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Major oral hemorrhage after tongue cancer surgery: A case report

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ABSTRACT

Introduction: Massive postoperative oral hemorrhage is an uncommon but potentially fatal complication in head and neck (H&N) oncologic surgery. In high-risk patients, especially those with a history of chemoradiotherapy and salvage surgery, delayed hemorrhage can swiftly lead to airway obstruction, cardiac arrest and irreversible hypoxic-ischemic brain injury (HIBI). Systematic nursing monitoring and escalation protocols are essential, yet their implementation varies across institutions.

Case Presentation: A 56-year-old male with recurrent squamous cell carcinoma of the oral tongue and a history of chemoradiotherapy for oropharyngeal cancer underwent selective neck dissection, right hemiglossectomy and radial forearm free flap reconstruction. After an uneventful early postoperative course in the intensive care unit he was transferred to the surgical ward on postoperative day (POD) 3. On POD 6, nursing staff reported a minor oral bleeding episode (~10 mL) to the on-duty physician. Approximately 20 minutes later, the patient experienced sudden profuse arterial oral hemorrhage (2 L estimated blood loss), rapidly lost consciousness and entered cardiac arrest. Return of spontaneous circulation was achieved after 36 minutes of cardiopulmonary resuscitation. The patient was urgently transferred to the operating room, where a second cardiac arrest occurred and was successfully resuscitated. Despite repeated hemostatic procedures and intensive supportive care, brain MRI on POD 12 demonstrated severe HIBI with cerebral herniation. Brain death was confirmed on POD 15.

Discussion: The hemorrhagic pattern — a sentinel bleed followed shortly by massive arterial rupture — is consistent with impending carotid blowout syndrome, a severe complication of radiation-induced endarteritis and surgical vessel exposure. The patient's cumulative risk profile (prior chemoradiotherapy, salvage surgery, R1/R2 margins, free flap reconstruction, delayed POD 6 timing) constitutes a recognized high-risk constellation. Management appraisal identifies three key areas: explicit escalation protocols for sentinel bleeds in high-risk H&N patients; limitations of supraglottic airway devices in massive oral hemorrhage; and the absence of formal risk stratification tools for ICU-to-ward transition decisions.

Conclusion: A minor postoperative oral bleed in a high-risk H&N oncology patient must be treated as a potential precursor to catastrophic hemorrhage regardless of volume or stable vital signs. Institutions require ward-based escalation algorithms, structured nursing observation protocols and simulation training for oral hemorrhage emergencies. Formal risk stratification tools and clear criteria for extended ICU or high dependency monitoring are urgently needed.

INTRODUCTION

Major head and neck (H&N) oncologic procedures, particularly radical resections with flap reconstruction, carry substantial postoperative risks including

hemorrhage, airway obstruction and acute clinical deterioration. Although severe bleeding events are not very common, they may quickly progress to hypoxemia, cardiac arrest and irreversible hypoxic-ischemic brain injury (HIBI). Postoperative oral bleeding may occur 6–7 days after surgery rather than during the immediate postoperative hours[1,2].

Evidence suggests that outcomes after free flap (FF) reconstruction depend on the surgical technique used and the timely recognition of complications[3]. In several hospitals, postoperative FF surveillance has progressively shifted to nurse-led models supported by bedside nursing presence and well-organized monitoring algorithms. However, implementation varies across institutions[2,3].

In this case report, we describe and critically analyze a nursing-centered case of severe postoperative oral hemorrhage in a patient who underwent salvage surgery for tongue cancer with FF reconstruction, leading to cardiac arrest, ROSC, ICU admission, and fatal HIBI. The aim of this case study is to examine ward surveillance, emergency airway and hemorrhage management, escalation protocols, and postoperative risk monitoring.

METHODOLOGY

This case report was conducted in accordance with the CARE (Case Report) reporting guidelines[4]. Explicit written consent for publication was obtained from the patient, including consent for publication in peer-reviewed journals and international databases. While all reasonable measures have been taken to de-identify the clinical information, absolute anonymization cannot be guaranteed.

