CASE REPORT

Case Report: Poor oral hygiene leading to an emergency condition: A case report of Ludwig's angina [version 1; peer review: 1 approved with reservations]

Prashant Pant¹, Oshan Shrestha ², Pawan Budhathoki¹, Nebula Devkota¹, Prabin Kumar Giri³, Dhan Bahadur Shrestha ⁴

¹Department of Emergency Medicine and Critical Care, Karnali Academy of Health Sciences, Jumla, 21200, Nepal

²Nepalese Army Institute of Health Sciences, Kathmandu, 44600, Nepal

³Department of Anesthesiology, Karnali Academy of Health Sciences, Jumla, 21200, Nepal

⁴Department of Internal Medicine, Mount Sinai Hospital, Chicago, Illinois, 60692, USA

V1 First published: 01 Dec 2021, 10:1219
<https://doi.org/10.12688/f1000research.74692.1>
Latest published: 01 Dec 2021, 10:1219
<https://doi.org/10.12688/f1000research.74692.1>

Abstract

Ludwig's angina (LA) is a rapidly spreading and potentially life-threatening infection having an odontogenic infection as the most common source. It involves the floor of the mouth and neck. Modernization in medical care has made this entity rare and of low mortality at the present but it is still feared as a lethal entity due to rapidly progressive airway obstruction that follows. Here we report a case of a 15-year-old male who suffered from LA. Presenting symptoms and findings of the examination helped in the clinical diagnosis. Immediate intubation, use of broad-spectrum antibiotics, and treatment of complications aided the patient's recovery. LA should be considered for differential diagnosis in the case of neck swelling especially in those having a history of poor oral hygiene and recent dental procedures. Management of LA and its complications should always involve doctors from multiple disciplines.

Keywords

airway obstruction, ENT emergency, Ludwig's angina, oral hygiene

Open Peer Review

Approval Status ?

1

version 1

01 Dec 2021

view

1. **Widiana Ferriastuti** , Universitas Airlangga, Surabaya, Indonesia
Dr. Soetomo General and Academic Hospital, Surabaya, Indonesia

Any reports and responses or comments on the article can be found at the end of the article.

Corresponding author: Oshan Shrestha (shresthaoshan93@gmail.com)

Author roles: **Pant P:** Conceptualization, Data Curation, Investigation, Project Administration, Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **Shrestha O:** Conceptualization, Data Curation, Investigation, Methodology, Project Administration, Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **Budhathoki P:** Data Curation, Investigation, Writing – Original Draft Preparation; **Devkota N:** Data Curation, Investigation, Resources, Writing – Original Draft Preparation; **Kumar Giri P:** Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; **Shrestha DB:** Conceptualization, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

Copyright: © 2021 Pant P *et al.* This is an open access article distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Pant P, Shrestha O, Budhathoki P *et al.* **Case Report: Poor oral hygiene leading to an emergency condition: A case report of Ludwig's angina [version 1; peer review: 1 approved with reservations]** F1000Research 2021, 10:1219 <https://doi.org/10.12688/f1000research.74692.1>

First published: 01 Dec 2021, 10:1219 <https://doi.org/10.12688/f1000research.74692.1>

Introduction

Ludwig's angina (LA) was first reported and published by a German physician Wilhelm Frederick von Ludwig in 1836. He described it as a throat infection that was different from other typical throat infections with specific characteristics; peculiar hardness of the involved tissue, swelling beneath the tongue, edema of the neck, and sparing of the glands.¹ Modernization in medical care has made this entity rare and of low mortality at the present. But it is still seen in emergency settings and is still feared as a lethal entity due to the rapidly progressive airway obstruction that follows.^{2,3} To highlight this most feared complication of LA, the word 'angina' is added as its origin is a Latin word 'angere', which means 'to strangle'.⁴

