

Superficial temporal artery aneurysm

Monika Starzak¹ , Grzegorz K. Jakubiak² , Mikołaj Pietrzak² , Grzegorz Cieślak² ,
Agata Stanek² 

¹Department and Clinic of Internal Medicine, Angiology and Physical Medicine, Specialistic Hospital No. 2, Bytom, Poland

²Department and Clinic of Internal Medicine, Angiology and Physical Medicine, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Bytom, Poland

Abstract

The superficial temporal artery (STA), an end branch of the external carotid artery, is a major artery of the head. Due to its location, where skin and fat tissue remain the only protection of the artery, it can be easily damaged while head injury, causing an aneurysm to form. So far around four hundreds of cases of STA aneurysms have been described in the literature.

We present a 37-year-old woman with a painless pulsatile mass of approximately one centimeter above the left ear and headaches in the left temporal area. In the past, she was a victim of domestic violence with a few head trauma.

The STA aneurysm was confirmed in ultrasound imaging. The patient did not meet the criteria for the diagnosis of giant cell arteritis. She was presented for a vascular surgery consultation and qualified for surgical resection of the aneurysm. In addition, the patient was diagnosed with hepatic hemangioma and mild aortic and mitral valve regurgitation.

According to the available literature, STA aneurysms have mostly been reported as post-traumatic. The gold standard for STA aneurysm treatment is surgical resection. The procedure was reported as safe, as well as a low grade of recurrence or complications during the procedure was shown in the literature.

Key words: superficial temporal artery aneurysm; head injury; headache; temporal mass; angio-computed tomography scans

Acta Angiol 2023; 29, 1: 25–29

Introduction

The superficial temporal artery (STA), an end branch of the external carotid artery, is a major artery of the head. It begins within the parotid gland and passes superficially over the posterior root of the temporal bone [1]. Due to this location, where the skin and fat tissues remain the only protection of the artery, it can easily be damaged by head injury. The first case of STA aneurysm was reported in 1742 by Thomas Bartholin. Since then, around four hundred cases of STA aneurysms have been described [2]. The most common clinical

presentation is a painless, growing, pulsatile mass in the temporal area and headaches on the involved side. STA aneurysms can be divided into true aneurysms or pseudoaneurysms [3]. Pseudoaneurysms are mostly post-traumatic aneurysms, due to the artery being prone to injury because of its anatomy [4].

The purpose of this paper was to present the case of a 37-year-old woman admitted to the Department and Clinic of Internal Medicine, Angiology, and Physical Medicine for diagnosis, in whom a post-traumatic STA aneurysm was finally diagnosed.

Address for correspondence: prof. Agata Stanek, MD, PhD, Department and Clinic of Internal Medicine, Angiology and Physical Medicine, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Batorego 15, 41–902 Bytom, Poland, e-mail: astanek@tlen.pl

Received: 06.11.2022

Accepted: 14.12.2022

Early publication date: 24.03.2023

This article is available in open access under Creative Commons Attribution-Non-Commercial-No Derivatives 4.0 International (CC BY-NC-ND 4.0) license, allowing to download articles and share them with others as long as they credit the authors and the publisher, but without permission to change them in any way or use them commercially.

Case report

Anamnesis and physical examination

The 37-year-old woman was admitted to the Clinic due to a painless pulsatile mass of around one centimeter above the left ear and headaches localized in the left temporal area. The mass had been noticed three months before the patient was admitted to the Clinic. The patient reported that the mass has grown in her observation since then. She neglected fatigue, fever episodes, and night sweats. She denied mandibular claudication and symptoms of polymyalgia. On physical examination, there was no hyperesthesia in the temporal area. Moreover, no sight problems were recorded. She has undergone a neurological examination with no abnormalities found. In the past, she was a victim of domestic violence with a few head traumas. As cardiovascular risk factors are concerned, she was an active smoker. To estimate the 10-year risk of developing cardiovascular disease the Framingham Risk Score as a sex-specific algorithm was used [5]. Taking age into consideration, she was considered at low cardiovascular risk.

