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Case Report

Identity of growing pulsatile mass lesion of the scalp after blunt head injury: Case reports and literature review

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ABSTRACT

A growing pulsatile lump of the scalp rarely occurs after blunt head injury. In this condition, the lump may be a delayed-onset traumatic vascular scalp injury such as a pseudoaneurysm or an arteriovenous fistula (AVF). We describe two cases of delayed-onset traumatic vascular scalp injuries: one involved a pseudoaneurysm of the superficial temporal artery, and the other, an AVF fed by the occipital artery. We reviewed reported cases of delayed-onset traumatic vascular scalp injury and discuss the features, diagnosis and treatment. When a growing lump of the scalp is encountered, ultrasonography may be useful in searching for vascular injuries.

Introduction

Blunt head injury often causes an immediate lump of the scalp due to subcutaneous hematoma. The lump usually shrinks gradually and heals without intervention. On the contrary, a growing pulsatile lump of the scalp rarely occurs after blunt head injury. In this condition, the lump may be a delayed-onset traumatic vascular scalp injury such as a pseudoaneurysm or an arteriovenous fistula (AVF). Although physicians often encounter chronic subdural hematoma, a well-known delayed-onset traumatic intracranial hemorrhage after blunt head injury [1–3], delayed-onset traumatic vascular scalp injuries are rarely encountered [4,5].

We describe two cases of delayed-onset traumatic vascular scalp injuries: one involved a pseudoaneurysm of the superficial temporal artery (STA), and the other, an AVF fed by the occipital artery (OA).

Case report

Case 1

An 87-year-old woman presented to our hospital with a progressive, painless pulsating lump in her right forehead. She had fallen and hit her right forehead 1 month prior. She had no neurological deficits. Physical examination revealed a 5 × 5 cm round mass of the right forehead (Fig. 1A). Ultrasonography showed a blood supply into the mass. Magnetic resonance imaging (MRI) revealed a right subcutaneous mass lesion (Fig. 1B, C), and the mass communicated with the frontal branch of the STA on magnetic resonance angiography (MRA) (Fig. 1D). We diagnosed a traumatic pseudoaneurysm of the STA. The patient underwent surgical resection of the pseudoaneurysm under local anesthesia (Fig. 1E). Histopathological findings confirmed the diagnosis of pseudoaneurysm. The patient's recovery was uneventful.

