

# A RARE CASE REPORT OF LUDWIG'S ANGINA: EARLY DETECTION AND PREVENTION OF AIRWAY CATASTROPHE

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**ABSTRACT Background:** Ludwig's angina is an infection of the soft tissue or gangrenous cellulitis, starting from the mouth's floor or the tongue's base. It can then directly spread to the neck's soft tissue, resulting in significant oedema and distortion of the adjacent airway, yielding fatal airway obstruction. **Case Report:** We report a case of a 29-year-old female who presented to our emergency department with a sore throat for 2 weeks, a fever for 12 days, and progressively increasing pain in her throat for 1 week. She could not swallow any solids or liquids since last night. In our case, we picked up a diagnosis of Ludwig's Angina quite early as we kept a high threshold of suspicion secondary to subtle signs of an impending airway problem: change in the patient's voice and subtle swelling of her chin described by the patient herself. A CT neck & floor of mouth confirmed our clinical suspicion and diagnosis of Ludwig's Angina. We managed her with aggressive early intravenous (IV) antibiotics, IV steroids and IV hydration which could prevent a fatal airway complication from transpiring. **Why Should an Emergency Physician Be Aware of This?** The authors believe that every emergency physician must be aware of Ludwig's Angina. This rare condition can lead to fatal airway obstruction and airway management mishaps in emergency departments. We highlighted the importance of recognising early signs of a threatened airway, which can be subtle, to begin with, and easily be missed, if not a very high suspicion, which only comes from being perspicacious about this condition. Early diagnosis and management can reduce mortality and morbidity significantly.

**KEYWORDS** Ludwig's Angina, Airway Emergency, Cellulitis, Soft tissue infection

## Introduction

Ludwig's Angina is an infrequent diagnosis in today's acute care settings. In 1836 German physician Wilhelm Friedrich von Ludwig first described Ludwig's Angina as a rapidly progressive, gangrenous cellulitis of the soft tissue of the floor of mouth and neck, sublingual, submental, and submandibular space, which frequently becomes fatal[1]. It was then named after him as Ludwig's Angina. Cellulitis often starts from the soft tissue

of the base of the tongue or floor of the mouth and directly spreads to surrounding tissues, resulting in significant oedema, finally, distortion and obstruction of the airway giving rise to fatal complications of this condition requiring invasive airway management & skills, may lead to airway mishaps in emergency departments. Other complications described in the literature are aspiration pneumonia and carotid arterial rupture or sheath abscess. Therefore, diagnosing Ludwig's Angina early can prevent mortality & morbidity related to it crucially.

## Case report

29-year-old female who presented to the emergency department with 2 weeks history of sore throat, fever x 12 days, progressively increasing pain in throat x 1 week. She has been unable to swallow any solids or liquids since last night.

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**Figure 1** Showing soft tissue heterogeneous swelling at the floor of the mouth and heterogeneous hypo density at the base of the tongue, suggestive of Ludwig's Angina.

### On examination

#### Primary Survey:

- Airway: Airway was patent. She was talking in full sentences. No stridor/ secretion/ drooling. Though she mentioned, her voice had changed since last night, more heavy sounding. I was worried about her airway. Patent now, but threatened for future airway obstruction.
- Breathing: No obvious breathing distress. No cyanosis. Chest=Bilateral (B/L) Air entry: equal. SpO<sub>2</sub>:99% on room air (RA), Respiratory Rate (RR): 16/min.
- Circulation: Blood Pressure (BP):116/86 mmHg, Pulse Rate (PR)-108/min, Capillary Refill Time (CRT) < 2 seconds, all peripheral pulses are palpable.
- Disability: She was Alert / A (on the AVPU scale).
- Exposure: no rash, temperature: 37.2°C (degree Celcius).

#### Short, focused history (SAMPLE) revealed:

- Signs & Symptom: she has been taking defame spray and other flu over-the-counter medications, which did not cause any improvement.
- Allergy: No allergies.
- Medications on: On fluoxetine, only ongoing medication.
- Past medical & surgical history: only depression.
- Last meal: was last night. Today morning she had only water, a small amount, unable to have been able to swallow anything.
- The event leading to this: 2 weeks of sore throat ended up in ED, with sudden deterioration of throat pain, unable to

swallow solids and difficulty swallowing liquids, feels her voice has changed, and severe pain in the throat and neck.

