ORAL SURGERY
ORAL MEDICINE
ORAL PATHOLOGY

CLINICAL NOTES

Near-fatal airway obstruction after routine implant placement

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Implants have gained tremendous popularity over the past two decades, and their placement in the interior edentulous mandible has become routine. A case of near-fatal airway obstruction secondary to sublingual bleeding and hematoma is presented. The complication, anatomy of the area, and previous literature are reviewed, as are precautions to implant placement and other surgical procedures near the floor of the mouth. Although placing dental implants is generally a benign procedure, practitioners must be prepared for potential complications and have a rehearsed plan of action for the treatment of emergent situations. The floor of the mouth contains branches of the submental and sublingual and mylohyoid arteries that may lead to life-threatening complications. This caution obviously extends to any dentoalveolar surgical procedures that concerns the floor of the mouth such as tori removal, extractions, and iatrogenic dental injuries. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;92:597-600)**

CASE REPORT

A 64-year-old woman presented for the placement of two implants in the mandibular canine areas under intravenous sedation (Fig 1). The patient was given local anesthetic with bilateral mandibular nerve blocks and anterior vestibular infiltration, using 7.2 cc of 2% lidocaine with 1:100,000 epinephrine. Incisions were made in the gingival, and the implant sites were prepared in a routine fashion with standard instrumentation for a threaded endosseous hex head implant system. The implant preparations were probed, and a small lingual perforation was noted at the inferior lingual portion of both preparations. There was no significant bleeding or swelling at this time. Because of the anatomy of the edentulous area and the angulation of the implant, the perforation was larger on the left side.

As the perforation was probed to determine whether adequate bone was present for integration, brisk bleeding ensued from the left implant site. The implant placement was deferred and attention focused on hemostasis. The socket was obturated with Gelfoam (Pharmacia & Upjohn, Kalamazoo, Mich), and digital pressure was placed on the floor of the mouth. During the next 2 minutes, the patient's tongue and floor of the mouth became extremely swollen and ecchymotic and the tongue protruded 5 cm from the oral cavity. In addition, the submental area developed an indurated swelling the size of an orange.

The patient had exhibited normal vital signs, but at this time she began to experience acute respiratory distress due to the obstruction of the airway and the tongue pressing against the palate from the gross swelling, which was continuing.

The respiratory distress continued, and the arterial oxygen saturation began to drop. A laryngoscope was placed in the pharynx to view the vocal cords and facilitate endotracheal intubation, but due to the extreme swelling of the tongue and floor of the mouth, the structures could not be elevated to visualize the vocal cords. A laryngeal mask airway was retrieved and forced into the pharynx past the swollen tongue, which was pressing against the palate. A patent airway was immediately established, and the patient's ventilation was assisted with positive pressure and 100% oxygen. The vital signs remained stable, and the arterial oxygen saturation returned to a normal value. The paramedics arrived and were accompanied by the surgeon to a hospital 5 minutes away, where the patient was taken directly to the operating room.

The patient was transported from the office setting to a hospital operating room, where the laryngeal mask airway and an IV were secured by the anesthesiologist. Because of the severe swelling, previous respiratory distress, and unknown status of the bleeding, a tracheostomy was performed while the patient was under local anesthesia. The procedure was complicated by an obese neck, swelling, hematoma, and the position of the thyroid gland, which, along with some related vessels, required sectioning during the tracheostomy.

A cuffed tracheostomy tube was placed, and the airway was secured. There was no obvious active bleeding, but the protruding tongue and floor of the mouth were extremely ecchymotic and edematous. The bleeding and swelling had

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Fig 1. Frontal and lateral views of the patient after emergency tracheostomy. Note the severe hematoma of the tongue and floor of the mouth. The tongue is blue from extravasation of blood, and the submental area is grossly expanded from hematoma. It is this type of swelling that forces the tongue against the hard and soft palate and obstructs the airway.

Fig 2. A lateral view of the patient 3 days after the bleed. The patient was asked to stick out her tongue in the photograph to show that the swelling was significantly diminished. Note the ecchymosis of the tongue and neck from the resolving hematoma.

appeared to stop at this point, which was now 45 minutes after the initial bleed. Because of the amount of distortion of the normal tissues and the fact that the bleeding appeared to have tamponaded, a decision was made to forego exploration of the floor of the mouth and observe the patient for further bleeding.

