Enlarging traumatic superficial temporal artery pseudoaneurysm from a lacrosse ball injury: illustrative case

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BACKGROUND The development of a mobile, growing, pulsatile mass after blunt head trauma to the forehead area, resulting in a superficial temporal artery pseudoaneurysm, is a very rare outcome. Most pseudoaneurysms are diagnosed with ultrasound, computed tomography (CT), and/or magnetic resonance imaging and treated via resection or, occasionally, embolization.

OBSERVATIONS The authors describe a case of a young male lacrosse player who presented with a bulging, partially pulsatile mass in the right forehead region 2 months after trauma from a high-velocity ball striking his head while helmeted. The authors reviewed 12 patients in the literature and describe each patient’s epidemiological features, nature of the trauma, and onset of the lesion after the trauma, as well as the diagnostic methods and treatments for each case.

LESSONS Overall, CT and ultrasound appear to be the easiest and most used methods of diagnosis, and resection under general anesthesia is the most common treatment method.

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KEYWORDS superficial temporal artery pseudoaneurysm; trauma; pulsatile; painless

The superficial temporal artery (STA) is a large artery that arises from the external carotid artery and supplies areas of the temple and scalp through the middle temporal artery, transverse facial artery, and the anterior auricular, frontal, and parietal branches of the STA.1 It is of clinical significance for 2 reasons: (1) it is usually the affected artery in giant cell arteritis and is frequently biopsied for testing and (2) because of its superficial positioning and anatomical course under the temporals muscle, it is vulnerable to injury following blunt head trauma.2 Rarely, blunt head trauma of the STA can result in the formation of a STA pseudoaneurysm (STAP), which generally presents as a bulging, painless, pulsatile mass 2–6 weeks after the initial trauma.3 Here, we present a case of an STAP in a 17-year-old male following a sports-related injury despite being helmeted.

Illustrative Case

A previously healthy 17-year-old male, who had sustained a high-velocity lacrosse ball impact to his helmet while playing lacrosse, presented with increasing swelling to his right forehead region over 2 months that was soft and partially pulsatile (Fig. 1). Since the forehead swelling was increasing, a contrast head computed tomography (CT) (Fig. 2) and head ultrasound (Fig. 3) were obtained, which revealed a vascular lesion in the form of a pseudoaneurysm. The patient subsequently had a right frontal-temporal, behind-the-hairline incision for gross-total resection of the lesion. The gross pathological evaluation revealed an irregular portion of rubbery pink-tan tissue, measuring 2.0 × 0.8 × 0.7 cm with a peripheral 1.2 × 0.7 × 0.6-cm, white-red, nodular lesion with a hemorrhagic surface, consistent with a scalp pseudoaneurysm (Fig. 4). The pathology report also confirmed this diagnosis. He did well postoperatively with resolution of the forehead swelling and, at the 1-year follow-up, had no further concerns.

Patient Informed Consent

The necessary patient informed consent was obtained in this study.
Discussion

Incidence

Although a very rare phenomenon, approximately 75%–95% of STAPs are of traumatic origin, while the rest are secondary to atherosclerosis or connective tissue disorders.2,4 A review of our patient’s history revealed the occurrence of a lacrosse injury several weeks before diagnosis, despite being helmeted at the time of injury. Important, and more common, differential diagnoses to consider include hematomas, lipomas, abscesses, and epidermoid cysts, whereas arteriovenous malformations and fistulas are uncommon.5

Treatment

Early confirmation of the diagnosis is essential because of the elevated risk of skin ulceration and bleeding, so ultrasound or CT is optimal for rapid diagnosis. The gold standard of treatment for this
pathology is surgical ligation and excision, although there have been some reports of successful treatment via endovascular embolization.\(^4\),\(^6\),\(^7\) It is important to note that the frontal branch of the STA communicates with the ophthalmic artery through the supraorbital/supratrochlear arteries. Therefore, emboli can pass through to the ophthalmic artery from the frontal branch of the STA when the vessel is being endovascularly cannulated. To reduce the risk of embolization with subsequent ocular damage, surgeons can excise the STAP instead.\(^3\) Surgical excision additionally poses a risk of facial nerve injury damage, and embolization has a risk of ischemic stroke. Non-surgical methods have been described, but the occurrence of resolution versus recurrence is not described frequently enough to validate it as a potential treatment option.\(^8\)

**Observations**

Upon review of 12 patients with STAP (Table 1), we noted that 5 of them had traumas associated with falls and the others had blunt traumas of various etiologies. Most were diagnosed by ultrasound and accompanied by CT, CT angiography, magnetic resonance imaging, and/or magnetic resonance angiography. All but 3 patients were treated by resection under general anesthesia; one was treated by resection under local anesthesia, the lesion in one spontaneously resolved with continuous pressure dressing after 5 weeks, and one was treated with vascular embolization. Although there are not many cases that describe embolization techniques for the resolution of this specific injury, it appears to be a viable tool for treatment that should be studied further as it is minimally invasive.

