Case report

Traumatic pseudoaneurysm of the superficial temporal artery: two cases

CHRISTINE BUCHANAN WELLER, DO
CHRISTOPHER REEDER, DO

Pseudoaneurysms of the superficial temporal artery are a rare and potentially critical cause of facial masses. Most pseudoaneurysms form as a result of blunt trauma and present as painless, pulsatile tumors that may be associated with neurologic findings and enlarged size. Without careful evaluation in the primary care setting, pseudoaneurysms can be easily misdiagnosed and improperly managed. They can, however, be accurately diagnosed through physical examination alone and subsequently treated with surgical ligation. The authors present two cases of traumatic pseudoaneurysms of the superficial temporal artery caused by blunt injury and discuss pertinent diagnosis and treatment options, as well as provide a brief review of the anatomy and histopathology of pseudoaneurysms.

(Key words: traumatic pseudoaneurysm, superficial temporal artery)

Pseudoaneurysm, or false aneurysm, presents rarely as a cause of facial tumor. However, the condition should be considered by physicians as a cause of facial masses in patients with recent traumatic head injuries. Primary care physicians can—by taking a good history and using careful palpation, auscultation, and ancillary testing—easily differentiate pseudoaneurysms from cysts, dermal lesions, and various aneurysms. Such care will help to ensure that patients are properly treated and appropriately referred. Proper referral is a key because surgical resection of a pseudoaneurysm is necessary to avoid complications such as hemorrhage, enlargement, and compression of nerves and vessels.

Approximately 337 pseudoaneurysms of the superficial temporal artery (STA) have been reported in the literature since 1644.1 We present two cases of traumatic pseudoaneurysm arising from the STA that were referred by family practitioners during a 1-month period, which suggests that this condition may be more common than reported. We also review the anatomy of the STA and the mechanisms of injury; pathophysiology, pertinent historical, and physical findings; differential diagnosis and other diagnostic considerations; surgical management; and complications of STA pseudoaneurysms.

Report of case

Case 1

A 23-year-old white man who was referred by an orthopedic family physician presented with a lump in the right temporal region. He reported being pushed into a post by another player during a basketball game 2 months earlier. He suffered no loss of consciousness or laceration at the time of injury. He denied a history of bleeding dyscrasias but reported a previous left craniotomy for a trauma-induced subdural hematoma as a child. The initial swelling he had after the basketball injury subsided within 1 day, but a new, well-defined mass became palpable 3 to 4 days later. Approximately 1 week later, the patient noted a pulse within the mass.

On physical examination, a 1.5-cm pulsatile swollen bump was palpated on the right temple (Figure 1). The mass was easily compressible with digital pressure, but no bruit was appreciable on auscultation. Proximal compression of the temporal artery eliminated the pulsation of the mass. Cranial nerve examination demonstrated no deficits. Computed tomography (CT) of the head revealed neither acute abnormality nor extraaxial mass.

Sedation and a local anesthetic provided adequate anesthesia for surgical exploration, which revealed two branches supplying the proximal pseudoaneurysm. On dissection and ligation of all supplying branches, a 1.3 × 1.1-cm mass was resected (Figure 2). Histologic evaluation confirmed the presence of a pseudoaneurysm. The patient recovered uneventfully.

Case 2

A 7-year-old white girl referred by her family physician presented with a mass on her right forehead. Her parents stated that 4 months earlier, the child lost her balance while playing and bumped her head on the corner of a wall. The patient denied loss of consciousness at the time of the injury. A few days later, a mass of fluctuating size formed at the area of injury. The presence of a pulsatile quality was noted by the parents at that time.

On physical examination, a 0.9-cm pulsatile mass was noted along the hairline on the right side of the forehead (Figure 3). The lesion flattened with pressure, and its pulsatility diminished after proximal artery compression. No bruit was noted, and cranial nerve examination revealed no abnormalities. Because of the location and presentation of the mass, and because of the findings during physical examination, a pseudoaneurysm was highly suspected. Therefore, no skull x-ray, echo-Doppler, angiogram, or CT scan was ordered. Surgical exploration...
revealed a 0.6 × 0.7-cm mass in the STA, which was later confirmed histologically to be a pseudoaneurysm (Figure 4). The patient recovered without complications.

