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CASE REPORT

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Maxillary tuberosity fracture: a life-threatening haemorrhage following simple exodontia

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ABSTRACT

Maxillary tuberosity fracture is a potential complication of routine exodontia of posterior maxillary teeth. On rare occasions, such a complication can result in torrential haemorrhage due to the close proximity of significant vessels to the area. We present a case of life-threatening haemorrhage complicating a tuberosity fracture during simple extraction of a maxillary posterior tooth. The local anatomy of the region is discussed and we provide guidelines for general dental practitioners for the management of the complication of a tuberosity fracture during routine exodontia.

Keywords: Haemorrhage, fracture, maxillary tuberosity.

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INTRODUCTION

General dental practitioners are aware of the many complications associated with extraction of teeth. Commonly, these have minimal morbidity for the patient. However, there are rare cases of life-threatening complications directly related to simple exodontia that is routine in general dental practice. Life-threatening haemorrhage is such a complication that may occur in medically compromised patients with coagulopathy but can also occur in otherwise healthy young adults. Fracture of the maxillary tuberosity is a potential sequela of removal of maxillary posterior teeth. Often, a small fragment of bone is able to be carefully dissected from its periosteum and delivered with the tooth. However, in cases of a large bony fragment, tearing the fragment from its periosteum and delivery with the tooth can result in serious complications.[1] We report a case of life-threatening haemorrhage resulting from a fractured maxillary tuberosity following routine extraction of a maxillary second molar tooth.

CASE REPORT

A healthy 20-year-old male presented to our emergency department with acute intraoral haemorrhage following a dental extraction of the left maxillary second molar tooth two hours previously by his local dentist. On arrival, he was in haemorrhagic shock, being tachycardic, hypotensive and slightly confused. These signs are consistent with an acute blood volume loss of between 750 mL to 1500 mL.[2] There was epistaxis and severe, pulsatile haemorrhage intraorally from the area of the left maxilla. He responded well initially to fluid boluses and pressure with large gauze pads. The patient's relatives provided history that the extraction was complicated by removal of a large piece of bone attached to the tooth.

The patient was immediately taken to the operative theatre for examination and control of haemorrhage under general anaesthesia. Intraoperatively, he was noted to have arterial haemorrhage in the region of the extraction socket where there was a large portion of the left posterior maxilla missing and a large oro-antral communication. Due to the size and depth of the defect, no bleeding vessels could be isolated and controlled. Haemostasis was achieved by packing the defect, the left antrum and left nose with ribbon gauze.

Postoperatively, the patient remained stable, was placed on IV antibiotics and a CT scan of the maxilla was performed which revealed an extensive defect in the region of the left posterior maxilla (Figs 1 and 2). The bony defect extended superiorly to include a large portion of the posterior wall of the left maxillary sinus. After 48 hours, a second operation was performed under general anaesthetic to remove the packing and close the large oro-antral communication.

The patient experienced no further episodes of haemorrhage and healing of the site was unremarkable.

Fig 1. Postoperative CT scan demonstrating maxillary tuberosity fracture posterior to the root apices of the left first molar. Note radiopaque nasal packing *in situ*.

Fig 2. Postoperative CT scan demonstrating bone defect extending to include the postero-lateral wall of the left maxillary antrum. Radiopaque nasal packing *in situ*.

The patient's haemoglobin was noted to have fallen from a premorbid 151 g/L to 93 g/L on day 1 post-operatively. More alarming was the haematocrit, or circulating packed cell volume, which showed a 41% decline and the red cell count demonstrating a 38% reduction. These values emphasize the significant volume of blood loss in this case (Table 1).

Table 1. Selected results from patient's full blood count

	Blood count on admission	Blood count day 1 postoperative
Haemoglobin g/L	151	93
Platelets /L	$289*10^9$	$193*10^9$
Red cell count /L	$6.2*10^{12}$	$3.8*10^{12}$
Haematocrit L	0.46	0.27

DISCUSSION

This case highlights potential serious complications for practitioners in the management of simple dental extractions. Fracture of the maxillary tuberosity is not an uncommon complication of removal of maxillary molar teeth. The incidence of fracture during third molar removal alone has been reported to be at around 0.6%.[3] Fragile vessels in the region of the posterior maxilla and tuberosity are easily ruptured when bone is fractured and separated from its periosteum. This can result in torrential bleeding and a life-threatening situation, as reported by this case. We advocate a conservative approach by the general dentist when a large maxillary tuberosity fracture becomes evident while removing a tooth. This includes abandoning any further attempts to remove the tooth and bone fragment, splinting where required, and prompt referral to an oral and maxillofacial surgeon.[4] In certain instances of severe haemorrhage, management may necessitate ligation of the external carotid artery or arterial embolization proximal to the bleeding vessel.[5] Such invasive procedures require subspecialist surgical and radiological intervention and may only be available in larger, tertiary referral hospitals.

