anterior movement of the levator muscle sling after the reconstruction.[21] A retrospective review performed by Mann et al on 505 palatoplasty patients undergoing Furlow double opposing Z-plasty with and without the aid of a buccal myomucosal flap showed that the buccal flap could help patients with wider, Veau III and IV clefts achieve similar nasal resonance scores and lower rates of secondary speech surgery compared to patients who underwent a double opposing Z-plasty alone (5.4% versus 7.1%).[22] A study by Habib et al[2] found that patients undergoing primary palatoplasty with a buccal myomucosal flap had lower rates of velopharyngeal insufficiency (6.4% versus 27%) and fistula development (1.6% versus 6.4%) after 3 years of follow-up compared to patients repaired without the flap. Further, no major problems have been described in the buccal flap donor site.[21] While these studies may be limited by differences in age-at-surgery, study location, and surgeon experience, they demonstrate the possibility for improved outcomes with the use of a buccal myomucosal flap in repairing especially wide clefts. Here, we used this flap to address a large palatal tissue deficit consisting of the majority of the right posterior hard and soft palate, and achieved desirable speech outcomes at 2 years post-surgery.

In summary, the initial goal of treatment for this patient was to correct her Veau II U-shaped cleft palate with standard hard and soft palatoplasty procedures. An intraoperative complication led to a revision of our surgical plan, necessitating the use of bilateral buccal fat pad flaps with a right sided buccal myomucosal flap. While long-term outcomes on speech and aesthetics remain to be seen, the results thus far are promising given that the common short-term complications of fistula, dehiscence, infection, and velopharyngeal insufficiency were avoided within a two-year follow-up period with this technique. It is our hope that this case will assist other surgeons with salvage after a pedicle is compromised in cleft palate surgery.

REFERENCES

1. Levi B, Kasten SJ, Buchman SR. Utilization of the buccal fat pad flap for congenital cleft palate repair. *Plast Reconstr Surg* 2009;123:1018–1021
2. Habib ME, Jackson IT, Thomas C. The evaluation of the use of the buccal myomucosal flap in cleft palate repair-a comparative study. *Eur J Plast Surg* 2010;33:7–12
3. Robertson AG, McKeown DJ, Bello-Rojas G, et al. Use of buccal myomucosal flap in secondary cleft palate repair. *Plast Reconstr Surg* 2008;122:910–917
4. Dean A, Alamillos F, Garcia-Lopez A, et al. The buccal fat pad flap in oral reconstruction. *Head Neck* 2001;23:383–388
5. Samman N, Cheung LK, Tideman H. The buccal fat pad in oral reconstruction. *Int J Oral Maxillofac Surg* 1993;22:2–6
6. Fujimura N, Nagura H, Enomoto S. Grafting of the buccal fat pad into palatal defects. *J Craniomaxillofac Surg* 1990;18:219–222
7. Hai HK. Repair of palatal defects with unlined buccal fat pad grafts. *Oral Surg Oral Med Oral Pathol* 1988;65:523–525
8. Stajcic Z. The buccal fat pad in the closure of oro-antral communications: a study of 56 cases. *J Craniomaxillofac Surg* 1992;20:193–197
9. Hanazawa Y, Itoh K, Mabashi T, et al. Closure of oroantral communications using a pedicled buccal fat pad graft. *J Oral Maxillofac Surg* 1995;53:771–775, discussion 775-776
10. Egyedi P. Utilization of the buccal fat pad for closure of oro-antral and/or oro-nasal communications. *J Maxillofac Surg* 1977;5:241–244
11. Van Lierop AC, Fagan JJ. Buccinator myomucosal flap: clinical results and review of anatomy, surgical technique and applications. *J Laryngol Otol* 2008;122:181–187
12. Chadwick S, Kosutic D. The use of a failed flap as a biological dressing. *Ann R Coll Surg Engl* 2016;98:e19–e21
13. Wheatley MJ, Meltzer TR. The management of unsalvageable free flaps. *J Reconstr Microsurg* 1996;12:227–229
14. Arce K. Buccal fat pad in maxillary reconstruction. *Atlas Oral Maxillofac Surg Clin North Am* 2007;15:23–32
15. Tostevin PM, Ellis H. The buccal pad of fat: a review. *Clin Anat* 1995;8:403–406
16. Ashtiani AK, Fatemi MJ, Pooli AH, et al. Closure of palatal fistula with buccal fat pad flap. *Int J Oral Maxillofac Surg* 2011;40:250–254
17. Ashtiani AK, Bohluli B, Kalantar M, et al. Effectiveness of buccal fat in closing residual midpalatal and posterior palatal fistulas in patients previously treated for clefts. *J Oral Maxillofac Surg* 2011;69:e416–e419
18. Mukherji MM. Cheek flap for short palates. *Cleft Palate J* 1969;6:415–420
19. Maeda K, Ojimi H, Utsugi R, et al. A T-shaped musculomucosal buccal flap method for cleft palate surgery. *Plast Reconstr Surg* 1987;79:888–896
20. Jagannathan M, Dixit V. Palatal lengthening following use of the buccal myomucosal flap in primary palatoplasty-real or apparent? A study of the physical variables. *Eur J Plast Surg* 2004;26:414–418
21. Varghese D, Datta S, Vargese A. Use of buccal myomucosal flap for palatal lengthening in cleft palate patient: Experience of 20 cases. *Contemp Clin Dent* 2015;6(Suppl 1):S36–S40
22. Mann RJ, Martin MD, Eichhorn MG, et al. The double opposing z-plasty plus or minus buccal flap approach for repair of cleft palate: a review of 505 consecutive cases. *Plast Reconstr Surg* 2017;139:735e–744e