**Lessons**

Although rare sequelae of blunt traumatic injury to the head, STAPs should be considered when a bulging, painless, pulsatile mass arises in patients after injury, even when helmeted. The most common and rapid diagnostic tools, ultrasound and CT, are sensitive and specific for pseudoaneurysms, and early diagnosis can help prevent future complications. The standard resection under general anesthesia method of treatment is still appropriate and the gold-standard, but less invasive, techniques such as embolization should be further studied.

**FIG. 4. A:** Resected STAP measuring approximately 2.5 × 1.2 cm. Microscopic examination of the 1-piece specimen revealed an irregular portion of rubbery pink-tan tissue measuring 2.0 × 0.8 × 0.7 cm. Bisection of the specimen revealed a peripheral, 1.2 × 0.7 × 0.6-cm white-red nodular lesion with a hemorrhagic cut surface. The nodular lesion occupied 50% of the cut surfaces, with the remaining cut surface being yellow-tan, resembling fibroadipose tissue. **B:** Microscopic examination of the artery demonstrates disruption of the vascular wall (left lower corner) with a locally contained hematoma expanding the adjacent tissue. Hematoxylin and eosin, low-power magnification.

**TABLE 1. Literature review of other patients with STAP**

<table>
<thead>
<tr>
<th>Authors &amp; Year</th>
<th>Age (yrs)/Sex</th>
<th>Trauma Type</th>
<th>Lesion Onset after Trauma</th>
<th>Diagnosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veen et al., 2014(^2)</td>
<td>50/M</td>
<td>Bicycle, helmeted</td>
<td>6 wks</td>
<td>US</td>
<td>Resection under general anesthesia</td>
</tr>
<tr>
<td>Sommer et al., 2020(^3)</td>
<td>13/M</td>
<td>GLF</td>
<td>Several wks (~ 2)</td>
<td>US, MRI</td>
<td>Resection under general anesthesia</td>
</tr>
<tr>
<td>Matsumoto et al., 2018(^5)</td>
<td>87/F</td>
<td>GLF</td>
<td>4 wks</td>
<td>US, MRI, MRA</td>
<td>Resection under local anesthesia</td>
</tr>
<tr>
<td>Cvetic et al., 2016(^7)</td>
<td>28/M</td>
<td>MVC</td>
<td>8 yrs</td>
<td>US</td>
<td>Vascular embolization</td>
</tr>
<tr>
<td>Khandelwal et al., 2018(^9)</td>
<td>35/M</td>
<td>Fall from slow moving train</td>
<td>1 wk</td>
<td>US, CT, CTA</td>
<td>Resection under general anesthesia</td>
</tr>
<tr>
<td>Manuel et al., 2012(^10)</td>
<td>29/M, 25/M</td>
<td>MVC, GLF</td>
<td>8 wks; 4 wks</td>
<td>CT, clinical diagnosis</td>
<td>Resection under general anesthesia, continuous pressure dressing w/ self-resolution in 5 wks</td>
</tr>
<tr>
<td>Tracy et al., 2015(^11)</td>
<td>16/M</td>
<td>Lacrosse ball trauma, helmeted</td>
<td>15 mins</td>
<td>US, CTA</td>
<td>Resection under general anesthesia</td>
</tr>
<tr>
<td>Peick et al., 1988(^12)</td>
<td>74/M, 18/M, 66/M</td>
<td>Blunt trauma</td>
<td>~3 hrs, 2 days, 4 days</td>
<td>CTA, CT, NA</td>
<td>Resection under general anesthesia</td>
</tr>
<tr>
<td>Roman et al., 2013(^13)</td>
<td>54/M</td>
<td>GLF</td>
<td>1 day</td>
<td>US, MRI</td>
<td>Resection under general anesthesia</td>
</tr>
</tbody>
</table>

CTA = computed tomography angiogram; GLF = ground level fall; MRA = magnetic resonance angiography; MRI = magnetic resonance imaging; MVC = motor vehicle collision; NA = not applicable; US = ultrasound.
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References

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Dr. Avellino reported being a scientific advisor and investor in 8Chili, Inc., which is an AR/VR mixed-reality company.

Author Contributions
Conception and design: all authors. Acquisition of data: all authors. Analysis and interpretation of data: all authors. Drafting of the article: all authors. Critically revising the article: all authors. Reviewed submitted version of the manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Avellino. Statistical analysis: Avellino. Administrative/technical/material support: Avellino, Bercu. Study supervision: Avellino, Bercu.

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