Case Report

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Ludwig's Angina Complicated by Descending Necrotizing Mediastinitis and Superimposed *Candida* Mediastinitis: Case Report and Literature Review

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Abstract

Ludwig's angina is a rapidly spreading infection of the floor of the mouth and neck. A rare and dreaded complication of Ludwig's angina is extension of the infection to the mediastinum. We describe a unique case of Ludwig's angina presenting with descending necrotizing mediastinitis, with the subsequent development of *Candida albicans* and *Candida krusei* mediastinitis.

Case Report

A 57-year-old man presented with a three-day history of progressive neck swelling with odynophagia. Two days prior, he was treated at another facility with oral clindamycin. Upon his presentation to our Emergency Department, he was noted to have tachycardia (pulse 126/minute), with trismus and purulent discharge from his oral cavity. He had numerous dental caries, and elevation of the floor of his mouth with visible necrotic tissue. The submental and submandibular regions were bilaterally swollen, with firm, erythematous skin extending from the neck to the upper chest wall.

Laboratory data was significant for a leukocyte count of 11,400 cells/mm³ with 40% bands, erythrocyte sedimentation rate of 116 mm/hr, and C-reactive protein of 491 mg/L. Glycated hemoglobin level was 5.1%, and HIV screen was negative. A contrast computed tomography (CT) scan of the neck revealed extensive fluid and gas collections in the bilateral masticator spaces, extending posteriorly to the retropharyngeal space, and inferiorly to the mediastinum (Figure 1).

The patient was nasally intubated for airway protection

and placed on empiric therapy with intravenous ampicillin-sulbactam 3 grams every 4 hours. He was taken to the operating room, where he underwent bilateral neck exploration with drainage of abscesses, right lateral thoracotomy with mediastinal debridement, and tracheostomy. Multiple abscesses were present deep to the sternocleidomastoid muscles, extending bilaterally from the floor of the oropharynx to the mediastinum, with cultures growing *Streptococcus intermedius*.

Over the next two weeks, he underwent three additional neck and mediastinal wound debridements. Due to persistent fevers, a repeat CT scan of the neck was performed, which revealed worsening bilateral neck abscesses extending to the mediastinum. Subsequent neck and mediastinal abscess cultures both grew *Candida albicans* and *Candida krusei*. Intravenous micafungin 100 mg every 24 hours was given, as the *Candida krusei* isolate was fluconazole resistant.

The patient was hospitalized for two months, undergoing a total of eight surgical debridements and complete dental extraction. He was maintained on intravenous ampicillin-sulbactam and micafungin for seven weeks, completing his antimicrobial course

one week after neck wound closure and tracheostomy decannulation. He was seen in outpatient follow-up two weeks later, with excellent clinical recovery.

Discussion

Ludwig's angina is a rapidly progressive infection, which can lead to multiple complications, including descending necrotizing mediastinitis. Our case highlights this infrequent, but devastating complication, in addition to the even rarer development of *Candida* mediastinitis.

Most commonly, Ludwig's angina arises from an infected mandibular molar tooth, with less frequent non-odontogenic causes including mandibular fracture, sialadenitis, lymphadenitis, head and neck malignancy, and trauma to the floor of the mouth [1]. Infection spreads inferiorly from the floor of the oropharynx to the submandibular space, which is defined anteriorly and laterally by the mandible, and inferiorly by the superficial layer of the deep cervical fascia [2]. This potential space can communicate with other deep fascial spaces, allowing for a swift spread of infection that can lead to airway compromise, as observed in our patient.

Extension of infection from the submandibular to lateral pharyngeal space can produce symptoms such as jaw pain and trismus, as demonstrated in our case [1]. The lateral pharyngeal space extends from the hyoid to the sphenoid bone, and is bordered laterally by the parotid gland, mandible, and the internal pterygoid muscle [1]. Additional complications arising from infection in this space include Horner's syndrome, cranial nerve nine to twelve palsies, jugular vein suppurative thrombophlebitis (Lemierre's syndrome), and carotid artery rupture or sheath abscess [1,2]. From the lateral pharyngeal space, infection can spread to the retropharyngeal and danger spaces, located between the posterior border of the pharynx or esophagus, and the anterior border of the spine [1]. These spaces communicate with the mediastinum, leading to complications such as pleural or pericardial effusions, as well as descending necrotizing mediastinitis, as seen in our case [1,2].

