

Life-Threatening Hemorrhage after Extraction of Third Molars: Case Report and Management Protocol

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A b s t r a c t

Few dental procedures have fatal complications, but severe postoperative hemorrhage can result in preventable death. This report describes a case of postextraction hemorrhage that led to airway compromise necessitating emergency airway management. This complication is rare, and a review of the literature revealed little in the way of case reports and treatment protocols. This article reviews the causes of and risk factors related to severe postoperative bleeding and presents an algorithm for management both in the dental office and in the hospital.

MeSH Key Words: molar, third/surgery; postoperative complications; postoperative hemorrhage/prevention & control

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The removal of third molars is the most common surgical procedure performed by oral and maxillo-facial surgeons.^{1,2} Severe intraoperative or postoperative hemorrhage is one of the few life-threatening complications for which a dentist may have to initiate management. A case of life-threatening hemorrhage occurring immediately after extraction of third molars and resulting in airway compromise is presented. The risks of hemorrhage associated with removal of third molars are reviewed, and a general management protocol is presented.

Case Report

A 32-year-old man was referred to the oral and maxillo-facial surgery department of Toronto General Hospital from the emergency department (ED) for assessment of postextraction hemorrhage. The emergency physician stated that the hemorrhage had stopped after 20 minutes of pressure with intraoral gauze while the patient was under observation in the ED. The patient's past medical history was significant only for bulimia for which he was receiving pharmacotherapy. He was also receiving sertraline and clonazepam for minor depression and anxiety. He was a nonsmoker and had no allergies. He had no history of bleeding tendency. He had undergone an appendectomy as a child and extraction of tooth 28 (in the dentist's office)

3 weeks before the current presentation; both procedures had been without complications. On the day of presentation, he had undergone extraction of teeth 18, 38, and 48 at his dentist's office under local anesthesia and oral sedation (5 mg diazepam given for 5 minutes preoperatively). The procedure lasted 3.5 hours. The patient recalled that the removal of teeth 38 and 48 had been "difficult." The patient experienced intraoral bleeding and facial swelling after he was discharged from the dental office. He went to his family doctor after vomiting blood. His ashen appearance, swelling and malaise prompted referral to the ED.

On examination in the ED, the patient's vital signs indicated mild hypotension (blood pressure 90/60 mm Hg) and tachycardia (heart rate 110 beats/min) signifying early hypovolemia. There was no postural drop in blood pressure, but mild hypoxia was noted (oxygen saturation 94% on room air). He was oriented but drowsy and lethargic. Extraoral bilateral submandibular swelling extended into the neck, with the swelling on the left side being more pronounced than that on the right. The incision for both mandibular third molar sites extended straight posteriorly, falling on the soft tissue lingual to the mandible. The soft palate was swollen on the left, and the uvula was not deviated. The patient could not bring his teeth into occlusion. He still had bilateral lingual nerve and inferior alveolar

Table 1 Local hemostatic agents useful for oral bleeding

Name	Source	Action	Application
Gelfoam (Pharmacia, Mississauga, Ont.)	Absorbable gelatin sponge (methylcellulose)	Scaffold for blood clot formation	Place into socket and retain in place with suture
Surgicel (Johnson & Johnson, Guelph, Ont.)	Oxidized regenerated methylcellulose	Binds platelets and chemically precipitates fibrin through low pH	Place into socket (Note: cannot be mixed with thrombin)
CollaTape (Sulzer Dental, Carlsbad, Calif.)	Highly cross-linked collagen	Stimulates platelet adherence and stabilizes clot; dissolves in 4–6 weeks	Pack ribbon into socket; easier to use than Gelfoam
CollaPlug (Sulzer Dental) Carlsbad, Calif.)	Preshaped, highly cross-linked collagen plugs	Stimulates platelet adherence and stabilizes clot; dissolves in 4–6 weeks	Place into socket
Avitene (Davol, Cranston, Rhode Island)	Microfibrillar collagen	Stimulates platelet adherence and stabilizes clot; dissolves in 4–6 weeks	Mix fine powder with saline to desired consistency
Thrombin (Thrombostat [Pfizer, Toronto, Ont.]	Bovine thrombin (5,000 or 10,000 units)	Causes cleavage of fibrinogen to fibrin and positive feedback to coagulation cascade	Mix fine powder with CaCl ₂ and spray into area; alternatively, mix with Gelfoam before application
Glynns Glue (Toronto General Hospital Dental Formulary)	Thrombin, Gelfoam, CaCl ₂ and sucralfate	Combination of Gelfoam and Thrombin plus sucralfate's adherent properties	Mix and pack into socket; suture in place
Tisseel (Baxter, Mississauga, Ont.)	Bovine thrombin, human fibrin, CaCl ₂ and aprotinin	Antifibrinolytic action of aprotinin	Requires specialized heating, mixing and delivery system; inject into socket