Laboratory tests

The results of the majority of performed laboratory tests were normal including peripheral blood count with leukocytes differentiation, erythrocyte sedimentation rate, C-reactive protein, fibrinogen, troponin, parameters of kidney function assessment, ions (sodium, potassium, calcium, and phosphate), liver function and injury tests, thyroid function parameters, iron, and vitamin B12 concentrations, uric acid, and total protein, as well as coagulation parameters (prothrombin time and activated partial thromboplastin time). In terms of lipid profile parameters, a slightly elevated concentration of total cholesterol (195 mg/dl) and low-density lipoprotein cholesterol (140 mg/dl) was found, with reduced high-density lipoprotein cholesterol (38 mg/dl) and a normal level of triglycerides (96 mg/dl). The concentration of selected cancer markers was determined, showing an increased concentration of CA 125 (51.4 U/ml), with the correct concentration of alpha-fetoprotein (AFP) and carcinoembryonic antigen (CEA).

Imaging and functional tests of the cardiovascular system

During hospitalization in the Department and Clinic of Internal Medicine, Angiology, and Physical Medicine in Bytom the left STA aneurysm was confirmed during clinical examination and ultrasound imaging. STA on a length of 6 mm, was widened up to 4 mm with a thickening of the aneurysm wall up to 1.1 mm and a suspicion of a thrombus in the aneurysm (Fig. 1). The

intima-media complex was thickened to 1.2 mm within the common carotid bulb, and apart from this the carotid and vertebral arteries in the ultrasound study were normal. Angio-computed tomography scan of carotid, vertebral, and brain arteries was performed in which a lack of posterior left connecting artery of the brain was found. The asymmetry of the carotid and vertebral arteries was also described, with the dominance of the left vertebral artery and the right internal carotid artery. Carotid, vertebral, and intracranial arteries aneurysms were excluded. The patient did not meet the criteria for the diagnosis of giant-cell arteritis. Thus, she was not qualified for an STA biopsy. She was presented for a vascular surgery consultation and qualified for surgical resection of the aneurysm.

The performed ECG examination revealed a sinus rhythm with a frequency of 60 per minute. Transthoracic echocardiography showed only mild mitral and aortic valve regurgitation, and apart from this, the morphology and function of the heart structures and the great arterial trunks were normal. A Doppler ultrasound examination of the lower extremity arteries was performed, which showed the correct blood flow spectrum. Measurements of the ankle-brachial index (ABI) and the toe-brachial index (TBI) were within the normal range. Measurement of the pulse wave velocity in the femoro-cervical section using the Sphygmocor XCEL apparatus showed a value that did not indicate increased vascular stiffness (6.2 m/s). The values of central and peripheral arterial pressure and the parameters of the pulse wave analysis were normal, in addition to a slightly increased augmentation index (Alx 36%, Alx75 29%).

Other diagnostic procedures

During hospitalization, the patient underwent an ultrasound examination of the abdominal cavity, in which a focal lesion of the liver with the morphology of the hemangioma was described, as well as a single parietal atherosclerotic plaque in the abdominal aorta, which was confirmed by computed tomography of the abdominal cavity and pelvis with contrast. In addition, a uterine myoma was described by computed tomography. An ultrasound of the thyroid was also performed, which showed a slightly increased volume of the gland (19.1 ml) and heterogeneity of the parenchyma, with no obvious focal changes (moreover thyrotropin and free thyroid hormone levels were normal). The chest radiograph was described by the radiologist as normal.

Discussion

An aneurysm is a widening of the artery caused by a weakness of the artery wall, classified according to the integrity of the three layers of the vessel wall into

