CASE REPORT

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# Management of Uncontrolled Bleeding after Tooth Extraction: A Case Report of Arteriovenous Malformation

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Clinicians must be able to recognize post-extraction complications and treat them in a timely manner; complications that may potentially be life-threatening require special attention. Although arteriovenous malformation (AVM) is a very rare disorder, it may induce life-threatening hemorrhage during surgical intervention in the pertinent site. The present article examines the diagnosis and treatment modalities of AVM based on the case of a patient who was diagnosed with AVM with continuous bleeding after tooth extraction and who was successfully treated.

Key Words: Dental care; Postoperative hemorrhage; Tooth extraction; Vascular malformations

## Introduction

Post-extraction hemorrhage may result from wound inflammation, congenital coagulation disorder, systemic diseases such as hypertension, and acquired coagulation disorders[1]. Arteriovenous malformation (AVM), which is one of the causes of post-extraction bleeding, is a rare disorder, and normally occurs (in 50% of cases) in the maxillofacial region, if the lesion is found within the bone[2]. AVM is abnormal blood flow that results when the walls of the artery and vein are connected through a tangle of abnormal blood vessels. If left untreated, this disorder may cause serious bleeding after surgery, such as tooth extraction, and can be potentially life-threatening[3].

Hence, the authors of this study aimed to examine the diagnosis and treatment of AVM based on the case of a patient with AVM after tooth extraction who was successfully treated, as well as a review of the pertinent literature.

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## Case Report

A 55-year-old woman presented at our hospital with continuous bleeding after extraction of the left maxillary second molar at a local dental clinic two weeks prior. Clinical examination of the patient showed signs of swollen gums, inflammatory granulation tissue, and bleeding near the extraction socket (Fig. 1). Dental panoramic radiography did not show any abnormalities near the socket (Fig. 2). Based on these findings, we diagnosed the patient with bleeding caused by residual inflammatory tissue within the socket. After removing the stitches placed at the local dental clinic, we curetted the socket carefully. The curetted tissue was sent for biopsy. Severe bleeding occurred during the curettage; therefore, we used gauze soaked in 0.1% Bosmin® (Cheil Pharmaceutical, Seoul, Korea), diluted five times, to stop the bleeding. After confirming hemostasis, we performed stitches on the wound with eight sutures, and the patient was discharged.

Six days later, the patient revisited our hospital for intermittent bleeding. Clinical examination confirmed a blood clot in the extraction socket, but bleeding was observed near the socket. The stitches were not observed (Fig. 3). The biopsy at the initial visit confirmed inflammatory granulation tissue, but we recommended magnetic resonance imaging (MRI), because her overall clinical manifestation seemed to indicate hemangioma. However, the patient refused the MRI and wished to return home after hemostasis for economic reasons. Thus, we re-curetted, packed the wound with collagen sponge, and sutured the socket. However, during curettage, due to uncontrollable bleeding, we performed electric cauterization and sutured after packing Surgicel® (Johnson & Johnson Medical, Seoul, Korea).

One week later, the patient again presented with bleeding. We then performed an MRI for an accurate diagnosis, and the MRI T2-weighted image showed signs of a mass-like lesion with heterogeneous high signal intensity accompanied by bleeding (Fig. 4). We suspected AVM; therefore, we consulted a radiologist at our hospital and