Comments

Anatomy
The external carotid artery splits to form three anterior, three posterior, and two terminal branches. The terminal branches (superficial temporal and internal maxillary) and one of the anterior branches (facial artery) are the vessels most susceptible to injury.1 Although generally protected from trauma by surrounding soft tissue, the branches of the STA sometimes approach the skin’s surface in bony facial regions. At such locations, the branches are susceptible to injury by external forces.1,2 The vessel first winds posterior to the temporal mandibular joint (TMJ), making it vulnerable to injury during surgical exploration of the TMJ.1-3 As the artery exits the parotid gland, it superficially crosses the bony zygomatic arch, dives deep under the thick, sheltering temporal skin, then emerges again at the superior temporal line of the skull where it is reexposed to potential trauma, such as in the cases described previously.1,2

Histopathology

An aneurysm may be classified as true, false, or dissecting. True aneurysms involve three intact arterial wall layers and account for most aneurysms.2 One percent of aneurysms are pseudoaneurysms,2 which develop as a result of complete or incomplete disruption of arterial intima, possibly due to trauma-induced necrosis of a section of the arterial wall.1-4 This disruption allows for extravasation and the formation of a blood-filled balloon that is encapsulated only by arterial adventitia or subcutaneous tissue. A fibrous pseudocapsule consisting of mucopolysaccharide-rich connective tissue replaces the arterial wall1,3 as the hematoma undergoes cavitation due to infiltrating leukocytes.1 As this tissue reorganizes, the hematoma can recanalize because of lysis and destruction of the luminal thrombus and extramural clot. This, in turn, allows substantial flow through the damaged artery and, thereby, expansion of the artery.3,4

Mechanism of injury
Depending on the location and depth of the artery, pseudoaneurysms can occur from either blunt or penetrating injury.5 Literature dating back to 1644 has cited several mechanisms of injury including “pecks from a rooster, motor and industrial accidents, knife and bullet wounds, injuries in warfare, and fist fights.” Other causes that have been noted include blows by sticks, canes, and balls; injuries from fencing and saber duels, arteriotomies; falls; hits by ice hockey pucks; and even kicks by horses.4 In addition, iatrogenic trauma secondary to surgeries,1,3,4 punch hair grafting,3 chiropractic manipulation, dental surgery (including circumferential mandibular wiring), mentoplasty, and internal carotid artery ligation have been implicated as potential causes of pseudoaneurysm.1,3,4,6 Spontaneous pseudoaneurysm formation uncommonly manifests as the result of congenital defects or atherosclerotic disease.6 Most traumatic pseudoaneurysms of the STA, including the two cases reported here, occur as a result of high-energy blunt trauma,2,3,7,8 though some sources claim that penetrating wounds more frequently cause pseudoaneurysms.3,5

History and physical examination findings
In the primary care setting, a brief examination of a patient with a pseudoaneurysm may yield a presumptive diagno-

Figure 1. A 1.5-cm pulsatile bump on the head of a patient with pseudoaneurysm resulting from an injury sustained during a basketball game.

Figure 2. Dissection and ligation of all supplying branches for a proximal pseudoaneurysm, resulting in resection of a 1.3 × 1.1-cm mass.
sis of an abscess or cyst. However, a detailed history and careful palpation can narrow the differential diagnosis considerably.

Following trauma, a pseudoaneurysm may become obvious in as few as 2 to 6 weeks after bruising or hematoma formation is noted. Some sources claim that detection can occur 2 to 4 months—or even years—after an injury. Superficial pseudoaneurysms may present asymptptomatically or as nontender, expanding, pulsatile masses found along the course of an artery, as in the cases described previously. Patients may report associated headache, ear discomfort, visual disturbance, dizziness, hemorrhage, unacceptable cosmetics, and neurologic deficit. A thrill or bruit may or may not be appreciable. Compression of the proximal artery should eliminate the pulse and diminish the size of the mass. Cranial nerve palsies, paresthesias, and vascular compromise have been reported and may be evident if the pseudoaneurysm leaks or ruptures. The resultant mass may compress nearby structures, or a luminal thrombus could theoretically embolize to a main vessel, although the latter event is unlikely.

