dimensional CT angiography (18) and selective angiography (2,11,25) are the most commonly used techniques. The differential diagnosis of STA pseudoaneurysms include abscess, hematoma, inflammatory lesion, parotid mass, lipoma, epidermal inclusion cyst, enlarged lymph node, a tumor of facial nerve, arteriovenous malformation or fistula and middle meningeal artery aneurysm with bony erosion (1,11,13,26).

The pseudoaneurysms of the STA should be treated in order to reduce the risk of rupture and hemorrhage, treatment of headache, resolving the cosmetic defect and reducing long term risk of potential bony erosion and recurrence by reaching enormous dimensions (2,10,11,13,16,25). It may also cause seizures and ischemia in the scalp. Conservative approach for treatment of STA aneurysm is known since 1861 (13) and can be advised particularly for critically ill patients (10). Excision, injection of thrombin glue (2) and endovascular embolization



Figure 2: A round, hypodense lesion (arrow) seen with hematoma in the left temporal region of the scalp in CT.

Table I: The List of the Patients with Pseudo-Aneurysm of the STA Following Craniotomy

Author	Age & Sex	Cause of Craniotomy	Duration time
Bobinski and et al. (2004)	73, M	Aneurysm clipping	17 days
Fernández-Portales and et al. (1999)	51, M	Aneurysm clipping	3 weeks
Lee and et al. (2002)	52, M	Aneurysm clipping	3 months
Shimoda and et al. (1988)	17, M	Traumatic intracranial hematoma	40 days
Rousseau and et al. (1985)	?,?	Frontal lobe meningioma	?
Tatewaki and et al. (1994)	?,?	Chronic subdural hematoma	?
Tsutsumi and et al. (2000)	48, M	Aneurysm clipping	40 days
Walker and Liu (2000)	50, M	Aneurysm clipping	4 weeks
Present case (2010)	52, F	Aneurysm clipping (revision of aneurysm clip)	4 days

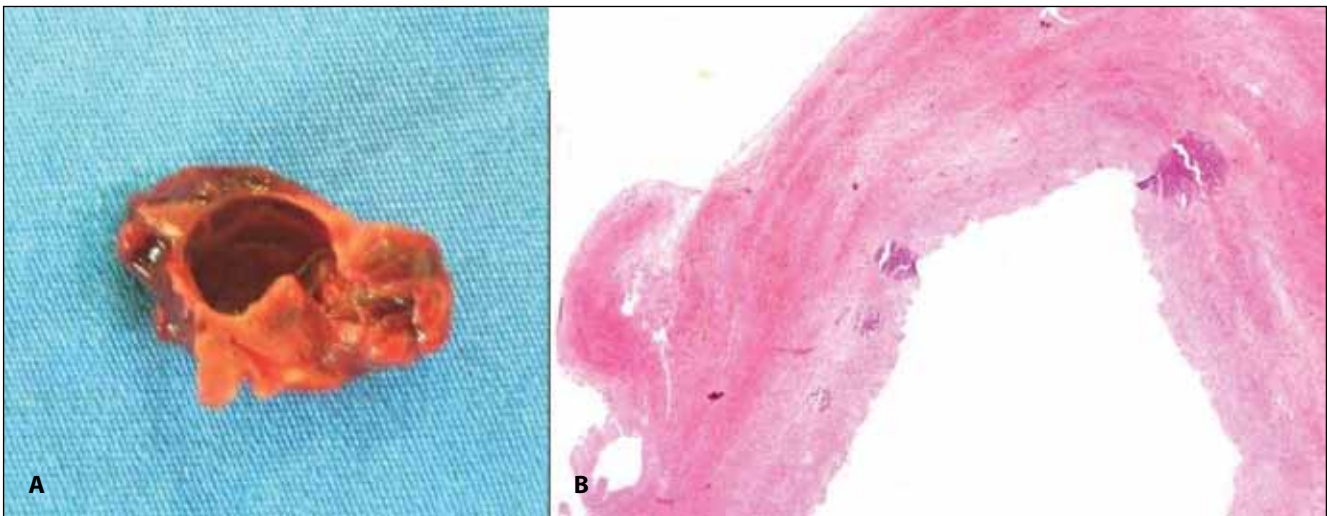


Figure 3: A) The macroscopic appearance of the pseudoaneurysm with cavitation like image, **B)** Wall of pseudoaneurysm formed by organized hematoma. (H&E X 40).

by coil (11) or Gelfoam (22) are used for the treatment. There are some objections to injection of thrombin glue because of the risks of administering thrombin systemically (24). Surgical treatment is commonly recommended for these lesions. Surgery can be performed under local anesthesia and provide accurate treatment as the presented case.

In conclusion, pseudoaneurysm of the superficial temporal artery should be considered among the early postoperative complications of the surgical procedures at the superficial temporal artery territory. Although some conservative approaches are used, excision of the aneurysm is recommended for treatment.

