Contralateral sialadenitis after resection of a right cerebellar metastasis: illustrative case

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BACKGROUND Acute postoperative sialadenitis is a rare and potentially morbid complication of cranial neurosurgery. This rapidly progressive, unilateral neck swelling often presents within hours of extubation. Diagnosis is made by imaging and exclusion of other causes of etiologies, such as neck hematoma, sialolithiasis, and dependent soft tissue edema.

OBSERVATIONS The authors presented a case of acute postoperative sialadenitis after suboccipital resection of a right cerebellar metastasis. Shortly after extubation, extensive left-sided neck swelling was apparent in the postanesthesia care unit. No central lines were placed during the procedure. Imaging revealed submandibular gland edema and fluid accumulation in the surrounding tissue. The patient was managed conservatively with steroids, antibiotics, and warm compresses, with complete resolution of symptoms 2 weeks after the procedure.

LESSONS This case emphasizes the broad differential of acute neck swelling after cranial surgery. Physical examination of the neck and airway protection should guide initial treatment. If a patient is stable, bedside ultrasound and computed tomography can be helpful with the differential diagnosis. Here the authors proposed an algorithm for diagnosis and treatment of acute neck swelling after cranial surgery.

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KEYWORDS sialadenitis; posterior fossa surgery; neck mass; cerebellar metastasis; parotitis; neurosurgery

Acute postoperative sialadenitis (also known as anesthesia mumps) is a rare complication of cranial neurosurgery.¹,² It has previously been noted as a complication of major abdominal surgery and may occur in as many as 0.1% of these cases.³ It was first reported in association with neurosurgical procedures by Berker et al. in 2004, and only a few reports on this topic have been published since.⁴⁻¹⁰ It typically presents in the immediate postoperative period as unilateral firm, nontender swelling in the submandibular region contralateral to the craniotomy site.⁹ The proposed etiology is the compression of the submandibular duct due to the rotation and flexion of the patient’s head, leading to salivary stasis and, subsequently, sialadenitis. Here, we describe a case of acute postoperative sialadenitis in a patient after a right suboccipital craniotomy for tumor resection, review the literature on this rare clinical entity, and review an algorithm to diagnose and treat neck swelling after cranial surgery.

Illustrative Case
Preoperative Course and Imaging

A 75-year-old right-handed man with a history of esophageal cancer presented to his local emergency room with severe dysmetria, nausea, and vomiting, resulting in transfer to our facility. His physical examination at presentation to our facility showed 4/5 strength in bilateral upper and lower extremities and mild dysmetria in the bilateral upper extremities. These symptoms prompted neuroimaging, which revealed multiple contrast-enhancing lesions concerning for metastases (Fig. 1A and B). The largest of these lesions was found in the right cerebellum and was associated with fourth ventricular effacement and obstructive hydrocephalus. Therefore, a right suboccipital craniotomy for resection of the large cerebellar mass was recommended.
Operation

The patient received a planned right frontal extraventricular drain placement and right suboccipital craniotomy for tumor resection. The patient was intubated with an endotracheal airway in a single attempt with a cuffed endotracheal tube (ETT) measuring 7.5 mm. The ETT was inserted to a depth of 23 cm as measured from the teeth with an initial cuff pressure of 24 cm H₂O. The intubation was performed via video laryngoscopy and cricoid pressure with a #4 blade. No complications or difficulties were encountered during intubation, and no central line was placed.

After placement of a right frontal external ventricular drain, the patient was then repositioned for the craniotomy in the lateral position with the right side up, and all pressure points were carefully padded (Fig. 2). The patient’s head was placed in the Mayfield pin headrest. The head was turned 45° downward so the right suboccipital surface was horizontal to the floor. Additionally, this positioning allowed for seated use of the operative microscope. Care was taken during positioning to facilitate venous outflow. The patient received an uncomplicated right suboccipital craniotomy, and the right cerebellar metastasis was resected (Fig. 1C and D). The surgery lasted 5 hours from intubation to extubation and was uneventful. After an uncomplicated extubation, the patient was taken to the postanesthesia care unit (PACU), where his examination was the same as before surgery; his neck was supple and not noticeably swollen.