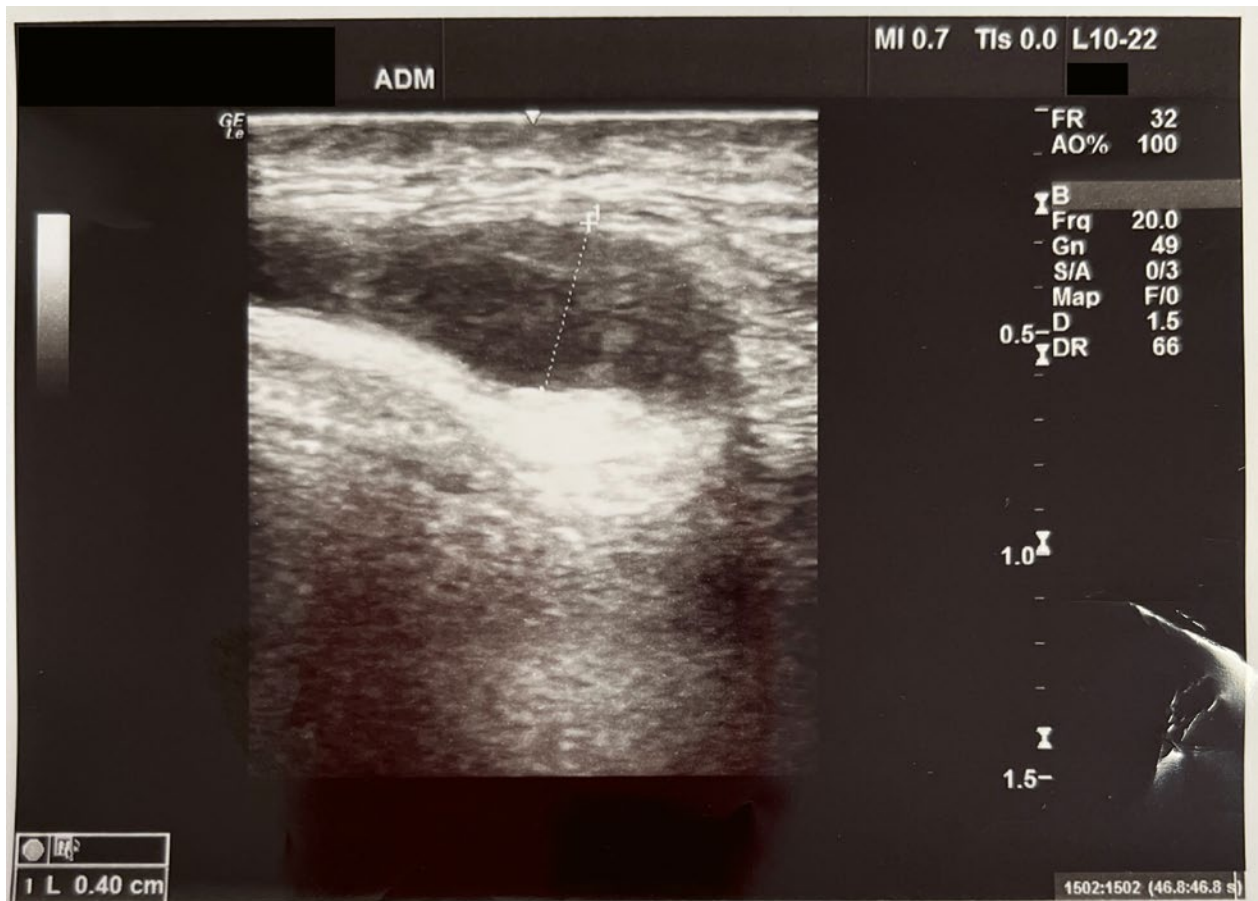


Figure 1. Superficial temporal artery aneurysm in ultrasound doppler exam

true, false (pseudoaneurysms), and dissecting aneurysms [6]. So far, STA aneurysms were mostly reported as post-traumatic aneurysms [7]. Only 5% of the cases are considered spontaneous aneurysms with congenital or atherosclerotic components accountable [8]. Due to STA location and the course through shallow subcutaneous connective tissues, it can be easily damaged while head injury, injections (e.g. botox), hair transplantation, or during plastic and reconstructive surgery in the temporal area [9–11]. Some studies have also been reported on STA aneurysms caused by mask-wearing during the COVID-19 pandemic. The STA aneurysms were located at the pressure point created by the rubber mask [12]. Articles commented on this issue suggest that any blunt or penetrating trauma to the temporal area may result in STA aneurysm development, due to partial transection or contusion of the arterial wall and its necrosis. Developed hematoma that further becomes organized, and its progressive dilatation explains the delayed appearance of the pulsating mass [13]. As reported, the delay in the appearance of pulsatile masses is from two to six weeks [14]. STA aneurysm should be taken into consideration while