**Differential diagnosis**

Temporal artery pseudoaneurysm may mimic epidermal inclusion cysts, lipomas, hematomas, abscesses, sebaceous cysts, aneurysms, arteriovenous fistulas of the middle meningeal artery, vascular and soft tissue tumors, lymphadenopathy, meningocele, and encephalocele. In case 1, the referring physician thought the mass to be a cyst and attempted aspiration without success. Fortunately, this procedure did not cause progression or rupture of the pseudoaneurysm prior to plastic surgery referral.

**Diagnostic evaluation**

Skull x-rays can be used in evaluating fracture-induced pseudoaneurysms, but they are poorly sensitive. Echo-Doppler may reveal a waveform of turbulent flow and high peripheral vascular resistance, which would eliminate consideration of an arteriovenous fistula. Contrast computed tomography or magnetic resonance imaging may find extracranial masses and intracranial pathology but both proved nondiagnostic in case 1. Arteriography is the diagnostic study of choice, but selective angiography with subtraction technique may better demarcate small aneurysms. In literature reviews, angiography was inconsistently used as a surgical indicator but was often used to aid in the diagnosis of complicated cases. However, the most cost-effective diagnostic method remains a thorough history and physical examination, as in case 2. Thus, diagnostic testing is necessary only if the etiologic factor is unclear.

**Treatment options**

Several therapeutic modalities have been reported in the literature. One case in 1861 described resolution of the pseudoaneurysm by compression while a student was studying, thereby causing the aneurysmal sac to consolidate. However, conservative measures are not recommended as the mass may continue to cause discomfort, headaches, disfigurement, and potentially lethal hemorrhage. Although some sources claim that temporal artery pseudoaneurysms resolve most commonly done for cosmetic reasons, the potential for hemorrhage or enlargement necessitates removal of the lesion and, thus, the procedure is considered reconstructive.

Definitive treatment of pseudoaneurysms...
Pseudoaneurysms have changed little since the second century when Antyllus ligated the artery immediately above and below the pseudoaneurysm with subsequent excision of the lesion. Winslow also reported ligation of the common carotid artery in 1935, boasting a cure rate of 87%. Surgical extirpation remains the treatment of choice. Occasionally, the pseudoaneurysm will occur at the bifurcation between two or more smaller branches, as in case 1. The astute surgeon should be cautious in identifying all vessels supplying the pseudoaneurysm to avoid unnecessary bleeding. In addition, end-to-end anastomosis or arterial grafting is occasionally necessary to restore blood flow to critical dependent structures. The external carotid circulation rarely requires this treatment.

Embolization of deeper pseudoaneurysms may also prove an effective alternative to surgery. A 1-mm coil can be positioned at the bifurcation of the anterior branch of the STA. The literature also reports use of isobutyl-2-cyanocrylate plus isophendylate (Pantopaque), polyvinyl alcohol, or an absorbable gelatin sponge in embolization. Another method that has been successful is superselective embolization of the proximal STA, distal external carotid artery, and proximal internal maxillary artery. Embolization may prove to be a promising approach to the treatment of vascular abnormalities.

Complications
Surgical correction of a pseudoaneurysm should be performed expeditiously after diagnosis because of the possibility of aneurysmal expansion and rupture. Additionally, as the mass enlarges it may compress adjacent arteries and nerves, causing numbness and paresthesia. Small thrombi within the pseudoaneurysm may embolize distally to cause similar symptoms. Mistaking an STA pseudoaneurysm for a tumor or abscess can lead to in-office biopsy or incision, which may cause massive bleeding. A another complication of an STA pseudoaneurysm is that it may be cosmetically unacceptable, regardless of its size. However, resection is considered reconstructive (that is, correction of an abnormality), not cosmetic (surgery of a completely normal structure).

Comments
The primary care physician should consider the possibility of a pseudoaneurysm in any patient presenting with a mass after head trauma. Superficial pseudoaneurysms, though rare, can enlarge and rupture, causing significant hemorrhage. Thus, patients with pseudoaneurysms should be identified and referred to a specialist in a timely fashion. Osteopathic physicians are highly trained in palpatory diagnostics, which often aids in differentiating a pseudoaneurysm from other causes of facial masses. A thorough history and physical examination should suffice for diagnosis when a pseudoaneurysm is suspected, making expensive diagnostic testing unnecessary in most cases. Surgical resection of an STA pseudoaneurysm via proximal and distal artery ligation remains the treatment of choice.

References