Application of Maxillomandibular Fixation for Management of Traumatic Macroglossia: A Case Report

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Craniomaxillofac Trauma Reconstruction 2015;8:352–355

Abstract

Keywords

- macroglossia
- maxillomandibular fixation
- tongue
- gunshot wound

We present a case of a 14-year-old adolescent boy who has oral cavity after gunshot wound to the tongue presenting with hemorrhage from the tongue requiring coil embolization of the right lingual artery. The patient subsequently developed macroglossia, which was managed with maxillomandibular fixation for a period of 3 weeks with complete resolution of glossal edema.

Macroglossia is an increase of tongue volume and/or alteration in tongue morphology. It has no clear definition and/or diagnostic criteria. Macroglossia is however classified by etiology: congenital, neoplastic, inflammatory, and traumatic. Traumatic macroglossia has been reported from glossal edema secondary to use of Dingman Mouth Gag (Medicon, Tuttlingen, Germany) for palatal surgery,¹ trauma to the tongue in coagulopathic/anticoagulated patient,^{2,3} seizure-induced trauma from tongue biting,^{2,4} following surgery for widening of the foramen magnum,⁵ and prolonged orotracheal intubation causing venous/lymphatic obstruction.⁶ In this report, we present a case of a gunshot wound to the face resulting in tongue injury with subsequent development of glossal edema requiring reduction and restraining the tongue within the oral cavity via maxillomandibular fixation.

Report of a Case

Emergency medical services brought a 14-year-old adolescent boy to the Emergency Department at the University Hospital, Newark, NJ, with bleeding from the oral cavity after gunshot

wound to the right upper lip region. The patient was able to speak in short sentences and was protecting his airway. A computed tomography (CT) scan of the maxillofacial region without contrast, CT neck with intravenous contrast, and CT cervical spine without contrast were obtained by Trauma and Surgical Critical Care Service. CT imaging revealed multiple radiopaque foreign objects within the body and base of the tongue consistent with bullet fragments (► **Fig. 1**) and emphysema along the retropharyngeal space. Emphysema extended from the level of the oropharynx to the false vocal cords. The patient was taken emergently to the operating by the Trauma and Surgical Critical Care Service for control of hemorrhage which appeared to originate from a small but deep tongue laceration. The Oral and Maxillofacial Surgery (OMFS) service was subsequently consulted at this time to aid in control of hemorrhage from tongue. The patient's airway was secured via orotracheal intubation before the arrival of OMFS service. At this time, control of bleeding from the tongue was performed with a "whip stitch" of the most posterior aspect of the right mobile tongue. After thorough head and neck examination, a 1 × 1 cm through-and-through laceration of the right upper

received

July 12, 2014

accepted after revision

September 13, 2014

published online

February 18, 2015

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Tel: +1(212) 584-4662.

DOI <http://dx.doi.org/10.1055/s-0035-1546815>.
ISSN 1943-3875.

Fig. 1 Sagittal cross-section of soft tissue-window computed tomography image with multiple bullet fragments within the body and base of the tongue.

lip was identified and was consistent with bullet entrance wound. A 2×2 cm laceration of the right lateral border of the mobile tongue was also identified and tunneled to the base of tongue. All soft tissue injuries were irrigated and repaired primarily using layered closure technique. Multiple fractured teeth were noted, and extraction of teeth 4, 6, 7, 8, 9, 26, 27, 28, and 29 was performed with debridement of associated alveolar bone. The patient was stable from a hemodynamic perspective and a decision was made to keep the patient intubated due to concern of future glossal edema. The tongue “whip stitch” was also maintained. The following day (hospital day 2), the patient was evaluated by neurointerventional surgery for embolization of right lingual artery (**Fig. 2**). This procedure was performed without any acute events, and the right tongue “whip stitch” was removed at this time with no subsequent bleeding episodes. The patient would go on to develop an acute infection of the tongue on hospital day 5, which was managed with an incision and drainage, local debridement, and intravenous antibiotic therapy. Due to the absence of an endotracheal tube air leak and concern for the laryngotracheal sequelae of long-term endotracheal intubation, the patient underwent open tracheostomy during this surgical intervention. The patient was weaned off the ventilator within 24 hours and was stable on tracheostomy collar. The patient was followed up closely with lack of improvement of his glossal edema. The patient’s tongue infection resolved without issue; however, by hospital day 15, the patient had persistent glossal edema with protrusion of the tongue outside the oral cavity (**Fig. 3**). The mobile part of the tongue which was protruding outside the oral cavity also appeared desiccated with sloughing of tissue from the tip of tongue (**Fig. 4**). The patient had been noncooperative throughout his hospital course with very limited clinical examinations. Furthermore, he would not cooperate with massage of tongue, application of wet dressing,

Fig. 2 Angiogram following coil embolization of right lingual artery.

and/or use of any prosthetic appliance. Since the patient was stable from a respiratory perspective with a tracheostomy tube, decision was made to place the patient in maxillomandibular fixation (MMF) utilizing an acrylic block within the edentulous sites attached to a stainless steel Erich arch bar (**Fig. 5a, 5b**). To prepare this construct, an alginate impression was obtained for fabrication of stone models. The patient was taken to the operating room on hospital day 16 for application of MMF (**Fig. 6**). The rationale of this protocol was to induce tongue atrophy by decreasing the space within the oral cavity. Due to the patient having a secure airway, this could serve as a conservative treatment measure. The patient’s operative course was uneventful. The patient was discharged to home 10 days later on hospital day 25. He was maintained in MMF for a period of 3 weeks. Following 3 weeks of MMF, the patient was

Fig. 3 Clinical photograph of patient on hospital day 16 with tongue protruding anteriorly beyond the lips.