Ethical Statement

This case report was conducted in accordance with the Declaration of Helsinki. At hospital admission, the patient provided written informed consent under the institution's standard admission procedure, which includes a General Data Protection Regulation (GDPR)-compliant consent form (Regulation (EU) 2016/679) explicitly covering the retrospective use of anonymized clinical data for academic and educational purposes. This practice is consistent with national bioethics legislation. While all reasonable measures have been taken to de-identify the clinical information, absolute anonymization cannot be guaranteed. Formal ethics committee approval was not required for the publication of a de-identified retrospective case report under these conditions[4].

CASE PRESENTATION

Patient Background and Surgical Procedure

A 56-year-old male was referred to the in-hospital H&N clinic for consultation. The patient presented with a new T2N0 squamous cell carcinoma of the oral tongue. In 2021, he had been diagnosed with oropharyngeal cancer and was treated with chemotherapy and radiotherapy. Early in 2025, he underwent surgery with R1 and R2 margins and developed an immediate relapse. Following surgery, he received 2 cycles of chemotherapy and 5 fractions of radiotherapy. A recent positron emission tomography (PET) scan showed no distant metastases. After multidisciplinary consultation, he was scheduled for radical salvage surgery, comprising selective neck dissection, right hemiglossectomy and reconstruction with a Radial Forearm Free Flap (RFFF).

Postoperative Course (POD 0–3)

After surgery the patient was transferred to the ICU for postoperative care and monitoring. During the first 2 days, no significant complications were reported. On POD 3, he was moved to the surgical ward.

Sentinel Event (POD 6)

On POD 6, the patient complained of a minor episode of bleeding from the tongue. The nurses assessed the patient, suctioned approximately 10mL of blood from the oral cavity and informed the doctor on duty for further evaluation. The most recent routine vital signs had been within normal limits at that time.

Hemorrhage and Resuscitation (POD 6)

Approximately 20 minutes after this first episode, the patient developed sudden major oral hemorrhage. Nursing staff informed the doctor on duty again and activated the resuscitation team. The bleeding was described by nursing and medical staff as arterial. The patient rapidly deteriorated and lost consciousness. Nurses attempted to maintain airway patency with continuous suctioning. The estimated blood loss was approximately 2L and the patient subsequently suffered cardiac arrest. Emergency cardiopulmonary resuscitation (CPR) was initiated. The airway was secured with a laryngeal mask airway (LMA) and 1 unit of packed red blood cells (PRBCs) was transfused. ROSC was achieved after 36 minutes of resuscitation. Following ROSC, the patient was urgently transferred to the operating room (OR) for surgical control of the bleeding. On arrival in the OR, the patient experienced a second cardiac arrest, which was again successfully resuscitated and ROSC re-established. Hemostatic surgery was performed and the patient was transferred intubated to the ICU.

ICU Evolution and Outcome (POD 7–15)

During ICU care the patient received an additional 2 units of PRBCs, 5 units of Fresh Frozen Plasma (FFP), fibrinogen, and tranexamic acid. On the evening of POD 7, he required further hemostatic surgery due to ongoing bleeding through the submandibular drains and nasogastric tube. He remained hemodynamically unstable, requiring very high doses of vasopressors.

On POD 8–9 the patient remained sedated, intubated, and mechanically ventilated with persistent hemodynamic instability and ongoing blood product transfusion requirements. Pupillary responses were absent. On POD 10–11, sedation was discontinued. The patient had no cough reflex and his pupils remained

non-reactive to light. On POD 12, bronchoscopy was performed and thick blood-stained mucus was observed in the bronchi. Brain magnetic resonance imaging (MRI) showed findings consistent with HIBI, including cerebral herniation and subarachnoid hemorrhage. On POD 13–14, the patient remained unconscious despite discontinuation of sedation. Neurological assessment showed no improvement and vasopressor requirements remained very high. On POD 15, two brain death assessments were performed at different times in the presence of the H&N surgeon and two ICU physicians. Brain death was confirmed.

The sequence of a minor bleeding episode followed by massive arterial hemorrhage, cardiac arrest and fatal post-anoxic brain injury prompted review of postoperative surveillance, escalation and emergency response processes in this high-risk surgical oncology patient.

