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Research Article

Palpable Pulsatile Mass of the Forehead: A Case Series of Superficial Temporal Artery Pseudoaneurysms

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Abstract

Background: Pseudoaneurysms of the Superficial Temporal Artery (STA) are rare and originate in most cases posttraumatically, often in young to middle-aged men. A palpable pulsatile mass at the temporal region is present, and pulsations can be eliminated or reduced by proximal compression of the STA. Diagnosis is often confirmed by duplex-sonography.

Methods: Between 2006 and 2016, five patients with a palpable pulsatile mass of the forehead presented at our institution. Case history, clinical, technical and histopathological patient data and corresponding treatment is presented and compared with current literature on pseudoaneurysms of the STA.

Results: In four cases the pulsatile mass was caused by a trauma, while in one case the mass arised spontaneously. Clinical examination revealed a palpable pulsatile mass on the forehead. The pulsatile quality of all tumors disappeared by unilateral compression of the STA. Duplex-sonography revealed a traumatic pseudoaneurysm in four cases and an arteriovenous (AV) malformation in one case. A resection of the pseudoaneurysms and AV malformation was performed. Histopathological examination confirmed the clinical diagnosis.

Conclusion: Despite recent advances in endovascular approaches, surgical resection remains the treatment of choice. Our results are concordant with current literature regarding pseudoaneurysms of the STA.

Keywords: Pseudoaneurysm; Superficial temporal artery; Treatment

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Abbreviations

STA - Superficial Temporal Artery

AV - Arteriovenous

APE - Anatomopathological Examination

Introduction

Pseudoaneurysms of the STA are rare. Since the first description by Thomas Bartholin in 1740, only 400 cases of STA-pseudoaneurysms, isolated or associated with arteriovenous fistulas, are described in scientific literature [1]. The most common etiology of STA-pseudoaneurysms is blunt trauma, accounting for 75% to 95% of cases. Penetrating injury, iatrogenic injury after surgical procedures involving face or head and spontaneous pseudoaneurysms due to atheromatosis or a congenital defect of the arterial wall are other described causes [2,3].

Although lesions of the STA are rare, the STA is unprotected over a long distance. In most case reports the superficial anterior branch is affected. Between the occipitofrontalis muscle and the temporalis muscle, the anterior branch of the STA is most vulnerable to compression against the rigid scull [2,4] (Figure 1). Male and elderly patients with atherosclerotic and/or calcified arteries are especially vulnerable to this type of aneurysm. Men are also more likely to be exposed to trauma [5].

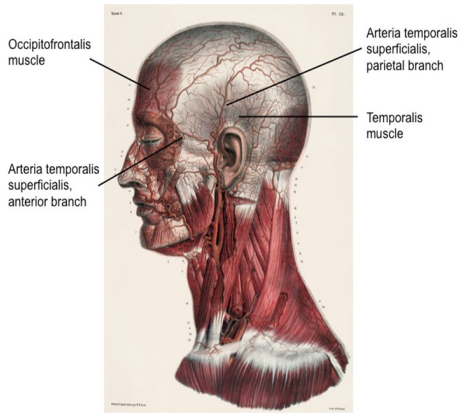

Figure 1: Anatomy of the ATS in relation to occipitofrontalis and temporalis muscle. Between the occipitofrontalis muscle and temporalis muscle the anterior branch of the STA is most vulnerable to compression against the rigid scull [1,4].

Most aneurysms of the STA are pseudoaneurysms: a trauma to the STA leads to partial transsection and/or contusion of a segment of the artery and causes the lumen of the artery no longer being surrounded by the three layers of the arterial wall [2,4] (Figure 2). This is in contrast to a "real" aneurysm, where the three layers of the arterial wall remain present. Often young patients have a compressible pulsatile mass of 1-1.5 cm approximately two to six weeks after traumatic injury of the temporal region. Additional symptoms can be throbbing headache, auditorial and visual disturbances, vertigo and rarely facial

nerve paresis. The pulsations of the mass can be eliminated or reduced by proximal compression of the STA. A systolic murmur and a palpable 'thrill' can be present [2,4].