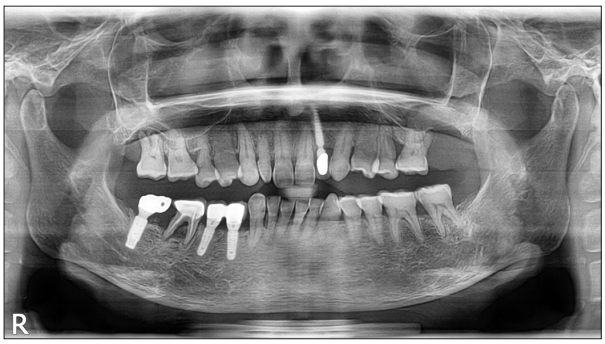


**Fig. 2.** Dental panoramic radiographs.

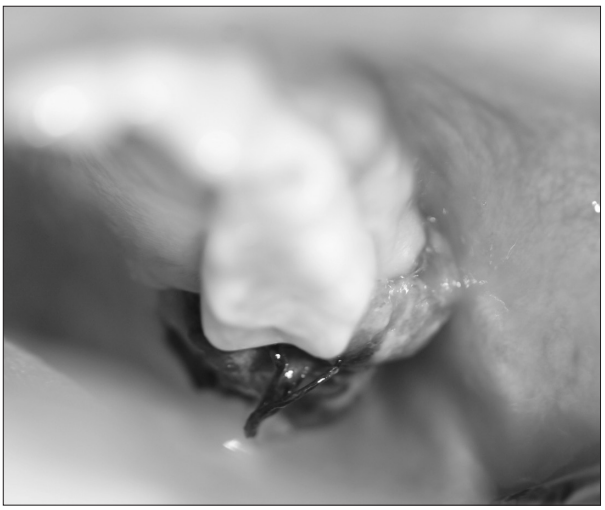

**Fig. 1.** Clinical photo in initial visit.

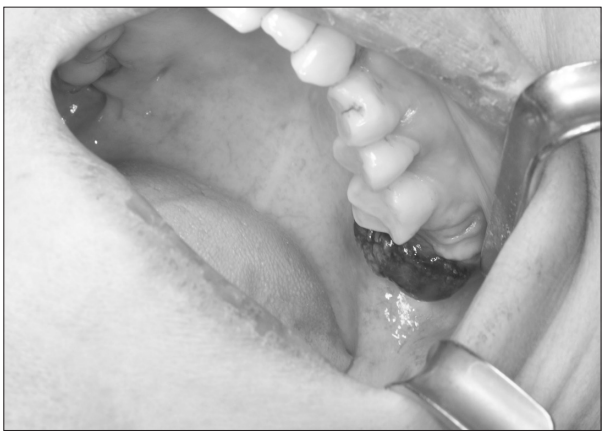

**Fig. 3.** Clinical photo in sudden visit.

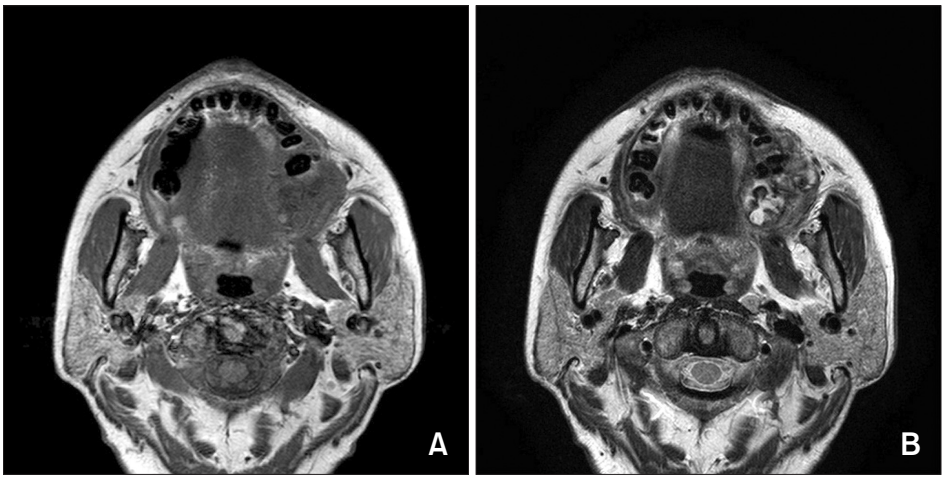


**Fig. 4.** A mass like lesion (3×2 cm) of heterogeneous iso-signal on T1-weighed (A), and heterogeneous high-signal on T2-weighted intensity (B). There is low signal hemosiderin deposit with shape of bubble on T2-weighted magnetic resonance images.