Table 1. Clinical timeline (POD 0–15)

POD	Event
0	Selective neck dissection, right hemiglossectomy, RFFF reconstruction performed. Patient transferred to ICU postoperatively.
1–2	Stable ICU stay. No significant complications recorded.
3	Patient transferred to the surgical ward.
4–5	Uneventful ward course. Routine vital signs within normal limits.
6	Patient reports minor oral bleeding. Nurses assess patient and suction approximate blood from the oral cavity. On-duty doctor informed. Vital signs at that time within limits.
6 (approx. 20 min later)	Sudden massive arterial oral hemorrhage (~2L estimated blood loss). Patient rapidly loses consciousness. Cardiac arrest. CPR initiated. LMA inserted. 1 unit PRBC transfused. ROSC achieved after 36 minutes.
6 (OR)	Urgent transfer to OR. Second cardiac arrest on arrival, resuscitated. Hemostatic surgery performed. Patient transferred intubated to ICU.
7	Re-exploration for ongoing bleeding through submandibular drains and nasogastric tube. Administered: 2 units PRBCs, 5 units FFP, fibrinogen, tranexamic acid. Hemodynamically unstable, very high vasopressor requirements.
8–9	Sedated, intubated, mechanically ventilated. Persistent hemodynamic instability. Al pupillary responses. Ongoing blood product requirements.
10–11	Sedation discontinued. No cough reflex. Pupils non-reactive to light. No neurological improvement.
12	Bronchoscopy: blood-stained mucus in bronchi. Brain MRI: HIBI with cerebral herniation and subarachnoid hemorrhage.
13–14	Unconscious, no neurological improvement despite cessation of sedation. Vasopressor requirements remain very high.
15	Two brain death assessments performed at different times in presence of H&N surgeon and two ICU physicians. Brain death confirmed.

DISCUSSION

This case report highlights a rare but devastating postoperative path in H&N oncology: a minor oral bleed followed by fatal arterial hemorrhage, airway compromise, cardiac arrest, and irreversible neurological injury despite subsequent surgical control of the bleeding. Previous case-based literature on oral cancer surgery has emphasized that massive postoperative hemorrhage is a life-threatening complication requiring close monitoring, rapid multidisciplinary management, and a structured nursing response[2]. In our case, brain MRI demonstrated HIBI with severe cerebral edema, tonsillar herniation, and absent intracranial arterial flow on flow-sensitive sequences. These findings were consistent with irreversible post-anoxic brain injury and explain the fatal outcome despite hemostatic surgery.

Hemorrhage Etiology

The precise mechanism of arterial hemorrhage in this case could not be confirmed intraoperatively with certainty. However, several plausible mechanisms deserve consideration given the patient's clinical background. Carotid blowout syndrome (CBS) represents the most clinically relevant possibility. CBS is a rare but catastrophic complication of H&N oncology, arising from arterial wall breakdown secondary to radiation-induced endarteritis, surgical exposure of vessels, wound breakdown, infection, or tumor recurrence[5]. A widely used classification system describes three grades: threatened (exposed carotid artery or impending rupture), impending (sentinel bleed) and acute (active hemorrhage)[5]. The sequence of events in this case, a minor sentinel bleed followed within 20 minutes by massive arterial hemorrhage, maps closely to the transition from impending to acute CBS. The incidence of CBS in patients treated with modern radiotherapy approaches 0.7–0.9%. However, it rises to 3–4% in postoperative patients and can exceed 17% in those who have previously been irradiated, a similar profile matching our patient[5]. Pseudoaneurysm formation is another recognized mechanism, whereby radiation-induced weakening of the arterial wall leads to progressive dilatation and eventual rupture under physiological blood pressure. Pseudoaneurysmal rupture has been described in patients undergoing chemoradiotherapy for H&N cancer, with sudden and massive hemorrhage as the presenting event[6]. Given that confirmatory imaging (computed tomography angiography-CTA) was not feasible in the acute context of cardiac arrest, the underlying vascular mechanism remained unconfirmed. The nature and velocity of the bleeding, combined with the patient's cumulative risk profile, are consistent with a major arterial source and are highly suggestive of CBS or large vessel erosion.