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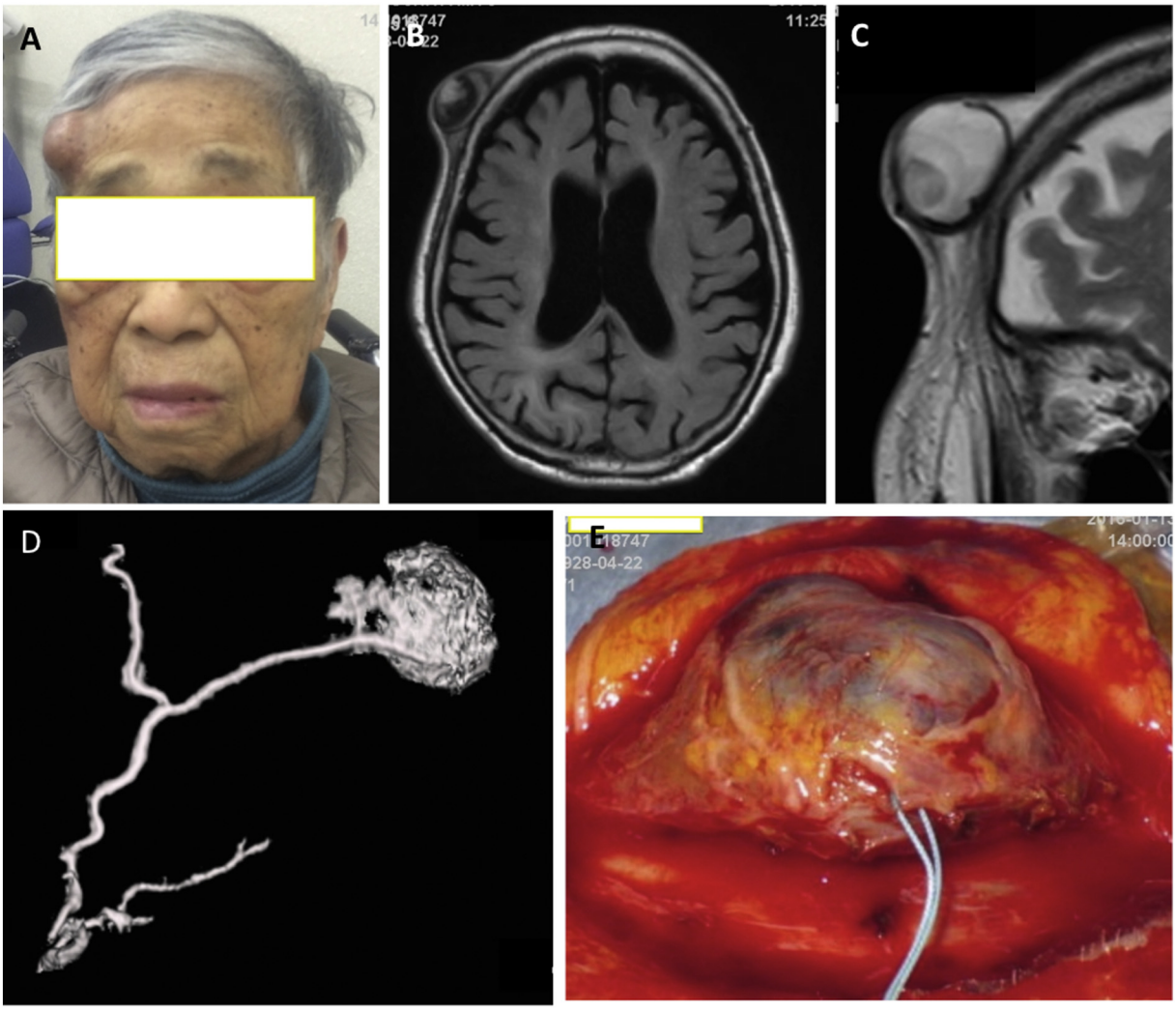

Fig. 1. (A) Macroscopic picture shows a 5 × 5 cm round mass of the right forehead. (B and C) Preoperative magnetic resonance imaging shows a right subcutaneous mass lesion (B: axial image on T1-weighted imaging [WI], C: coronal image on T2WI). (D) Magnetic resonance angiography shows that the mass communicates with the frontal branch of the superficial temporal artery (STA). (E) Intraoperative photograph shows a pseudoaneurysm of the STA.

Case 2

An 80-year-old woman presented to our hospital with a progressive painful pulsating swelling of her left occiput. She had bumped her left occiput against a door 1 month prior. She had no neurological deficits. Physical examination revealed a 5 × 2 cm mass with redness over the left occiput. Computed tomography (CT) showed subcutaneous swelling in the right occipital region (Fig. 2A). Ultrasonography showed irregular blood flow. Angiography revealed a subcutaneous AVF fed by the left OA (Fig. 2B). The AVF drained into the dilated variceal cutaneous veins. The patient underwent surgical disconnection of the AVF under general anesthesia (Fig. 2C). The small feeders and dilated variceal cutaneous veins were gently dissected from the adjacent subcutaneous tissue. The feeders were all coagulated and cut. The patient's recovery was uneventful. Postoperative CT showed improvement of the subcutaneous swelling (Fig. 2D).