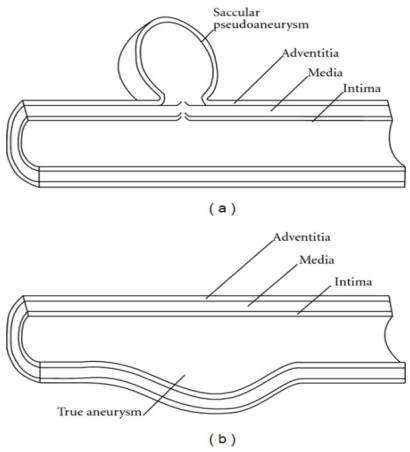

Figure 2: Schematic demonstration of anatomy of pseudoaneurysm (a) true aneurysm (b) In true aneurysm all layers of the vessel wall are involved [6]

In the differential diagnosis a lipoma, hemangioma, AV malformation, meningocele, angiofibroma, and supra-orbital neurinoma should be kept in mind. Nevertheless, the correct diagnosis can often be made by detailed history and accurate clinical examination [4]. Diagnosis is frequently confirmed by duplex-sonography and sometimes by classical or CT-angiography [2,7].

Material and Methods

We retrospectively created a database of patients on whom an operation of the STA was performed, excluding STA biopsies. Between 2006 and 2016, five patients at our institution have undergone surgery of the STA for a palpable pulsatile mass of the forehead. We provided demographic, histologic, clinical and therapeutic data of these five patients. Finally, we compared our results with current literature and provided a review on pseudoaneurysms of the STA and its treatment. Verbal informed consent for publication of patient information and images was provided by our patients.

Results

History, clinical examination and duplex-sonography revealed a traumatic pseudoaneurysm of the STA in four cases, and a subcutaneous AV malformation of the STA in one case. In all 5 cases surgical resection with ligation of the proximal and the distal vessels of the pseudoaneurysms and AV malformation was performed (Table 1).

Case 1

A 45-year-old male patient presented with pain at the left temporal region. The patient had no pertinant medical history. Four weeks before he was involved in a road accident. He suffered a fracture of the left orbita and a fracture of the right fifth rib. The fracture of the left orbita was treated conservatively. Clinical examination showed a sensitive temporal region and a small painful pulsatile tumor was observed (Figure 3A). Duplex-sonography of the pulsatile tumor was performed, which confirmed the diagnosis of a pseudoaneurysm of the STA (Figure 3B). The pseudoaneurysm had an average diameter of 0.43 cm, compared to the expected diameter of the STA of approximately 0.10 cm.

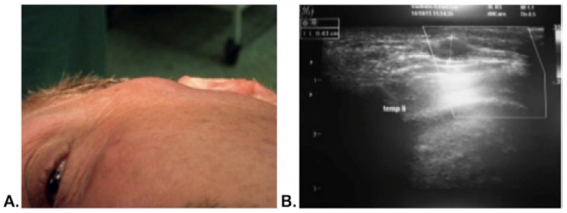

Figure 3A: Pulsatile tumor at the left temporal region. **B:** Duplex-sonography of the STA pseudoaneurysm with a diameter of 0.43 cm.

The left temporal region was anesthetized with lidocaine (Xylocaine) 2%. Through a pre-auricular longitudinal incision the pseudoaneurysm was subsequently dissected and visualized. Next, the proximal and distal temporal artery was ligated after which the pseudoaneurysm was completely resected.

The diagnosis of a posttraumatically pseudoaneurysm was histopathologically confirmed. An arterial vessel with an aneurysmatic dilatation and a prominent intima was seen microscopically. In addition, regional fibrosis was observed already showing signs of organization. Within this fibrous plaque inflammatory cells, including mononuclear and eosinophilic cells, were found. Both the tunica elastica and media were fragmented. No smooth muscle fibers were found in the pseudoaneurysm. Histopathologically there were no arguments for arthritis. The patient recovered uneventfully [8].

Case 2

An 18-year-old male patient presented with a painful progressive swelling at the right temporal region after a motorcycle accident 6 weeks before. During the accident, he fell on the right temporal region while wearing a helmet which initially only caused a small hematoma and headache. As the hematoma resolved, the headache and swelling at the right temporal region progressively increased. Clinical examination showed a sensitive and painful pulsatile swelling at the right temporal region with a maximal diameter of about 1 cm.