Patient-Specific Risk Factors

This patient carried an unusually high cumulative burden of hemorrhagic risk. Prior chemoradiotherapy is a well-established independent contributor to vascular complications, impairing wound healing, inducing radiation-mediated endarteritis, and reducing the tissue tolerance of subsequent surgical interventions[5,6]. Salvage surgery after prior treatment failure with positive margins (R1/R2) creates a surgically hostile environment with compromised vascularity, increased friability, and impaired healing. Free flap reconstruction in this context adds further complexity. A recent nested case-control study of 548 flaps found hematoma rates of approximately 9.65% with multiple patient and technical factors contributing additively to complication risk[7]. The temporal pattern of hemorrhage on POD 6 is consistent with published evidence showing that delayed bleeding and tissue breakdown most commonly manifest during the first postoperative week, particularly in irradiated tissue with impaired healing capacity[1]. The convergence of prior chemoradiotherapy, salvage surgery, free flap reconstruction and delayed postoperative timing constitutes a high-risk profile that warrants formal risk stratification prior to ward transfer. Formal hemorrhage risk stratification tools for H&N patients remain underdeveloped. This case emphasizes the need for explicit criteria to guide decisions about prolonged ICU monitoring, high-dependency unit (HDU) admission, or enhanced ward surveillance before discharge.

Critical Appraisal of Sentinel Bleed Management

This case raises questions regarding the threshold for diagnostic and escalation response in high-risk patients. At the time of the first bleed, routine vital signs were within normal limits and the blood volume was small (approximately 10mL). Nevertheless, given the patient's cumulative risk profile, a minor oral bleed in this context qualifies clinically as a potential "impending" event within the CBS classification framework[5]. Current expert opinion on CBS management identifies sentinel bleeds in high-risk H&N patients as an indication for urgent senior surgical review. Where feasible in a hemodynamically stable patient, it also supports emergent CT angiography to identify vascular compromise before catastrophic hemorrhage occurs[5]. Approximately half of patients with impending CBS who present with a sentinel bleed will progress to acute hemorrhage[8]. This does not imply that bedside nursing or medical staff acted incorrectly. Rather, it highlights the importance of explicit, protocol-driven thresholds that frame the combination of a sentinel bleed and a high-risk surgical background as warranting urgent escalated assessment. The rapid progression between the first and second bleeding episode illustrates the operational difficulty of diagnostic evaluation during acute deterioration, reinforcing the need for pre-defined, immediate escalation pathways for any new oral bleeding in high-risk H&N patients.

Airway Management Considerations

Airway management in the setting of massive oral hemorrhage represents one of the most challenging clinical scenarios in H&N surgery. In this case, an LMA

was used by the resuscitation team during cardiac arrest to secure ventilation. While the LMA enabled rapid airway rescue when speed was paramount in a peri-arrest context, its limitations in massive oral hemorrhage warrant discussion. The LMA does not protect against aspiration and does not provide a definitively sealed airway in the presence of active oropharyngeal hemorrhage. Current guidance for airway management in H&N emergencies and difficult airway situations identifies endotracheal intubation as the preferred definitive airway device in patients with oral hemorrhage and surgical airway access (cricothyrotomy or emergency tracheostomy) as the fallback when oral intubation is not achievable due to bleeding, anatomical distortion, or oropharyngeal compromise[9]. In the specific context of cardiac arrest with massive oral bleeding, the placement of an LMA reflects the operational realities of prehospital and ward resuscitation and is consistent with international resuscitation guidance supporting supraglottic airways as a rescue option during cardiac arrest. It is important to acknowledge that airway decisions during catastrophic oral hemorrhage are frequently shaped by immediate operator expertise, available equipment at the time of the emergency, and the degree of anatomical distortion present, factors that may preclude application of the theoretically preferred approach even when guidelines are known. Nonetheless, this case supports the pre-designation of airway roles within simulation training for H&N hemorrhage, including early anesthesiology notification, pre-positioning of video laryngoscopy, suction-assisted airway equipment and a surgical airway kit at the bedside of high-risk patients.