The patient was admitted to the intensive care unit and placed on a ventilator. A chest x-ray was obtained to confirm tracheostomy position and evaluate lung fields for possible aspiration. Ice was applied to the chin and neck. The patient underwent an uneventful course in the intensive care unit. She was weaned off the ventilator on the second postoperative day. By the third postoperative day, a majority of the swelling had subsided (Fig 2) and the tracheostomy was discontinued the afternoon of the fourth postoperative day. The patient remained in the hospital for an additional 48 hours.

DISCUSSION

Dental implants are an accepted mainstay of restorative dental therapy; thousands of dental implants are placed per year in a safe and effective manner. Although most dental implants can be placed very simply, case reports of near-fatal complications from dentoalveolar surgery exist.[1-12] Severe bleeding can also occur from iatrogenic injuries in the floor of the mouth as a result of misdirected dental burs and disks.[13,14]

Bavitz et al[15] presented an excellent review of the arterial supply to the floor of the mouth, in which they state that the lingual artery is typically the third branch of the external carotid artery. From its place of origin, approximately at the level of the hyoid bone, the lingual artery courses anterior; it then makes a small loop and passes deep into the hyoglossus muscle. Medial to the muscle, the artery continues anteriorly and superiorly. At the approximate area of the anterior border of the hyoglossus muscle, the lingual artery releases the sublingual artery and continues as the profunda (deep) lingual artery, which is the terminal branch and main artery to the body of the tongue. The sublingual artery is situated in the floor of the mouth, medial to the sublingual gland, and it supplies blood to the gland, the mucous membrane of the floor of the mouth, the mylohyoid muscle, and the lingual gingivae. The artery also sends small branches to the tongue, as well as into the mandible, through foramina in the genial tubercle area.

In addition to the facial artery, except when arising as a common trunk with the lingual, is the fourth branch arising from the external carotid artery. After its route through the submandibular gland and before crossing the inferior border of the mandible, the facial artery gives rise to the submental artery. The submental artery courses anteriorly along the inferior surface of the mylohyoid muscle. The submental artery supplies blood to the submandibular triangle, the anterior belly of the digastric muscle, and the mylohyoid muscle

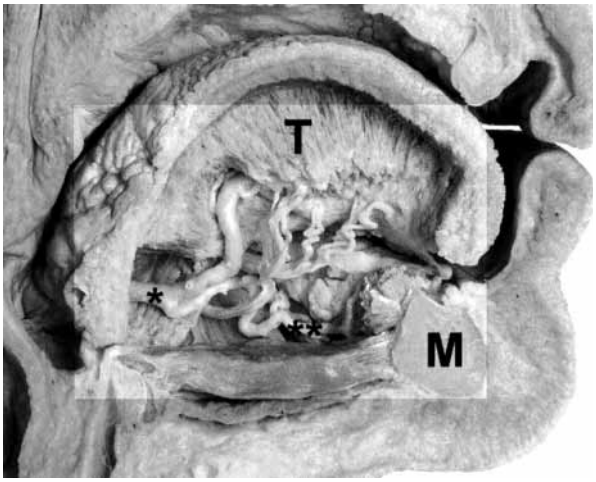

Fig 3. A cadaver dissection showing the lingual artery and the sublingual artery as they transverse the floor of the mouth. The lingual artery is normally the third branch of the external carotid artery, and, therefore, violations of this artery or one of its branches can produce severe bleeding. (Picture courtesy of RHH McMinn, RT Hutchins. Color Atlas of Human Anatomy. Chicago: Mosby–Year Book; 1977.)

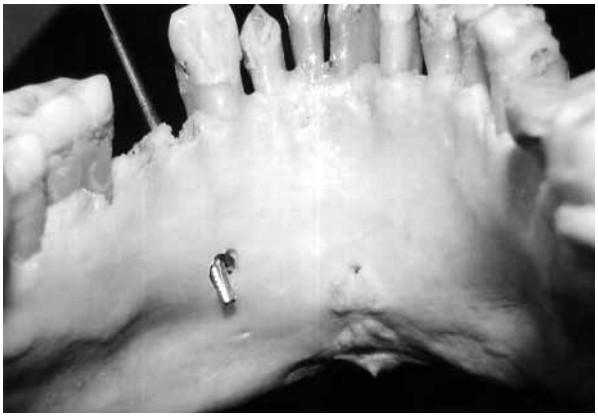

Fig 4. A dried mandible showing a bur perforation at the base of a first premolar socket. Tearing of the periosteum, muscles, or vessels may result in severe bleeding. The concave mandibular anatomy should always be kept in mind, and gentle drill pressure with great tactile attention should be used so the lingual cortex of the mandible is not perforated.