Figure 1: Transverse computed tomography scan with contrast at the level of the mandibular extraction socket, 5 hours after extraction of wisdom teeth. The airway is constricted at the oropharynx (arrow). There is active bleeding from the lingual soft tissue of tooth 38, which has resulted in an expanding hematoma in the lateral pharyngeal space. Scale unit = 1.0 cm.

nerve anesthesia at the time of this examination, which was now 6 hours after the extraction. The results of all blood testing were normal. Computed tomography (CT) revealed a left-sided hematoma involving the submandibular and lateral pharyngeal spaces (Fig. 1). The hematoma resulted in deviation of the oropharynx and constriction of the airway at the level of the oropharynx, the narrowest point measuring 1.2×4.1 cm. The patient's clinical condition

declined, with a decrease in oxygen saturation to 87% on 6 L/min oxygen by face mask, which produced altered mental status. Airway compromise due to the expanding hematoma, with potential life-threatening consequences, was diagnosed. The hypovolemia responded to fluid replacement, and it was decided to secure the airway. The patient was taken to the operating room, where he was intubated with a fiberoptic technique without sedation. He was then admitted to the intensive care unit. He remained intubated for 2 days and was treated with antibiotics and high-dose steroids. Follow-up CT confirmed that the hematoma was not expanding, and the patient was extubated over a tube-exchanger. He was discharged 6 days after admission.

Follow-up examination on the ninth postoperative day revealed mild trismus and resolution of the extraoral swelling. The patient reported decreased sensation of the left lower lip, and a 2-point discrimination test confirmed paresthesia. His chief complaint was complete bilateral loss of sensation to his tongue. Intraoral examination revealed left-sided ecchymosis involving the left retromolar and soft palate region. His speech was muffled, and sensory testing revealed bilateral anesthesia of the anterior two-thirds of his tongue. By the time of the 4-month postoperative visit, the functioning of the inferior alveolar nerve had mildly improved, but there was no change to the sensation of

his tongue. Head and neck examinations revealed no abnormalities, and all swelling had resolved.

Discussion

The overall complication rate associated with the removal of third molars is 7% to 10%, and the risk of hemorrhage is 0.2% to 1.4%.^{1,2} Other complications include postoperative infection (0.06% to 4.3%), neurosensory injury (0.02% to 7.1%), alveolar osteitis (1% to 30%), oral antral fistula (0.06%), temporomandibular joint dysfunction and jaw fracture (< 0.01%).² In one large study involving a retrospective analysis of 1,000 mandibular and 500 maxillary third molar extractions by oral surgeons,³ the rate of postoperative complications was 4.3% for the mandibular extractions and 1.2% for the maxillary extractions. The rate of postoperative bleeding for mandibular and maxillary third molar extraction was 0.6% and 0.4%, respectively.³ These complications occurred mostly in cases of deep distoangular and horizontal impaction in the mandible. In the maxilla, high vertically positioned molars were most often implicated.

Jensen⁴ reviewed 103 cases of postoperative hemorrhage after oral surgery and made several important observations. He found that the male to female ratio was 2:1, and the age range was 21 to 45 years. There was a personal or family history of bleeding in 25% of cases. Postoperative bleeding occurred within 8 hours of the surgery in 75% of cases. More than half of the patients (54%) underwent some form of unsuccessful hemostatic intervention in the office or the ED. The general physical condition of the patient was not affected in 84% of cases. Among cases in which the location of the bleeding was identified, 7% had an arterial source and 72% involved hemorrhage from the soft tissue. A single site of bleeding was found in 43% of cases. About a quarter (26%) of patients left the dental office with active bleeding, and 10% had inadequate postoperative instructions. Local control was successful in 84% of patients. Hematological investigations revealed no diagnosable bleeding abnormalities, except in 4 patients with previously known coagulation deficiencies.

Airway compromise rarely results from a postextraction hematoma. A review of the literature revealed only one case of death resulting from asphyxiation caused by a postextraction hematoma.⁵ In that case, a 71-year-old man had undergone extraction of 11 teeth without complication. Forty days later he underwent removal of impacted tooth 48 by his private dentist, and 8 hours later he was admitted to the ED for treatment of a hematoma in the floor of the mouth. The oral surgeon was consulted 4 hours later, by which time the patient had experienced respiratory arrest. Autopsy revealed marked swelling caused by the hematoma, which involved the submandibular, lingual and buccal spaces, accompanied by severe narrowing of the oropharynx.