The primary risk factors for developing Ludwig's angina complicated by airway obstruction, mediastinitis, pneumonia, or sepsis were identified in a retrospective study involving 81 patients with submandibular space infection, ranging in age from 12-to 96-years old [3]. The risk factors identified in multivariate analysis were diabetes mellitus, other comorbid diseases, bilateral submandibular swelling, and anterior visceral space

involvement [3]; the latter two were present in our patient.

The mortality rate of Ludwig's angina is estimated to be less than 10% [4]. However, it can increase to greater than 30% when complicated by descending necrotizing mediastinitis [5]. Most frequently, viridans group streptococci are the causative organisms [2,6,7], which is consistent with *Streptococcus intermedius* isolation in our patient's initial abscess cultures. In patients with severe infection, such as was present in our patient, or in immunocompromised hosts, more virulent pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) are increasingly being identified. Dixon and Steele recently described a pediatric patient with Ludwig's angina and mediastinal extension due to MRSA [8].

Another pathogen warranting consideration in the setting of unremitting infection or immunocompromise is *Candida*. The majority of published reports of *Candida* mediastinitis have involved postoperative infection following cardiothoracic surgery, with an incidence of 5% among published cases of mediastinitis [9]. A retrospective study of nine cases of *Candida* mediastinitis following cardiothoracic surgery reported a mortality rate of 56%, with a median time between surgery and onset of mediastinitis of 11 days [9]. Eight patients were infected with *Candida albicans*, with the remaining patient infected with *Candida glabrata* [9]. All nine patients were noted to have postoperative exposure to broad spectrum antimicrobial agents prior to the development of *Candida* infection [9].

Two cases of *Candida* mediastinitis in the setting of Ludwig's angina have been reported in the literature [10,11]. One case involved a 26-year-old woman with poorly controlled type 2 diabetes mellitus, who presented with neck swelling, trismus, and dysphagia [10]. She was found to have a right parapharyngeal space abscess on CT scan of the neck. The abscess was not initially cultured, and the patient was started on empiric antimicrobial therapy. Several days later, CT scan of the chest revealed right lower-lobe pneumonia and bilateral pleural effusions. Mediastinal extension of the abscess was noted, with cultures growing *Candida parapsilosis* and *Candida krusei*. The second case involved a 48-year old man with a seven-day history of fever and odynophagia [11]. Similar to our patient, he had no history of immunodeficiency. CT scan of the neck revealed a retropharyngeal abscess, with initially negative cultures. Broad spectrum antimicrobial therapy was continued

for several days, after which repeat imaging revealed an enlarging abscess, pneumomediastinum, pleural effusions, and pneumonia. Repeat cultures of abscess aspirate grew *Candida albicans*.

Similar to our case, both patients were diagnosed with *Candida* mediastinitis several days after exposure to broad spectrum antimicrobial therapy, which is known to increase *Candida* growth in its commensal habitat [10]. Combined with the severe mucosal disruption associated with Ludwig's angina, these patients all developed a high risk for *Candida* infection [10]. Their clinical decline and worsening radiographic findings, despite broad spectrum antimicrobial therapy and surgical drainage, were compelling signs of a primary fungal infection or super infection. In our patient, initial abscess cultures showed no fungal growth, suggesting that his *Candida* infection was likely a superimposed fungal infection that developed in a postoperative setting and after prolonged exposure to antibiotics.

The selection of empiric antimicrobial therapy in Ludwig's angina should account for aerobic and anaerobic oral flora, including beta-lactamase producing anaerobes. Agents generally lacking activity against the oral commensal *Eikenella corrodens* should be avoided. This includes clindamycin, cephalexin, and metronidazole [12]. Empiric MRSA coverage should also be considered in complicated infection or immunocompromise⁸. In addition to appropriate empiric antimicrobial therapy, early and aggressive surgical intervention is essential to survival and recovery [13,14].

Conclusion

Ludwig's angina is associated with numerous complications, with descending necrotizing mediastinitis being among the most severe. Recovery from infection relies on prompt surgical intervention, as well as empiric antimicrobial therapy that accounts for infection burden and immunodeficiency. *Candida* infection, although rare, must be considered when these therapeutic measures are failing.

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Conflicts of Interest

The authors report no conflicts of interest.

Figure 1: Contrast CT of the neck demonstrating extensive fluid and air collections in the bilateral masticator spaces (A), with progression to the submandibular space (B), and mediastinum (C).

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