Complications of dental infections due to diagnostic delay during COVID-19 pandemic

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SUMMARY

We present three cases who presented to the emergency department with severe complications of dental infections: Ludwig's angina, necrotising fasciitis and peritonsillar abscess. All of our cases presented at the beginning of COVID-19 pandemic, with complications of dental infections. They delayed their dental treatment due to the pandemic. The airway management was difficult in our cases. Their mortality risk increased due to complications. We aimed to draw attention to complicated odontogenic infections which are rarely seen in emergency department in the past, however started to show up increasingly particularly at the beginning of the COVID-19 pandemic.

BACKGROUND

Dental abscesses and dental apex infections often arise after dental caries, trauma and failed root canal treatment.[1] Dental caries are initially painful lesions, and they may result in tooth abscesses if the disease progresses.[2] Diagnosis is made on physical examination and imaging.[3] Spread of untreated dental infection to the neck may result in upper airway obstruction and even bleeding and nerve damage if the infection involves the contents of the carotid sheath. Further spread may cause mediastinitis through involvement of retropharyngeal space, and necrotising fasciitis may be seen if the infection spreads superficially.[4] Use of analgesics may mask oropharyngeal involvement, and a CT scan may promote early detection of deep neck involvement, may enable early surgical drainage and hence prevents mortality.[5]

Most of the patients tended to delay their medical follow-up and treatments due to the fear of having COVID-19 particularly at the beginning of the pandemic. In this case series, we aimed to present complicated infections supposed to be resulted from delaying the treatment of dental infections during COVID-19 pandemic.

CASE PRESENTATIONS

Case 1: Ludwig's angina

A male patient in his 30s presented to the emergency department (ED) with the complaint of shortness of breath in April 2020. He had not gone to the dentist due to fear of being infected with COVID-19. The patient complained of toothache increasing in intensity for 2 days. His vital signs were stable. The patient had trismus and tooth caries, and his left inferior first and second molar teeth were missing on the oral and oropharyngeal examination. The laboratory findings of the patient shown total leucocyte count as 14.8×10^9/L (4–10.5×10^9/L), haemoglobin as 0.143 g/L, creatinine as 0.73 mg/dL (0.67–1.17 mg/dL), C-reactive protein (CRP) as 354.07 mg/L (<5 mg/L), and erythrocyte sedimentation rate as 95 mm/hour (0–15 mm/hour). The CT of the neck revealed fluid collection (abscess) in the sublingual and submandibular regions on both sides, more prominently on the left side (figure 1). Periapical lysis was seen around the root of the second molar tooth on the right. In the light of the radiological imaging findings, the patient was diagnosed with Ludwig's angina and abscess formation. The areas of lysis were compatible with caries, and periapical lytic lesions were observed in a number of teeth in the superior alveolar arch. The wound culture revealed *Streptococcus viridans* and *Parvimonas micra*; therefore, the patient was administered imipenem 500 mg four times a day and metronidazole 500 mg two times per day. The patient was discharged after 15 days, with full recovery.

Case 2: necrotising fasciitis

A male patient in his 40s presented to the ED with the complaint of shortness of breath in May 2020. He had not gone to the dentist due to fear of being infected with COVID-19. The oxygen saturation of the patient was 77%, and his other vital signs were stable. There was widespread pitting oedema, tenderness and crepitation on his neck. His left molar tooth was broken and bruised, and his tongue was pushed to the right side on oropharyngeal examination. His laboratory results were total leucocyte count 19.97×10^9/L (4–10.5×10^9/L), haemoglobin 0.172 g/L, creatinine 2.13 mg/dL (0.67–1.17 mg/dL), CRP 37.38 mg/L (<5 mg/L) and erythrocyte sedimentation rate 4 mm/hour (0–15 mm/hour). Free air was observed under the skin of the cervical region, around the thyroid gland and the clavicle, between the muscular structures of the neck, and around the soft tissues on the CT of the neck (figure 2). The patient had cardiac arrest during endotracheal intubation in the emergency operating room. The patient could not be intubated, and tracheotomy was performed during cardiopulmonary resuscitation (CPR). The neck tissues were necrotic and black in colour. Multiple CPR attempts were performed, the patient was administered norepinephrine infusion and the infusion rate was increased in the follow-up period. The patient developed cardiac arrest again soon after,and did not respond to CPR. He died 15 hours after his admission to the ED.