Odontogenic infection, especially pre-apical infection of mandibular molars, is the most common origin of Ludwig's angina and this predominance of dental etiology has been well backed up by evidence.^{2,3} Other less common etiologies include peritonsillar abscess, mandibular fracture, or other facial trauma. Although males and age groups from 20 to 40 years are commonly affected by LA,⁴ it has also been reported in neonates, children, and the elderly.³ Causative agents are usually a mix of both aerobic and anaerobic bacteria, including mouth organisms like streptococci or staphylococci.⁵

Here, we report a case of a 15-year-old male who developed LA, was overwhelmed by its complications and later recovered from it. Also, there was an incidental finding of a roundworm in his respiratory tract. This case report is presented in line with the CARE guidelines.⁶

Case presentation

A 15-year-old male presented to the emergency department with concerns of swelling over his submandibular region (for nine days), fever (for four days), dysphagia, dysphonia, and drooling (for two days). Meticulous history taking revealed that the patient had experienced pain in his mandibular teeth recently, but he did not seek any medical attention for it. He had no known history of allergy, no history of trauma nor surgical or dental procedures. When asked about his personal history, he stated that he inconsistently brushed his teeth, and he had a habit of eating sugary items and drinking carbonated drinks. There was also no practice of visiting a dentist regularly in the patient's family. On the day of the presentation, physical examination showed a fever of 102 degrees Fahrenheit, pulse rate of 143 beats per minute, respiratory rate of 37 breaths per minute, and blood pressure of 133/90 mmHg. Remarkable findings on examination were halitosis, firm and tender swelling which extended from one angle of the mandible to the other with bilateral involvement of submandibular space and sublingual space, restriction of mouth opening with an inter-incisor gap of 2 cm, swollen tongue, which was lifted up, and dental carries over both his mandibular first molars. However, examination for stridor, headache, cyanosis and regional lymph node involvement were negative (Figure 1).

Figure 1. On presentation, submandibular and sublingual swelling.

Figure 2. Multiple incisions performed along the two angles of the mandible for drainage. Discharge can be seen coming from the vertical incision that was carried out to perform emergency tracheostomy.

Figure 3. A 17-centimeter-long *Ascaris lumbricoides* roundworm that emerged from the endotracheal tube while suctioning and caring for the secretion.

The diagnosis of LA was made by judging the clinical picture: firm, tender, bilaterally symmetric swelling of sublingual space and submandibular space, presence of carious teeth, and history of poor oral hygiene. The patient was immediately admitted to the intensive care unit (ICU) and management was started promptly due to the possible impending airway obstruction. A vertical midline incision just above the sternal notch was given to perform an emergency tracheostomy, but couldn't be performed successfully due to the purulent discharge coming out of the incision site. Then emergency endotracheal (ET) intubation was performed with the help of direct rigid laryngoscopy under general anesthesia. Multiple incisions along the angle of the mandibles were performed for drainage of the neck swelling. The patient was put on clindamycin (300 mg) and meropenem (1 gm) intravenously for 12 days and carious teeth (both mandibular first molars) were extracted. Elective tracheostomy was performed eight days later (Figure 2).

On the third day of admission, while suctioning and caring for secretion from the ET tube, a roundworm came out of the ET tube. Adult worm identification examination confirmed that it was *Ascaris lumbricoides*. However, eosinophils were not raised and there was no trace of other worms and their eggs on the X-ray. For deworming, oral albendazole 400 mg was administered for three days. As the patient was being monitored regularly for possible complications of LA, empyema thoracic and loculated effusions were noticed on the fourth day of admission. Chest-tube insertion was carried out for its management. Our patient was also prescribed vancomycin (40 mg/kg) for 14 days as urine culture tested positive for *Enterococcus* species on the twelfth day of ICU admission (Figures 3 and 4).

After successfully managing a series of complications and close monitoring for up to 26 days, the patient was transferred to the pediatric ward from the ICU. The patient recovered very well and faced no new issues. The tracheostomy was closed, and discharge was planned for the patient. Our patient and his parents were counseled about his clinical condition and the interventions carried out. Our patient was prescribed mupirocin (2%) ointment for application over the closed incision sites and prednisone tablets (5 mg, once a day, for five days) along with pantoprazole tablets (40 mg, once a day, for one month). He was called for a follow-up two weeks after discharge (Figures 5 and 6).