painless, pulsatile mass in the temporal area is being examined [15]. In addition, headaches on the affected side, ear discomfort, dizziness, and neurological defects were also reported in some cases, however, most of the patients have had no symptoms [16]. Subcutaneous hematoma, dural arteriovenous fistula, inflammatory diseases such as giant cell arteritis, sebaceous cyst, dermoid cyst, neoplastic diseases such as facial nerve schwannoma or parotid gland tumor, meningocele, lymphadenopathy are the conditions that should be involved in the differential diagnosis of temporal mass [17]. Giant cell arteritis is the most common form of vasculitis observed in adults [18]. A careful diagnostic path should be taken because if the diagnosis is missed and no treatment is implied, it can lead to irreversible blindness [19]. The diagnosis of STA aneurysm can be made based on the patient's history and physical examination, and then confirmed with different imaging modalities. In most cases, proper physical examination is sufficient for diagnosis due to their vascular signs such as a pulsatile mass thrill. However, when the aneurysm is thrombosed the vascular signs might not be present [20]. In most cases, the diagnosis was confirmed by

ultrasound imaging and angio-computed tomography [21]. In some patients, magnetic resonance angiograms or catheter angiograms were performed [22]. All of the imaging modalities presented give a good STA aneurysm visualization and permit one to exclude other diagnoses. If the patient is not suspected of a vasculitis no biopsy of the temporal artery is required [23].

Although STA aneurysms have a relatively benign course, when compared with aneurysms of larger caliber arteries, they may lead to severe hemorrhage and be associated with a difference of bothersome symptoms, however cosmetic problems, pain, and discomfort are the main reason for the treatment [24]. The gold standard for STA aneurysm treatment is surgical resection [25]. The procedure was reported as safe and with a low grade of recurrence of the aneurysms or complications during the procedure which is shown in the literature [26]. After surgical treatment, mostly cosmetic problems were noticed, such as scars or skin defects [27]. Depending on the location of the STA aneurysm and its size some nerves can be damaged during the surgical procedure [28]. The frontozygomatic branch of the facial nerve and the auriculotemporal nerve are the most commonly injured nerves [29]. It may result in facial local peripheral paralysis or abnormal ear sensibility and parotid gland increased secretion [30].

Endovascular treatment might be considered in a selected group of patients when the aneurysm is located in a relatively inaccessible area for open surgical treatment, such as the part of the superficial temporal proximal artery. Proper dissection of these proximal lesions requires exposure of the parotid and facial nerve before ligation and resection of the aneurysm, which increases the rate of possible complications during surgery [31]. Coil embolization, as an alternative treatment method, is highly effective, leaving no facial scar, but thickening in the temporal area may still be palpable [32]. In a subacute aneurysm, lasting for more than three weeks, and a chronic aneurysm, lasting for more than three months, ultrasound-guided thrombin injection was reported as a safe and successful treatment. However, it can cause distal tissue necrosis [33].

Conclusions

STA aneurysm is a rare pathology, caused mainly by blunt trauma to the temporal area. Accurate examination with different imaging modalities, mostly ultrasound imaging, permits the proper diagnosis. Surgical ligation and resection of the aneurysm is the gold standard of treatment; however, endovascular treatment can be a safe and effective procedure in some cases.

Conflict of interest

None.