Postoperative Course

After approximately 5 minutes in the PACU, the patient was noted to have developed new acute left-sided lateral neck swelling that was not apparent immediately after extubation (Fig. 3). The patient’s neck was mildly tender to palpation, but he endorsed no difficulty swallowing, no voice changes, no difficulty breathing, and no restricted neck range of motion. The differential for these findings in the neck included a soft tissue hematoma, sialolithiasis, acute sialadenitis, lymphatic or vascular obstruction, dependent edema, and angioedema.

A bedside ultrasound performed in the PACU was concerning for soft tissue swelling and an enlarged, cystic mass, which is not consistent with a hematoma. Computed tomography angiography (CTA) of the neck demonstrated extensive left submandibular gland edema with free fluid and soft tissue stranding in the submandibular space (Fig. 3C). There was no evidence of airway compression, compromise of major vessels, abscess, sialolith, or hematoma. The patient was transferred to the intensive care unit for close monitoring with a plan to reintubate if he showed signs of respiratory distress. He was started on antibiotics for 5 days to treat for gram-positive bacteria typically seen in the flora of the mouth and associated with sialadenitis.

On postoperative day 1, the patient was noted to have a 2-cm increase in neck circumference. He was asymptomatic with no
dysphonia, shortness of breath, stridor, or difficulty swallowing. The otolaryngology service performed an additional assessment of the neck with bedside ultrasound, which showed worsened left submandibular gland swelling and edema of the subcutaneous fat without additional fluid collections or masses (Fig. 3D). The patient was started on high-dose steroids. Swelling eventually improved with continued conservative management. The patient was never in respiratory distress and did not require reintubation. He was discharged to home on postoperative day 7 with marked improvement in swelling.

Discussion

Observations

Acute postoperative sialadenitis is a rare complication of neurosurgical procedures and has seldom been reported in the literature (Table 1). In one case series, Kim et al. described four patients who developed postoperative sialadenitis after retrosigmoid craniotomies in the supine position and one patient who developed sialadenitis after a far-lateral craniotomy in the park bench position. In another case study, a patient who received a left anterior temporal lobectomy was found to have contralateral sialadenitis resulting in hoarseness, right-sided tongue deviation, right-sided Horner’s syndrome, and symptoms of right brachial plexus compression. Cavaliere et al. reported a case of submandibular sialadenitis causing complete airway obstruction that required 7 days of intubation after a right parieto-occipital craniotomy. Quinn et al. presented a case of postoperative sialadenitis after a brainstem mass biopsy that required intubation for 5 days. The exact reported incidence of this entity in neurosurgical procedures varies; however, frequency of acute bacterial parotitis in after abdominal surgery is better documented and may occur in up to 0.1% of cases. The case series by Kim et al. estimated that sialadenitis occurred in 0.84% of all retrosigmoid approaches at their institution. Another case series reported that postoperative sialadenitis occurred in 0.16% of their craniotomies and 1.9% of all sitting position neurosurgical procedures over a 5-year period. Other groups have cited an estimated incidence of sialadenitis as 1 in 1,000 to 3,000 after neurosurgical procedures.

The mechanism of postoperative sialadenitis is likely multifactorial. However, in all reported cases, neck swelling was apparent contralateral to the craniotomy site, suggesting mechanical compression as the most likely etiology. Across these previous works, postoperative neck swelling occurred most often from hours to 2 weeks after surgery. It is likely that the pathogenesis of postoperative neck swelling in these cases is heavily influenced by surgical position. Cases in which the head is placed in a turned and flexed position for surgery, such as retrosigmoid or suboccipital approaches, may be most likely to result in this postoperative complication. Positioning of the head in these cases may cause obstruction of salivary gland ducts, which is worsened by ETT and tongue compression. Once the duct is obstructed, it leads to salivary stasis and potential secondary bacterial infection with oral bacteria due to lack of salivary secretions, similar to siaolithiasis. In our case, we chose to place the patient lateral for access to the tumor. Alternatively, we could have placed the patient prone. This approach for positioning would have also prevented excess neck rotation. However, the prone position can result in increased venous pressure from increased pressure on the abdomen and increased positive end-expiratory pressure required to adequately ventilate these patients. In addition to positioning, other patient-specific and perioperative factors may influence likelihood of duct compression and postoperative submandibular swelling. Factors that may predispose to an increased risk of sialadenitis include extent of soft tissue edema, hypothyroidism, and malnutrition.