### Management

She was given some analgesia, IV access was secured—> IV paracetamol 1gm was given. Types of blood were sent for Full Blood Count (FBC), Urea & Electrolytes, C - reactive protein (CRP). Her CRP (79) & WBC (12.9) were raised. Her venous blood gas analysis showed no acidosis at this point. Capillary blood glucose (CBG) was normal. ECG 12 lead showed sinus tachycardia.

### Secondary Survey and Head-to-Toe Examination:

- Head, Eye, Ear, Nose, Throat (HEENT), Neck Examination: The patient was asked to open her mouth to assess any obvious airway obstruction, mainly by tongue swelling but detected none. No drooling of saliva from the mouth. It was noted during oral examination ABSENT of any pus point in the tonsils/ posterior pharyngeal wall, with no tonsillar congestion. The tongue is still not pushed upwards and obstructing the airway—tenderness mostly around the mouth's floor and the chin's base. The patient mentioned that she felt a new swelling had developed at the chin base of her tongue, which was difficult to appreciate as she had a chubby chin and had never seen it by me before. The swelling was also very painful. I asked her to show me her old pictures, and after comparing her face in an old picture to herself now, it was more obvious that she certainly had developed some swelling at the base of her face and chin.
- Chest, CVS, Abdominal, and Neurological examinations were unremarkable.

### Provisional diagnosis:

Following examinations, there were a few provisional diagnoses in our mind as followings:

- Ludwig's angina-Cellulitis of the base of the tongue and soft tissue at the submandibular space.
- A Submandibular Gland Abscess
- Retropharyngeal Abscess

### Further Management

Treatment started with broad-spectrum IV antibiotics with IV Co-Amoxiclav, IV Metronidazole, IV steroids with dexamethasone, and IV hydration with Normal Saline. As the patient was haemodynamically stable, we arranged an urgent CT mandible and neck. As shown in Figure I, the CT neck and mandible showed: swelling & fullness at the mouth floor with heterogeneous hypo density at the base of the tongue suggestive of Ludwig's Angina, correlating it with clinical presentation. CT confirmed the diagnosis of Ludwig's Angina. We discussed her case with maxilla-facial surgeons, and she was transferred under them for further management and care. She was conservatively managed with hospitalization, a continuation of IV antibiotics, IVF & IV steroids. In due course, she improved without requiring any invasive airway procedures like tracheostomy or intubation. As the swelling subsided and she could swallow without pain, she was discharged home on oral antibiotics and analgesia. We were delighted to know, after 3 weeks, on our follow-up courtesy call that she improved without complications.

## Discussion

Ludwig's Angina is a disease of the floor of the mouth and cellulitis of the submandibular space. Submandibular space is divided into sublingual space superiorly and submaxillary space inferiorly.

### Epidemiology & Causality:

Ludwig's angina most commonly originates from dental infections, from 2nd and 3rd mandibular molars, in 90% of cases[3]. Other sources of infection leading to Ludwig's Angina are facial bone fractures, tongue piercing, tonsillitis & peritonsillar abscess, infection or calculi in salivary glands, head & neck neoplasia, etc[4,5]. Poor dental hygiene is an independent risk factor for developing Ludwig's Angina. Though it involves primarily prior healthy individuals, certain conditions predispose the individuals to it, which are: alcoholism, diabetes, HIV, immunosuppression from drugs or diseases, etc[6]. In the pre-antibiotic era, death from Ludwig's Angina was 50%, which went down to 8%[4,7].

In our case report, the source of the infection was the sore throat, harboured over two weeks, an uncommon cause of Ludwig's Angina in literature. It was not treated early with oral antibiotics, even when not self-resolved. The bacterial infection then unfurled in the submandibular space, the base of the tongue.

### Pathophysiology:

Originating from dental infection, it spreads to the subgingival pocket initially and then spreads freely further to tissue planes below, first sublingual space and then sub maxillary space, after crossing the mylohyoid muscle. Because of the open communication between these spaces, it is often bilateral. In further progression, cellulitis may also involve the soft tissue of the neck, pre-vertebral and pretracheal soft tissues, and pharyngomaxillary and retropharyngeal spaces. Pathological Organism: Ludwig's Angina is mostly a polymicrobial infection; the source of the organism is most commonly the oral cavity, which includes gram-positive organisms, gram-negative organisms and anaerobes. Commonly causative organisms are Streptococcus species, Staphylococcus, Fusobacterium, Bacteroids, and Peptostreptococcus. In immune-compromised patients, atypical organisms like Pseudomonas, Escherichia coli, Candida, or Clostridium could be found as well[8].