A better understanding of potential hazards for haemhorrage can be gained by considering the vessel anatomy of the region. The arterial supply is largely derived from the maxillary artery which, after traversing anteriorly and obliquely past the lateral pteryogid, enters the pterygopalatine fossa.[6] Just prior to entering the fossa, it gives off branches of the posterior superior alveolar artery that wrap around the tuberosity and descend anteriorly and inferiorly (Fig 3). Further dissections have shown that a bucco-gingival branch may occur from the posterior superior alveolar artery, which approaches the infraorbital surface of the maxilla and in some cases anastomoses with the infraorbital artery.[7] Other arteries that may be affected in a tuberosity fracture if the fracture were to travel posteriorly and superiorly into the pterygopalatine fossa include the branches of the maxillary artery that arise from within the pterygopalatine fossa. These include the descending palatine artery, the descending pharyngeal artery, and to a lesser extent the sphenopalatine, infraorbital and

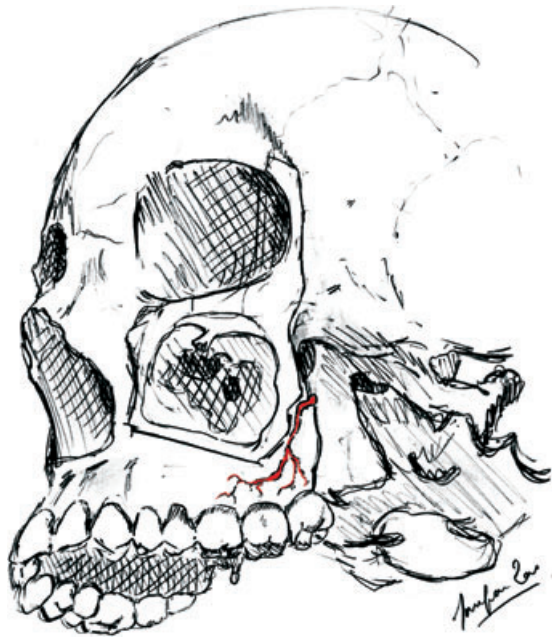

Fig 3. Anatomy of left posterior superior alveolar artery (red). Zygoma cut.

vidian arteries. Studies have also suggested considerable variation in the anatomy of the posterior third of the maxillary artery. In particular, the patterns of bifurcation of the sphenopalatine and descending palatine artery.[8] A case has been reported of a dental extraction complicated by a tuberosity fracture involving removal of parts of the pterygoid plate, the attachment of the lateral pterygoid and the lateral pterygoid artery.[1]

The venous supply is derived largely from branches of the pterygoid venous plexus, which may be found in between the lateral and medial pterygoids, or between the lateral pterygoids and the temporalis. The plexus is highly variable in structure but is thought to wrap around the maxillary artery, protecting it from occluding as mastication takes place.[9] Veins in the pterygopalatine fossa are generally very small in calibre and follow the course of the arteries. One study found that in only 2 of 20 specimens could a sphenopalatine vein be identified. Its course was described as exiting the sphenopalatine foramen, passing the pterygomaxillary fissure inferiorly and posteriorly before joining the pterygomaxillary plexus.[10] Aside from this, the venous drainage is markedly absent in the pterygopalatine fossa.

It should be noted that the vasculature is almost exclusively related intimately with the overlying periosteum. In cases where profuse bleeding emanates from the extraction site of an upper wisdom tooth, it is usually a branch of the posterior superior alveolar artery that is torn along with the tuberosity. The situation is made even more troublesome by the fact that the artery may retract deeper into the underlying tissue, making identification of the point of haemorrhage even more difficult to locate and ligate or clamp.

CONCLUSIONS

We advocate the following guidelines for general dental practitioners in managing the complication of maxillary tuberosity fracture during or following the extraction of an upper posterior tooth:

(1) Always discuss the potential of a tuberosity fracture during the process of obtaining consent, especially in the case of a lone standing tooth.
(2) Application of finger pressure with the non-dominant hand to stabilize the maxillary segment and help the operator detect a fracture during the extraction process.
(3) If a fracture was to occur, cease the procedure immediately.
(4) If the bony fragment is mobile, carefully dissect the surrounding mucosa from the bone with periosteal elevators, as opposed to simply ripping the tooth and surrounding tissue out. This will lessen the likelihood of a larger vessel being torn.
(5) If bleeding does occur, pack the socket with haemostatic substance (e.g. oxidized cellulose) or sterile ribbon gauze. Pack the area with as much material as necessary to tamponade the bleed, while being mindful not to obstruct the patient's airway. Plain sterile gauze swabs may be used to pack the site. It is important to note that the number of swabs should be accounted for, so they are not inadvertently left behind at the time of removal. The use of gauze pads with an embedded radiopaque marker is preferable. It may be prudent to prepare a 'bleeding pack' including gauze swabs, suctions tips, haemostatic dressings (e.g. oxidized cellulose), and suture materials so that they are immediately available.
(6) If profuse bleeding occurs, pack the area and arrange prompt transfer of the patient to hospital. Important information that should be included is a written referral and any relevant radiographs. The length of time required for the packing to be left *in situ* may vary from 48 hours to five days, depending on the risk profile of the patient and the severity of the bleed. In cases of a severe bleed, we advocate surgical exploration of the site and removal of the pack within 24–48 hours in the controlled environment of an operating theatre by a specialist surgical team.
(7) Referral to an oral and maxillofacial surgeon is appropriate for follow-up and management of oro-antral communications that may develop secondarily.

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