Proposed Escalation Protocol

In oral cavity and tongue surgery, hemorrhage simultaneously threatens circulation and the patient's airway. Blood can rapidly obstruct the upper airway, impair oxygenation and cause sudden loss of consciousness. Reviews of tongue reconstruction have noted that postoperative airway swelling is common enough that many patients require tracheostomy in the early postoperative period, underscoring the baseline airway vulnerability of this population[8]. In the present case, bedside nursing actions were appropriate and consistent with published case-based recommendations that emphasize the central role of nursing interventions in the early recognition and management of postoperative hemorrhage[2]. Although no specific guidelines were identified for suctioning in postoperative hemorrhage following glossectomy, current guidance from analogous H&N procedures (thyroidectomy, tonsillectomy) supports cautious oral suctioning for airway protection while emphasizing avoidance of deep or blind suctioning near the surgical site, which risks disrupting the flap or precipitating further hemorrhage[10,11].

Based on this case and the supporting literature, we propose the following practical, ward-based escalation pathway for any new postoperative oral bleeding in high-risk H&N patients.

It should be noted that this pathway represents expert interpretation obtained from a single case in combination with supporting literature and is not a validated clinical guideline. It is intended as a framework for institutional adaptation rather than a prescriptive protocol.

1) Immediate nursing response: Call for help immediately, activate suction, position patient upright or lateral to protect the airway and alert the on-duty doctor.

2) Initial medical assessment within 5 minutes: Assess airway patency, oxygen saturation, heart rate, blood pressure and level of consciousness. Characterize the bleed visually, for example arterial or venous and estimated volume.

3) If any of the following are present — arterial bleeding pattern, volume >50mL, declining oxygen saturation, altered level of consciousness, or high-risk patient profile (salvage surgery, prior radiation, free flap) — immediately activate the major hemorrhage protocol: call the senior surgeon and anesthesiologist, alert the operating room, obtain large intravenous access, perform urgent cross-match and prepare blood products.

4) In high-risk patients (salvage surgery, prior radiation, free flap reconstruction), any sentinel bleed, regardless of volume, may warrant management as a potential impending major hemorrhage event and trigger urgent senior surgical review and consideration of emergent CT angiography in hemodynamically stable patients.

5) All events, including minor bleeds, should be documented in accordance with institutional policy, reported and reviewed through institutional quality assurance processes.

Comparison with Published Cases

To contextualize the present case, Table 2 compares key features with the case reported by Shi et al.[2], a closely related published case report describing massive postoperative hemorrhage in oral cancer surgery with nursing-centered analysis. Key similarities include patient sex, operative complexity, free flap reconstruction, ward-based hemorrhage and the critical role of nursing interventions. Notable differences include the role of prior chemoradiotherapy and salvage surgery in the present case, the presence of a sentinel bleed followed by rapid escalation to cardiac arrest, and the ultimately fatal outcome. The comparison illustrates that while the nursing response may be appropriate and standardized, patient-specific factors and particularly the prior chemoradiotherapy and salvage surgery context, profoundly alter the hemorrhagic risk trajectory and the likelihood of a catastrophic outcome.

Table 2. Comparison with a similar case

Feature	Present Case	Shi et al.[2]
Patient	56-year-old male	46-year-old male
Primary cancer site	Oral tongue (recurrent)	Oral floor
Prior treatment	Oropharyngeal cancer (2021): chemoradiotherapy, 2025: surgery + 2 cycles chemo + 5 fractions RT	None documented
Surgery performed	Selective neck dissection, right hemiglossectomy, RFFF	Total glossectomy, partial mandibulectomy, free flap
Hemorrhage onset	POD 6 (after ward transfer)	POD 3 (after ward transfer)
Hemorrhage volume	~2L (arterial)	Life-threatening (not specified)
Sentinel bleed	Yes (~10mL, 20 min before major event)	No sentinel bleed described
Airway management	LMA during cardiac arrest	Airway management with suctioning, no arrest
Cardiac arrest	Yes (×2), 36 min CPR for ROSC	No cardiac arrest
Nursing response	Suctioning, escalation, CPR	Suture removal, pressure hemostasis, multidisciplinary collaboration
Outcome	Brain death (POD 15)	Functional recovery

