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Traumatic hematoma-based pseudoaneurysm of the superficial temporal artery in a 7-year-old boy: a case report

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Case Report

The superficial temporal artery (STA), the terminal branch of the external carotid artery, is divided into the frontal (anterior) and parietal (posterior) branches. The frontal branch of the STA is located superficially on the anterior region of the scalp, making it especially susceptible to trauma. Here, we report a traumatic pseudoaneurysm of the STA in a 7-year-old boy who was injured in a minor car accident. A physical examination showed only a small bruise on the patient's forehead, and all vital signs were stable at the emergency room of our medical center. A facial computed tomography scan showed no significant findings. However, the boy later re-visited the hospital with slight swelling on the right forehead, and an ultrasonography scan revealed a hematoma near the right temporal artery. The resected hematoma (approximately 2 cm) was diagnosed as a traumatic pseudoaneurysm. Awareness of the possibility of a traumatic pseudoaneurysm in the STA may prevent a circumspect diagnosis in the future.

Abbreviations: CT, computed tomography; STA, superficial temporal artery

Keywords: Case reports / Hematoma / Pseudoaneurysm / Temporal artery / Ultrasonography

INTRODUCTION

Traumatic pseudoaneurysms in the face are difficult to diagnose at the initial evaluation because they often resemble simple bumps. A computed tomography (CT) scan usually only shows a diffuse hematoma under the area of swelling due to contusion. However, in some cases, such as that presented herein, initial CT imaging shows no significant abnormalities. Nevertheless, a small amount of blood clotting can develop into a visually apparent hematoma in weeks or days [1,2]. Patients may visit the hospital several times during the gradual development of a palpable mass, which is eventually diagnosed as a pseudoaneurysm via ultrasonography or enhanced CT. In many cases, the pseudoaneurysm may be overlooked initially, and the diagnosis of traumatic pseudoaneurysm is made afterward [3].

CASE REPORT

A 7-year-old boy was brought to the emergency room for a contusion on his head due to a traffic accident. He received a complete medical examination in the emergency room, including a CT scan. He returned home because he had no fractures, intercranial hemorrhage, or significant soft-tissue injury to the forehead. The patient visited the hospital 5 days later with minor pulsatile swelling on the forehead that was only slightly noticeable. At that time, only conservative care was considered.

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Fig. 1. The patient had a palpable mass that developed about 14 days after a car accident.

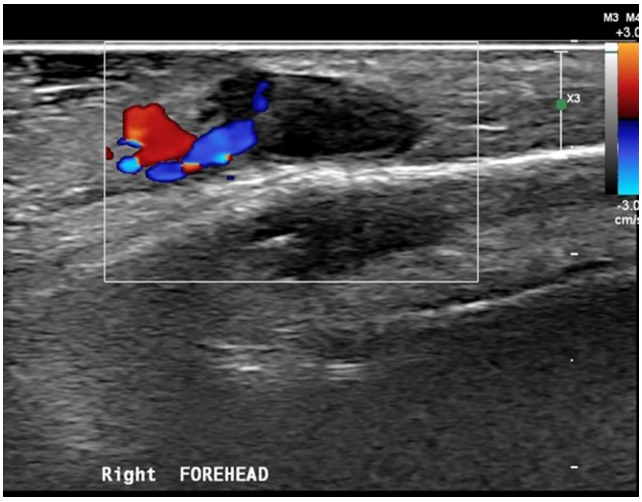

Fig. 2. A Doppler ultrasound scan shows the "to and fro" pattern of flow in the pseudoaneurysm near the right superficial temporal artery.

The patient presented again with a palpable but nonpulsatile mass 12 days after the accident (Fig. 1). In the outpatient center, a brief exploratory procedure was conducted. Aspiration of the hematoma was attempted using an 18-gauge needle to avoid creating a scar. However, the hematoma was not successfully exposed. An ultrasound scan was performed, and the patient was admitted to the hospital for excisional surgery under general anesthesia. The patient had no symptoms, such as headache, neck pain, nausea, or vomiting. The ultrasound scan showed a pseudoaneurysm near the right superficial temporal artery (STA) on the forehead (Fig. 2). The "to and fro" flow pattern on the Doppler scan helped to identify the point of communication with the artery.