Discussion

Traumatic vascular scalp injuries such as pseudoaneurysm and AVF are uncommon. Table 1 shows a comparison of their clinical features based on our literature review. They have both common and differentiating characteristics. AVF is rarer than pseudoaneurysm, based on comparison of the reported numbers. They can occur in patients of all ages. However, AVF in elderly patients is rare. Male dominancy is seen for both lesions. Although they are usually associated with a growing pulsatile lump of the scalp, clinical manifestations are primarily related to the size and position of the lesion. Patients may present with headache, ear discomfort,

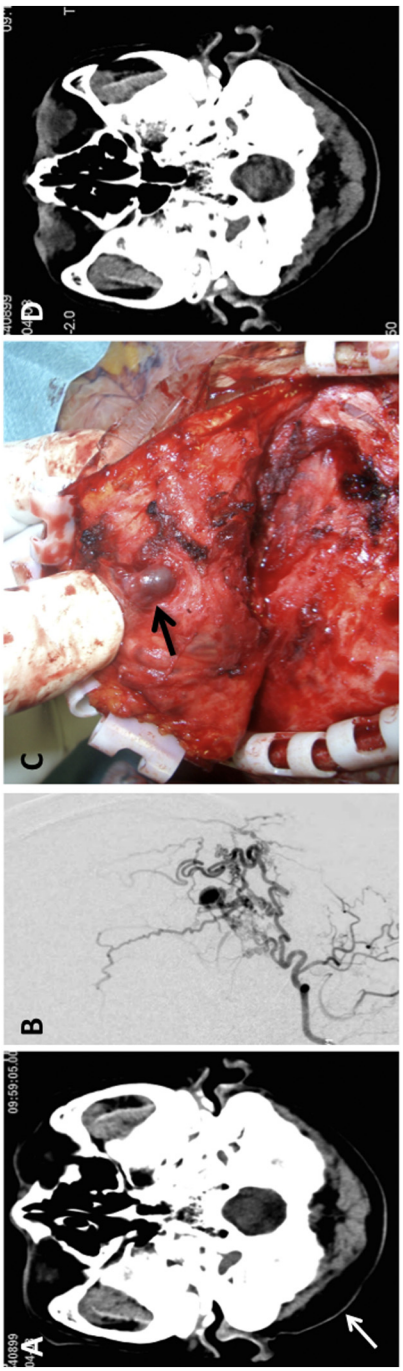

Fig. 2. (A) Preoperative computed tomography (CT) shows subcutaneous swelling in the right occipital region (arrow). (B) Digital subtraction angiography of the right external carotid artery shows an arteriovenous fistula (AVF) of the scalp. The AVF drains into dilated variceal cutaneous veins. (C) Intraoperative photograph shows the dilated variceal cutaneous veins (arrow). (D) Postoperative CT shows improvement in the subcutaneous swelling.

Table 1
Comparison of clinical characteristics between traumatic vascular scalp injuries.

	Pseudoaneurysm	Arteriovenous fistula
Number of reported cases	> 200	30–40
Sex (male:female)	4:1	8:1
Age, years	Median 27 (range, 3–90)	Median 32 (range 10–53)
Interval between trauma and diagnosis	From 2 days to 17 years (typically within 2 to 6 weeks)	From 1 day to 30 years (typically within 1 week or > 1 year)
Vulnerable artery	STA ≫ OA	STA ≫ OA rarely with MMA or ICA
Treatment	Surgical resection > Endovascular embolization > Direct puncture and injection of thrombin	Surgical disconnection > Endovascular embolization > Intralesional sclerosing agent

ICA: internal carotid artery; MMA: middle meningeal artery; OA: occipital artery; STA: superficial temporal artery.

