

Ludwig's Angina: Case Series with Description of the Ultrasonographic Features of the Emergency Conditions

Antigone DELANTONI¹, Apostolos SARAFPOULOS², GAVRILL TSIROPOULOS³, Hatice Ahsen DENİZ², Kaan ORHAN⁴

¹Dept of Oral Surgery, Implant Surgery and Radiology, Faculty of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece

²Radiologist Ahepa General Hospital, Thessaloniki Greece

³ENT Surgeon, Ahepa General Hospital, Thessaloniki, Greece

⁴Department of Dentomaxillofacial Radiology, Ankara University, Faculty of Dentistry, Ankara, Turkey

Abstract

Introduction: Ludwig's Angina (LA) is a rare but rapidly evolving form of toxic cellulitis with heavy clinical symptoms and the potential of a rapid spread to adjacent cervical triangles.possible expansion.

Case Report: This case series describes the ultrasonographic (USG) features, imaging characteristics and aims to highlight the importance of USG imaging of spreading infections caused by dentomaxillofacial pathologies. Although the diagnosis of Ludwig's angina is more clinical, ultrasound is a necessary complementary examination to delineate the extent of the inflammation and to highlight its most common complications, such as obstruction of the airway, abscess formation, osteomyelitis and vascular clots which are indications for more immediate treatment.

Conclusion: The use of ultrasound for evaluating the extent of the condition is not often reported (and it is reported as isolated case reports) in the literature which allows for a high end and detailed estimation of the infection and its surrounding tissues.

Keywords: Ludwig's Angina, Ultrasonography, infection

Introduction

Ludwig angina (LA) is a rapidly evolving cellulitis of the upper neck area. It is diffused inflammation of bacterial origin and its expansion is by tissue continuity. In most cases it extends to include the sublingual submandibular and submental spaces¹⁻². Ludwig angina spreads into superficial and surrounding facial tissues. Generally, the original source of the infection is dental, mostly an untreated or an undiagnosed dental abscess, It can also arise from otitis media, tongue piercing, sialadenitis, or sialolithiasis of the submandibular glands⁶⁻⁸. In advanced cases airway obstruction is the major problem that preents, while other complications of the condition include pneumothorax⁵, thoracic empyema⁶, septicemia etc^{3,4,7-8}. Overall, its rapid expansion and mortality rate about 8% makes it a potentially mortal infection⁹. Mortality caused by LA was greater than 50% in the preantibiotic era.¹⁰. The use of ultrasound for evaluating the extent of the condition is not often reported (and it is reported as isolated case reports) in the literature though modern machines allow for a high end and detailed estimation of the infection extend and its surrounding tissues possible expansion. The aim of this paper is to present the key

ultrasonographic features of Ludwig angina through a case series presentation where ultrasonography was selected as the initial examination of imaging.

In many cases ultrasonography is the initial radiographic exam of choice. This is because it is readily available in hospital emergencies, it depicts the soft tissues with good enough detail to set in most cases the initial diagnosis and it has no radiation or the patient.

Case Series

During the past year in the radiology dept. of the AHEPA general Hospital of Thessaloniki and Dentomaxillofacial Radiology Department of Ankara University there was a total of four cases, three of them in the emergencies and one case were in the dental outpatient clinic that were studied with ultrasound and the diagnosis of Ludwig's Angina was set by the clinical and ultrasonographic findings. The informed consent were taken from all patients and legal guardian. The consent was included that the patient's clinical photo, radiographs can be used for scientific purposes and publishing.

Corresponding Author: Kaan ORHAN e-mail: call53@yahoo.com

Received: 25.09.2020 • **Accepted:** 20.11.2020

DOI: 10.33706/jemcr.800027

©Copyright 2020 by Emergency Physicians Association of Turkey - Available online at www.jemcr.com

Case 1

53-year-old male recruited to emergency department with painful pulsating swelling of the submandibular area. The patient presented with a painful, pulsating swelling of the submandibular area, accompanying edema, and rubor of the skin. The clinical estimation was abscess of the submandibular area, the ultrasonographic image demonstrated thick walls of the lesions since it was a formed abscess and high vascularity diaphragms within the lesion. The pathological lesion was accompanied by multiple lymph nodes with a rounded image, while the entire neck area had high vascularity and superficial cellulitis, the abscess was punctured (Figure 1).

Case 2

36 years old female who had difficulty in swallowing and intense dental pain admitted to emergency. Collection of inflammatory material forming an abscess superficial to the mandibular ramus was observed with the use of ultrasound. There was accompanying edema under the skin, and increased vascularity with the use of color Doppler. The inflammation was expanding to adjacent tissues with intense thickening of the skin, and the presence of pathological lymph nodes with swelling and pain upon palpation in the entire neck area (Figure 2).