References

1. Gray H, Vandyke H. Anatomy descriptive and surgical. John W. Parker and Son, London 2011: 1825-1861.
2. Khandelwal P, Akkara F, Dhupar V, et al. Traumatic pseudoaneurysm of the superficial temporal artery. *Natl J Maxillofac Surg*. 2018; 9(1): 74-77, doi: [10.4103/njms.NJMS_64_15](https://doi.org/10.4103/njms.NJMS_64_15), indexed in Pubmed: [29937664](https://pubmed.ncbi.nlm.nih.gov/29937664/).
3. DeSanti L. Des tumeurs anev. de la région temporale. *Arch Gen Med*. 1884; 154: 543-679.
4. van Uden DJP, Truijers M, Schipper EE, et al. Superficial temporal artery aneurysm: Diagnosis and treatment options. *Head Neck*. 2013; 35(4): 608-614, doi: [10.1002/hed.21963](https://doi.org/10.1002/hed.21963), indexed in Pubmed: [22302542](https://pubmed.ncbi.nlm.nih.gov/22302542/).
5. D'Agostino RB, Vasan RS, Pencina MJ, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation*. 2008; 117(6): 743-753, doi: [10.1161/CIRCULATIONAHA.107.699579](https://doi.org/10.1161/CIRCULATIONAHA.107.699579), indexed in Pubmed: [18212285](https://pubmed.ncbi.nlm.nih.gov/18212285/).
6. Al-Sibassi AN, Ethunandan M. Superficial temporal artery aneurysm: case report and review of literature. *J Oral Maxillofac Surg*. 2020; 78(7): 1147-1150, doi: [10.1016/j.joms.2020.01.033](https://doi.org/10.1016/j.joms.2020.01.033), indexed in Pubmed: [32119828](https://pubmed.ncbi.nlm.nih.gov/32119828/).
7. Veen EJD, Poelmann FB, Ijma FFA. A traumatic superficial temporal artery aneurysm after a bicycle accident. *J Surg Case Rep*. 2014; 2014(10), doi: [10.1093/jscr/rju112](https://doi.org/10.1093/jscr/rju112), indexed in Pubmed: [25352578](https://pubmed.ncbi.nlm.nih.gov/25352578/).
8. Grasso RF, Quattrocchi CC, Crucitti P, et al. Superficial temporal artery pseudoaneurysm: a conservative approach in a critically ill patient. *Cardiovasc Intervent Radiol*. 2007; 30(2): 286-288, doi: [10.1007/s00270-005-0307-6](https://doi.org/10.1007/s00270-005-0307-6), indexed in Pubmed: [16988876](https://pubmed.ncbi.nlm.nih.gov/16988876/).
9. Prado A, Fuentes P, Guerra C, et al. Pseudoaneurysm of the frontal branch of the superficial temporal artery: an unusual complication after the injection of botox. *Plast Reconstr Surg*. 2007; 119(7): 2334-2335, doi: [10.1097/01.prs.0000261095.07321.09](https://doi.org/10.1097/01.prs.0000261095.07321.09), indexed in Pubmed: [17519763](https://pubmed.ncbi.nlm.nih.gov/17519763/).
10. Murphy JG, Mikhail W, Condon KC. Traumatic aneurysm of the superficial temporal artery, secondary to hair transplantation. *Ir Med J*. 1981; 74(5): 139, indexed in Pubmed: [7239862](https://pubmed.ncbi.nlm.nih.gov/7239862/).
11. Dinner MI, Hartwell SW, Magid AJ. Iatrogenic false aneurysm of the superficial temporal artery. Case report. *Plast Reconstr Surg*. 1977; 60(3): 457-460, indexed in Pubmed: [897006](https://pubmed.ncbi.nlm.nih.gov/897006/).
12. Kobayashi H, Morishita T, Yoshinaga S, et al. Enlargement of preexisting superficial temporal artery pseudo-aneurysm co-incident to mask wearing during the Covid-19 pandemic. *Interdiscip Neurosurg*. 2022; 27: 101396, doi: [10.1016/j.inat.2021.101396](https://doi.org/10.1016/j.inat.2021.101396), indexed in Pubmed: [34660208](https://pubmed.ncbi.nlm.nih.gov/34660208/).
13. Manz HJ, Gomes MN. Sports injury as cause of traumatic pseudoaneurysm of superficial temporal artery. *Arch Pathol Lab Med*. 1984; 108(10): 775-776, indexed in Pubmed: [6548117](https://pubmed.ncbi.nlm.nih.gov/6548117/).
14. Seferi A, Alimehmeti R, Pajaj E, et al. Superficial temporal artery pseudoaneurysm presenting as a growing, pulsatile, and tender mass. *Surg Neurol Int*. 2016; 7: 66, doi: [10.4103/2152-7806.184264](https://doi.org/10.4103/2152-7806.184264), indexed in Pubmed: [27413578](https://pubmed.ncbi.nlm.nih.gov/27413578/).
15. Derstine M, Doyle C. Traumatic pseudoaneurysm of the superficial temporal artery. *J Emerg Med*. 2021; 61(4):