Discussion

We report a case of LA that originated from an odontogenic infection. Prabhu *et al.*⁷ concluded that odontogenic infections with poor oral hygiene are consistent in the majority of cases. Firstly, infection originates in the subgingival pocket then spreads to the musculature of the floor of the mouth. This infection now progresses below the mylohyoid line gaining access to sublingual space. Since the roots of the second and third mandibular molars lie below the mylohyoid line, infection of these teeth are most frequently involved in the development of LA. The infection then spreads to the

Figure 4. Chest X-ray showing improved status of loculated effusion before and after the treatment.

Figure 5. Patient's status after closure of the tracheostomy.

On 3rd June, 2021: Presented with bilateral submandibular swelling and carious mandibular first molars with a history of poor oral health hygiene.

4th June: Massive secretion from endotracheal tube (ET).

5th June: An *Ascaris lumbricoides* roundworm came out of the ET tube.

6th June: Empyema and loculated effusion.

12th June: Elective tracheostomy done.

29th June: Transferred to the pediatric ward from the ICU.

20th July: Tracheostomy closure.

22nd July: Planning for discharge.

Figure 6. Timeline showing major events.

submandibular space from the sublingual space. Okoje *et al.*⁸ pointed out in their study that the first mandibular molar can be involved in the development of LA but at low frequency. In our patient, there was the presence of unattended carious mandibular molars which acted as the source of infection.

Diagnosis of LA is made based upon the clinical picture, and laboratory tests are of little immediate value.⁹ Grodinaky's criteria for diagnosis of LA includes the involvement of more than one space usually bilaterally, the presence of gangrene with serosanguineous, putrid infiltration with very little or no frank pus, sparing of glandular structures and spread is through continuity not by lymphatics.³ As soon as we diagnosed the patient, he was intubated and admitted to the ICU due to the possible impending airway obstruction. This is the most feared complication of LA and this was to be considered with the utmost emergency. After securing the airway, early treatment of the underlying cause was important to avoid a lethal outcome. We removed the patient's carious teeth, and he was put under broad-spectrum antibiotics. Since causative agents are usually a mix of both aerobic and anaerobic bacteria, the aim while using antimicrobials should be to cover all possibilities.^{4,5} Besides airway complications, our patient also showed empyema and pleural effusion on radiological examination. Empyema and pleural effusion are some of the noted complications of LA.² This was only noticed later when radiological examinations were carried out as the priority was to intubate the patient and secure the airway first. *Enterococcus* species were isolated from the urine of the patient and this is thought to be hospital-acquired as *Enterococcus* species are a common cause of nosocomial urinary tract infection.¹⁰

LA is not only a subject of concern of dental, otorhinolaryngology, and respiratory disciplines but a matter that raises multidisciplinary concern due to its other complications: mediastinitis, aspiration pneumonia, rupture of the carotid artery, thrombophlebitis of the internal jugular vein, necrotizing fasciitis, and osteomyelitis.²

Conclusion

Although LA is a rare entity, it should be considered for differential diagnosis in cases of neck swelling especially in those having a history of poor oral hygiene and recent dental procedures. This condition spreads aggressively and demands aggressive management with the priority of securing the airways first and the use of broad-spectrum antimicrobials. Complications of LA require special attention from multiple disciplines. The practice of good oral hygiene is not just about the oral cavity but is also about life-threatening conditions like LA.

Patient perspective

Our 15-year-old patient has developed a positive outlook towards the condition he went through. He understands the clinical state he was in and is thankful to the entire hospital, especially the nurses who took care of him during his hospital stay. The patient understands the importance of maintaining good oral hygiene.

Data availability

All data underlying the results are available as part of the article and no additional source data are required.

Consent

Written informed consent for publication of their clinical details and clinical images was obtained from the patient.