Fig. 4 Clinical photograph of patient's tongue with desiccated, sloughy tissue.

found to have complete resolution of his glossal edema (►**Fig. 7**) and had subjective and objective normal tongue mobility. Tongue also appeared normal in color, and the patient had no sensory or motor deficits. He was subsequently decannulated without incident.

Discussion

Macroglossia is a condition that should always be taken seriously due to potential for upper airway compromise especially in traumatic cases due to the rapid onset of glossal and pharyngeal edema. In this patient population, securing a definitive airway is of the utmost importance. In our case, the patient had a secure surgical airway; however, no attempt at tracheotomy tube downsizing could be made due to his persistent, significant glossal edema. Due to concern for necrosis of the portion of the mobile tongue, which was desiccated and anteriorly displaced outside the oral cavity and sequelae of long-term tracheotomy, our patient required urgent management of his condition, and a “watch and wait” approach could no longer be used.

Fig. 5 (a) Stone model of maxillary and mandibular dental arches. (b) Areas of missing teeth in maxilla and mandible “blocked out” with cold cure acrylic resin secured to Erich arch bar.

Fig. 6 A 25-gauge stainless steel wire used to secure Erich arch bars to maxilla and mandible in circumferential fashion, with maxillomandibular fixation wires supporting jaws into maximal intercuspation of remaining teeth.

It was hypothesized in this case that the glossal edema resulted from penetration and cavitation secondary to a close range ballistic injury. There also could have been a component of venous and/or lymphatic outflow obstruction, as well as an effect of embolization of the right lingual artery on local glossal tissues. With regard to the management of macroglossia, in cases of congenital macroglossia and/or macroglossia secondary to a metabolic or vascular disease process, it is prudent to treat the underlying disease in addition to the use of tongue reduction surgery (Lebovics). Although tongue-reduction surgery is the treatment of choice for congenital macroglossia, in cases of traumatic macroglossia, a more conservative approach should be used due to the tongue being an extremely adaptable organ. For instance, Jakobson et al reported on the use of a bite raiser and muscle relaxation to resolve glossal edema secondary to seizure-induced trauma to the tongue.² Alvi and Theodoropoulos reported on reduction of acquired macroglossia utilizing a

Fig. 7 Clinical photograph of patient's tongue following 21 days of maxillomandibular fixation with normal tongue size and function, as well normal tongue appearance.

small bite block, hand massages, and wet dressings.⁷ In cases of venous and/or lymphatic drainage of the tongue, amelioration of the pressure to the tongue could provide rapid improvement in glossal edema.² There have also been reports of preventing trauma to the enlarged tongue utilizing various prosthetic appliances, such as a modified bite guard.⁸ In our review of the English literature, we found that most authors report a convalescence period of 1 week or greater.² In our case, being that the patient's airway was secured with a tracheotomy tube and due to the patient's noncooperation, decision was made to proceed with the application of MMF in hopes of inducing atrophy of the tongue, which was successful in resolving the

patient's glossal edema. Ideally, the patient's MMF could have been released on a weekly basis to re-evaluate tongue size and for routine hygiene; however, due to the patient's extreme lack of cooperation, it was decided to maintain the patient in MMF for a period of 3 weeks with the hope of allowing this for complete resolution of his glossal edema. The patient would of required general anesthesia to reapply MMF if he required additional period of fixation; however, the patient and his family were not supportive of this idea.

References

- 1 Aziz SR, Ziccardi VB. Severe glossal edema after primary palatoplasty. *J Oral Maxillofac Surg* 2009;67(6):1326–1328
- 2 Jakobson DJ, Einav S, Krichevsky I, Sprung CL, Sela MS. Traumatic macroglossia: a life-threatening complication. *Crit Care Med* 1999; 27(8):1643–1645
- 3 Kurlemann G, Lunkenheimer A, Jorch G, Bulla M, Hilgenberg F. Traumatic macroglossia—a rare indication for tracheotomy [in German]. *Klin Padiatr* 1985;197(4):312–314
- 4 Saah D, Braverman I, Elidan J, Nageris B. Traumatic macroglossia. *Ann Otol Rhinol Laryngol* 1993;102(9):729–730
- 5 Denny JC III. Postoperative macroglossia causing airway obstruction. *Int J Pediatr Otorhinolaryngol* 1985;9(2):189–194
- 6 Sharma PK, Bhakta P, Srinivasan S, Khan RM, Kaul N. Acute tongue enlargement secondary to pharyngeal packing after tracheal intubation—a case report. *Middle East J Anaesthesiol* 2012; 21(5):761–764
- 7 Alvi A, Theodoropoulos PA. Self-inflicted traumatic macroglossia. *J Laryngol Otol* 1997;111(1):75–76
- 8 Karayazgan-Saracoglu B, Kecik D. Utilization of a modified bite guard for preventing traumatic macroglossia. *J Craniofac Surg* 2011;22(1):238–240