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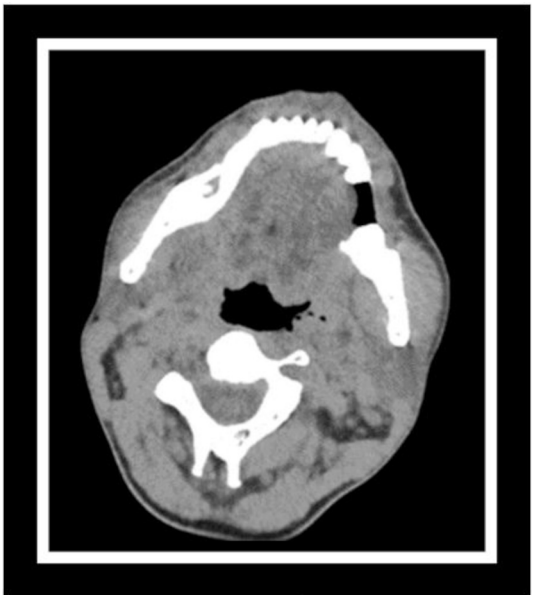

Figure 1 Case 1: abscess in the left submandibular region.

Case 3: peritonsillar abscess

A male patient in his 40 was admitted to the ED in June 2020 with the history of tooth extraction 15 days ago, and facial swelling that started afterwards. His vital signs were stable. On physical examination, his oropharynx was hyperaemic, there was purulent discharge, the uvula was on the midline without any asymmetry and there was cellulitis on the right palatine tonsil. The laboratory tests of the patient were as follows: total leucocyte count 38.3×10^9/L (4–10.5×10^9/L), haemoglobin 0.161 g/L, creatinine 0.89 mg/dL (0.67–1.17 mg/dL), CRP 109.20 mg/L (<5 mg/L) and erythrocyte sedimentation rate 3 mm/hour (0–15 mm/hour). On neck CT, there were missing teeth on the right inferior alveolar arch as well as the signs of periapical lysis, cellulitis and oedema in the premaxillary and buccal space,the right palatine tonsil increased in volume with hyperdense areas inside. Free air was observed between the thyroid cartilage and the hyoid bone (figure 3). Tracheotomy was performed since the patient could not be intubated in the operating room. The orifice of the spontaneous fistula 1 cm below the gingivobuccal sulcus was widened, and purulent material was drained from the area extending from the premaxillary region to the zygoma. The patient was administered vancomycin after surgical drainage. The patient was discharged 22 days after his admission.

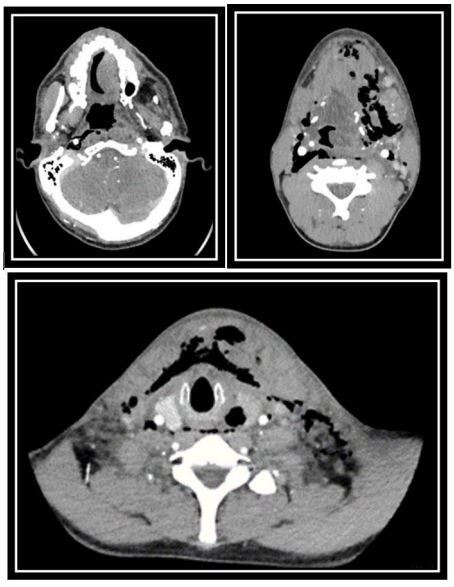

Figure 2 Case 2: air within the soft tissues.

Figure 3 Case 3: cellulitis and oedema in the premaxillary and buccal space.

DISCUSSION

Dental infections are frequently seen in the immunosuppressed, smoking and diabetic patients in the underdeveloped countries[6]; however, fatal odontogenic infections have been reported in the developed countries during the COVID-19 pandemic.[7] Odontogenic infections are generally localised infections; however, they may cause cavernous sinus thrombosis, suppurative jugular vein thrombophlebitis, carotid artery erosion, bacteraemia, bacterial endocarditis, mediastinitis, maxillary sinusitis, osteomyelitis and deep neck infections if they are not diagnosed and treated early.[8] Most odontogenic and submandibular infections spread through the superficial layer of the deep fascia of the neck; however, infections of second and third molars may involve the middle layer.[9]

Ludwig's angina is the inflammation of the sublingual and submandibular spaces. Its origin is odontogenic in 90% of the cases,[10] and it may result in mortality. Although Ludwig's angina is rarely seen in the ED, mortality has been reported.[7 11 12] Endotracheal intubation must be performed before the patient has stridor or cyanosis. Broad-spectrum antibiotics (targeting Gram-positives, negatives and anaerobes) and tooth extraction (if the infection is odontogenic) are required.[10]