This case also brings to light the need for a differential diagnosis for acute postoperative neck swelling remote from a surgical site (Fig. 4). An expanding neck hematoma should always be considered first because it may lead to airway compromise. Continuous reevaluation of airway patency is the first step in management of these cases. There should be a low threshold to reintubate because airway compromise may make airway access impossible in minutes. After airway evaluation and vital signs assessment, images should be obtained. Point-of-care ultrasound can be useful for a rapid bedside evaluation. Ultrasound evaluation of acute sialadenitis typically reveals salivary duct dilatations, hypoechoic parenchyma, and enlarged intraglandular lymph nodes. Doppler may show hypervascularization resultant from inflammation. Although ultrasound is often sufficient to evaluate cases of sialadenitis, alternative causes of unilateral neck swelling may be better evaluated with CT angiography. On CT, postoperative sialadenitis typically presents with extensive soft tissue edema, evidenced by areas of hypointensity with some mild contrast enhancement and enlargement of the

Fig. 3. A and B: Acute left submandibular swelling was noted shortly after suboccipital craniectomy for right cerebellar mass resection. C: Axial CT shows the left submandibular gland (white arrow) as significantly larger than the right submandibular gland. In the largest cross-sectional dimensions, the submandibular gland measured approximately 2.9 × 2.1 cm. D: Bedside submandibular ultrasound showed edema of subcutaneous fat (black arrows) and dilation of salivary ducts (white arrow). Additionally, no evidence of alternative cause for submandibular swelling was visualized.
| Authors & Year | No. of Cases | Positioning | Presenting Symptoms | Management | Long-Term Sequelae | Preoperative Risk Factors | Reported Rate of Sialadenitis |
|----------------|--------------|-------------|----------------------|------------|------------------|--------------------------|-----------------------------|
| Tattersall, 1984<sup>15</sup> | 1 | Suboccipital craniotomy, sitting | Tongue, lips, & bilateral face swelling, respiratory distress | Extubated after 17 days | Death | None reported | None reported |
| Narayan & Umamaheswara, 1999<sup>16</sup> | 1 | Right retrosigmoid craniectomy, lateral | Unilateral left face & neck swelling, inspiratory stridor | Tracheostomy (21 days), hydrocortisone, hyaluronidase injection | None | None reported | None reported |
| Berker et al., 2004<sup>4</sup> | 5 | 4 posterior fossa craniotomies, & 1 parasagittal craniotomy, sitting | Unilateral swelling | Spiramycin 1 mg BID for 4 days | None | None reported | 0.16% of all craniotomies & 1.9% of all sitting neurosurgical cases in 5-yr period |
| Izci et al., 2005<sup>17</sup> | 1 | Left pterional craniotomy, supine | Right submandibular swelling | Warm compresses | None | None reported | None reported |
| Kim et al., 2008<sup>5</sup> | 5 | Retrosigmoid, far-lateral craniotomies, supine & park bench | Unilateral neck swelling | 4 patients extubated after 5–7 days, 1 patient given conservative management, all patients received 7–10 days of third-generation cephalosporin antibiotics | None | None reported | 0.84% of all retrosigmoid/ far-lateral approaches in a 4-yr period |
| Cavaliere et al., 2009<sup>6</sup> | 1 | Right parieto-occipital craniotomy, prone | Left neck swelling | Mannitol, dexamethasone, linezolid, meropenem, clindamycin, tracheostomy lasting 7 days | Dysphonia, right vocal cord palsy at discharge on postop day 28 | None reported | None reported |
| Hébert-Blouin et al., 2009<sup>10</sup> | 1 | Right frontal craniotomy | Left brachial plexopathy | Steroids, sialagogues, broad-spectrum antibiotics | None | Prior episodes of periprocedural neck swelling | None reported |
| Shimizu et al., 2009<sup>18</sup> | 1 | Right suboccipital craniotomy, park bench | Left brachial plexopathy | Heparin | Brachial plexopathy, unilateral weakness, & sensory disturbances | None reported | None reported |
| Singha & Chatterjee, 2009<sup>7</sup> | 1 | Right retrosigmoid craniotomy, extreme lateral | Left neck swelling | Extubated after 14 days, antibiotics | None | None reported | None reported |

