

A Rare Complication of Tooth Abscess — Ludwig's Angina and Mediastinitis

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A b s t r a c t

Deep neck infections are a rare but potentially fatal complication of pulpal abscess of the teeth. If an infection can progress rapidly from a toothache to a life-threatening infection, then it is critical that dentists be able to recognize the danger signs and identify the patients who are at risk. This article reviews a case of a seemingly innocuous toothache which rapidly progressed to Ludwig's angina and mediastinitis, and discusses how to recognize and manage these life-threatening infections.

MeSH Key Words: case report; periapical abscess/complications; Ludwig's angina

© J Can Dent Assoc 2001; 67:324-7
This article has been peer reviewed.

A 74-year-old woman saw her dentist for removal of deep MOB caries of tooth 37 and restoration with amalgam. The procedure was uncomplicated, with no pulp exposure. The patient was told that the tooth might require either root canal or extraction at a later date should the pulp degenerate. Six months later the patient returned to the office for a regular checkup and stated that the tooth was mildly tender but otherwise asymptomatic. Two weeks after the checkup the patient developed spontaneous pain in the tooth but elected not to call her dentist, as it was a Friday afternoon. Seventy-two hours after the pain appeared, the patient returned to the office with massive facial swelling that developed over a 24-hour period. Her past medical history included hypertension, remote thyrotoxicosis and a previous breast biopsy. She was otherwise healthy, on Inderal, Capoten and Synthroid. She had no known drug allergies. The review of systems was unremarkable.

The dentist noted bilateral submandibular swelling, an altered voice, trismus, and a raised floor of mouth. The patient was referred to an oral and maxillofacial surgeon and immediately admitted to hospital for a computed tomography (CT) scan and intravenous antibiotics. The CT scan showed diffuse cellulitis of the neck. There was abscess formation medial to the left mandible extending into the anterior and middle neck down to the thoracic

inlet that included both the vascular sheath (carotid artery and internal jugular vein) as well as the retropharyngeal space. The abscess cavity was irregularly shaped, approximately 5 cm x 5 cm in area and had multiple air bubbles in the soft tissues (Fig. 1). The cellulitis extended to the mediastinum and surrounded the aorta (Fig. 2).

An awake fibre-optic intubation was completed in the operating room and the patient was given penicillin G Na 4 million units, metronidazole 500 mg and gentamicin 150 mg intravenously. To facilitate intubation a needle decompression of the major abscess cavity was performed through the submandibular triangle, but only a small amount of pus was aspirated. After the airway was secured the patient was transferred to a tertiary care facility where a second oral and maxillofacial surgeon and a thoracic surgeon took over her care along with an intensivist. Drainage of the deep neck spaces was completed through multiple (4) incisions (Fig. 3). This procedure included opening into the retropharyngeal space through an incision along the anterior sternomastoid muscle (Fig. 4). Mediastinoscopy was completed but no pus was found in the mediastinum. One-half inch Penrose drains were inserted throughout the neck and into the thoracic inlet (Fig. 5). Culture and sensitivity tests grew anaerobic gram-negative and gram-positive bacilli.

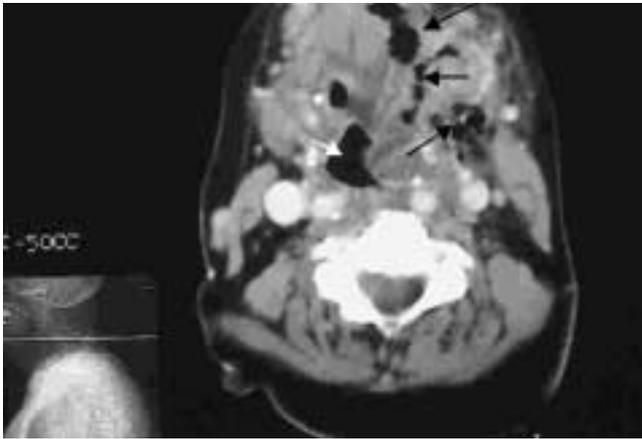


Figure 1: CT scan with intravenous contrast of the neck. The edge of the mandible is seen anteriorly and the vertebrae posteriorly. The airway (at the level of the epiglottis) is deviated severely to the left (white arrow). Gas bubbles are seen in the soft tissue to the right (black arrows).