- e96–e97, doi: [10.1016/j.jemermed.2021.07.007](https://doi.org/10.1016/j.jemermed.2021.07.007), indexed in Pubmed: [34364704](https://pubmed.ncbi.nlm.nih.gov/34364704/).
16. Peick AL, Nichols WK, Curtis JJ, et al. Aneurysms and pseudoaneurysms of the superficial temporal artery caused by trauma. *J Vasc Surg.* 1988; 8(5): 606–610, doi: [10.1067/mva.1988.avs0080606](https://doi.org/10.1067/mva.1988.avs0080606), indexed in Pubmed: [3054173](https://pubmed.ncbi.nlm.nih.gov/3054173/).
 17. Evans CC, Larson MJ, Eichhorn PJ, et al. Traumatic pseudoaneurysm of the superficial temporal artery: two cases and review of the literature. *J Am Acad Dermatol.* 2003; 49(5 Suppl): S286–S288, doi: [10.1016/s0190-9622\(03\)01487-7](https://doi.org/10.1016/s0190-9622(03)01487-7), indexed in Pubmed: [14576656](https://pubmed.ncbi.nlm.nih.gov/14576656/).
 18. Watts RA, Robson J. Introduction, epidemiology and classification of vasculitis. *Best Pract Res Clin Rheumatol.* 2018; 32(1): 3–20, doi: [10.1016/j.berh.2018.10.003](https://doi.org/10.1016/j.berh.2018.10.003), indexed in Pubmed: [30526896](https://pubmed.ncbi.nlm.nih.gov/30526896/).
 19. Saadoun D, Vautier M, Cacoub P. Medium- and Large-Vessel Vasculitis. *Circulation.* 2021; 143(3): 267–282, doi: [10.1161/CIRCULATIONAHA.120.046657](https://doi.org/10.1161/CIRCULATIONAHA.120.046657), indexed in Pubmed: [33464968](https://pubmed.ncbi.nlm.nih.gov/33464968/).
 20. Gressenberger P, Gütl K, Jud P. Post-traumatic aneurysms of the superficial temporal artery. *Dtsch Arztebl Int.* 2021; 118(5): 70, doi: [10.3238/arztbl.m2021.0101](https://doi.org/10.3238/arztbl.m2021.0101), indexed in Pubmed: [33785128](https://pubmed.ncbi.nlm.nih.gov/33785128/).
 21. 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(4): 346–348, doi: [10.1177/1538574413519712](https://doi.org/10.1177/1538574413519712), indexed in Pubmed: [24420058](https://pubmed.ncbi.nlm.nih.gov/24420058/).
 22. Johnston J, Sullivan CM. Superficial temporal artery pseudoaneurysm following facial trauma. *BMJ Case Rep.* 2018; 2018, doi: [10.1136/bcr-2018-224303](https://doi.org/10.1136/bcr-2018-224303), indexed in Pubmed: [29574436](https://pubmed.ncbi.nlm.nih.gov/29574436/).
 23. Keser G, Aksu K. Diagnosis and differential diagnosis of large-vessel vasculitides. *Rheumatol Int.* 2019; 39(2): 169–185, doi: [10.1007/s00296-018-4157-3](https://doi.org/10.1007/s00296-018-4157-3), indexed in Pubmed: [30221327](https://pubmed.ncbi.nlm.nih.gov/30221327/).
 24. Pipinos II, Dossa CD, Reddy DJ. Superficial temporal artery aneurysms. *J Vasc Surg.* 1998; 27(2): 374–377, doi: [10.1016/s0741-5214\(98\)70371-4](https://doi.org/10.1016/s0741-5214(98)70371-4), indexed in Pubmed: [9510295](https://pubmed.ncbi.nlm.nih.gov/9510295/).