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TABLE 1. Review of the literature reporting cases of postoperative neck swelling in neurosurgical cases

| Authors & Year | No. of Cases | Positioning | Presenting Symptoms | Management | Long-Term Sequelae | Preoperative Risk Factors | Reported Rate of Sialadenitis |
|----------------|-------------|-------------|---------------------|------------|-------------------|--------------------------|----------------------------|
| Prabhu et al., 2010 | 19 | Left vestibular schwannoma, semisitting | Unilateral neck swelling | Extubated after 7 days, broad-spectrum antibiotics | None | None reported | None reported |
| Rowell et al., 2010 | 1 | Left temporal craniotomy, semirecumbent | Left neck swelling | Cold compresses | None | None reported | None reported |
| Diehn & Morris, 2012 | 1 | Right retrosigmoid craniotomy, supine with shoulder bump | Brachial plexopathy | Extubated after 2 days, sialagogues, warm compresses, antibiotics, steroids | Glossopharyngeal neuralgia at 3-mo follow-up | None reported | None reported |
| Özdek et al., 2014 | 1 | Right retrosigmoid craniotomy & auditory brainstem implantation, supine | Unilateral neck swelling | Ceftriaxone, dexamethasone | House-Brackman grade 4 facial paralysis that recovered over months | None reported | None reported |
| Uchino et al., 2015 | 2 | Right retrosigmoid craniotomy, park bench, & right suboccipital craniotomy, lateral | Unilateral neck swelling | 1 patient extubated after 3 days, 1 patient extubated after unreported length, antibiotics, corticosteroids | None | None reported | None reported |
| Vendantam et al., 2016 | 1 | Left anterior temporal lobectomy, supine with shoulder bump | Horner’s syndrome & brachial plexopathy | Extubated after 9 days, corticosteroids, antibiotics, c1 esterase inhibitor protein | None | None reported | None reported |
| Clark et al., 2019 | 1 | Right retrosigmoid craniotomy, supine | Unilateral neck swelling | Steroids, racemic epinephrine, tracheostomy | None | None reported | None reported |
| Naylor et al., 2021 | 1 | Left retrosigmoid craniotomy, supine | Horner’s syndrome | IV fluids, warm compress, sialagogues | None | None reported | None reported |
| This work | 1 | Right suboccipital craniotomy, lateral position | Unilateral neck swelling | Warm compresses, antibiotics, dexamethasone | None | None reported | None reported |

IV = intravenous.
Postoperative neck swelling includes acute neck hematoma (resultant from line placement, surgical site in neck, pseudoaneurysm, or preexisting vascular wall weakness), angioedema (often medication related), and sialadenitis. This entire spectrum of possible diagnoses is well evaluated with CT and ultrasound. If diagnosis is still in doubt after imaging with both modalities, serial imaging can help monitor unilateral neck swelling.

In all reported cases of postoperative sialadenitis, management involved some combination of analgesics, corticosteroids, antibiotics, warm compresses, and/or airway protection by intubation. Empirical antibiotics can help prevent complications. Should swelling continue, high-dose corticosteroids can be used to reduce swelling and risk of airway compromise.

Although postoperative sialadenitis is manageable when quickly identified, prevention of this complication is preferred. Multiple strategies can be used to reduce the risk of postoperative sialadenitis: (1) working with the anesthesiologist to ensure that the ETT is not under tension, which may obstruct salivary gland outflow; (2) limiting the use of anticholinergic medications and other medications that decrease salivary gland outflow; (3) ensuring adequate hydration before, during, and after the operation; and (4) avoiding excessive rotation of the neck because postoperative sialadenitis can occur even when the neck is supple and adequate venous drainage is present.

**Lessons**

Positioning for posterior fossa surgery can include rotation and flexion of the neck. Some patients may develop acute postoperative sialadenitis, potentially because of their surgical positioning. Although acute sialadenitis is usually not apparent at the end of the operation, swelling often presents within hours of surgery. Important alternative diagnoses to consider include abscess, sialolith, and especially neck hematoma. Prevention strategies include perioperative hydration and minimization of head and neck extreme positioning. Because sialadenitis is a rare complication in patients undergoing cranial neurosurgery, surgeons should make sure that positioning meets other surgical requirements, such as adequate lesion access, appropriate room for retraction and surgical working area, and minimization of other more common surgical complications. However, this case demonstrates that sialadenitis should be remembered during the management of acute postoperative neck swelling.

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