REFERENCES

1. Angevine PD, Connolly ES Jr: Pseudoaneurysms of the superficial temporal artery secondary to placement of external ventricular drainage catheters. *Surg Neurol* 58(3-4):258-260, 2002
2. Bobinski L, Boström S, Hillman J, Theodorsson A: Postoperative pseudoaneurysm of the superficial temporal artery (S.T.A.) treated with Thrombostat (thrombin glue) injection. *Acta Neurochir (Wien)* 146(9):1039-1041, 2004
3. Buckspan RJ, Rees RS: Aneurysm of the superficial temporal artery presenting as a parotid mass. *Plast Reconstr Surg* 78(4):515-517, 1986
4. Cheng CA, Southwick EG, Lewis EC: Aneurysms of the superficial temporal artery: Literature review and case reports. *Ann Plast Surg* 40(6):668-671, 1998
5. Delbarre M, Joly P, Mihout MF, Clavier E, Thomine E, Lauret P: Aneurysm of superficial temporal artery in angiolymphoid hyperplasia lesions. *Ann Dermatol Venereol* 124(3):242-244, 1997 (Article in French)
6. Dinner MI, Hartwell SW Jr, Magid AJ: Latrogenic false aneurysm of the superficial temporal artery. Case report. *Plast Reconstr Surg* 60(3):457-460, 1977
7. Fernández-Portales I, Cabezudo JM, Lorenzana L, Gómez L, Porras L, Rodríguez JA: Traumatic aneurysm of the superficial temporal artery as a complication of pin-type head-holder device. Case report. *Surg Neurol* 52(4):400-403, 1999
8. Fox JT, Cordts PR, Gwinn BC: Traumatic aneurysm of the superficial temporal artery: Case report. *J Trauma* 36(4):562-564, 1994
9. Giele H, Robbins P, Smith C: False aneurysm of the superficial temporal artery: A surgical complication. *Ann Plast Surg* 36(2):219-220, 1996
10. Grasso RF, Quattrocchi CC, Crucitti P, Carboni G, Coppola R, Zobel BB: Superficial temporal artery pseudoaneurysm: A conservative approach in a critically ill patient. *Cardiovasc Intervent Radiol* 30(2):286-288, 2007
11. Hong JT, Lee SW, Ihn YK, Son BC, Sung JH, Kim IS, Kim IS, Kim MC: Traumatic pseudoaneurysm of the superficial temporal artery treated by endovascular coil embolization. *Surg Neurol* 66(1):86-88, 2006
12. Lee GY, Daniel RT, Halcrow S: Postoperative pseudoaneurysm of the superficial temporal artery. *J Neurol Neurosurg Psychiatry* 72(4):553-554, 2002
13. Lee KS, Gower DJ, McWhorter JM: Aneurysm of the superficial temporal artery. *Neurosurgery* 23(4):499-500, 1988
14. Levisianos I, Sood V: Traumatic aneurysm (pseudoaneurysm) of the superficial temporal artery. *Emerg Med J* 25(4):239-240, 2008
15. Manzon S, Nguyen T, Philbert R: Bilateral pseudoaneurysms of the superficial temporal artery following reconstruction of the frontal sinus: a case report. *J Oral Maxillofac Surg* 65(7):1375-1377, 2007
16. Murphy M, Hughes D, Liaquat I, Edmondson R, Bullock P: Giant traumatic pseudoaneurysm of the superficial temporal artery: Treatment challenges and case review. *Br J Neurosurg* 20(3):159-161, 2006

17. Nishioka T, Kondo A, Aoyama I, Nin K, Shimotake K, Tashiro H, Takahashi J, Kusaka H: A case of spontaneous superficial temporal artery aneurysm. *No Shinkei Geka* 16(8):1009–1012, 1988 (Article in Japanese)
18. 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* 43(4): 209–211, 2008
19. Prado A, Fuentes P, Guerra C, Leniz P, Wisnia P: Pseudoaneurysm of the frontal branch of the superficial temporal artery: An unusual complication after the injection of botox. *Plast Reconstr Surg* 119(7):2334–2345, 2007
20. Riaz AA, Ismail M, Sheikh N, Ahmed N, Atkin G, Richman P, Loh A: Spontaneously arising superficial temporal artery aneurysms: A report of two cases and review of the literature. *Ann R Coll Surg Engl* 86(6):W38–40, 2004
21. Rousseaux M, Lesoin F, Barbastre, Jomin M: Postoperative aneurysm of the superficial temporal artery. *Neurochirurgie* 31(5):461–463, 1985 (Article in French)
22. Shimoda M, Ikeda A, Sato O, Watabe T: A case of multiple superficial temporal artery pseudoaneurysms following craniotomy. *No Shinkei Geka* 16(6):797–800, 1988 (Article in Japanese)
23. Tatewaki K, Wanibuchi M, Kurokawa Y, Ueda T: A case of recurrent chronic subdural hematoma caused by traumatic STA aneurysm. *Shiritsu Kushiro Sogo Byoin Igoku Zasshi* 6:147–149, 1994 (Article in Japanese) cited in ref. Tsutsumi.
24. Teh LG, Sieunarine K: Thrombin injection for repair of pseudoaneurysms: A case for caution. *Australas Radiol* 47(1):64–66, 2003
25. Tsutsumi M, Kawano T, Kawaguchi T, Kaneko Y, Ooigawa H: Pseudoaneurysm of the superficial temporal artery following craniotomy--case report. *Neurol Med Chir (Tokyo)* 40(5): 261–263, 2000
26. Walker MT, Liu BP: Superficial temporal artery pseudoaneurysm following craniotomy. *J Neurol Neurosurg Psychiatry* 73(5):605, 2002
27. Winslow N, Edwards M: Aneurysms of the temporal artery. *Am J Surg* 28:696–702, 1935
28. Ysa A, Arruabarrena A, Bustabad MR, Perez E, del Campo A, Garcia-Alonso J: Images in vascular medicine. True aneurysm of the superficial temporal artery. *Vasc Med* 13(3):295–296, 2008