

Ludwig's Angina with Evolving Airway Compromise in a Patient with Chronic Kidney Disease: A Case Report.

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ABSTRACT

Ludwig's angina is a rapidly progressive, potentially life-threatening infection of the floor of the mouth that can lead to airway compromise. We report the case of a 56-year-old man with chronic kidney disease on regular haemodialysis who presented with progressive submandibular swelling, trismus, and dysphagia following an untreated odontogenic infection. Initial management included airway monitoring and broad-spectrum intravenous antibiotics. Clinical deterioration occurred on the third day, with worsening respiratory symptoms and reduced mouth opening. Neck ultrasonography revealed a loculated abscess extending from the right upper jugular to the submandibular region with diffuse subcutaneous oedema. The patient subsequently underwent surgical decompression and incision drainage, yielding purulent material for culture. Antimicrobial therapy was continued based on susceptibility results, resulting in satisfactory clinical improvement and wound healing. This case highlights the importance of early recognition, vigilant airway assessment, prompt imaging, and timely surgical intervention in the management of Ludwig's angina, particularly in patients with predisposing comorbidities.

Keywords: Ludwig's angina; Odontogenic infection; Airway management; Chronic disease Knowledge

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INTRODUCTION

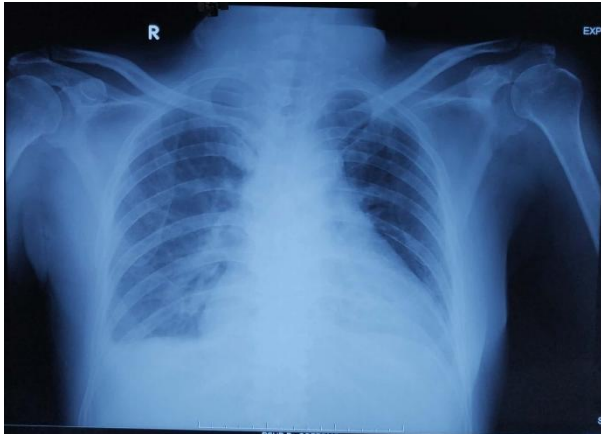
Dental infections can sometimes lead to serious complications. One such complication is Ludwig's angina. Ludwig's angina is named after the German physician Wilhelm Friedrich von Ludwig who first described the condition in 1836 as a progressive, often fatal gangrenous cellulitis (Candamourty *et al.*, 2012). Ludwig's angina is a form of acute diffuse cellulitis that occurs in the maxillofacial region involving bilaterally the sublingual, submental, and submandibular spaces (Sjamsudin *et al.*, 2020). The location of this space is lower than the base of the tongue, infection in this cavity can result in elevation of the floor of the mouth and posterior displacement of the base of the tongue into the airway which can cause airway obstruction (Sjamsudin *et al.*, 2020). Therefore, Ludwig's angina is considered a life-threatening condition (Strich, Heil and Masur, 2020) (Thorndike and Kollef, 2020). Indonesia, to date, there are no specific guidelines for the management of acute Ludwig's angina. Although standardized guidelines are currently lacking, the mainstay of treatment focuses on airway management and adherence to infection control principles, as illustrated in this case report. The objective of this report is to raise clinical awareness and facilitate early recognition of similar cases, considering the rarity and potential severity of this condition.

CASE REPORT

A 56-year-old man presented to the emergency department with a two-day history of dyspnea. He also reported reduced oral intake due to trismus and odynophagia beginning two days prior to admission. Five days before presentation, a dental cavity was identified during a dental visit; however, no extraction was performed. The patient had been undergoing twice-weekly hemodialysis for end-stage renal disease for the past five months. His medical history was significant for hypertension for four years, managed with amlodipine 10 mg once daily for the past year. On examination, the patient was clinically stable, with a blood pressure of 156/80 mmHg, heart rate of 79 beats/min, respiratory rate of 20 breaths/min, oxygen saturation of 97% on room air, and an axillary temperature of 37.7 °C. Pain severity was mild (Numeric Rating Scale score: 3). Marked bilateral submental and submandibular swelling with tenderness and poorly defined margins was evident. Chest examination demonstrated percussion dullness and reduced breath sounds over the right lower hemithorax. Bilateral lower-limb pitting edema was also observed. Laboratory investigations revealed severe normocytic normochromic anemia (hemoglobin 6.2 g/dL) and marked leukocytosis (21,040/ μ L) with neutrophil predominance. Renal function was significantly impaired, with a blood urea nitrogen level of 44 mg/dL and serum creatinine of

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9.64 mg/dL. In contrast, liver function tests and serum electrolyte levels were within normal limits



ECG evaluation showed sinus and no other abnormalities. Chest radiography demonstrated homogeneous opacification involving the right lower hemithorax extending laterally to the mid-lung field (Figure 1).

Figure 1. Anteroposterior chest radiograph consistent with a right-sided pleural effusion.