Ward Monitoring and Institutional Readiness

A key learning point is the short warning window before deterioration. The patient reported a minor bleeding episode approximately 20 minutes before the fatal event, at a time when earlier routine observations had been normal. The literature on tongue surgery shows that postoperative oral bleeding may occur several days after surgery rather than only during the immediate postoperative period, and delayed bleeding around POD 6-7 has been described[1]. Taken together, these findings support a practical nursing message: in high-risk postoperative H&N patients, any new oral bleeding, even in small volume, should be treated as a potential warning sign of major haemorrhage that needs immediate reassessment, increased observation frequency and urgent escalation for senior surgical review.

Although fatal arterial oral hemorrhage is not common and not well quantified in salvage hemiglossectomy populations, the broader reconstructive literature suggests that postoperative complications are sufficiently frequent to justify standardized monitoring and escalation systems. A recent meta-analysis of FF reconstruction in oral cancer reported an overall complication rate of 24% with bleeding (4%) and vascular events (5%) among the reported subgroups[12]. Although these figures do not specifically represent fatal hemorrhage, they confirm that postoperative bleeding and hematoma are clinically important events requiring clear observation criteria, escalation algorithms and timely access to operative intervention.

This case also illustrates how quickly a patient can deteriorate on the ward, with a major emergency developing within 20 minutes of a small warning bleed, even though routine observations had previously been normal. Nurse-led FF monitoring literature emphasizes that outcomes depend not only on surgery but also on intensive monitoring and early recognition of complications. However, gaps remain in protocol

standardization, training and escalation systems[3]. The hemorrhage occurred on POD 6, after the immediate postoperative period and after transfer from the ICU to the surgical ward. FF literature suggests that ward-based postoperative care may achieve outcomes comparable to ICU monitoring in selected settings when supported by structured protocols, adequate staffing and trained teams[3]. Nevertheless, this case argues for a risk-stratified approach. Factors such as salvage surgery after chemoradiotherapy, extensive resection with flap reconstruction, airway vulnerability and a sentinel bleeding episode may each independently justify advanced monitoring in an HDU or ICU, continuous observation or increased surveillance frequency on the ward. A single case cannot determine whether prolonged ICU stay would have altered the outcome. However, it supports the development of explicit step-up criteria and escalation pathways for high-risk patients.

The most important lesson from this case is system-focused: this case supports ongoing efforts to strengthen preparedness so that small early bleeding episodes may benefit from standardized escalation pathways. Case-based literature on hemorrhage after oral cancer surgery, recommends standardized nursing workflows, increased surveillance for high-risk patients, multidisciplinary coordination and ongoing quality improvement through training and retrospective event review[2]. In parallel, nurse-led monitoring literature emphasizes that safe implementation depends on standardized education, actionable protocols and consistent escalation systems[3]. Practical measures arising from this case include: a ward-based algorithm that treats any new postoperative oral bleeding in high-risk H&N patients as a potential airway emergency with defined escalation steps; simulation training for oral hemorrhage with airway obstruction, covering suctioning, role allocation and timely activation of anesthesia and surgical support; standardized observation documentation for H&N patients; and clear pathways for rapid access to the OR and blood product support when bleeding is suspected.

CONCLUSION

This case shows that in a head and neck oncology patient with a high cumulative risk profile — prior chemoradiotherapy, salvage surgery and free flap reconstruction — a minor oral bleed cannot be safely dismissed as benign based on volume or stable vital signs. The short interval between the sentinel bleed and catastrophic hemorrhage demonstrates how rapidly impending carotid blowout syndrome can progress to an unsalvageable outcome despite prompt nursing recognition and resuscitation.

As a single case, this report cannot establish causality or generalize incidence. Nonetheless, it supports the need for explicit, risk-stratified escalation protocols for postoperative oral bleeding in this population, incorporating urgent senior surgical review, low-threshold access to CT angiography, and simulation-based airway and hemorrhage training, rather than relying on volume or vital sign thresholds. Prospective, multicenter evaluation of such protocols is required.

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