CASE REPORT

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Fatal Intracranial Hemorrhage Following Pediatric Oral Surgical Procedure

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ABSTRACT: Deaths during dental and oral surgical procedures may lead to litigation alleging malpractice. For this reason, and because of their sudden and unexpected nature, they often come to the attention of forensic pathologists. We review the clinical and anatomic findings of a 3-year-old boy who expired following an oral surgical procedure in the temporomandibular region. During the operation, perforation of the base of the skull occurred causing laceration of a branch of the middle meningeal artery and fatal subdural and epidural bleeding.

KEYWORDS: pathology and biology, oral surgery, intracranial hemorrhage, middle meningeal artery

Death during a dental procedure or oral surgery, especially of a child, is a tragic and extremely rare occurrence. Fatalities directly associated with such procedures are usually related to the use of general anesthesia [*1,2*]. The most frequently described postoperative complications are seldom life threatening [*3–7*]. We describe an apparently unique case of a pediatric death due to intracranial hemorrhage which followed oral surgery performed to relieve impaired movement of the jaw.

Case Report

A 3-year-old boy presented at the oral-maxillofacial surgery clinic with the chief complaint of difficulty in opening his mouth. According to the mother the child could not separate his front teeth by more than 1 cm. Standard radiographs and computerized tomography (CT) showed a fibrous or fibro-osseous pseudoankylosis of the coronoid process and left mandibular coronoid hyperplasia. To treat this condition, the child was scheduled for a coronoidotomy and gap arthroplasty of the left ramus of the mandible.

On the date of the surgical procedure the patient was placed supine on the operating room table, given general anesthesia, and intubated. Local anesthetic was also injected laterally and medially to the left coronoid process of the mandible. The coronoidotomy and gap arthroplasty were performed using an intraoral approach, and after the procedure the mouth could be opened to a distance of 3 cm between the edges of the upper and lower incisors. There were no apparent complications; blood loss was estimated at approximately 25 mL, and the child was extubated and taken to recovery with stable vital signs.

Approximately 4 hours after arrival in the recovery room, the surgical resident was called because nursing personnel noted a decreased level of responsiveness in the patient. Soon afterward, the child went into coma. Emergency CT of the head showed an extracerebral, high density collection adjacent to the inner table of the skull on the left consistent with an acute subdural hematoma. Edema of the left cerebral hemisphere and a shift of midline structures to the right were also noted. An emergency cerebral angiogram showed total occlusion of the left internal carotid artery at the point where it passed through the petrous portion of the skull. The child remained in coma for the remainder of his hospital course and finally was pronounced dead two days after admission.

At autopsy, there was a 0.3 cm traumatic linear defect of the middle fossa of the floor of the cranial cavity. The injury was at the junction of the greater wing of the sphenoid bone, and the squamous portion of the temporal bone. It penetrated inward immediately beneath the course of the anterior branch of the middle meningeal artery. There was laceration of the artery adjacent to the defect with resulting epidural and subdural hemorrhage. Cerebral edema was also present, with uncal and cerebellar tonsillar herniation.

Discussion

This case was highly unusual because complications of dental and oral surgical procedures are very seldom fatal. Such deaths

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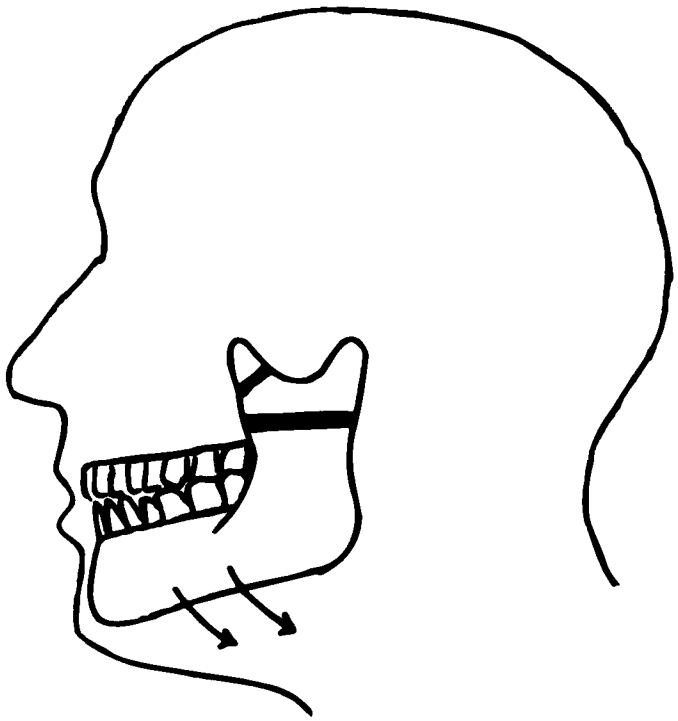

