

Bilateral Lingual Artery Embolization to Control Massive Oral Bleeding That Leads to Cardiac Arrest

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Abstract

Oral cavity structures receive abundant perfusion from the branches of the external carotid artery. Although hemorrhage is a common complication of oral cancer, bleeding from a cancerous mouth can be a devastating event in the emergency department. Lingual artery embolization is a minimally invasive interventional radiology procedure that has rarely been reported in the literature. This case involves a patient with tongue cancer who experienced massive oral bleeding leading to cardiac arrest. Fortunately, the patient was successfully resuscitated, and spontaneous circulation was restored. Diagnostic angiography confirmed the presence of pseudoaneurysm in the lingual artery. Ultimately, bleeding was definitively controlled through bilateral lingual artery embolization. This case underscores the critical importance of a multidisciplinary approach involving emergency physicians, otolaryngologists, and interventional radiologists in managing complex vascular lesions in the head and neck. Furthermore, it contributes to the growing body of evidence supporting the use of embolization techniques as a valuable tool in the management of vascular lesions in the head and neck region.

Keywords: Lingual artery embolization, oral bleeding, tongue cancer

Introduction

One of the principal branches of the external carotid artery is the lingual artery, which is responsible for supplying blood to the tongue and oral cavity. The lingual artery causes several branches that nourish various structures in the lingual and sublingual regions. These branches extend their supply to the jaw, buccal and gingival mucosa, different parts of the tongue (including the body, tip, and posterior region), palatoglossal arch, soft palate, lingual tonsil, epiglottis, and mylohyoid muscle (1).

Tongue cancer is the most prevalent malignant tumor in oral cancer cases. Advanced tongue cancer or radiotherapy often leads to a common complication: hemorrhage. Bleeding can be profuse, and without prompt and effective treatment, it may lead to suffocation, shock, and high mortality rates (2).

This case revolves around a patient with tongue cancer who experienced massive oral bleeding, which ultimately resulted in cardiac arrest. Fortunately, the patient was successfully resuscitated, and spontaneous circulation was restored.

Subsequently, the bleeding was definitively controlled through bilateral lingual artery embolization.

Case Report

A 42-year-old male, a known case of locally invasive squamous cell carcinoma (SCC) of the tongue and left buccal mucosa cancer, presented to the emergency department with bleeding from the tumor bed and intermittent low-grade fever for the past day. The bleeding had been increasing and was associated with blood clots. The patient also reported facial pain and swelling. His vital signs showed a blood pressure of 109/65 mmHg, a pulse rate of 88 beats/min, a temperature of 37.2 °C, a respiratory rate of 15 breaths/min, and an oxygen saturation of 97% on room air.

The patient had previously received chemotherapy and multiple cycles of radiotherapy and was now on immunotherapy. He underwent tracheostomy and a percutaneous endoscopic gastrostomy tube for feeding. Notably, the patient was not on any antiplatelet or anticoagulant medications.



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Cite this article as: Eid MM, Jaiganesh T. Bilateral Lingual Artery Embolization to Control Massive Oral Bleeding That Leads to Cardiac Arrest. Eurasian J Emerg Med. 2023;22(4): 258-61.

Received: 07.07.2023

Accepted: 24.09.2023



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Physical examination revealed left jaw tenderness, swelling, and limited mouth opening due to pre-existing trismus, whereas the rest of the examination was unremarkable. The bleeding was initially suctioned and packed with adrenaline-soaked swabs, which successfully controlled the bleeding. The patient was scheduled for admission to the oncology department because of possible sepsis. However, the bleeding recurred, necessitating additional packing with tranexamic acid-soaked materials and the initiation of intravenous tranexamic acid, which successfully halted the bleeding.

Laboratory tests indicated a prothrombin time of 13.4 s (normal range: 9.5-12.5), an international normalised ratio of 1.21 (normal range: 0.87-1.15), an activated partial thromboplastin time of 27.9 s (normal range: 22.2-34.2), and a fibrinogen level of 6.30 g/L (normal range: 1.5-3.87). Blood tests showed a white blood cell count of $30.3 \times 10^9/L$ (normal range: 4.5-11), hemoglobin level of 8.2 g/L (normal range: 13.2-17.3), and platelet count of $389 \times 10^9/L$ (normal range: 140-400). His baseline hemoglobin level ranged from 8.9 to 9.5 g/L.