In the operating room, a small incision was created on the right forehead, and an abnormal pouch of soft tissue near the STA was seen (Fig. 3). The outer soft tissue layer was meticulously dissected, and a hematoma-like mass was finally identified. The oval-shaped mass was removed from the open wound site. The surrounding fibrous layer was partially removed (Fig. 4). The size of the oval mass was 1.5×1 cm (Fig. 5). Sutures were placed on the subcutaneous layer and the skin, and the operation was completed. The patient was discharged without complications on the 5th day after surgery (Fig. 6).

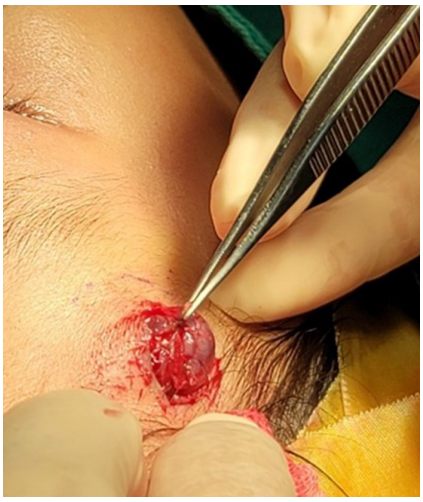

Fig. 3. A small incision was made on the right forehead, and a pouch of soft tissue was found near the superficial temporal artery.

Fig. 4. The fibrous tissue surrounding the hematoma was partially removed.

The pathological finding was hematoma with myxofibrous tissue and vascular proliferation. A photomicrograph showed an organizing hematoma with granulation tissue but no true vascular wall (Fig. 7). It clearly confirms the diagnosis of a pseudoaneurysm.

Fig. 5. The size of the oval mass was about 1.5×1 cm.

Fig. 6. The patient was discharged without any complications on the 5th day after the operation.

DISCUSSION

The arterial wall is composed of three layers, the tunica adventitia (outer layer), tunica media (middle layer), and tunica intima (internal layer) [4,5]. These three layers surround a true aneurysm in an artery since the aneurysm pouches through the arterial wall. In contrast, in a pseudoaneurysm (or false aneurysm), local hematoma forms from blood leakage from a traumatically damaged arterial wall [5]. A hematoma then develops and organizes with a pseudo-capsule, slowly expanding from the pressure exerted by local blood flow. This slow expansion of the hematoma explains the frequently reported gap of 1 to 6 weeks between the traumatic event and the onset of the mass [6]. Approximately 10 days lapsed in our patient before a palpable mass developed on his forehead.

A pseudoaneurysm consists of a hematoma from blood leakage and the surrounding perivascular fibrous tissue. When a hemorrhage from an injured vessel is stopped by the surrounding fascia and other soft tissue, it is gradually encapsulated by fibrous tissue similar to the adventitia [5,7,8]. In the patient in our case, a few layers of thick fibrous tissue encapsulated the hematoma, as seen in Fig. 4.

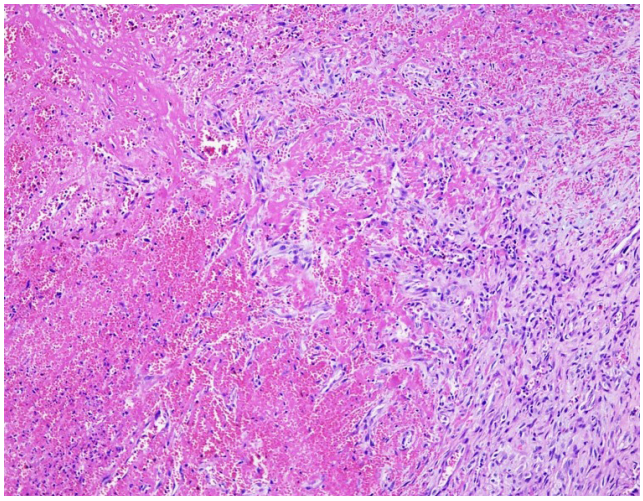

Fig. 7. A photomicrograph showed an organizing hematoma with granulation tissue, but no true vascular wall (hematoxylin and eosin stain, ×200).

