A CASE REPORT

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Pseudoaneurysm developing after extraction of the mandibular third molar requiring transcatheter arterial embolization: A case report and literature review

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Abstract

Objective: Post-extraction bleeding, which is difficult to stop, is rare. However, arterial hemorrhage may lead to a state in which hemostasis is difficult to obtain. We herein report a case in which arterial embolization effectively stopped hemorrhagic bleeding due to mandibular third molar extraction.

Case Report: The patient was a 24-year-old man who suffered from abnormal bleeding during tooth no. 48 extraction. As hemostasis via compression with gauze would be difficult, the patient was referred to our department for emergency treatment to stop the bleeding. There was nothing special to note in terms of his vital signs at the time of his initial visit, with pulsatile bleeding from the extraction socket of the left mandible. A panoramic radiograph showed the root of tooth no. 48 was suitably separated. On the day of his visit, hemostasis was performed via compression using tie-over gauze. No significant bleeding was observed after the removal. However, the patient visited the emergency department with a complaint of re-bleeding, and arterial bleeding from the extraction socket was observed upon the release of compression with gauze. A traumatic pseudoaneurysm consistent with the site of tooth extraction was observed by a selective angiographic examination during hospitalization. Hemostatic treatment with transcatheter arterial embolization (TAE) was performed at the Department of Diagnostic Radiology.

Results: Post-extraction bleeding is a recognized and frequently encountered complication in oral and maxillofacial surgery.

Conclusion: The course was favorable following treatment on the seventh day after extraction, and the patient was discharged from the hospital in remission.

Keywords: Adverse effects, Embolization, Oral hemorrhage, Pseudoaneurysm, Tooth extraction
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Introduction

Although bleeding after tooth extraction occasionally occurs,[1,2] in many cases, it can be stopped by local compression. However, massive arterial hemorrhage forming a pseudoaneurysm may occur very rarely. Pseudoaneurysms are vascular lesions caused by damage to the arterial wall and occur after surgery or trauma, causing uncontrolled bleeding.[3,4] We report a case of traumatic pseudoaneurysm formation after extraction of a mandibular third molar for which arterial embolization was effective. We provide a summary of this case and consider the relevant literature

Case Report

A 24-year-old Japanese male presented to our department for emergency treatment in October 2019 with abnormal bleeding during left mandibular third molar extraction at another hospital. There was nothing noteworthy in his medical or family history, and he had no history of allergies. At the initial visit, his height, weight, and body temperature were 169.4 cm, 70.6 kg, and 37.4º, respectively. His vital signs were normal, and no consciousness or respiratory disorders were observed. Hemostasis was achieved by compression with gauze; however, pulsatile bleeding was observed in the extraction socket of the left mandible when the gauze was removed. Peripheral blood testing revealed the following: red blood cells (RBC), 515000/μL; hematocrit, 45.6%; white blood cells (WBC), 10400/μL; and C-reactive protein, 0.03 mg/dL, indicating a mild increase in white blood cells as shown in table 1.

No major abnormalities were observed in other clinical parameters, including renal function, liver function, and coagulation system. A panoramic radiograph showed that the tooth root was suitably separated with no damage to the mandibular canal figure 1.

On the same day, local anesthesia (2% lidocaine hydrochloride, 1:80,000 adrenaline 3.6ml) was administered at the wound site and gauze soaked in 0.1% adrenaline solution was applied to perform the tie-over method to stop bleeding.

Abnormal bleeding was not observed when the gauze was removed six days after the onset of bleeding figure 2. On days 15, 18, and 21 after post-onset, compression or the tie-over method was used to stop bleeding every time it reoccurred from the extraction site. On day 23 post-onset, the patient visited our hospital's emergency department because of re-bleeding. The compression gauze was removed, and the mucous membrane around the extraction socket was

Table 1. Blood test findings.

WBC	10400/μL	(3500～8500/μL)
RBC	515×10 4 /μL	(370～490×10 4 /μL)
Hemoglobin	15.7g/dL	(11.5～15g/dL)
Hematocrit	45.60%	(35～45%)
Platelet	277×103/μL	(150～350×103/μL)
TP	7.5g/dL	(6.7～8.2g/dL)
ALB	4.7g/dL	(3.9～5.2g/dL)
T-Bil	0.5mg/dL	(0.4～1.3mg/dL)
AST	27U/L	(10～35U/L)
ALT	17U/L	(5～40U/L)
ALP	230U/L	(100～320U/L)
BUN	14.9mg/dL	(8～20mg/dL)
Cre	1.11mg/dL	(0.4～0.8mg/dL)
UA	5.4mg/dL	(3.0～7.0mg/dL)
Na	141.0mEq/L	(136～145mEq/L)
Cl	104mEq/L	(99～107mEq/L)
K	4.2mEq/L	(3.6～4.8mEq/L)
APTT	27.8sec	(23～36sec)
PT-INR	0.97	(0.8～1.2)
D-dimer	1.4μg/kg	(0.0~1.0μg/kg)
CRP	0.03mg/dL	(0～0.35mg/dL)

WBC: White Blood Cell, RBC: Red Blood Cell, TP: Total Protein, ALB: Albumin, T-Bill: Total Bilirubin, AST: Aspartate aminotransferase, ALT: alanine aminotransferase, ALP: alkaline phosphatase, BUN: Blood Urea Nitrogen, Cre: Creatinine, UA: Uric Acid, APTT: Activated Partial Thromboplastin Time, PT-INR: Prothrombin Time-International Normalized Ratio, CRP: C-reactive protein

Table 2. Eleven reports of pseudoaneurysms after tooth extraction, including our present.