FIG. 1—*Darkened areas show where mandible was sectioned in a gap arthroplasty and coronoidotomy procedure to allow increased freedom of movement.*

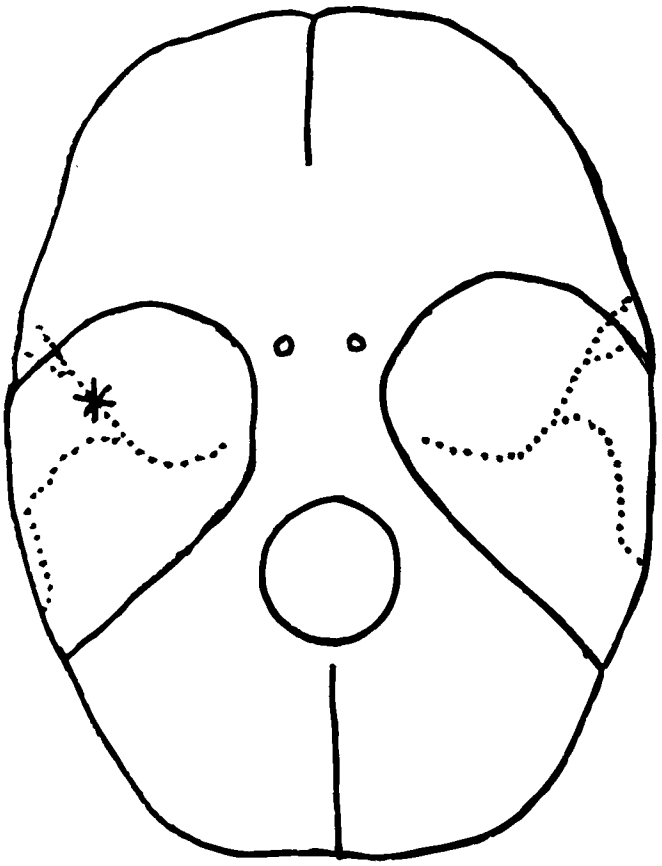

FIG. 3—*Diagram of base of skull after brain has been removed showing site of traumatic defect (*) where laceration of anterior branch of middle meningeal artery occurred.*

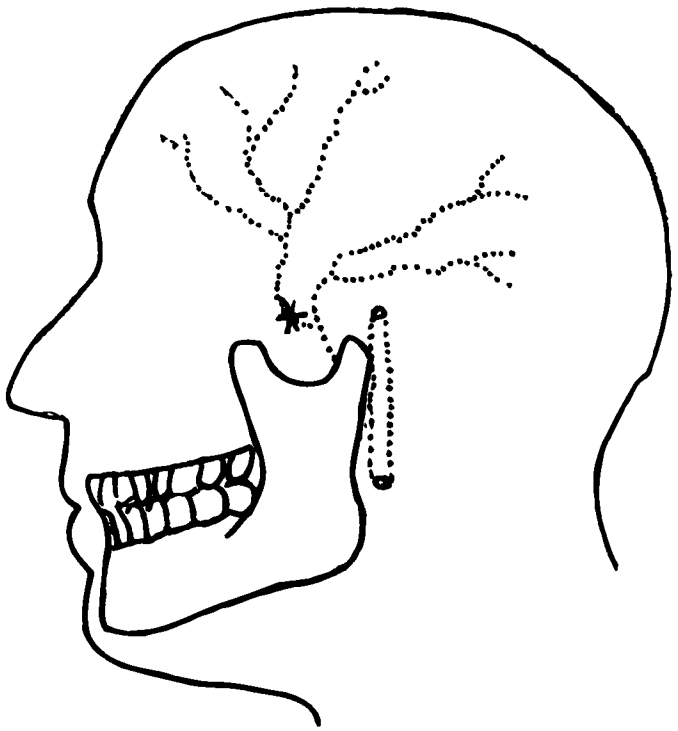

FIG. 2—*Dotted lines show internal carotid artery and anterior and posterior branches of middle meningeal artery. Star (*) marks site of injury.*