Compartment Syndrome of the Temporal Muscle

Gian Battista Bottini, MD, DMD, Hüseyin Can Tükel, DMD,† Christian Brandtner, MD, DMD,* Jörn Wittig, MD, BDS,* and Alexander Gaggl, MD, DMD**

Abstract: The authors report a patient with masticator space abscess due to an ascending infection following a wisdom tooth extraction. They administered antibiotics and did an incision and drainage; however, osteomyelitis of the mandible and compartment syndrome of the temporal muscle complicated the course. The authors suggest a physiopathology and discuss the management of this study.

Key Words: Compartment syndrome, fascial space infection, masticator space

We report a patient with masticator space abscess due to an ascending infection following a wisdom tooth extraction. We administered antibiotics and did an incision and drainage; however, osteomyelitis of the mandible and compartment syndrome of the temporal muscle complicated the course.

From the *Department of Oral and Maxillofacial Surgery, University Hospital of the Private Medical University Paracelsus, Salzburg, Austria; and †Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Çukurova University, Adana, Turkey.

Received May 1, 2019.
Accepted for publication September 5, 2019.

Address correspondence and reprint requests to Gian Battista Bottini, MD, DMD, Department of Oral and Maxillofacial Surgery, University Hospital of the Private Medical University Paracelsus, Müllner Hauptstrasse 48, A-5020 Salzburg, Austria; E-mail: g.bottini@salk.at

The authors report no conflicts of interest.

Copyright © 2019 by Mutaz B. Habal, MD

ISSN: 1049-2275
DOI: 10.1097/SCS.0000000000006053

Copyright © 2020 Mutaz B. Habal, MD. Unauthorized reproduction of this article is prohibited.

To our knowledge, this is the 1st description of a patient with compartment syndrome of the temporal muscle in a human.

CLINICAL REPORT

A 53-year-old man presented with pain, fever, and a swollen temple. He had a mandibular 3rd molar extraction due to pericoronitis 10 days earlier. Of note, in his medical history, the patient was affected by acromegaly, for which he had refused every form of treatment. Nevertheless, he was followed up regularly, and his condition was stable over many years.