Case	Sex	Age (years)	Origin	Treatment	APE	Time to pseudoaneurysm after trauma
Case 1	Male	45	Traumatic	Surgical resection	Pseudoaneurysm (Ø: 0.43 cm)	4 weeks
Case 2	Male	18	Traumatic	Surgical resection	Pseudoaneurysm (Ø: 1.10 cm)	6 weeks
Case 3	Male	48	Atraumatic	Surgical resection	AV malformation (Ø: 2.26 cm)	-
Case 4	Female	64	Traumatic	Surgical resection	Pseudoaneurysm (Ø: 0.92 cm)	1 year
Case 5	Male	24	Traumatic	Surgical resection	Pseudoaneurysm (Ø: 0.80 cm)	2 weeks

Table 1: Case report summary.

APE: Anatomo Pathological Examination, Ø: diameter

Complete resection of the pulsatile protuberance with ligation of the proximal and distal STA was performed under local anesthesia.

The diagnosis of a posttraumatically pseudoaneurysm of 1.10 cm was histopathologically confirmed.

Case 3

A 48-year-old male patient presented with a pulsatile tumor at the left frontoparietal region which caused headache, especially during warm weather. The patient had no pertinent medical history. Clinical examination showed a pulsatile tumor at the left frontoparietal region. By compression of the left STA the pulsatile quality of the tumor disappeared. By compression of the right STA the pulsations remained present.

Duplex-sonography showed a very high systolic and diastolic flow of the left STA compared to the right STA. Angio-MRI confirmed a subcutaneous ateriovenous (AV) malformation at the left frontoparietal region with a maximal diameter of 2.26 cm. The AV malformation showed a slightly hypertrophic and tortuous parietal branch of the left STA (Figure 4). There was no connection with the intracranial circulation.

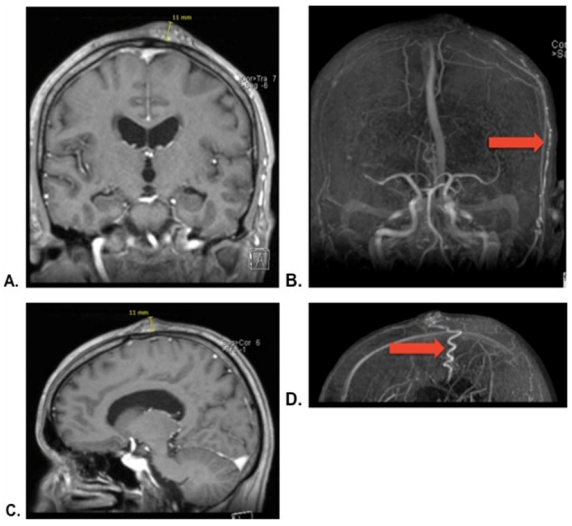

Figure 4A: AV malformation on Angio-MRI (coronal plane). **B:** AV malformation on Angio-MRI (coronal plane) with a slightly hypertrophic and tortuous left STA (red arrow). **C:** AV malformation on Angio-MRI (sagittal plane). **D:** AV malformation on Angio-MRI (sagittal plane) with a slightly hypertrophic and tortuous left STA (red arrow).

The afferent left STA proximal to the AV malformation was ligated under general anesthesia. Subsequently the AV malformation was completely resected. The diagnosis of an AV malformation was confirmed histopathologically. Recovery was uneventful.

Case 4

A 64-year-old female patient presented with a painful progressive swelling at the left temporal region. One year before the patient had fallen on her head and the head wound was sutured by the general practitioner. Clinical examination showed a painful pulsatile swelling at the left temporal region under the year-old scar of the head wound. The scar was re-incised under general anesthesia. The pseudoaneurysm was visualised and the proximal and distal STA ligated. Finally, the pseudoaneurysm was completely resected.

Case 5

A 24-year-old male patient presented with a pulsatile tumor at the right anterior temporal region 2 weeks after a traumatic head to head injury during a football match. Initially a large hematoma was present which gradually resolved except for a small swelling. Clinical examination showed a painful pulsatile swelling at the right anterior temporal region. By proximal compression the pulsations diminished, in contrast to distal compression wherein the pulsations remained present. Duplex-sonography confirmed the diagnosis of a posttraumatic pseudoaneurysm of the anterior branch of the STA with an average diameter of 0.80 cm. Surgical resection under local anesthesia (lidocaine (Xylocaine) 2%) was performed with ligation of the proximal and distal anterior branch of the STA.

Histopathological diagnosis of a posttraumatic pseudoaneurysm of 0.80 cm was confirmed. The tunica media and lamina elastic interna of the tunica intima suddenly disappeared. In other words, a fragmentation and loss of these inner layers was present, concordant with a pseudoaneurysm. The remaining lumen of the arterial vessel consisted of adventitia filled with thrombus (Figure 5).

