Postoperative Acute Sialadenitis after Skull Base Surgery

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ABSTRACT

During retrosigmoid and far-lateral skull base surgical approaches, the head may be positioned at the extreme limits of rotation and flexion. In rare instances, patients may develop acute sialadenitis after surgery as a result of this positioning technique. Over a 4-year period, five patients developed postoperative sialadenitis after undergoing either a retrosigmoid craniotomy in the supine position ($n = 4$) or a far-lateral craniotomy in the park-bench position. Based on all the retrosigmoid and far-lateral approaches performed by the senior author (RFS), the incidence of sialadenitis was 0.84%. In all five patients, the acute sialadenitis was not clinically apparent at the conclusion of the operation. However, the diagnosis was evident within 4 hours of surgery. In each case, the neck swelling in the vicinity of the submandibular gland was contralateral to the craniotomy site. All patients were treated with intravenous hydration and antibiotic therapy. One patient was extubated immediately after surgery with no obvious evidence of sialadenitis. However, she required emergent reintubation due to airway compromise. The mechanism of acute sialadenitis in these patients was obstruction of the salivary duct caused by surgical positioning. This previously unreported observation in patients undergoing skull base surgery deserves consideration during perioperative and postoperative management.

KEYWORDS: Skull base surgery, sialadenitis, far lateral, retrosigmoid

Skull base surgery can require unique patient positioning strategies to maximize anatomical ex-

posure. Extremes of positioning may subject patients to an increased risk of surgical morbidity.

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For example, underlying cervical spondylosis has produced spinal cord injury in patients placed in semisitting and prone positions.^{1,2} Head rotation can cause unwanted kinking of the internal jugular vein, which leads to clinically evident elevated venous pressure.³ We present five patients who developed acute onset sialadenitis after skull base surgery and discuss the diagnosis, treatment, and outcomes associated with this complication.

MATERIALS AND METHODS

Between January 2000 and October 2004, five patients (3 men, 2 women; mean age, 40 years; age range, 20 to 64 years) with acute sialadenitis were diagnosed in the perioperative period. During the same period, 464 retrosigmoid procedures and 129 far-lateral procedures were performed by the senior author (RFS).

The hospital charts of the five patients with sialoadenitis were reviewed retrospectively. The pathology treated included three meningiomas, one vestibular schwannoma, and one brainstem cavernous malformation. Four patients underwent retrosigmoid craniotomies, and one patient underwent a far-lateral suboccipital craniotomy. In all cases, the sialoadenitis was identified within 4 hours of surgery.

RESULTS

Postoperatively, three patients remained intubated—two as a precautionary measure after resection of their lesions, and one due to evidence of submandibular gland swelling at the conclusion of surgery. Two patients were extubated immediately after surgery without clinical signs of sialadenitis. One of these patients required emergent reintubation for airway compromise after the acute sialadenitis developed.

Duration of intubation was based on clinical evaluation of soft tissue swelling and assessment of airway patency (Fig. 1). Once significant salivary gland swelling had diminished and evaluation of pharyngeal soft tissues demonstrated no significant mass effect, patients were extubated. Intubation was maintained in four of the five patients for a minimum of 5 postoperative days (mean, 5.8; range, 5 to 7 days). The fifth patient, who was extubated postoperatively, did not require reintubation but was monitored in the intensive care unit (ICU) for 4 days as the sialadenitis resolved. Overall, the mean number of days spent in the ICU was 6.2 days (range, 4 to 8 days). In the absence of neck swelling and sialadenitis, all five patients would have been transferred to the floor after 2 days in the ICU.

All patients received intravenous hydration with isotonic fluids and third-generation cephalosporin antibiotics for 7 to 10 days after surgery. In the first three cases, otolaryngological consultation clinically confirmed the diagnosis of acute sialadenitis. On examination, no evidence of sialolithiasis was discovered (Fig. 2). In the remaining two cases, no otolaryngological consultation was obtained due to our increased awareness of this entity. At discharge from the hospital, all patients were safely extubated with normal speech and swallowing. The submandibular gland swelling had resolved in all patients. There were no pneumonia infections, and all patients were discharged at their baseline pulmonary status.

These five cases represent 0.9% of the retrosigmoid and 0.8% of the far-lateral procedures performed by the senior author (RFS). Overall, the incidence of acute sialadenitis related to skull base procedures was 0.84%.

DISCUSSION

Pathogenesis

Given the extreme rotation and flexion imparted during retrosigmoid and far-lateral procedures, the

Figure 1 Photograph of a patient with a meningioma involving the right cerebellopontine angle. The tumor was resected via a retrosigmoid approach. Postoperatively, acute submandibular sialoadenitis was identified on the left (arrows). This patient suffered no airway compromise and did not require reintubation.

mechanism of action in our patients was likely manifold. Ostensibly, a patient with compression of the tongue from the endotracheal tube and extreme head positioning during rotation and flexion can occlude Wharton's duct. Furthermore, soft tissue compression of the gland, particularly in larger individuals, can contribute to duct obstruction and pressure ischemia. Once the duct is mechanically obstructed, the situation is functionally identical to sialolithiasis,⁴⁻⁶ which leads to salivary stasis and secondary bacterial infection. The cause of infection is the lack of salivary secretions, which permits retrograde bacterial overgrowth from oral flora. The most common pathogen is usually gram-positive bacteria, such as *Streptococcus* or *Haemophilus*.⁵ In our series, none of the cases developed overt clinical signs of salivary gland infection.

In all our cases, acute sialadenitis occurred contralateral to the skull base lesion, which was the side most affected by the extreme positioning. The onset of inflammation was dramatic. In all

patients, submandibular swelling was detected either perioperatively or within 4 hours of surgery. This presentation supports mechanical obstruction as the inciting event for acute sialadenitis in this series.