The causes of postextraction hemorrhage can be classified as local or systemic.^{6,7} Systemic causes may include medication that directly or indirectly affects coagulation, coagulation disorders, liver disease (one of the most common causes of coagulopathies) and hypertension. Most congenital coagulopathies are diagnosed early in life, and many of these patients present to the dental office for treatment with prior knowledge of their condition. Patients who do not have a diagnosed systemic cause or have not had previous surgery (which would uncover a bleeding abnormality) are at risk for unforeseeable complications. In these cases prevention may not be possible.

For patients who have undergone previous dental extractions without complications, the occurrence of postoperative hematoma may suggest a purely local anatomic cause. Local factors resulting from soft-tissue and vessel injury represent the most common cause of postoperative hemorrhage.⁸ Hemorrhage from the mandibular molars is more common than bleeding from the maxillary molars (80% and 20%, respectively),⁴ because the floor of the mouth is highly vascular. Furthermore, the distolingual aspect of the mandibular third molar region is the most highly vascularized site, and this should be taken into consideration when all third molars are to be removed.⁹ This area may encompass an accessory artery emanating from the lingual aspect of the mandible, and bleeding may be profuse if this vessel is cut.^{5,6}

Routine preoperative blood testing of patients without a relevant medical history of coagulation disorders is inappropriate.¹⁰ A small group of patients may bleed after dental extractions even though they have a normal hematological profile. It has been suggested that oral fibrinolysis because of salivary enzymes may be responsible for clot lysis in these cases.¹¹ The use of fibrin-stabilizing factors such as epsilon-aminocaproic acid and tranexamic acid are helpful in these cases.

In the case presented here, the hemorrhage might have been due to direct injury to the lingual artery or one of its branches on the distolingual aspect of the left third molar site. However, the use of a handpiece could also cause laceration of any blood vessel in the area if it is passed deep to the tissues. The location of the incision in this patient, as well as his lingual anesthesia, indicates that the nerve and vessel injury might have been caused by a surgical blade. The cut vessel might have retracted posteriorly and medially, bleeding deep into the paralingual spaces rather than intraorally. The immediate life-threatening emergency related to operative hemorrhage after extraction often relates to the airway, not hypovolemia, as in this case.

Treatment of postextraction bleeding starts with a review of the patient's medical and surgical history. Vital signs and clinical status should be monitored continuously. An attempt to quantify the amount of blood loss is helpful.