### Presenting Clinical Features[4,7]:

- History of a recent dental infection/ dental procedure.
- Neck pain, neck swelling and advancing to a "Bull Neck" deformity by loss of jawline from oedema and swelling in submental space.
- Difficulty in speaking,
- Trismus from irritation of muscles of mastications.
- Hoarseness or change in voice, stridor, drooling of saliva, and inability to swallow saliva are all features of the advanced disease process and airway compromise.
- Patients may look toxic or systemically unwell if the infection causes sepsis, fever, and lethargy. Unwell appearances are other common features of the systemic sign of infections.

In our case, we picked up a diagnosis of Ludwig's Angina quite early as we kept a high threshold of suspicion secondary

to red flag symptoms: change in the patient's voice and subtle swelling of her chin described by the patient herself. These were difficult to pick up clinically on examination of a person seeing the first time, without a prior impression of them to compare with. All these presenting features were subtle signs of an impending airway problem, and missing these signs in Emergency Department could have been detrimental. We took the help of her old photos to make the differences in a presentation to us in ED. Having a healthy chin, the new swelling was difficult to pick up otherwise.

### Diagnosis & Management:

The diagnosis of Ludwig's Angina is mostly clinical, which is then confirmed by a CT scan of the Neck and Mandible. Early diagnosis is of utmost importance to prevent life-threatening complications, most commonly airway obstruction. An airway assessment is a crucial first step in managing Ludwig's Angina. The first step is detecting the subtle signs and symptoms of impending airway compromise, securing the airway early, if threatened, by early intubation or tracheostomy, involving experts like anaesthetists and ENT specialists early, and predicting a difficult airway in advance. Once the airway is taken care of, definitive care can be initiated by broad-spectrum IV antibiotics covering gram-positive & gram-negative organisms and anaerobes, maintaining hydration by IV fluids. Sometimes, IV steroids are also used to reduce soft tissue oedema and to swell from the inflammatory process. However, it does not have much evidence in practice. The patient often presents in an advanced stage of the disease requiring surgical debridement under anaesthesia.

We decided to go ahead for a CT neck and floor of the mouth, keeping a high suspicion for Ludwig's Angina while considering the radiation exposure to the neck for a young woman. Our CT neck confirmed the presence of the fullness of the mouth floor with irregular hypodensity at the base of the tongue. The soft tissue heterogeneous swelling at the base of the tongue, suggestive of Ludwig's Angina, correlates with clinical presentation, as shown in Figure 1. Absence of any pathology in salivary glands, and no retropharyngeal abscess. We managed her with aggressive early intravenous (IV) antibiotics, intravenous steroids and intravenous hydration, which could prevent a fatal airway complication from transpiring. Our patient was then referred to maxillofacial surgeons, under whom she got admitted to continue treatment. She improved in due course in the hospital and was discharged without complications. Most previous case reports of Ludwig's Angina in literature were reported in the advanced stage with airway complications, requiring invasive airway procedures on presentation. It compels us to confer if most of the cases are missed in the early stage due to subtle signs of presentation, mistaken as a simple sore throat or simple oral/ dental infection, lacking adequate further evaluation and if that comes from lack of awareness of Ludwig's Angina among emergency and primary care physicians. If it could be diagnosed early, we could save a lot of detrimental outcomes it leads to. We diagnosed her early enough to be able to avoid airway complications and could avoid unwarranted invasive airway procedures. This makes our case unique from all other previously reported cases and makes our case pedagogic to our peers.

### Why Should an Emergency Physician Be Aware of This?

Not every emergency and primary care physician has experience diagnosing or managing Ludwig's Angina, a notoriously

cliquish condition. We, the authors, believe that every emergency and primary care physician must be aware of Ludwig's Angina, which, though a rare condition, can give rise to fatal airway obstruction and airway management mishaps in emergency departments. We highlighted the importance of recognising early signs of a threatened airway in Ludwig's Angina, which could be very subtle, to begin with, and can easily be missed early, if not a very high suspicion, which can only come from being perspicacious about this condition. An Emergency Physician can accomplish early diagnosis and management of Ludwig's Angina as they can prevent fatal airway obstruction from arising and unwonted, defacing, invasive airway procedures to manage those complications.

## **Declarations**

### ***Ethics approval and consent to participate***

All consents have been taken.

### ***Consent for publication***

Informed consent has been taken.

### ***Competing interests***

The authors declare that they have no competing interests.

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