From the endocrinology point of view, his insulin-like growth factor 1 was below the normal range (57.50 ng/mL), whereas his growth hormone was within the normal range (0.29 ng/mL). Intraoral examination revealed pus coming from the socket 38. A computed tomogram (CT) showed an abscess in the masticator and temporal space. We started intravenous antibiotics (Piperacillin/Tazobactam 4.5 g 3 times daily) and did an incision and drainage placing 6 drains, and, among the others, a through and trough drain from intraoral (retromolar area-maxilla) to extraoral (temporal region) through the infratemporal and temporal spaces under general anesthesia (Fig. 1A). The STOP-BANG questionnaire[1] detected a high risk for obstructive sleep apnea, which is frequently associated with acromegaly.[2] Therefore, the patient was admitted to an intermediate care ward for 24 hours after general anesthesia for monitoring of his respiration. The inflammatory markers improved, and the swelling initially decreased; however, it did not resolve entirely and later increased again. Therefore, we did a 2nd incision under local anesthesia 17 days later. However, we did not obtain any pus. A magnetic resonance imaging (MRI) demonstrated that the infection was spreading along the mandibular nerve toward the cranium with a reactive enhancement of the dura mater. A bony erosion of the condylar head was evident at a CT imaging (Fig. 1B). Neurosurgical consultation excluded an intracranial abscess. *Escherichia coli* grew in cultures. As per microbiologist recommendation, we changed the antibiotics to Ceftriaxone 2 g once daily + Clindamycin 600 mg 3 times daily IV, as this combination can reach high concentrations in the cerebrospinal fluid. Ten days later, a 2nd MRI was still negative for a cranial abscess, but showed signs of osteomyelitis of the left condylar head, along with persistent abscess in the temporal muscle, edema in the masticator space, and intraarticular effusion (Fig. 1C). At this stage, we decided to explore the region via a hemicoronal incision. As we incised the fascia of the temporal muscle, abundant pus under pressure drained. A portion of the temporal muscle (5.5 × 5 cm) was frankly necrotic and was excised and sent to histology. Sections of the muscle were dark brown, showing the macroscopic picture of a red infarction (Fig. 1D). We detached the muscle from its insertion on the coronoid process to improve the mouth opening and placed a drain under suction. After the fasciotomy and debridement, the patient improved, and we switched to oral antibiotics (Clindamycin 600 mg 3×1 + Levofloxacin 500 mg). The histologic report confirmed the macroscopic diagnosis: "...fibrotic soft tissue with extensive necrotic areas. Furthermore, striated skeletal muscle with partially dense inflammatory infiltration and necrotic sections." At discharge, 15 days later, the patient was free from pain but still had a limited mouth opening (27 mm). One month later, his mouth opening was 6 cm. By this time, a temporal hollowing was noticeable; however, the patient refused further any treatment to augment the volume of the defect, and the hair covers it.

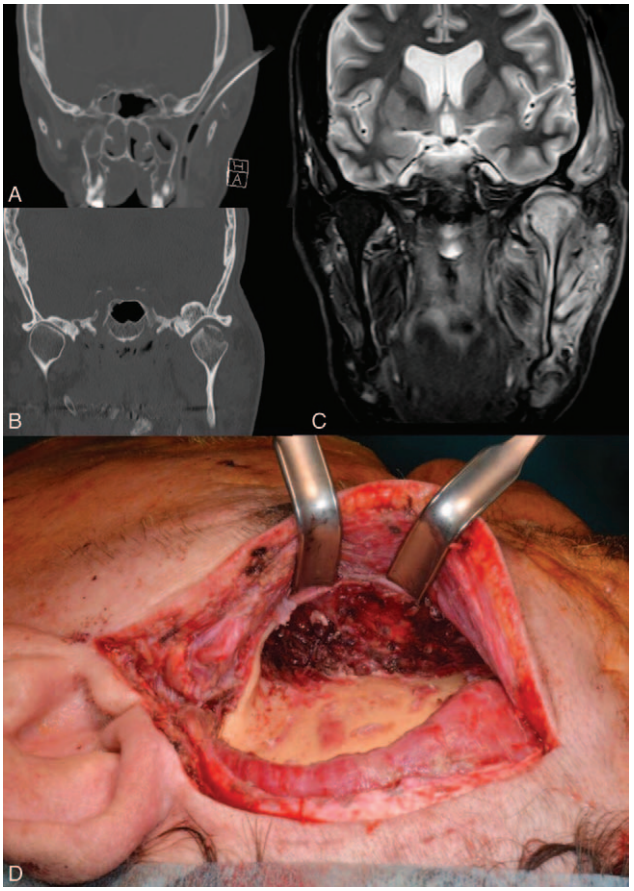


FIGURE 1. (A) Computed tomography (CT) coronal view: pull-through-drainage from intraoral (retromolar area-maxilla) to extraoral (temporal region) through the infratemporal and temporal spaces on the left-hand side. (B) CT coronal view: a bony erosion of the condylar head is evident on the left-hand side. (C) Magnetic resonance imaging coronal view: osteomyelitis of the condylar head, along with persistent abscess in the temporal muscle, edema in the masticator space and intraarticular effusion on the left-hand side. (D) Clinical picture at operation, showing the temporal muscle after fasciotomy and debridement.