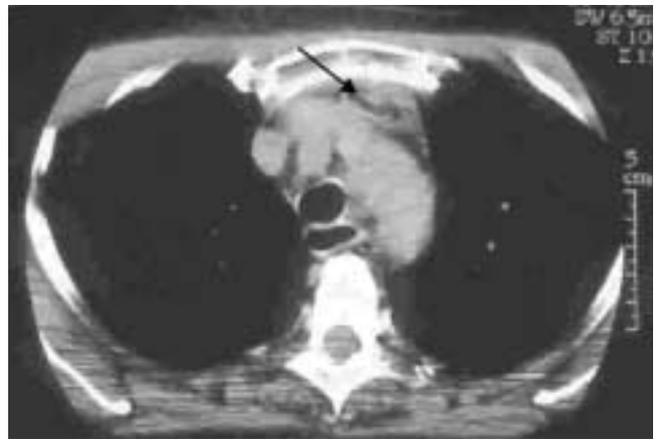


Figure 2: CT scan with intravenous contrast of the chest. The aortic arch is seen anteriorly with the trachea and esophagus posteriorly. Streaking of the fat plane between the aorta and sternum is indicative of infection (black arrow).



Figure 3: Planned incisions of the neck. The incision to the right is along the sternomastoid and was used for access to the mediastinum.

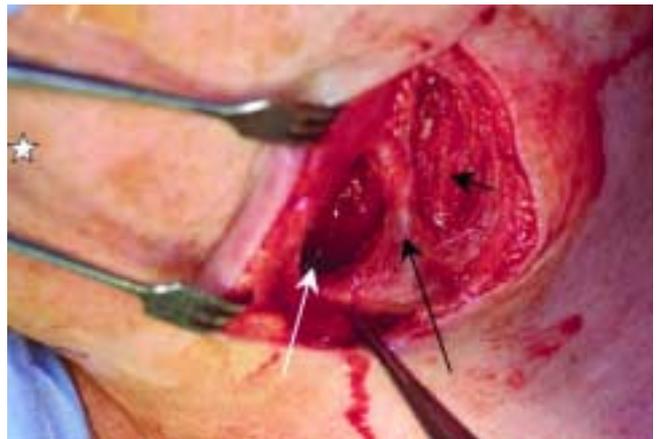


Figure 4: Opening into the neck with a view of the thoracic inlet (white arrow), the external jugular vein (long black arrow) and the sternomastoid muscle (short black arrow). The chin is marked with a star.

Thirty-six hours postoperatively a CT scan showed complete obliteration of the airway around the endotracheal tube (Fig. 6). On day 9 the swelling had resolved enough to allow extubation and patient discharge from the intensive care unit. The drains were removed on day 13 after surgery and were packed with one-quarter inch ribbon gauze until granulation was complete several weeks later. The patient made an uneventful recovery, except for an uncomplicated course of *Clostridium difficile* colitis and a bout of reversible hearing loss attributed either to the use of the gentamicin or to an otitis media resulting from prolonged nasal intubation. The patient has been followed for one year postoperatively with no further complications.

Discussion

This case demonstrates the potentially catastrophic consequences of odontogenic infections. The patient, while elderly, was in good health and had an active lifestyle. In

addition the bacteria that caused this infection were those routinely seen in odontogenic infections. The infection, however, was anything but routine. The bacteria from tooth 37 perforated the lingual plate of the mandible and spread along the planes of the cervical fascia.¹ The sublingual and submandibular spaces were infected by direct extension causing the Ludwig's angina (bilateral cellulitis of the submandibular and sublingual spaces).² In adults, 52% of cases of Ludwig's angina are caused by dental caries³ and have a mortality rate of 8-10%.^{3,4} Anaerobic bacteria were responsible for the gas formation in the soft tissues. In this case, either the extension along the carotid sheath or the retropharyngeal space may have caused the mediastinitis. Both spaces extend into the superior mediastinum. Where neck infections descend to the mediastinum it is usually through the retropharyngeal space (71% of cases); however, the carotid sheath is the conduit in 21% of cases.⁵

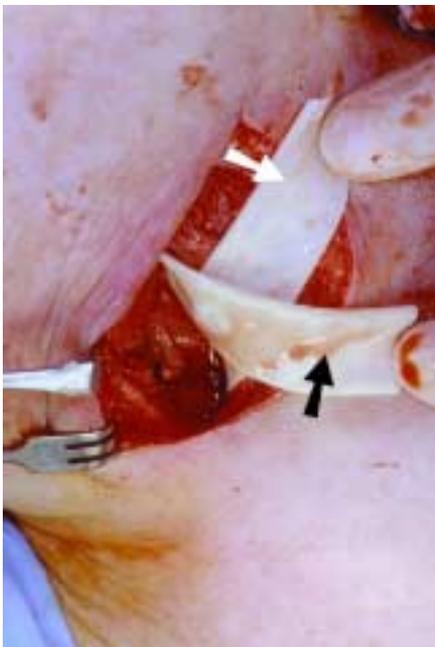


Figure 5: Penrose drains in the submandibular space (black arrow) and the retropharyngeal space (white arrow).



Figure 6: Postoperative CT scan with contrast showing complete obliteration of the airway around the endotracheal tube (white arrow).