The case was discussed with an otolaryngologist, and the decision was made to arrange arterial embolization through interventional radiology because of the patient's history of multiple presentations with oral bleeding. The interventional radiologist expressed concerns regarding the risk of stroke with bilateral lingual artery embolization. However, the patient experienced massive bleeding following a significant episode of vomiting blood from his mouth and tracheostomy tube. His vital signs deteriorated rapidly, with a blood pressure drop to 70/35 mmHg, a pulse rate of 125 beats/min, and an oxygen saturation decrease to 70% in room air.

Efforts to control the bleeding, including suction and multiple attempts at packing, were unsuccessful, leading to cardiac arrest. Resuscitation efforts were initiated, reversible causes of cardiac arrest were ruled out, and hypovolemic shock was identified as the primary cause. Consequently, a massive transfusion protocol was activated, and the patient received packed red blood cells, fresh frozen plasma, cryoprecipitate, platelets, and recombinant activated factor VII (Novo 7). Multiple doses of epinephrine, sodium bicarbonate, and dextrose were also administered. Fortunately, the patient achieved a return of spontaneous circulation after 20 min, and the bleeding was temporarily controlled.

The otolaryngologist replaced the tracheostomy tube, and the patient was then transferred to interventional radiology for embolization after stabilization. A bilateral internal and external carotid artery angiogram was performed (Figure 1), revealing evidence of abnormal tumor vascularity supplied by the lingual

artery, with a new false aneurysm affecting the left lingual artery measuring 3x5 mm in diameter.

Bilateral lingual artery embolization was performed using metallic coils and 500-700 particles through the Progreat Microcatheter until stasis was achieved, without complications (Figure 2). The bleeding was successfully controlled, and the

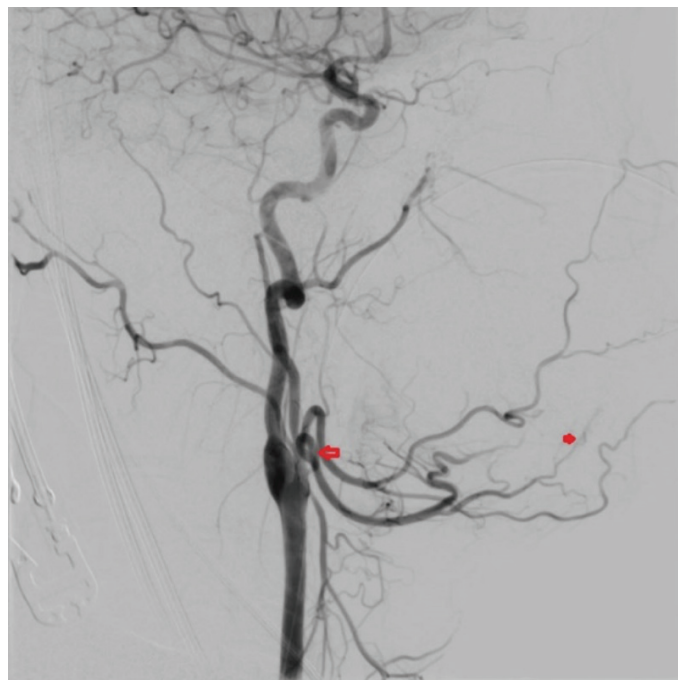


Figure 1. A bilateral internal and external carotid artery angiogram indicated the presence of abnormal tumor vascularity supplied by the lingual artery. Additionally, it revealed a newly formed false aneurysm in the left lingual artery, measuring 3x5 mm in diameter

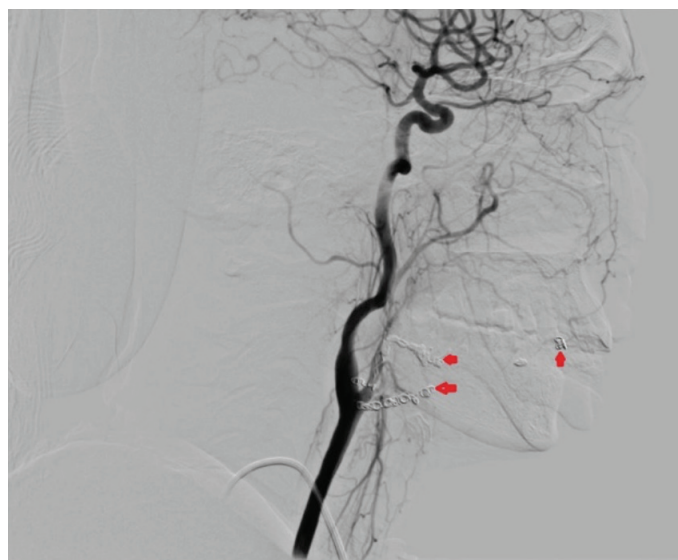


Figure 2. A bilateral internal and external carotid artery angiogram confirmed the successful embolization of the bilateral lingual artery using metallic coils and 500-700 particles delivered through the Progreat Microcatheter

patient's blood pressure improved to 105/67. The patient was then transferred to the intensive care unit, where he remained for several days before being transferred to the medical floor. The patient had an uneventful admission and was subsequently discharged to a homecare facility.

