

CASE REPORT

General Medicine

Progressive subcutaneous emphysema and compressive optic neuropathy following dental analgesia

Patrick Fink MD¹ | Lisa Doyle MD²¹ Department of Surgery, University of Utah, Division of Emergency Medicine, Salt Lake City, Utah, USA² Department of Surgery, Utah Emergency Physicians, Salt Lake City, Utah, USA

Correspondence

Patrick Fink, MD, University of Utah Division of Emergency Medicine, Salt Lake City, UT, USA.

Email: patrick.fink@hsc.utah.edu

Funding and support: By *JACEP Open* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

1 | INTRODUCTION

Minor dental procedures are common and rarely result in complications leading to presentation to the emergency department (ED). Subcutaneous emphysema is a rare cause of airway compromise, particularly outside of a trauma context. Here, we describe the presentation of a patient with rapidly expanding subcutaneous emphysema beginning during a dental procedure that both threatened airway compromise and caused compressive optic neuropathy.

2 | CASE REPORT

A 37-year-old female with history of Crohn's disease presented to a large, urban ED accompanied by her dentist. She was undergoing placement of a crown on a left, upper molar, and her dentist noticed spontaneous and progressive swelling of her left face following injection of local anesthetic. He recognized this as subcutaneous emphysema and immediately transported her to the ED in his private vehicle.

The patient was immediately roomed into a critical care bay. On evaluation, she was seated upright, tachycardic, normotensive, and breathing spontaneously without audible stridor. There was substantial swelling of the soft tissues of the left face, periorbital region, submandibular space, and neck. Crepitation to palpation was present throughout, consistent with subcutaneous gas. The patient was able

to phonate when encouraged, but did so guardedly and with a muffled voice.

As we evaluated the patient, her submandibular swelling visibly expanded, so the decision was made to intubate for airway protection. She was prepared in an upright, seated position and given 3% lidocaine gel on the posterior tongue by tongue depressor. The patient was administered 0.5 mg/kg ketamine intravenously to facilitate a dissociated awake look at her oropharyngeal anatomy. A Glidescope MAC S3 blade was used to perform upright face-to-face video laryngoscopy and a clear, symmetrical view of the vocal cords was achieved. The patient was then induced with an additional 0.5 mg/kg ketamine and 1.2 mg/kg rocuronium intravenously and was intubated in a semi-reclined position without complication (Figure 1).

Computed tomography (CT) of the neck, maxillofacial region, and brain were then obtained, demonstrating extensive air within the soft tissues, masticator space, and orbit of the left face. The patient's case was discussed with the ears, nose, and throat (ENT) physician on call who recommended ICU observation without immediate surgical intervention. On return from CT, the patient's sedation was weaned for neurological examination and she communicated, by drawing, a new visual field deficit in her left eye preserving only the upper medial quadrant.

Ophthalmology was consulted and further review of the patient's CT imaging revealed an air bubble in the optic canal abutting the optic nerve (Figure 2). Sedated fundoscopic examination with a PanOptic ophthalmoscope revealed no explicative retinal pathology. Immediate consultation with hyperbaric medicine was obtained and the decision was made to take the patient for immediate hyperbaric treatment in an effort to decompress the optic nerve.

Supervising Editor: Kenneth D. Katz, MD.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2020 The Authors. *JACEP Open* published by Wiley Periodicals LLC on behalf of the American College of Emergency Physicians.



FIGURE 1 Left-sided facial, periorbital, and submandibular swelling secondary to subcutaneous emphysema

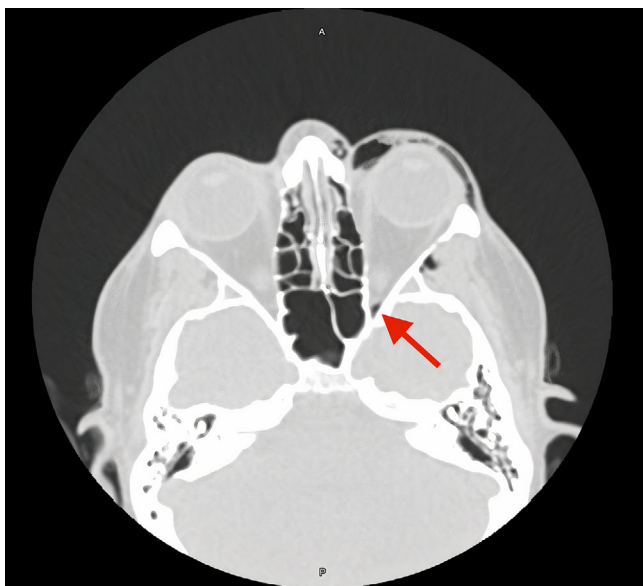


FIGURE 2 Non-contrast axial maxillofacial computed tomography (CT) demonstrating left-sided intraorbital soft tissue air as well as gas located within the optic canal (arrow)

The patient was taken directly to the hyperbaric suite where she was started on intravenous lidocaine 1 mg/min for neuroprotection in the setting of gas embolism and treated in a monoplace hyperbaric chamber with 3 ATA for 30 minutes, then 2 ATA for 60 minutes prior to ICU admission. She remained in ICU for 2 days and was treated with a second dose of hyperbaric oxygen with 2.2 ATA for 90 minutes on hospital day 2 for residual visual deficit. She was extubated on hospital day 2 after significant reduction in her facial swelling and was discharged on hospital day 3 with resolution of both her soft tissue swelling and visual deficit.