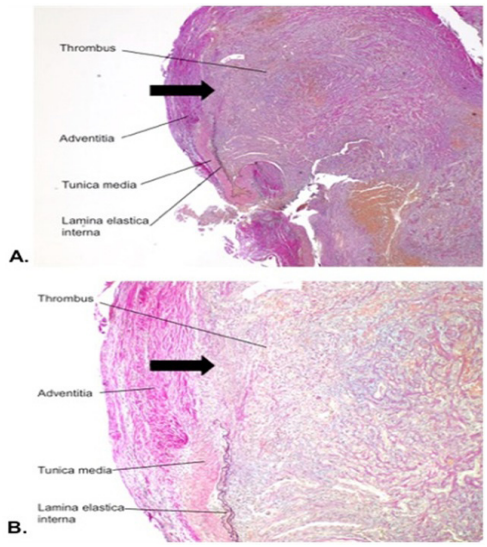

Figure 5A: Transverse section of the pseudoaneurysm (4x magnification). **B:** Transverse section of the pseudoaneurysm (10x magnification). Black arrow: fragmentation and loss of the tunica media and lamina elastic interna of the tunica intima. The lumen of the pseudoaneurysm consisted of adventitia filled with thrombus.

Discussion

STA-pseudoaneurysms require adequate treatment due to the risk of spontaneous rupture, pain and potential esthetic reasons [4, 8]. However, only three case reports with spontaneous rupture of the STA-pseuodoaneurysm have been described in literature. Surgical resection under general or local anesthesia is considered the standard therapy [1,2,4,9]. The pseudoaneurysm is localized with subsequently ligation of the proximal and distal STA; next, the pseudoaneurysm is completely resected [10].

Nonsurgical methods include observation and application of continuous pressure over the aneurysm with eventual thrombosis. These methods can be effective in cases of small STA-pseudoaneurysms sometimes associated with arteriovenous fistulas [1,5]. Others

suggest that conservative treatment is not appropriate due to the risk of rupture, bleeding and thromboembolism [5,11].

Nowadays endovasculair approaches for treatment of vascular malformations gain popularity. Endovascular treatment using a microcoil or vascular plug may be used as a therapeutic tool when the STA-pseudoaneurysm has a relatively inaccessible localization, such as the proximal STA [1]. In these cases, adequate dissection of the parotid gland and the facial nerve before ligation and resection of the aneurysm may pose a greater threat than the aneurysm itself, justifying endovascular embolization as the first choice of treatment [1]. Compared to surgical resection, coil embolization requires a longer peroperative time but has a shorter recovery time and avoids/minimizes the surgical scar [1,9]. Nikolakopoulos et al., suggest that an endovascular approach should only be performed when angiography is mandatory for diagnosis [5].

Furthermore, percutaneous ultrasound-guided injection of thrombin can be used on chronic or subacute pseudoaneurysms with a diameter of 4 cm or less [5]. In contrast to coil-embolisation, local injection of thrombin has a higher incidence of complications such as allergic reactions, risk for recanalisation and distal ischemia [5,9]. Other disadvantages are the lag time for resolution of the thrombosed pseudoaneurysm and the need for reexamination with duplex ultrasound to ensure no recanalization of the pseudoaneurysm has occurred [5].

The diagnosis is confirmed histopathologically with loss of normal arterial architecture and an arterial wall that mainly consists of fibrous tissue and organized thrombus.

Conclusion

Our results are concordant with the current literature regarding pseudoaneurysms of the STA. 75% of our patients with a STA-pseudoaneurysms are male with a median age of 35 years at diagnosis. For patients with a traumatic event preceding the development of a pseudoaneurysm the median delay was 3 weeks, in contrast to the AV malformation which arised spontaneously. All our patients presented with a pulsatile swelling at clinical examination. Correct diagnosis could be made by detailed history and clinical examination, and confirmed by duplex-sonography in four cases and angio-MRI in one case. In all five cases, surgical resection with ligation of the proximal and the distal vessels of the pseudoaneurysm and the AV malformation was performed. Histopathologically, the diagnosis of a traumatic pseudoaneurysm of the STA was confirmed in four cases, with a median diameter of 0.86 cm, and an AV malformation of the STA in the remaining case.

STA-pseudoaneurysms are rare and develop in most cases posttraumatically. Despite recent advances in endovascular approaches, surgical resection remains the treatment of choice.

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