The cervical photo showed a soft tissue mass was found in the right and left colli region, dominant to the right, which caused tracheal deviation to the side (Figure 2)

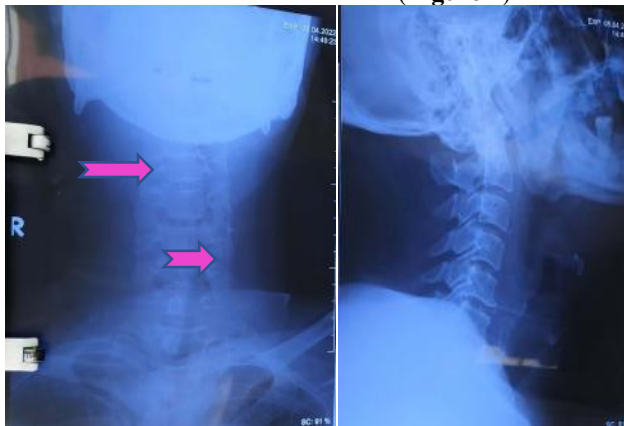


Figure 2. The soft tissue mass in the right and left neck region was dominantly right, which causes deviation of the trachea to the left, causing narrowing of the tracheal lumen to as high as VC 2-4, with the narrowest lumen as high as VC 4.

The head and neck surgery team identified a right cervical soft-tissue mass causing tracheal deviation at the C2–C4 level. However, there were no clinical features of airway compromise, and no airway intervention was required at that time. Pulmonology

review confirmed a right-sided transudative pleural effusion, for which therapeutic thoracentesis was performed, yielding 500 mL of pleural fluid. The patient continued his scheduled haemodialysis, during which two units of packed red blood cells were transfused. In addition, the patient received supplemental oxygen via nasal cannula at 4 L/min. medical management included intravenous ceftriaxone 1 g every 12 hours and intravenous

metronidazole 500 mg every 8 hours. Antihypertensive therapy consisted of oral amlodipine 10 mg once daily and candesartan 8 mg once daily



On the third day of treatment, the patient developed worsening dyspnoea accompanied by sudden limitation of mouth opening and increasing pain and swelling of the lower jaw and neck. Maximal interincisal mouth opening was reduced to 2.5 cm (Figure 3)

Figure 3. Clinical demonstrating trismus (two-finger mouth opening), submandibular swelling with erythema, and elevation of the tongue.

Neck ultrasonography revealed a loculated hypoechoic lesion with partially ill-defined margins and internal mobile echoes extending from the right upper jugular region (approximately 2.6 × 2.2 cm) to the right submandibular region (approximately 6.8 × 2.2 cm). A mosaic pattern consistent with subcutaneous oedema was observed in the bilateral submandibular, mental, and thyroid regions (Figure 4). These findings confirmed the diagnosis of Ludwig's angina (floor-of-mouth phlegmon), and the patient was scheduled for surgical decompression and incision drainage

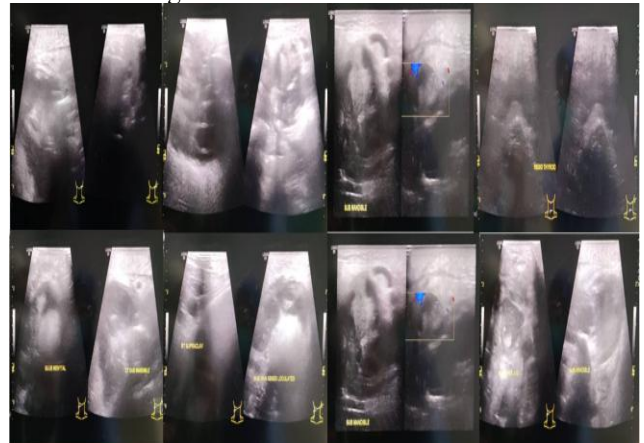


Figure 4 Ultrasonographic findings of the neck showing a loculated hypoechoic abscess in the right upper jugular region extending to the right submandibular space, accompanied by diffuse subcutaneous oedema in the bilateral submandibular, mental, and thyroid regions.

Intraoperatively, marked submandibular and sublingual swelling was identified, extending approximately two finger breadths above the jugular incision and two finger breadths below the inferior margin of the mandible bilaterally. Blunt dissection was carried out until

penetration of the bilateral mylohyoid muscles. Approximately 70 mL of brownish-yellow purulent material mixed with blood was drained, and samples were obtained for microbiological culture. Tunnelling

through loose connective tissue was performed up to 4 cm caudal to the submandibular incision. An additional transverse incision was made 4 cm caudal to the initial bilateral incision, yielding a further 10 mL of purulent, blood-stained fluid. Thorough irrigation was performed using antiseptic solution followed by normal saline until the cavity was clean. A corrugated (handschoen) drain was subsequently placed (**Figure 5**). Culture and sensitivity testing demonstrated susceptibility to the initially prescribed empirical antibiotics; therefore, the same antimicrobial regimen was continued for a further week. On re-evaluation after ten days, the patient showed satisfactory wound healing.