dizziness, cosmetic defect, fatigue, and hemorrhage. The interval from trauma to diagnosis ranges from 1 day to longer than 10 years, and the appearance of the lesions differs in typical interval length. The interval for appearance of pseudoaneurysm is typically within 2 to 6 weeks. However, there are two peaks in the interval to appearance of AVF, i.e., within 1 week or longer than 1 year. The difference may be due to a difference in pathogenesis. In pseudoaneurysm, an organized fibrous capsule on the injured arterial wall is formed around the hematoma and grows gradually [6]. On the other hand, for AVF, there are two suggested theories: the laceration theory and the disruption theory [7–10]. In the laceration theory, simultaneous lacerations of the artery and the accompanying vein result in a single fistula. In the disruption theory, rupture of the vasa vasorum in the artery wall causes proliferation of endothelial cells, which then forms numerous small vessels, leading to vascular communication channels between the artery and vein. The interval to formation of an AVF may be earlier in the laceration theory than that in the disruption theory. The most vulnerable artery is the STA, but pseudoaneurysm and AVF of the OA is quite rare, as seen in Case 2 [11–14]. The STA is the most vulnerable artery because of its superficial course and less surrounding protective tissue as it runs just below the temporalis muscle [6,15].

Diagnosis

When a physician encounters a growing lump of the scalp, differential diagnosis should include hematoma, lipoma, epidermoid cyst, abscess, aneurysm, AVF, lymphadenopathy, neuroma, angiofibroma, meningocele, encephalocele, and lymphoid hyperplasia [6,10]. In traumatic vascular injuries, because the majority of the lumps are pulsatile, this finding may help in the diagnosis. However, there are some non-pulsatile masses that occur as a result of traumatic vascular injuries [10]. In addition, a nonvascular mass lesion may appear pulsatile due to transmitted pulsation from an adjacent artery [10]. Hence, ultrasonography may be very useful to search for vascular injuries. Diagnostic imaging such as MRI, MRA, CT angiography, and traditional angiography should be chosen based on the clinical situation [10,16]. When the lesion is a pseudoaneurysm, MRI and MRA are sufficient without angiography [16]. However, when the lesion is an AVF, angiography, which shows the feeding and draining vessels in detail, is needed to guide the treatment plan [10]. In our cases, ultrasonography was useful for the searching of vascular injuries, and further imaging confirmed the diagnoses and guided treatment.

Treatment

Indications for treatment include improvement of disfigurement, prevention of hemorrhage, and relief of symptoms such as headache and tinnitus [9,10,16]. Therapeutic options include surgery, endovascular embolization, and intralesional injection of thrombin or absolute alcohol. Among them, surgical resection of pseudoaneurysm and surgical disconnection of AVF have been the most common methods with low complication rates and high rates of cure [10,16]. However, there are possible surgical complications such as facial nerve palsy, skin defect due to dissection too close to the skin, excessive bleeding due to entering into the lesion, and cosmetic problems due to scarring from surgery [10,16]. On the other hand, endovascular embolization with a coil or Onyx (ev3 Neurovascular, Irvin, CA) has been reported and might prove to be an acceptable alternative to surgery [17,18]. However, this procedure has some problems such as embolic complication related to catheterization of the aortic arch and carotid artery, skin necrosis, and a higher recurrence rate than surgery [10,16]. Hence, procedures should be chosen based on the clinical situation and patient's background. When the lesion presents with bleeding, endovascular embolization may be useful because surgical exploration may make it difficult to identify the source of bleeding. In fact, Isaacson et al. [19] reported a case in which life-threatening bleeding from a pseudoaneurysm was successfully treated with coil embolization. Particularly for AVF, because partial excision or embolization may lead to recurrence, a combination of surgery and endovascular treatment may be useful. In our cases, because simple vascular structures were involved, we chose surgery and achieved good results.

Conclusion

Although delayed-onset traumatic vascular injuries are rare, physicians should consider the possibility in a patient with head and facial trauma. When a growing lump of the scalp is encountered, ultrasonography may be useful in searching for vascular injuries.

Conflicts of interest disclosure

None of the authors has any conflicts of interest to disclosure.