DISCUSSION

There are only a few reports of temporal abscesses following mandibular extractions, and the spread of infection against gravity is not clearly understood.[3–5] Shand et al reported 2 rare patients with ascending necrotizing fasciitis as a result of odontogenic infection and suggested that immunocompromised patients are prone to necrotizing infections.[6] An abnormality of the immune system in patients with acromegaly might have been a contributing factor in the present patient.[7]

Tentatively, we suggest a physiopathology. Hyperemia and increased vascular permeability facilitated the spreading of microorganisms within the bone and led to osteomyelitis of the condyle.

In addition to that, the through-and-through drain, by establishing a communication between the oral cavity and the masticator space, might have facilitated an ascending infection through this path.

The muscles that elevate the mandible are invested by a thick fascial envelope, which blends into their bony insertions. The temporal fascia is particularly resilient, one of the reasons why it is used as a graft in many procedures.

Furthermore, these masticator muscles are directly attached to the bone on one of their surfaces. The above anatomy represents a compartment.

We suspect that the dissection through the temporal muscle may have caused localized muscle damage, edema, and hematoma, and because the temporal fascia is inelastic, this raised the pressure

© 2020 Mutaz B. Habal, MD
Copyright © 2020 Mutaz B. Habal, MD. Unauthorized reproduction of this article is prohibited.

within the compartment. The elevated pressure, in turn, caused a disturbance of the circulation, and for this reason, neither the antibiotics could reach their target, nor the tissues could heal.

Fasciotomy and debridement eventually led to a resolution by opening the compartment, relieving the pressure, re-establishing the circulation, and allowing the antibiotics to reach their target. The gushing of pus when incising the fascia represents indirect evidence of elevated pressure inside the temporal muscle.

We wish to highlight 2 practical considerations that could be useful for the readers when managing fascial space infections. Firstly, in the absence of a definite improvement 48 hours after incision and drainage, cross-sectional imaging can provide vital information on the adequacy of surgical therapy and nature, localization, and extent of pathology. Secondly, in a specific patient with a temporal abscess, because of the anatomical peculiarity of the masticator space, consider the possibility of a compartment syndrome requiring fasciotomy via a hemicoronal incision, rather than conventional incision and drainage.

REFERENCES

1. Semelka M, Wilson J, Floyd R. Diagnosis and treatment of obstructive sleep apnea in adults. *Am Fam Physician* 2016;94:355–360
2. Tasbakan MS, Kacmaz Basoglu Ö, Yildirim Simsir I, et al. Obstructive sleep apnea characteristics in patients with well-controlled acromegaly and their compliance with positive airway pressure therapy. *Turk J Med Sci* 2017;47:1348–1353
3. Yonetsu K, Izumi M, Nakamura T. Deep facial infections of odontogenic origin: CT assessment of pathways of space involvement. *AJNR Am J Neuroradiol* 1998;19:123–128
4. Schuknecht B, Stergiou G, Graetz K. Masticator space abscess derived from odontogenic infection: imaging manifestation and pathways of extension depicted by CT and MR in 30 patients. *Eur Radiol* 2008;18:1972–1979
5. de Oliveira Neto PJ, de Souza Maliska MC, Sawazaki R, et al. Temporal abscess after third molar extraction in the mandible. *Oral Maxillofac Surg* 2012;16:107–110
6. Shand JM, Breidahl A, Hing NR, et al. Ascending necrotising fasciitis as a result of odontogenic infection: a report of two cases. *Aust Dent J* 2001;46:134–138
7. Colao A, Ferone D, Marzullo P, et al. Lymphocyte subset pattern in acromegaly. *J Endocrinol Invest* 2002;25:125–128