Case No	Authors	Year	Sex	Age	Extraction site	Causes vascular	Surgical technique
1	Lucas EM, et al.12	2008	M	25	Mandibular third molar	Facial artery	TAE (NBCA-lipiodol)
2	Rayati F, et al.15	2010	M	35	Mandibular first molar	Facial artery	Resection+facial artery ligation
3	Stiefel MF, et al.17	2010	M	39	Maxillary second molar	Posterior superior alveolar artery	TAE (NBCA-lipiodol)
4	Pukenas BA, et al.13	2012	F	20	Mandibular third molar	Facial artery	TAE (EVOH)
5	Sagara Y, et al.16	2013	M	24	Mandibular third molar	Inferior alveolar artery	TAE (NBCA-lipiodol)
6	Sagara Y, et al.16	2013	F	37	Mandibular third molar	Inferior alveolar artery	TAE (NBCA-lipiodol)
7	Sagara Y, et al.16	2013	M	29	Mandibular third molar	Inferior alveolar artery	TAE (NBCA-lipiodol)
8	Sagara Y, et al.16	2013	M	24	Mandibular third molar	Inferior alveolar artery	TAE (NBCA-lipiodol)
9	Sagara Y, et al.16	2013	M	26	Maxillary third molar	Posterior superior alveolar artery	TAE (NBCA-lipiodol)
10	Saurabh KR, et al.14	2019	M	24	Maxillary third molar	Internal carotid artery	TAE (NBCA-lipiodol)
11	Present Case	2025	M	24	Mandibular third molar	Inferior alveolar artery	TAE (NBCA-lipiodol)

TAE: Transcatheter Arterial Embolization, NBCA: N-butyl-2-cyanoacrylate, EVOH: Ethylene-vinyl alcohol copolymer

Figure 1. Panoramic radiograph at the first visit.

found to be thin, with pulsatile bright red bleeding from tooth no. 48 extraction socket of the left mandible, thereby making suturing and hemostatic treatment difficult. We decided to hospitalize the patient for thorough examination. Dynamic CT revealed no obvious pseudoaneurysm or extravasation of contrast medium. Subsequently, selective angiographic examination was performed by the Department of Diagnostic Radiology. An aneurysm-like lesion consistent with the extraction site was observed in the inferior alveolar artery that branched from the maxillary artery, and jet-like leakage of the contrast medium was observed figure 3. Taken together, the arterial hemorrhage attributed to the rupture of a traumatic pseudoaneurysm in the branch of the inferior alveolar artery was diagnosed.

Continuous transcatheter arterial embolization (TAE) was performed. In TAE, we punctured the right common femoral artery and inserted a 4Fr guiding catheter. Then, selected the left common carotid artery and external carotid artery for DSA imaging. Inserted Carnelian® HF into the mandibular artery and performed DSA imaging. A pseudoaneurysm corresponding to the extraction site was identified. Subsequently, embolization was performed using NBCA (n-butyl-2-cyanoacrylate). We confirmed decreased delineation of the causative vessel, inferior alveolar artery branch, and the presence of NBCA around the bleeding site. The treatment was completed and the absence of bleeding in the oral cavity was confirmed. On day 26 post-onset, tooth no. 48 was extracted under general anesthesia. No postoperative abnormal bleeding or hypoesthesia of the mental nerve was observed. The symptoms improved on day 33 post-onset, and the patient was discharged from the hospital. Thereafter, no abnormal bleeding was noted. This case was described in accordance with CARE guidelines.

Discussion

Post-extraction bleeding is a recognized and frequently encountered complication in oral and maxillofacial surgeries. The rate of postoperative bleeding after mandibular third molar extraction is 0.6%, and that after maxillary third molar extraction is 0.4%.[5] Systemic causes of bleeding include platelet problems, coagulation disorders, excessive fibrinolysis, and inherited- or medication-induced problems. The local causes include soft tissue and bone bleeding. Although rare, traumatic pseudoaneurysms resulting from tooth extraction procedures can cause hemorrhage.