References

[1] H. Matsumoto, H. Hanayama, T. Okada, Y. Sakurai, H. Minami, A. Masuda, et al., Clinical investigation of chronic subdural hematoma with impending brain herniation on arrival, Neurosurg. Rev. 41 (2018) 447–455.
[2] H. Matsumoto, S. Matsumoto, Y. Yoshida, Concomitant intracranial chronic subdural hematoma and spinal subdural hematoma: a case report and literature review, World Neurosurg. 90 (2016) 706 (e1-9).
[3] A.M. Alvarez-Pinzon, J.E. Valerio, K.A. Barkley, H.N. Swedberg, A.L. Wolf, A case report and technical tip of chronic subdural hematoma treated by the placement of a subdural peritoneal shunt, Trauma Case Rep. 7 (2017) 7–10.
[4] S. Mangla, S.J. Sclafani, External carotid arterial injury, Injury 39 (2008) 1249–1256.
[5] J.W. Merkus, G.A. Nieuwenhuijzen, P.P. Jacobs, S.F. van Roye, R. Koopman, M.S. Pruszczynski, et al., Traumatic pseudoaneurysm of the superficial temporal artery, Injury 25 (1994) 468–471.
[6] M. Hosseini, S. Miri, Traumatic pseudoaneurysm of the superficial temporal artery: a case report, Turk Neurosurg. 23 (2013) 531–533.
[7] H.J. Ki, H.K. Lee, J.W. Hur, J.W. Lee, Post-traumatic arteriovenous fistula of the scalp, J. Korean Neurosurg. Soc. 58 (2015) 298–300.
[8] F. Zheng, H. Augustus Pitts, R. Goldbrunner, B. Krischek, Traumatic arteriovenous fistula of the scalp in the left temporoparietal region with intra- and extracranial blood supply, Case Rep. Vasc. Med. 2016 (2016) 8671472.
[9] J. Shinoda, T. Iwai, T. Morita, Y. Miwa, M. Takada, N. Sakai, et al., Traumatic arteriovenous fistula of the scalp—report of two cases and review of the literature in Japan, Neurol. Med. Chir. (Tokyo) 25 (1985) 55–60.
[10] F. Li, S. Zhu, Y. Liu, Y. Chen, L. Chi, G. Chen, et al., Traumatic arteriovenous fistula of the superficial temporal artery, J. Clin. Neurosci. 14 (2007) 595–600.
[11] A.R. Changa, A.M. Meleis, L. Bassani, Delayed occipital artery pseudoaneurysm following blunt force trauma, World Neurosurg. 89 (2016) 732 (e1-6).
[12] V. Madan Rao, S.A. Feig, Traumatic arteriovenous fistulae of the scalp, Rev. Interam. Radiol. 5 (1980) 17–20.
[13] N. Nagpal, G.S. Bhargava, B. Singh, Occipital artery pseudoaneurysm: a rare scalp swelling, Indian J. Surg. 75 (2013) 275–276.
[14] M. Patel, H. Tchelepi, D.H. Rice, Traumatic pseudoaneurysm of the occipital artery: case report and review of the literature, Ear Nose Throat J. 87 (2008) E7–12.
[15] E.J. Veen, F.B. Poelmann, F.F. IJ, A traumatic superficial temporal artery aneurysm after a bicycle accident, J. Surg. Case Rep. (2014) 2014.
[16] D.J. van Uden, M. Truijers, E.E. Schipper, C.J. Zeebregts, M.M. Reijnen, Superficial temporal artery aneurysm: diagnosis and treatment options, Head Neck 35 (2013) 608–614.
[17] V.Z. Cvetic, O. Radmili, B. Lukic, M. Colic, L. Davidovic, Endovascular treatment of traumatic pseudoaneurysm of the superficial temporal artery, Vasc. Endovasc. Surg. 50 (2016) 171–174.
[18] G. Dabus, R. Pizzolato, E. Lin, A. Kreusch, I. Linfante, Endovascular treatment for traumatic scalp arteriovenous fistulas: results with Onyx embolization, J. Neurointerv. Surg. 6 (2014) 405–408.
[19] G. Isaacson, P.S. Kochan, J.P. Kochan, Pseudoaneurysms of the superficial temporal artery: treatment options, Laryngoscope 114 (2004) 1000–1004.