Mortality due to upper airway obstruction has been reported in Ludwig's angina with an odontogenic origin.[11 12] Narrowing of the oral cavity due to dental abscess may necessitate supraglottic airway management, and oedema of the floor of the mouth may cause difficult endotracheal intubation.[13] It has been reported that cardiac arrest complications occur more frequently following difficult intubation.[14] Blind nasal intubation is not suggested due to the risk of abscess rupture.[15] If endotracheal

intubation cannot be done in these patients, surgical airway management is recommended.[16]

S. viridans, one of the most common causative microbial agents in the literature, was cultured in our case, and recovery could be achieved with early administration of suitable antibiotics and surgical drainage. Early diagnosis, administration of suitable antibiotics and surgical drainage are important in the management of Ludwig's angina since due to complications including airway obstruction and septic shock with a mortality rate over 90%.[17]

Necrotising fasciitis is characterised by rapid, progressive, necrotic infection of the superficial fascia and associated cutaneous tissues. It is usually more common in immunocompromised patients and in the abdomen, perineum and extremities.[17] Although only 1 case with dental infection ends with necrotizing fasciitis per year, 4 out of 1000 necrotising fasciitis cases worldwide are caused by neck infections.[18 19] Untreated infection of second and third molar teeth easily spread into the submandibular space and then into the sublingual, submental and parapharyngeal spaces. Ludwig's angina and necrotizing fasciitis may develop in this way.[11 18] Since there is no chance of survival without surgical debridement, the use of CT scans or simply the use of antibiotics should not delay the treatment of patients.[20] Manifestation of an odontogenic infection and its rapid spread were important causes of the mortality of our patient.

Peritonsillar abscess often develops due to tonsillitis, and less frequently due to chronic dental infections. It is the most common head and neck infection, with an incidence of 1 in 10 000 in the EDs. Peritonsillar abscess may cause upper airway obstruction through extension into the parapharyngeal and/or retropharyngeal spaces, laryngeal oedema, and sepsis,[21] and endotracheal intubation may be difficult, as in our case. The treatment includes broad-spectrum antibiotics and drainage.[21]

A retrospective study comparing secondary care services from March to June 2020, when lockdown was implemented due to COVID-19, to the same months the previous year discovered that the time between symptom onset and presentation to medical attention increased in 2020 (mean 3.6 days in 2020 vs 6.9 days in 2019). In 2020, the patients' hospitalisation duration increased (mean 1.79 days for 2019, 2.38 days for 2020) and they were more likely to present with more than three symptoms (among trismus, stridor/difficulty breathing, odynophagia/dysphagia or any other airway symptom). Quarantine without adequate primary healthcare was found to delay the presentation of patients seeking treatment for odontogenic infection and to worsen the clinical manifestations at presentation.[22] In our case series, we have also reported complicated odontogenic infections presented at the beginning of the COVID-19 pandemic in our country. These patients delayed their presentation to medical attention and avoided presentation to primary healthcare services for fear of COVID-19.

It has been considered that non-emergency dental procedures would increase the spread of COVID-19. It has been stated that the patients who need emergency dental treatment should be determined beforehand during the pandemic.[23] In addition, it has been reported that the use of telemedicine is beneficial for the management of orofacial pain during the COVID-19 pandemic.[24] Teledentistry, which was popular prior to the COVID-19 pandemic, has advantages such as allowing patients to meet with a specialist dentist without travelling a long distance, lowering costs and reducing the need for patients to take time off from work, but it has limitations such as screening, consultation and history taking, lack of experience in healthcare providers with the software and technology used, and the necessity for patients to have a dialogue with different people every time due to the virtual environment are described as the weaknesses.[25] Teledentistry, within the subcontexts of teleconsultation, teletriage, telediagnosis and telemonitoring, has been reported as potential solutions for current dental practices during the COVID-19 pandemic.[26]

Although uncomplicated dental infections have a good prognosis, dental infections that spread to deep neck structures have a poor prognosis, and the mortality rate varies between 1% and 25%.[27] We believe that it is important to follow-up dental health and treat oral and oropharyngeal infections during COVID-19 pandemic since odontogenic infections may progress and cause life-threatening complications if left untreated.

Learning points

- Delay in dental treatment in the pandemic era may cause complicated odontogenic infections and mortality due to late diagnosis and treatment.
- During the pandemic, patients who need emergency dental treatment should be identified and patients with odontogenic infections should admit to hospital earlier.
- Treatment strategies (eg, telemedicine) should be planned in primary healthcare services to promote early diagnosis and treatment.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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