Risk Factors

Numerous medical conditions are associated with the predisposition to salivary stasis and thus an increased risk of sialadenitis⁴: diabetes mellitus, hepatic failure, renal failure, hypothyroidism, Sjögren's syndrome, depression, and malnutrition. Perioperative use of medications with anticholinergic effects can also predispose patients to salivary stasis. Either by diuresis or the anticholinergic process, antihistamines, phenothiazines, β -blockers, barbiturates, and diuretics all contribute to systemic dehydration, which increases the risk of salivary stasis. Anesthesia and surgery are known risk factors

Figure 2 Axial computed tomography (CT) of a patient who underwent a right retrosigmoid craniectomy for the resection of a brainstem cavernous malformation. The left submandibular gland is clearly enlarged compared with the right (arrows). No ductal stone was evident. Postoperatively, the patient required 6 days of intubation.

for salivary stasis and acute bacterial infection of the salivary gland.

However, the association of skull base approaches with acute sialadenitis has not previously been reported. Although an older age is associated with decreased salivary secretions and an increased risk of sialadenitis,⁷ our patients were relatively young (mean age, 40 years). None of the patients were morbidly obese, which also might be a suspected risk factor given the significant mass effect imparted on the submandibular gland by soft tissue. Because the duration of surgery in our cases ranged from 3 to 6 hours, which is well within the average for skull base cases at our institution, we cannot ascribe length of surgery as a risk factor. None had medical conditions predisposed toward salivary stasis. None had a history of salivary gland problems. However, one patient received intraoperative barbiturates, which are associated with salivary

stasis, as part of a standard protocol for burst suppression.

Treatment and Course

After airway protection, our treatment paradigm included copious hydration to facilitate salivary duct secretions and antibiotics directed at gram-positive pathogens. Steroids were not administered. Because the submandibular gland swelling decreased incrementally over time, no ductal dilatation or sialolithotomy was required. However, if swelling and obstruction persist, these procedures can be instituted as part of the treatment. When submandibular gland swelling clearly began to diminish, the pharyngeal soft tissues were evaluated before the patients were extubated, on average 5 to 6 days after surgery. After extubation,

no patients required further pulmonary care, and all patients returned to their baseline pulmonary status at discharge.

Prevention

We routinely perform retrosigmoid craniotomies with patients in the supine position and far-lateral craniotomies with patients in the park-bench position. Our five cases represent only 0.84% of the retrosigmoid and far-lateral craniotomies/craniectomies performed at our institution during the same period. Given this small cohort, it is difficult to ascertain whether these individuals were predisposed anatomically for salivary duct obstruction or if their surgical positioning varied from the norm enough to account for the acute sialadenitis.

The disadvantage of retrosigmoid craniotomies performed in the supine position with a shoulder roll under the ipsilateral shoulder is that significant rotation and flexion of the patient's head is required to access the cerebellopontine angle. A retrosigmoid craniotomy performed with the patient in the semisitting position requires a lesser degree of head rotation and flexion. The latter position is a useful alternative that may reduce the risk of salivary duct obstruction during surgery. Semisitting, supine with a shoulder roll, and prone positioning all have inherent advantages and disadvantages. However, given that acute sialadenitis is rare and that its course is relatively benign when recognized early, we still use supine positioning with a shoulder roll.

CONCLUSIONS

Careful attention to preoperative hydration and avoidance of excessive head and neck positioning may help prevent salivary duct obstruction in skull base surgery patients. For optimal and safe postoperative management, the signs of acute sialadenitis must be recognized quickly after skull base

surgery. Fortunately, with early recognition and treatment, the course of this entity is typically benign.

REFERENCES

1. Rau CS, Liang CL, Lui CC, Lee TC, Lu K. Quadriplegia in a patient who underwent posterior fossa surgery in the prone position: case report. *J Neurosurg* 2002;96:101–103
2. Morandi X, Riffaud L, Amlashi SF, Brassier G. Extensive spinal cord infarction after posterior fossa surgery in the sitting position: case report. *Neurosurgery* 2004;54:1512–1515
3. Keiper GL Jr, Sherman JD, Tomsick TA, Tew JM Jr. Dural sinus thrombosis and pseudotumor cerebri: unexpected complications of suboccipital craniotomy and translabyrinthine craniectomy. *J Neurosurg* 1999;91:192–197
4. Raad II, Sabbagh MF, Caranasos GJ. Acute bacterial sialadenitis: a study of 29 cases and review. *Rev Infect Dis* 1990;12:591–601
5. McQuone SJ. Acute viral and bacterial infections of the salivary glands. *Otolaryngol Clin North Am* 1999;32:793–811
6. Finck M, Cheng EY. Acute pseudotongue enlargement after general anesthesia. *Anesth Analg* 1998;87:1443–1445
7. Lundgren A, Kylan P, Odkvist LM. Nosocomial parotitis. *Acta Otolaryngol* 1976;82:275–278

Commentary

The authors have compiled a compelling case series of acute sialadenitis after neurosurgical procedures associated with significant head rotation. The article appears to be the first reported association between acute sialadenitis and neurosurgical positioning. The five cases described all involve the extreme head rotation required by retrosigmoid and far-lateral approaches. Kim et al offer a thorough review of the diagnosis and treatment for this clinical entity as well as a proposed mechanism for the complication.

This report is particularly useful for neurosurgeons who, while performing the bulk of retrosigmoid and far-lateral cranial procedures, might be

less familiar with the recognition and treatment of acute sialadenitis. Such a seemingly rare and minor complication might have drastic implications if airway patency is compromised in the immediate postoperative period. Awareness of

this clinical entity is important for all surgeons who must access the skull base using extreme head rotations.

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