An extravascular hematoma accumulates very closely to the injury location in the artery. Therefore, pulsation at the site can also be observed in a pseudoaneurysm [9]. The patient's parents stated that clear pulsation on the right temporal area was noticed for a week after the accident. Pulsation was also clearly observed during the patient's first visit to the outpatient office. However, no noticeable pulsation on the forehead was observed on the patient's subsequent admission.

CT and ultrasonography are essential tools for diagnosis [10]. A "to and fro" pattern of flow indicates high turbulence. This pattern, which has also been described as the "Pepsi sign," "yin-yang sign," or "tai-chi sign," occurs in both true and false aneurysms in various imaging modalities. On color Doppler ultrasonography, the "to and fro" radiological sign indicates bidirectional flow due to blood swirling into a true or false aneurysm in systole and away from it in diastole. The definitive diagnosis of a pseudoaneurysm requires the detection of an injured artery, which is the feeding artery; the identification of a pathognomonic "to and fro" pattern of blood flow on Doppler ultrasonography; and the uncovering of a pseudo-capsule fibrotic layer around the pseudoaneurysm, in which none of the normal arterial layers are present [11].

In the patient described herein, Doppler ultrasonography was performed just before admission for excisional surgery, which was performed approximately 2 weeks after the accident. A

thick fibrous band around the hematoma was found intraoperatively. The pseudoaneurysm in our patient seemed to be in the mature phase of wound healing. Blood from the ruptured artery had turned into a hematoma covered with thick fibrous bands, and the ruptured segment of the STA was sealed with organized fibrous and tunica adventitia tissue in the perivascular area. Thus, pulsation was not as palpable as earlier, and color Doppler ultrasonography did not show a crystal-clear bidirectional flow pattern around the hematoma-based pseudoaneurysm (Fig. 2). Another partial explanation for these findings may be that our patient was only 7 years old since pediatric vascular injuries might have distinct properties. In particular, vascular injuries in childhood are characterized by small and thin-walled vessels with poor tissue support and a pronounced tendency for vascular spasms. The relatively small intravascular volume is quite important when treating pediatric vascular lesions [12]. Generally speaking, a turbulent flow tends to occur in large-diameter pipes or vessels through which fluid flows at a high velocity.

Angiography was not performed because the possibility of a pseudoaneurysm was not assured until confirmed by the biopsy results. Color Doppler ultrasonography was performed almost 2 weeks after the accident. Therefore, it only showed a mild "to and fro" bidirectional flow pattern, not the "Pepsi sign," which indicates high-degree turbulence.

In conclusion, a pseudoaneurysm may be difficult to diagnose because it initially resembles a minor contusion on the forehead or head, with slight swelling and bruising. In addition to radiological findings, a history of trauma supports the diagnosis of pseudoaneurysm since it results from an injury to a blood vessel. Therefore, it is incumbent upon medical practitioners to pay close attention to a patient's trauma history [13,14]. Acknowledging that pseudoaneurysms may occur after a traumatic incident helps prevent medical practitioners from overlooking relevant diagnostic clues. Thus, focusing on another condition that resembles a traumatic pseudoaneurysm may lead clinicians to a dead-end diagnosis. Therefore, surgeons should be aware of the possibility of a pseudoaneurysm at any injured artery site.

NOTES

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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None.

Ethical approval

The report was approved by the Institutional Review Board of Dongkang Medical Center (IRB No. DK 2022-06-01, issued 2022-06-09).

Patient consent

The patient's legal guardians provided written informed consent for the publication and use of his images.

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