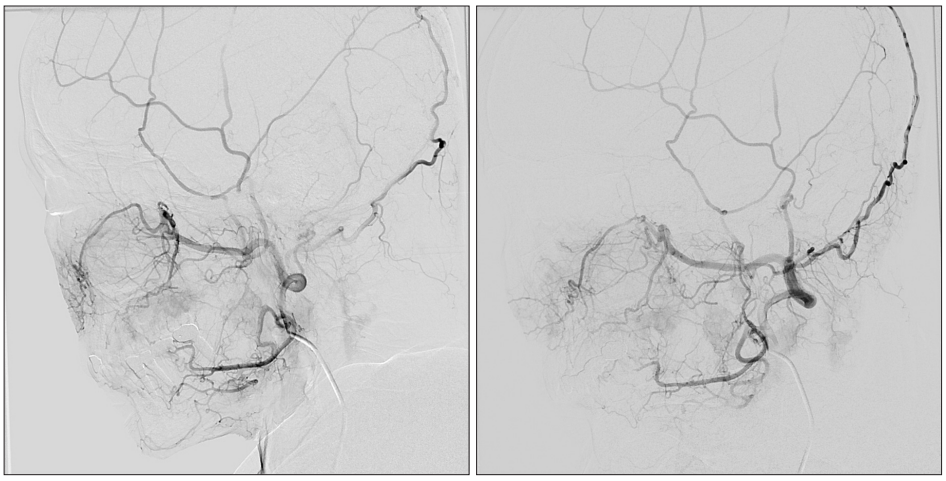

**Fig. 5.** Left external carotid artery lateral angiogram.

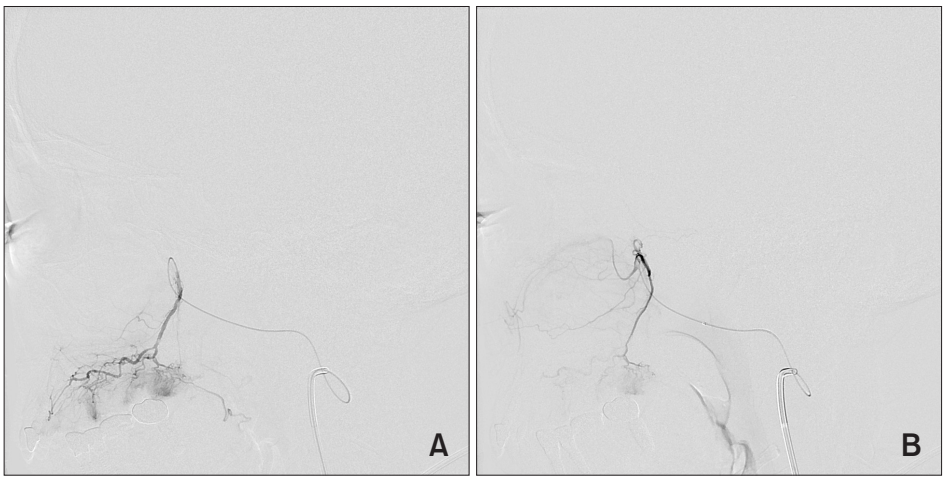


**Fig. 6.** Left greater palatine artery was embolized. (A) Pre-embolization lateral angiogram. (B) Post-embolization lateral angiogram.

decided to perform angiography, which confirmed AVM, with the left greater palatine artery (GPA) as the feeding vessel (Fig. 5). Therefore, we performed embolization on the GPA with polyvinyl alcohol, and after embolization, the blood flow to the site was confirmed to be reduced (Fig. 6).

Two days following embolization, we resected the lesion including removal of the left maxillary

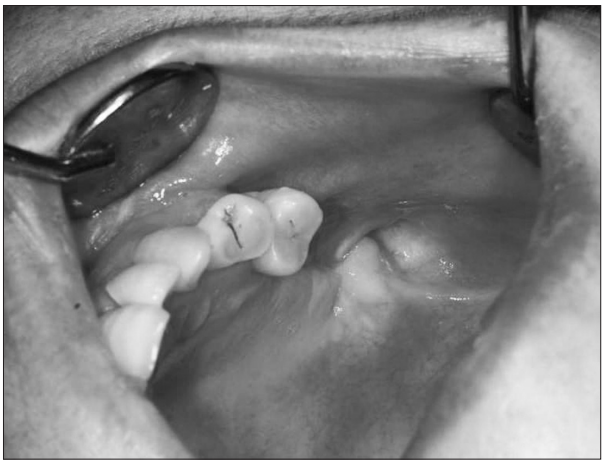

**Fig. 7.** Clinical photo in final visit.

first molar under general anesthesia. Bleeding was confirmed to have stopped during a postoperative follow-up, and as the patient showed good recovery (Fig. 7), she was transferred back to a local dental clinic for prosthodontic therapy.