Discussion

Patients with oral SCC often experience bleeding, which can manifest as sudden catastrophic events, occasional massive bleeding, or persistent low-volume leakage. Hemorrhage in oral SCC is associated with local tumor irradiation, spontaneous tumor bleeding, and chemotherapy. In cases of recurrent illness, bleeding due to chemotherapy-induced thrombocytopenia, a consequence of prior chemoradiotherapy (CRT), can also be significant. Free radicals from CRT may damage the adventitial vasa vasorum, leading to early atherosclerosis, adventitial fibrosis, wall thinning in the carotid artery, and even thrombosis. Furthermore, high total and fractional doses of radiation therapy, especially in cases of repeated irradiation, may increase the risk of vascular mucosal damage (3).

Notably, surgery has also been linked to bleeding in oral SCC patients, in addition to CRT. Some patients have reported developing pseudoneurysms up to 20 years after extensive neck dissection and radiotherapy. Bacterial infections at the surgical sites of head and neck surgeries have been associated with vasa vasorum thrombosis and artery wall damage (3).

The lingual artery, typically extending from the dorsal end of the tongue to its tip, covers approximately 75% of the tongue's length. For approximately three-quarters of its length, the artery follows a lateral and inferior course (1).

The robust blood supply in the oral cavity is attributed to the presence of collateral vessels. Lingual artery embolization is a specialized interventional radiological procedure that plays a significant role in the comprehensive management of tongue cancer. In cases where advanced cancers affect local vascular systems, lingual artery embolization serves as a crucial adjuvant therapy to address both the oncological and symptomatic aspects of the disease. When significant bleeding cannot be controlled by mechanical pressure and packing, embolization or ligation is recommended (4).

Given the complex anatomy of the head and neck and the abundant blood supply, surgical treatment can be challenging. However, super-selective lingual artery embolization is a straightforward approach that effectively stops bleeding and allows for rapid identification of blood vessels (2).

Lingual artery embolization in the context of tongue cancer serves several essential purposes:

1. Hemostasis: The primary goal is to achieve hemostasis and prevent further bleeding episodes. Tumor-induced vascular damage can weaken the lingual artery, making it prone to rupture. Embolization effectively occludes the feeding vessels, thereby controlling hemorrhage and stabilizing the patient's condition (2).

2. Symptom Relief: In addition to its hemostatic benefits, lingual artery embolization can significantly alleviate the symptoms associated with tumor-related bleeding. This includes dysphagia, odynophagia, and speech difficulties, which can profoundly impact a patient's quality of life (2).

3. Facilitation of Surgery or Radiation Therapy: In some cases, embolization may be performed as a preoperative or pre-radiation therapy measure. By reducing tumor vascularity and minimizing the risk of intraoperative bleeding, it enhances the safety and feasibility of surgical resection or radiation therapy (5).

To address significant bleeding by blocking the entire channel, the lingual artery is often ligated above the hyoid bone. After ligating the lingual artery stem at its origin from the external carotid artery, healthy collateral circulation may remain (4).

This case report contributes to the growing body of evidence supporting the use of embolization techniques in the management of vascular lesions in the head and neck region. Moreover, it underscores the importance of prompt recognition and intervention in cases of lingual artery pseudoaneurysms, which can have life-threatening consequences if left untreated.

Conclusion

Bleeding associated with mouth cancer can be a devastating emergency event, potentially leading to cardiac arrest. It is imperative to initiate early and appropriate management, fostering teamwork among various specialties. Interventional radiology can play a crucial role in precisely identifying the responsible blood vessels, and lingual artery embolization has emerged as a swift and effective method for controlling bleeding with minimal complications.

Ethics

Informed Consent: Consent to the case's publication and the pictures taken from the patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.M.E., T.J., Concept: T.J., Design: M.M.E., Data Collection or Processing: M.M.E., Analysis or Interpretation: M.M.E., Literature Search: M.M.E., Writing: M.M.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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