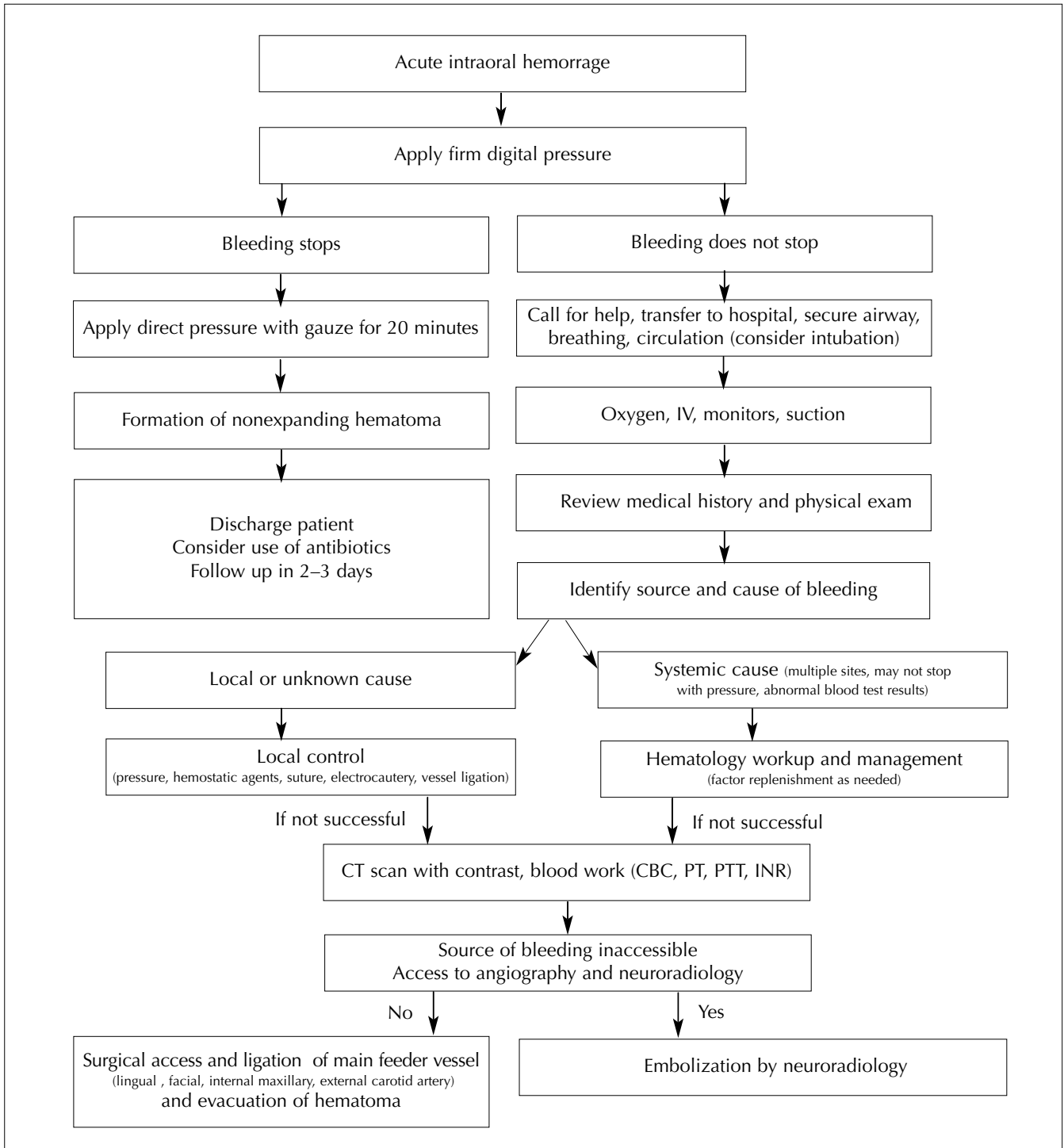


Figure 2: Algorithm for management of acute intraoral hemorrhage. IV = intravenous, CT = computed tomography, CBC = complete blood count, PT = prothrombin time, PTT = partial thromboplastin time, INR = international normalized ratio.

Hypotension due to loss of blood volume can be measured by blood pressure and heart rate. Blood pressure measured with the patient sitting down and then repeated 1 minute after he or she has come to a standing position (postural change) will provide information about volume status. An increase in the heart rate of more than 15 beats/minute, a decrease in the systolic blood pressure of more than

15 mm Hg or any drop in the diastolic blood pressure indicates significant hypovolemia (defined as more than 30% of total blood volume lost).¹²

Intraoral examination with adequate lighting of the oral cavity and oropharynx will allow identification of the bleeding area. Direct pressure with gauze is then applied for 20 to 30 minutes. If the bleeding continues, infiltrative

local anesthetic (1:100,000 epinephrine) should be applied. In contrast to the common misconception that any clot that has formed should be left in place, all clot and debris must be removed to allow examination of the socket. The socket should be curetted and suctioned to identify the source of bleeding. If the source is not arterial, then any of a variety of local hemostatic agents can be used (Table 1). If an arterial source is identified (indicated by pumping of bright red blood), the vessel must be ligated. If the source is intra-alveolar, then absorbable packing may be placed into the socket, followed by suturing. If local measures are not successful then the situation needs to be managed urgently, especially if the patient becomes symptomatic (Fig. 2). Airway, breathing and circulation must be assessed. As with all emergencies, airway management is the first step in stabilizing the patient. Uncontrollable intraoral hemorrhage can quickly lead to airway compromise either because of an expanding hematoma in the neck or from blood pooling in the airway.

A hematoma is a collection of blood in a virtual space. The size and spread of a hematoma depends on its vascular origin (capillary, venous or arterial) and the tissue into which it is bleeding (muscle, fat or interstitia). Hematomas stop expanding when the pressure of the pooling blood exceeds the vascular pressure of the bleeding site. Hematomas typically occur when an infiltrative block is given in the buccal vestibule (posterior superior alveolar injection). However, practitioners must be aware that hemorrhage can occur into deeper spaces without immediate signs or symptoms. The management of intraoral hematoma is described in the algorithm (Fig. 2).

Conclusion

Few dental procedures have the potential to result in life-threatening complications. However, dental extraction is one procedure that can result in preventable deaths. Several issues should be emphasized, including the importance of careful surgical technique, planning, knowledge of the surgical anatomy and recognition of surgical complications. The patient described here suffered long-term tongue anesthesia as well as emergent airway compromise. The oral and maxillofacial surgeon and the dentist play crucial roles in recognizing and managing many emergencies in the ED, including postextraction hemorrhage. The most immediate danger for a healthy patient with severe postextraction hemorrhage is airway compromise. Active bleeding that is not controlled by local measures in the dental office should be referred to the nearest hospital ED so that the airway can be secured and the hemorrhage managed appropriately. ♦

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