## Discussion

In 1982, Mulliken and Glowacki[4] broadly categorized vascular anomalies into hemangioma and vascular malformation, in accordance with the clinical and histological findings. Vascular malformation was subdivided depending on the blood vessels involved and the blood flow, and AVM in the present case can be categorized as a vascular malformation with a high flow.

AVM may result due to abnormal tangling of the arteries and veins that arise from fetal endothelial precursors which lose the ability to produce and release platelet-derived growth factors and transforming growth factor β1 that are essential for the formation of adventitial cells during blood vessel formation[5]. AVM is present at birth but is usually not detected immediately, and it gradually intensifies over a period of time. Normally, no clinical symptoms are observed, which prevents detection[6]. When AVM affects the jaw bone, clinical symptoms, such as bleeding near the periodontal tissue, mobility of the affected teeth, and facial edema, present in rare cases[7]. Radiological findings may show irregular, soap bubble-shaped lesions with unclear boundaries, and sometimes there may be root resorption in the affected teeth[6].

Undetected AVM may cause life-threatening hemorrhage when surgery is performed on affected areas. There has been a report on the mortality of a patient due to excessive post-extraction bleeding that was caused by AVM, which was not discovered during the preoperative evaluation[8]. Therefore, clinicians must be cautious during assessment and treatment of AVM.

If a bony lesion of AVM is suspected, needle aspiration is a good alternative to prevent biopsy-induced bleeding. For accurate diagnosis, generally selective angiography through the femoral artery is performed. If AVM is diagnosed in patients scheduled for surgery on the affected area, such as tooth extraction, embolization is usually performed 24 to 48 hours prior to surgery to prevent excessive bleeding during surgery[9]. Although there are various treatment options for AVM, the current recommendation is preoperative embolization and wide resection of the affected area.

Kluba et al.[10] reported a successful case of embolization that was concurrently performed with extraction of the third molar, during which excessive bleeding occurred. They successfully treated AVM by performing several additional trials of embolization after extraction, thereby demonstrating the possibility of treating AVM without surgical resection. However, even if the embolization reduces blood flow to the affected areas and lowers bleeding-induced risks, there is a great possibility that the blood vessels will be regenerated within a few days as the lesioned area has high angiogenic effects. Thus, the currently accepted treatment for AVM is embolization accompanied by resection of the affected area[6].

If bleeding occurs due to AVM that was undetected during preoperative testing, the bleeding must be controlled first through local hemostasis.

At the same time, continuous arterial blood gas analysis monitoring should be performed to prevent bleeding-induced side effects, and if necessary, transfusion must be performed in a timely manner. If angiography can be performed simultaneously, arterial malformation should be confirmed through angiography, and the relevant vessels should be embolized. However, when these procedures cannot be performed, the blood vessel suspected to be the feeding vessel must be ligated appropriately before the bleeding aggravates.

In the present case, a patient with uncontrollable post-extraction bleeding was diagnosed with AVM via MRI and transfemoral angiography. After confirming the diagnosis, we embolized and resected the affected areas, and the AVM was successfully treated.

Although AVM may lead to life-threatening bleeding, it is difficult to detect clinically and radiologically. Therefore, it is important to conduct a thorough investigation of any bleeding-related events or history to enable an accurate diagnosis. If AVM is suspected, angiography should be performed prior to surgery for a definitive diagnosis. Once the feeding vessel is identified through angiography, embolization is the most suitable option before the surgery to protect the patient from the risk of excessive bleeding during surgery.

## Conflict of Interest

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

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