While the patient in this case had no systemic diseases associated with bleeding tendency (e.g., liver dysfunction), complete hemostasis was extremely difficult to achieve after attempting local hemostasis for several bleeding occurrences. TAE was used to stop bleeding as a mildly invasive treatment relative to ligation of the maxillary artery and external carotid, which has been previously selected in cases with difficult hemostasis.[6,7] It is possible to efficiently stop bleeding because embolization is selectively performed using an obturator. In this case, arterial bleeding was stopped by TAE, and no abnormal bleeding was observed, even when the remaining tooth root was extracted under general anesthesia. Currently, the success rate of TAE is high with a low number of adverse events.[8] However, if anastomosis is present between the external carotid

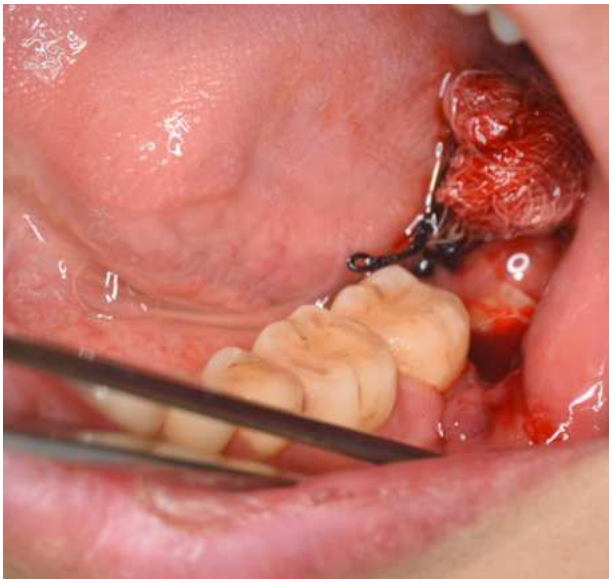

Figure 2. Intraoral findings on day 23 post-onset.

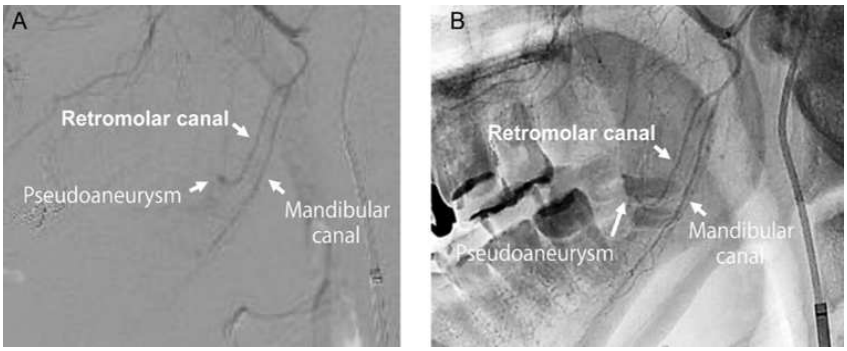

Figure 3. A. Images at the time of angiography, B. An aneurysm-like lesion consistent with the extraction site was observed in the branch of the inferior alveolar artery.

artery and internal carotid or vertebral artery, TAE is contraindicated because of the risk of aberration of the obturators. Moreover, necrosis of the normal tissue around the wound and ulceration of the mucous membrane may occur.

No special findings were found on dynamic CT performed prior to TAE. Angiographic examination was subsequently performed, and a traumatic pseudoaneurysm was identified. The spatial resolution of CT for medical use is approximately 0.625 mm,[9] whereas the vascular diameter in this case is 0.5 mm; thus, it was difficult to visualize. In comparison, dental cone-beam CT has a very fine spatial resolution of 0.08-0.3 mm, enabling the depiction of tiny blood vessels.[10] Given the possibility of bleeding following third molar extraction using a panoramic radiograph alone. As in this case, it is important to conduct a close examination under a dental cone beam CT prior to tooth extraction surgery to accurately determine the risk.

The mechanism underlying the pathogenesis of traumatic pseudoaneurysms is considered to involve slight damage to the arterial wall, resulting in the formation of a hematoma around the area of artery compression and expansion of the blood vessel wall, after which the hematoma dissolves over several days or weeks, thereby fixing the arterial wall expansion and causing an aneurysm in the same area.[4] In our case, we determined that the bleeding was caused by a secondary aneurysm rupture that appeared as an elliptical shadow. Initially, an aneurysm of the main trunk of the inferior alveolar artery was suspected and was later confirmed to be located in the branch of it on angiographic examinations. The retromolar canal, which is considered to be the causative blood vessel in this case, is one of the branches of the main tube of the inferior alveolar artery, with the frequency of occurrence varying ranging from 7.7 to 72.0%. It has been reported that 18% of branches branch the retromolar canal towards the root apex of the mandibular third molar; therefore, caution should be exercised when extracting the third molar. According to the report, the retromolar canal is classified according to its structure as follows: type A1 (41.9%), coming up vertically from the main tube of the inferior alveolar artery; type A2 (16.1%), with horizontal branches apart from type A1; type B1 (29.0%), with a curve; type B2 (12.9%), with horizontal branches apart from type B1; and type C (frequency unknown), with horizontal branches. This case was classified as type B1.[11]

To our knowledge, there have been 11 reports on pseudoaneurysms after tooth extraction, including the present case table 2.[12-17]

Conclusion

Mandibular third molar extraction is very common in oral and maxillofacial surgery; however, detailed examination with preoperative images is necessary because such procedures may cause bleeding that is difficult to control. TAE and selective carotid angiography were useful for the management of hemorrhage probably caused by a traumatic aneurysm after tooth extraction.

Acknowledgments

None.

Conflict of Interest

The authors report no conflict of interest.

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