 25. Kim E. True aneurysms of the superficial temporal artery: Diagnosis and treatment. *Clin Neurol Neurosurg.* 2014; 126: 64–68, doi: [10.1016/j.clineuro.2014.06.014](https://doi.org/10.1016/j.clineuro.2014.06.014), indexed in Pubmed: [25203714](https://pubmed.ncbi.nlm.nih.gov/25203714/).
 26. Stapleton CJ, Fusco MR, Thomas AJ, et al. Traumatic pseudoaneurysms of the superficial temporal artery: case series, anatomy, and multidisciplinary treatment considerations. *J Clin Neurosci.* 2014; 21(9): 1529–1532, doi: [10.1016/j.jocn.2014.02.004](https://doi.org/10.1016/j.jocn.2014.02.004), indexed in Pubmed: [24631326](https://pubmed.ncbi.nlm.nih.gov/24631326/).
 27. Rubio-Palau J, Ferrer-Fuertes A, García-Díez E, et al. Traumatic pseudoaneurysm of the superficial temporal artery: case report and review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2014; 117(2): e112–e114, doi: [10.1016/j.oooo.2013.08.020](https://doi.org/10.1016/j.oooo.2013.08.020), indexed in Pubmed: [24268124](https://pubmed.ncbi.nlm.nih.gov/24268124/).
 28. Grasso RF, Quattrocchi CC, Crucitti P, et al. Superficial temporal artery pseudoaneurysm: a conservative approach in a critically ill patient. *Cardiovasc Intervent Radiol.* 2007; 30(2): 286–288, doi: [10.1007/s00270-005-0307-6](https://doi.org/10.1007/s00270-005-0307-6), indexed in Pubmed: [16988876](https://pubmed.ncbi.nlm.nih.gov/16988876/).
 29. Matsumoto H, Yamaura I, Yoshida Y. Identity of growing pulsatile mass lesion of the scalp after blunt head injury: Case reports and literature review. *Trauma Case Rep.* 2018; 17: 43–47, doi: [10.1016/j.tcr.2018.09.010](https://doi.org/10.1016/j.tcr.2018.09.010), indexed in Pubmed: [30310847](https://pubmed.ncbi.nlm.nih.gov/30310847/).
 30. Cvetič VZ, Radmili O, Lukic B, et al. Endovascular treatment of traumatic pseudoaneurysm of the superficial temporal artery. *Vasc Endovascular Surg.* 2016; 50(3): 171–174, doi: [10.1177/1538574416637449](https://doi.org/10.1177/1538574416637449), indexed in Pubmed: [26979616](https://pubmed.ncbi.nlm.nih.gov/26979616/).
 31. Hong JT, Lee SW, Ihn YK, et al. Traumatic pseudoaneurysm of the superficial temporal artery treated by endovascular coil embolization. *Surg Neurol.* 2006; 66(1): 86–88, doi: [10.1016/j.surneu.2005.10.022](https://doi.org/10.1016/j.surneu.2005.10.022), indexed in Pubmed: [16793454](https://pubmed.ncbi.nlm.nih.gov/16793454/).
 32. Kang I, Mo YW, Jung GY, et al. Pseudoaneurysm of the superficial temporal artery after blunt trauma: case report and literature review. *Arch Craniofac Surg.* 2022; 23(3): 130–133, doi: [10.7181/acfs.2022.00178](https://doi.org/10.7181/acfs.2022.00178), indexed in Pubmed: [35811345](https://pubmed.ncbi.nlm.nih.gov/35811345/).
 33. Isaacson G, Kochan PS, Kochan JP. Pseudoaneurysms of the superficial temporal artery: treatment options. *Laryngoscope.* 2004; 114(6): 1000–1004, doi: [10.1097/00005537-200406000-00008](https://doi.org/10.1097/00005537-200406000-00008), indexed in Pubmed: [15179202](https://pubmed.ncbi.nlm.nih.gov/15179202/).