The prognosis for this type of infection is guarded. In 1938, mediastinitis was reported to have a mortality rate greater than 50%.⁶ This figure remained virtually unchanged almost 50 years later when another report in 1983⁷ estimated the mortality rate at 42%. A more recent review of the world literature estimates the mortality rate at 25%.⁸ This decrease in mortality rates between 1983 and 1995 has been attributed to earlier detection and treatment as a result of contrast-enhanced CT imaging (CECT).

Dentists should be cognizant of the signs of infections, especially those which extend into the deep planes. These signs can include fever, swelling of the floor of the mouth, swelling below the inferior border of the mandible, asymmetric bulging of the pharyngeal walls and trismus or pain out of proportion to the amount of swelling (**Table 1**). Dentists should also look for and record signs of an impending airway disaster, which include a muffled voice (“hot potato voice” due to a swollen tongue), a raised tongue or floor of the mouth, and an inability to tolerate or swallow salivary secretions⁹ (**Table 2**).

If a deep neck infection is suspected, early CECT imaging should be considered, as clinical exam alone has a sensitivity of 55%.¹⁰ In other words, there is a 45% chance that a deep neck abscess will be misdiagnosed as cellulitis when using clinical exam alone. The combination of CECT and clinical exam, however, has an accuracy rate of 89% with a sensitivity rate of 95%. The critical step in diagnosis is the differentiation between cellulitis and abscess formation which vary in their initial treatment. When an abscess is identified or strongly suspected surgical incision and

Table 1 Signs of deep neck infections

- Swelling below the inferior border of the mandible
- Swelling of the floor of the mouth
- Difficulty swallowing
- Difficulty talking
- Pain while swallowing or pain out of proportion to swelling
- Trismus out of proportion to swelling

Table 2 Signs of an impending airway disaster

- Stridor (a raspy noise while breathing)
- Tracheal deviation
- Inability to tolerate secretions
- Swollen tongue
- Raised tongue or floor of mouth
- Muffled voice (“hot potato” voice)

drainage should be performed and a drain inserted. When cellulitis is suspected antimicrobial therapy alone can be used. Regardless of whether the neck is abscessed or celluitic the patient’s airway competency must be carefully evaluated. If any of the signs listed in **Table 2** are found or if the CT shows significant airway deviation or narrowing, then an awake-fibreoptic intubation (or surgical airway) should be performed to secure the airway.¹¹ Airway management is the most important aspect of immediate care and should not be delayed for a CT or for any other reason that may compromise the patient’s health. Mortality occurs most often due to hypoxia or asphyxia rather than overwhelming sepsis.

Antimicrobial therapy for odontogenic infections has been described in many other references and is not the focus of this article.^{9,12-14} For minor infections, the authors prefer to prescribe penicillin VK 600 mg 4 times a day and metronidazole 500 mg twice a day orally for 7 days as first-line therapy for outpatient treatment, or clindamycin 300 mg 4 times a day for 7 days for patients allergic to penicillin. In life-threatening infections the authors prefer penicillin G Na 4 million units every 6 hours intravenously with metronidazole 500 mg every 12 hours intravenously, or, for patients allergic to penicillin, clindamycin 600 mg every 8 hours intravenously. In case of a massive infection, the authors also prefer to add gram-negative coverage to the antibiotic spectrum typically gentamicin 3 mg/kg intravenously every 24 hours until a gram-negative species can be ruled out with culture and sensitivity tests. When drains are inserted they should be left in place for 2 days or until the drainage stops. Culture and sensitivity tests should be sent for analysis as often and as soon as possible for any major infection. Subsequent antibiotic therapy will be based on the results. Patients who are immuno- or medically compromised should also be carefully monitored, as they may not develop a fever or leukocytosis (elevated white blood cell count) in the face of even major infections. Immunosuppression may occur due to diabetes, steroid therapy (used to treat lupus and certain types of arthritis and to suppress tumors), HIV infection, chemotherapy, radiation treatment or transplant therapy.¹⁵ These patients will be especially susceptible to life-threatening complications from deep neck infections.

Conclusion

While a life-threatening deep neck infection is an uncommon complication of tooth abscess, dentists should be able to recognize the signs and symptoms. The patient should be examined for swelling below the inferior border of the mandible, fever, excessive trismus, floor of mouth or tongue elevations, and deviation of the pharyngeal walls. In addition, the signs of an impending airway disaster, including muffled voice, inability to tolerate secretions and protruding tongue, should be carefully evaluated. The basics of infection management include prompt airway management, evaluation by CECT for major infections, incision and drainage of abscessed cavities, and early, appropriate antimicrobial therapy first on an empiric basis then as guided by culture and sensitivity results. Quick referral to an oral and maxillofacial surgeon and early definitive care will minimize the morbidity and mortality of these serious infections. ♦

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The authors have no declared financial interest.

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C D A R E S O U R C E C E N T R E

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