Figure 5. Clinical appearance of the submandibular region. (A) Pre-operative view showing marked submandibular swelling. (B) Post-operative view following surgical incision and drainage with drain placement, demonstrating decompression of the affected area

DISCUSSION

Ludwig's angina is an acute, rapidly progressive, diffuse suppurative cellulitis of the floor of the mouth that typically spreads bilaterally from the submandibular space to the sublingual and submental spaces (Bridwell *et al.*, 2021). The condition is most commonly odontogenic in origin, with *Streptococcus sp* being the predominant pathogens. Other frequently implicated microorganisms include anaerobic gram-negative bacteria such as *Prevotella*, *Porphyromonas*, and *Fusobacterium*. Odontogenic infections are characteristically polymicrobial, involving both aerobic and anaerobic organisms, and mixed infections have been reported in up to 50% of cases (Owobu *et al.*, 2020). Dental infections affecting the mandibular second and third molars are the most frequent source of Ludwig's angina, as the roots of these teeth extend below the mylohyoid muscle, facilitating direct spread into the submandibular space. From there, infection may progress to the sublingual, pharyngomaxillary, and retropharyngeal spaces, significantly increasing the risk of airway

compromise (Owobu *et al.*, 2020; Aditya dan Janar Wulan, 2015). This mechanism is consistent with the present case, in which an untreated dental cavity preceded progressive submandibular swelling, trismus, and pain, reflecting typical disease progression.

Ludwig's angina most commonly affects adults aged 20–60 years and shows a marked male predominance (male-to-female ratio 3:1–4:1) (Blanchard *et al.*, 2013). Although it often occurs in otherwise healthy individuals, several conditions predispose to its development, including diabetes mellitus, chronic kidney disease, immunosuppressive states, and alcoholism, all of which impair host immune responses and facilitate rapid spread of infection (Fellini *et al.*, 2017; Bondar, Klimontov dan Simakova, 2011). In the present case, chronic kidney disease requiring regular haemodialysis likely contributed to disease susceptibility and progression

Clinically, Ludwig's angina presents as diffuse cellulitis involving the floor of the mouth and submandibular region, with bilateral swelling and tongue elevation observed in the majority of cases (Bridwell *et al.*, 2021). Progressive disease may manifest with dysphagia, odynophagia, drooling, trismus, and signs of impending airway compromise, including stridor, dysphonia, and respiratory distress (Bridwell *et al.*, 2021). In the present case, clinical deterioration occurred on the third day, characterised by laboured breathing, worsening trismus, snoring, and inability to speak. Neck ultrasonography demonstrated a loculated abscess in the right upper jugular and submandibular regions with associated subcutaneous oedema, confirming advanced disease and explaining the evolving airway-threatening features.

Airway assessment is the cornerstone of management in Ludwig's angina, as maintaining airway patency remains the highest priority. Patients must be closely monitored for signs of impending airway compromise, with prompt airway intervention indicated when necessary (Bridwell *et al.*, 2021). Given the polymicrobial nature of the infection, empirical broad-spectrum intravenous antibiotics targeting aerobic and anaerobic organisms are recommended, commonly combining a third-generation cephalosporin with metronidazole (Aditya dan Janar Wulan 2015; Bridwell *et al.*, 2021). Surgical intervention is warranted in the presence of suppuration or radiological evidence of abscess formation, with incision and drainage accompanied by microbiological culture to guide therapy (Vallée *et al.*, 2020). In the present case, clinical deterioration on the third day with evolving airway-threatening features prompted imaging, which confirmed a loculated abscess, necessitating surgical decompression and drainage. Purulent material was obtained for culture, and antimicrobial therapy was continued accordingly.

CONCLUSION

This case illustrates the presentation and management of Ludwig's angina in a 56-year-old male patient. Ludwig's angina is a potentially life-threatening condition, and this report highlights the critical importance of early diagnosis, vigilant airway assessment, timely administration of broad-

spectrum antibiotics, and prompt surgical intervention in achieving a favourable outcome, particularly in cases with extensive soft-tissue involvement.

Declaration of Patient Consent

The authors confirm that all necessary patient consent forms have been duly obtained. In these forms, the patient has agreed to the publication of their images and relevant clinical details in this journal. The patient acknowledges that while their name and initials will not be disclosed and all reasonable efforts will be made to protect their identity, complete anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

Author contribution

All authors contributed equally to the final version of the publication, have read, and approved the manuscript.

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None

Ethical Approval

This case report was conducted in accordance with the ethical standards of the institutional and national research committee. Written informed consent was obtained from the patient for publication of the clinical details and accompanying images. Ethical clearance was not required for single case reports according to institutional policy

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