3 | DISCUSSION

Subcutaneous air after dental procedures has been described in the setting of invasive procedures.¹⁻⁴ Ophthalmologic complications after analgesia in dental procedures is rare and has been attributed to the direct effect of analgesic medications.⁵ This patient presented with rapidly expanding subcutaneous emphysema beginning after local anesthetic injection and prior to the use of a drill or other surgical tools. A case of similar but self-limited emphysema has been described after trans-cricothyroid membrane injection of local anesthetic.⁶ We hypothesize that needle-induced emphysema may result from the creation of a small, ball-valve type wound following injection, given that emphysema expansion continues after instrumentation ceases.

Expanding swelling of the face, neck, or submandibular tissues poses an airway threat that must be recognized by the emergency clinician. This patient's visibly progressive swelling and muffled voice prompted us to quickly secure her airway. The use of ketamine for a dissociated awake look at the larynx has been previously described.^{7,8} In our case, an awake look was reassuring against an anatomically difficult airway and the patient was safely paralyzed for intubation. Although emergence of difficult intubating conditions after neuromuscular blockade in the ED is rare,⁹ dual setup for cricothyroidotomy was also prepared. No anatomic abnormality was noted to explain the patient's voice change prior to intubation, so we speculate that this may have been a behavioral response to a perceived airway threat.

Optic neuropathy due to gas compression has been previously described in the setting of orbital fractures.¹⁰ This is, to our knowledge, the first description of optic neuropathy due to subcutaneous emphysema dissecting into the orbital tissues. This presentation highlights the need to evaluate for vision compromise in cases of orbital emphysema. Potential for vision loss should compel weaning of sedation to facilitate examination. This patient was fortunate to present in a resource-rich setting and responded well to treatment with hyperbaric oxygen therapy. Intravenous lidocaine has proven to be neuroprotective in animal models of air embolism and was initially recommended by the hyperbaric medicine physician.^{11,12} Thankfully, after treatment with hyperbaric oxygen, intravenous lidocaine, and steroid, this patient recovered her vision. Access to a hyperbaric medicine team is relatively uncommon, and this case highlights the importance of hyperbaric oxygen therapy as a valuable treatment modality without practical alternative.

4 | CONCLUSION

We describe a case wherein local dental analgesia resulted in progressive subcutaneous emphysema of the facial soft tissues leading to impending airway compromise and compressive optic neuropathy. This rare case highlights the potential for serious complications after common minor procedures as well as the need to evaluate for vision compromise in cases of orbital subcutaneous emphysema.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

1. Jeong CH, Yoon S, Chung SW, Kim JY, Park KH, Huh JK. Subcutaneous emphysema related to dental procedures. *J Korean Assoc Oral Maxillofac Surg*. 2018;44(5):212-219.
2. Rossiter JL, Hendrix RA. Iatrogenic subcutaneous cervicofacial and mediastinal emphysema. *J Otolaryngol*. 1991;20(5):315-319.
3. Vidal CAG, Pizarro CAV, Arriagada AA. Subcutaneous emphysema secondary to dental treatment: case report. *Med Oral Patol Oral Cir Bucal*. 2007;12(1):e76-e78.
4. Torgay A, Aydin E, Cilasun U, Durmaz L, Arslan G. Subcutaneous emphysema after dental treatment: a case report. *Pediatr Anesth*. 2006;16(3):314-317.
5. Alamanos C, Raab P, Gamulescu A, Behr M. Ophthalmologic complications after administration of local anesthesia in dentistry: a systematic review. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2016;121(3):e39-e50.
6. Wong M. Subcutaneous emphysema following trans-cricothyroid membrane injection of local anesthetic. *Can J Anaesth*. 2000;47(2):165-168.
7. Kovacs G. Definitive Awake Intubation. EMCrit. <https://emcrit.org/emcrit/definitive-emergent-awake-intubation/2017>. Accessed July, 2020.
8. Tonna J, DeBlieux P. Awake laryngoscopy in the emergency department. *J Emerg Med*. 2016;52(3):324-331.
9. Blair A, Filbin M, Kulkarni R, Walls R. The failed intubation attempt in the emergency department: analysis of prevalence, rescue techniques, and personnel. *J Emerg Med*. 2002;23(2):131-140.
10. Sarkies N. Traumatic optic neuropathy. *Eye (Lond)*. 2004;18(11):1122-1125.
11. Evans D, Catron P, McDermott J, Thomas L, Koblina A, Flynn E. Effect of lidocaine after experimental cerebral ischemia induced by air embolism. *J Neurosurg*. 1989;70(1):97-102.
12. Mitchell SJ. Lidocaine in the treatment of decompression illness: a review of the literature. *Undersea Hyperb Med*. 2001;28(3):165-174.

How to cite this article: Fink P, Doyle L. Progressive subcutaneous emphysema and compressive optic neuropathy following dental analgesia. *JACEP Open*. 2020;1:1278-1280. <https://doi.org/10.1002/emp2.12270>