Navigation-Assisted Treatment of Giant Cysts in the Pterygopalatine Fossa With Endoscopy Method

Tiancong Liu, MD, Yang Sun, MD, Jinxing Li, MD, and Weiliang Bai, MD

Abstract: A couple of cysts lying in the pterygopalatine fossa are rare. The authors report a case of a 28-year-old woman who was admitted to the authors' hospital with a 1-month history of headache and numbness on the left head. Three-dimensional computed tomography revealed a large soft mass in the pterygopalatine fossa. Magnetic resonance imaging showed that there were a couple of cysts in the pterygopalatine fossa. One cyst measured $41 \times 38 \times 34$ mm and the other $23 \times 19 \times 19$ mm. A transpterygoid transnasal endoscopic approach and resection of the lesion was performed. The authors opened the cyst with coblation and the lesion showed a lot of transparent thick yellow liquid. The authors located the posterior wall the other cyst with ENT image navigation. The puncture was conducted and a lot of yellow liquid flowed out of the lesion. The patient recovered rapidly. The headache and numbness were alleviated and disappeared after 1 month. The patient currently has no evidence of recurrence at 1 year postoperatively. The coblation and ENT image navigation make the surgeon more easily to achieve risk-free surgery under endoscopy.

Key Words: Coblation, cyst, endoscopy, image navigation, pterygopalatine fossa

The pterygopalatine fossa (PPF) is a cone-shaped depression deep to the infratemporal fossa and posterior to the maxilla on both sides of the skull. The fossa is located between the pterygoid process and the maxillary tuberosity, close to the orbital apex. This space communicates with both the nasal and oral cavities, the infratemporal fossa, the orbit, the pharynx, and the middle cranial fossa through 8 foramina. Pathologic processes in this space are rare, with the most common disease processes being juvenile nasopharyngeal angiofibroma, neurogenic tumors, a perineural extension of sinonasal malignancy, and meningoencephaloceles.[1,2] The early symptoms are uncharacteristic, and may easily be overlooked by patients and their clinicians. Otolaryngologists are becoming more and more familiar with the tumor in PPF. Endoscopic sinus surgery is a well-established technique for the treatment of sinus diseases, including chronic sinusitis and nasal neoplasms. Endoscopic sinus surgery to approach nasal neoplasms is limited, as the tumor can be too extensive.[3] The cyst of pterygopalatine fossa is rare. In this report, we discuss a case of a couple of giant cysts in the pterygopalatine fossa, and we treat the disease through the endoscopy method.

CLINICAL REPORT

A 28-year-old woman was admitted to our hospital with 6-month hearing loss in her left ear. She had a headache and numbness on the left head 1 month ago. The patient was referred for the three-dimensional computed tomography (CT) and magnetic resonance imaging (MRI) of the sinus. Computed tomography revealed a large soft mass in the pterygopalatine fossa (Fig. 1A, B). Magnetic resonance imaging showed that there were a couple of cysts in the pterygopalatine fossa. A couple of homogeneous ovoid lesions hyperintense on T2-weighted imaging in the pterygopalatine fossa were discovered. One cyst measured $41 \times 38 \times 34$ mm, and the other $23 \times 19 \times 19$ mm (Fig. 1C, D). The cyst squeezed the posterior and lateral wall of the maxillary sinus and made it deformed. Prior to surgery, a wide range of differential cell counts were obtained. Laboratory workup, including a complete blood count with differentials and determination of liver enzymes and electrolytes, showed no abnormal findings. A transpterygoid transnasal endoscopic approach and resection of the lesion was

From the Department of Otolaryngology, Shengjing Hospital, China Medical University, Shenyang, China.
Received August 20, 2019.
Accepted for publication September 7, 2019.
Address correspondence and reprint requests to Weiliang Bai, MD, Department of Otolaryngology, Shengjing Hospital, China Medical University, Shenyang 110004, China; E-mail: bweiliangcmu@163.com
The authors report no conflicts of interest.
Copyright © 2019 by Mutaz B. Habal, MD
ISSN: 1049-2275
DOI: 10.1097/SCS.0000000000006073

Copyright © 2020 Mutaz B. Habal, MD. Unauthorized reproduction of this article is prohibited.