through perforating branches. The blood supply to either side of this muscle can be taken over functionally by one of these arteries in the absence of the other.[15] Bavitz et al[15] dissected 74 human adult cadavers, in which 60% of the lateral neck dissections had a large branch of the submental artery perforating the mylohyoid muscle. This indicates that the submental artery plays a very significant role in the blood supply to the floor of the mouth and lingual gingival. Fifty-three percent of the dissections of the floor of the mouth revealed a small, insignificant, or missing sublingual artery. In each of these cases, a large branch of the submental artery was found perforating the mylohyoid. This indicates that the submental artery is most often the major source—and sometimes the only arterial source—to the floor of the mouth (Fig 3).

In 1999, Hofschneider et al[6] reported a cadaver study in which 34 human heads were dissected to examine the arterial supply that is at risk for injury in the floor of the mouth. Their study showed the presence of a sublingual artery in 71% of the specimens. Extremely relevant was their finding of a large branch of the submental artery perforating the mylohyoid muscle at an average distance of 31 mm lateral to the Menton. A conclusion of this study was that the injured vessels in the floor of the mouth are most likely branches of the sublingual artery and not the submental artery. Regardless of the variability of the specific vessel involved, both studies indicate that the submental and sublingual arteries may course intimately to the lingual cortical plate from the floor of the mouth. It should be stressed that the atrophic edentulous mandible is even shorter and perforations occur deeper in the floor of the mouth (Fig 4). The relevance of the dissection study by Bavitz et al[15] indicates that previous attempts to ligate the lingual artery for floor of mouth hemorrhage may be ineffective and that the sublingual or its parent facial artery should be ligated first. If this does not control the bleeding, then the lingual artery should be ligated. Arterial ligation procedures are complex operations and require the expertise of a surgeon skilled in head and neck surgery. External arterial ligation is only used in severe or uncontrollable cases. Successful exploration of the floor of the mouth with visualization and ligation of the offending vessel has been described.[7] The author interjects that exploration of a hematoma or active bleed of the floor of the mouth is very technically difficult because of the engorgement of the tissues and the nature of the injured or severed artery to retract into the deeper tissues. If this procedure is attempted, the patient should be sedated, with a secure airway, to prevent respiratory obstruction and aspiration. Should a significant floor of the mouth laceration or hematoma develop, pressure should be placed between the suspected area by placing the thumb inside the mouth over a stack of gauze and the index finger outside the mouth to compress the bleeding area. If any significant bleeding or swelling results, airway compromise should be anticipated. Although this article represents immediate hemorrhage, delayed bleeding has been described hours after surgery.[8] Because severe bleeding can be delayed, it is prudent to closely follow any patient with significant penetrating trauma to the floor of the mouth. This includes

injuries from iatrogenic dental treatment. Although the patient in this case was not surgically explored for the source of the bleeding, the implant preparations were explored with a probe and the apparent cause of the bleed was perforation of the lingual cortex above the inferior border. The literature describes direct arterial damage with extreme bleeding, but it should be noted that damage to the muscles and other soft tissues (without direct arterial damage) could also cause brisk bleeding. This case represented emergency management due to acute respiratory obstruction. Should the hemorrhage have not spontaneously tamponaded, other measures would have been necessary. Direct exploration is not always effective, and external carotid artery angiography and endovascular therapy (vessel embolization) may be necessary.[16,17] There are preventative measures to be considered before placing implants in an atrophic mandible. One simple method is to palpate the lingual surface to determine the possibility of perforation potential. In addition, palpation of the lingual surface of the mandible during the preparation while gently advancing the bur would be helpful. A lingual subperiosteal flap will ensure direct observation and protection of the lingual structures for those patients in whom perforation is a concern.

Use of images such as computed tomographs or tomograms that show the mandibular anatomy in a sagittal plane would also be beneficial for those patients with a greater potential for perforation.

CONCLUSION

Although placing dental implants is generally a benign procedure, practitioners should be aware of and anticipate potential complications. Having a rehearsed plan of action for the treatment of emergent situations can never be overstated. The floor of the mouth contains branches of the submental and sublingual arteries; if the lingual mandibular cortex is perforated, this may lead to life-threatening complications. This caution obviously extends to any dentoalveolar surgical procedure in proximity to the floor of the mouth such as genioplasty, tori removal, extractions, and iatrogenic dental injuries.

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