Acknowledgements

We would like to acknowledge the role played by Dr Ramesh Bhattarai and Mr. Manoj Pradhan during the study.

References

- Murphy SC: **The person behind the eponym: Wilhelm Frederick von Ludwig (1790–1865).** *J. Oral Pathol. Med.* 1996; **25**: 513–515. [PubMed Abstract](#) | [Publisher Full Text](#)
- Spitalnic SJ, Sucov A: **Ludwig's angina: Case report and review.** *J. Emerg. Med.* 1995; **13**: 499–503. [Publisher Full Text](#)
- Patterson HC, Strome M, Kelly JH: **Ludwig's angina: An update.** *Laryngoscope.* 1982; **92**: 370–378. [PubMed Abstract](#) | [Publisher Full Text](#)
- Marcus BJ, Kaplan J, Collins KA: **A case of Ludwig angina: A case report and review of the literature.** *Am. J. Forensic Med. Pathol.* 2008; **29**: 255–259. [Publisher Full Text](#)
- Saifelddeen K, Evans R: **Ludwig's angina.** *Emerg. Med. J.* 2004; **21**: 242–243. [Publisher Full Text](#)
- Riley DS, Barber MS, Kienle GS, et al.: **CARE guidelines for case reports: explanation and elaboration document.** *J. Clin. Epidemiol.* 2017; **89**: 218–235. [PubMed Abstract](#) | [Publisher Full Text](#)
- Prabhu ES: **Nirmalkumar, Acute fascial space infections of the neck: 1034 cases in 17 years follow up.** *Ann. Maxillofac. Surg.* 2019; **9**: 118–123. [PubMed Abstract](#) | [Publisher Full Text](#)
- Okoje VN, Ambeke OO, Gbolahan OO: **Ludwig's angina: An analysis of cases seen at the University College Hospital, Ibadan.** *Ann. Ibadan Postgrad. Med.* 2018; **16**: 61. (accessed July 28, 2021). [Free Full Text](#)
- An J, Madeo J, Singhal M: **Ludwig Angina.** StatPearls; 2021. (accessed July 7, 2021). [Reference Source](#)
- Felmingham D, Wilson APR, Quintana AI, et al.: **Enterococcus Species in Urinary Tract Infection.** *Clin. Infect. Dis.* 1992; **15**: 295–301. [Publisher Full Text](#)

Open Peer Review

Current Peer Review Status: ?

Version 1

Reviewer Report 19 August 2022

<https://doi.org/10.5256/f1000research.78469.r146406>

© 2022 Ferriastuti W. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Widiana Ferriastuti

¹ Department of Radiology, Universitas Airlangga, Surabaya, Indonesia

² Dr. Soetomo General and Academic Hospital, Surabaya, Indonesia

- In Figure 6., "Timeline showing major events", the timeline of the patient's examination to diagnosis and treatment can be improved by being made in narrative form, so that the storyline is more understandable from each event.
- In the second paragraph of the "Discussion" section, "Diagnosis of LA is made based upon the clinical picture, and laboratory tests are of little immediate value". Here the authors can add the "before and after treatment" supporting laboratory data, so that the causing factors of the ascaris lumbricoides presence can be made more clinically understandable.
- For example, in the article referenced here, page 3104 conveys the results of the lab exam before and after the patient's examination, so that it can be used as supporting data to determine medical conditions and ensure patient safety.¹

References

1. Gunawan F, Ferriastuti W: Ludwig's angina: An alarming radiology challenge. *Radiol Case Rep.* 2022; **17** (9): 3103-3106 [PubMed Abstract](#) | [Publisher Full Text](#)

Is the background of the case's history and progression described in sufficient detail?

Yes

Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?

Partly

Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?

Yes

Is the case presented with sufficient detail to be useful for other practitioners?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Head and neck radiologist

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias
- You can publish traditional articles, null/negative results, case reports, data notes and more
- The peer review process is transparent and collaborative
- Your article is indexed in PubMed after passing peer review
- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com

F1000Research