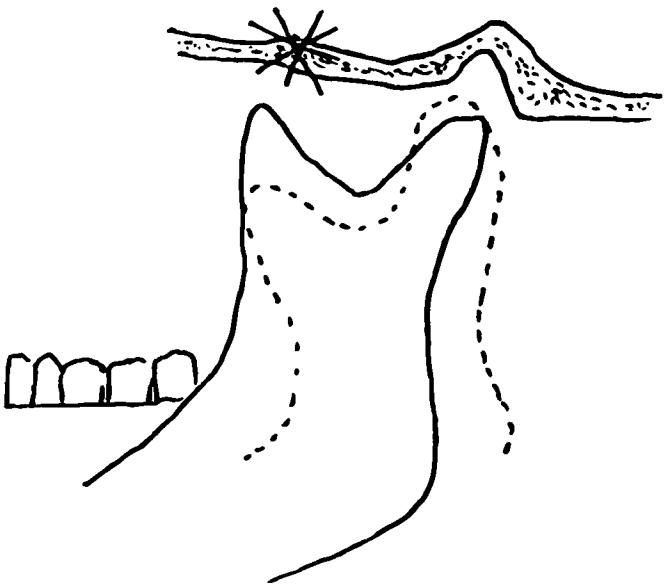

FIG. 4—*Star (*) marks site of perforation of skull at suture between sphenoid and temporal bones. Dotted outline shows position of mandible when mouth is open.*

FIG. 5—*Photograph of base of skull after brain has been removed. Tip of needle indicates site of perforation.*

often come to the attention of forensic pathologists because of allegations of malpractice. When death does occur under such circumstances it is often coincidentally due to natural disease or the result of a problem with general anesthesia [*1,2*]. The most common complications of dental procedures and oral surgery are bleeding and infection and these can almost always be controlled. Adverse sequelae to invasive procedures specifically involving the temporomandibular joint (TMJ) are rarely life threatening and include partial hearing loss, hypersensitivity of hearing, or ringing of the adjacent ear, and injuries to nerves in the region [*5–7*].

The underlying disorder requiring treatment in this case was stiffening or fixation of the TMJ. This problem may result from the formation of fibrous adhesions between the bones forming the joint (false or pseudo-ankylosis) or actual osseous union between these bones (bony or true ankylosis). Both types of ankylosis of the TMJ may be caused by developmental hyperplasia, trauma, infections, or rarely tumors. When the TMJ is involved by infection, the process is often due to spread of organisms from untreated otitis media [*4,8,9*]. Though TMJ ankylosis is most commonly unilateral, it may be bilateral [*9,10*].

Because TMJ ankylosis may result in significant health problems, especially in children, early treatment is recommended. If not promptly corrected, TMJ ankylosis before 6 years of age may result in disturbance of the mandible's growth with resulting permanent deformity. Inability to open the mouth due to the ankylosis predisposes the patient to dental caries because proper brushing is difficult or impossible and interferes with adequate nutrition because only a semisolid diet can be consumed once the disorder reaches its advanced stages. Therefore, though the outcome in this case was tragic, surgery was definitely indicated [*4,8,9*].

The three main approaches to surgical treatment of TMJ ankylosis are gap arthroplasty (the method used in our case), interpositional arthroplasty, and joint reconstruction. Gap arthroplasty is probably the least complex. In this procedure the area of ankylosis is resected and a gap is left between the upper and lower portions of the mandible. The ankylosis may, however, recur and bridge the gap. Therefore, in interpositional arthroplasty the gap is filled with a foreign material to prevent the two parts of the mandible from growing together again. In joint reconstruction all abnormal soft tissue and bone are removed and replaced with a bone graft or prosthetic device. The gap arthroplasty procedure used in this case is illustrated in Fig. 1 [*4,8,9*]. Additionally, because of ankylosis involving the coronoid process of the mandible, a coronoidotomy was performed.

To our knowledge, the fatal complication of surgical treatment of TMJ ankylosis we report has not been previously described. A review of the region's anatomy shows clearly the close proximity of the injured artery to the operative site (Figures 2,3). It was not possible to ascertain what instrument caused the fatal perforation of the skull—possibilities include needles used to inject local anesthetic, retractors, and other surgical tools. The base of the skull in a 3-year-old is only 0.1 cm thick in the involved area, and the perforation occurred at the suture between the sphenoid and temporal bone—an easily penetrated location [Figs. 4,5].

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