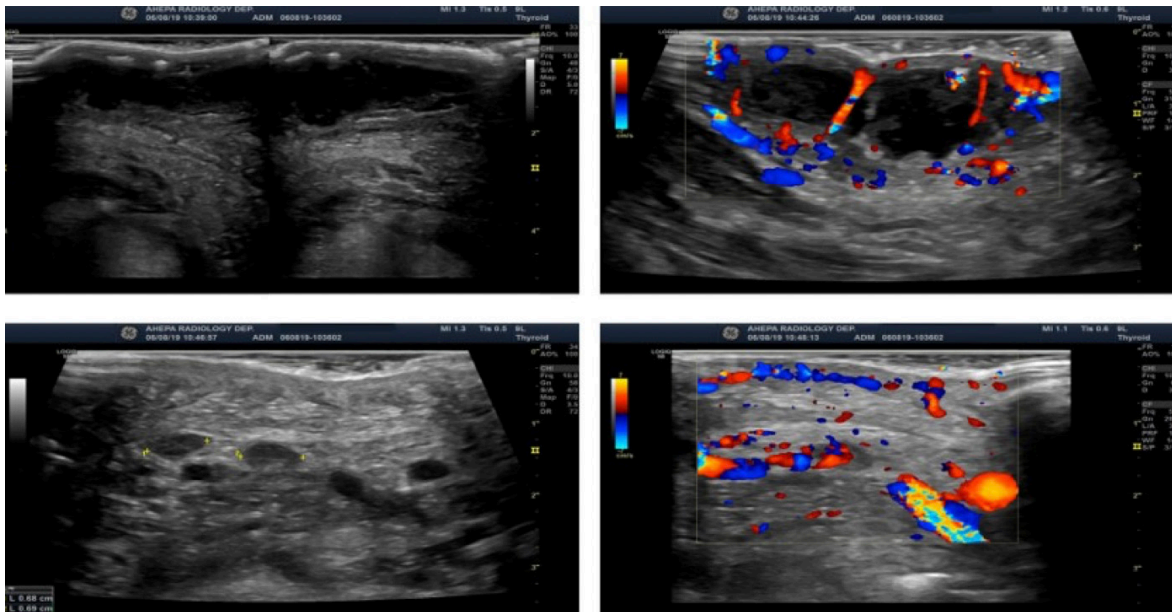


Figure 1: USG images show an abscess of the submandibular area with a thickened wall and increased vascularity with the use of color Doppler. Multiple, slightly rounded superficial lymph nodes with a reactive image, intense skin cellulitis and increased hemorrhage.

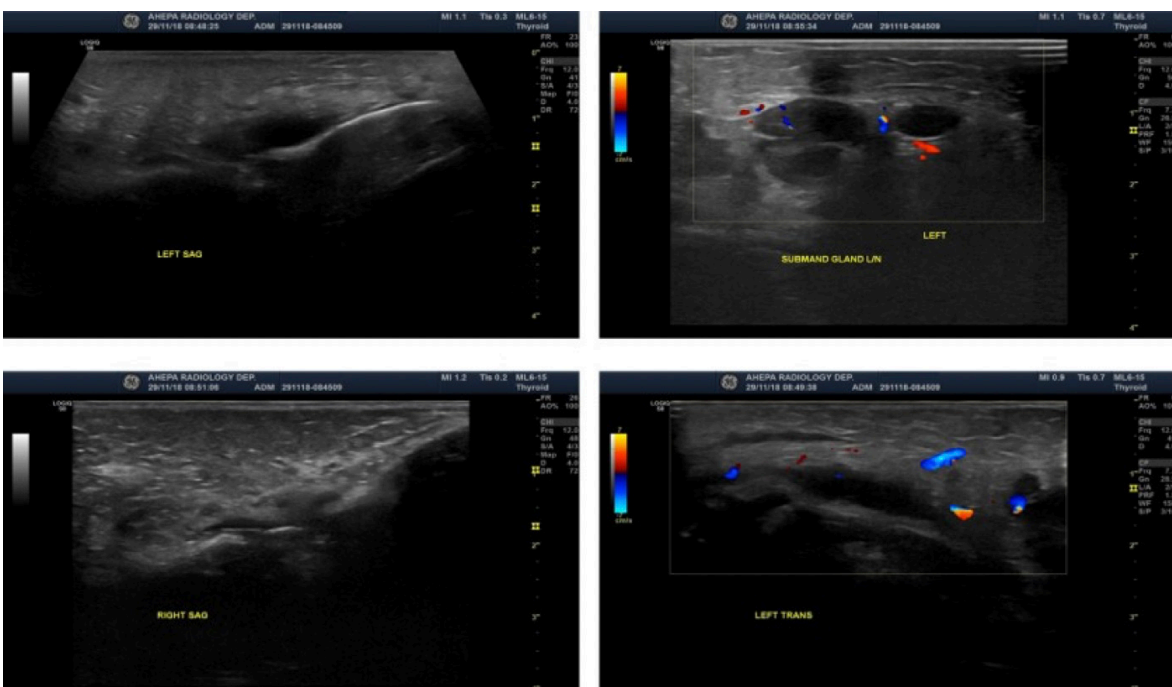


Figure 2: USG images revealed abscess formation superficial to the ramus of the lower jaw, subcutaneous edema and increased vascularity in Color Doppler. Expansion of the lesion to the adjacent tissues apparent thickening of the skin, and presence of abnormally enlarged lymph nodes in the underlying region.

Case 3

42 years old female admitted to oral diagnosis clinic of dental faculty. She had an abscess due to periapical infection of mandibular molar that was initially diagnosed with panoramic radiography. The patient later referred to USG imaging for further examination. USG showed a pus filled localized swelling in the soft tissue with deep tissue extension. The lesion had a hypoechoic echo pattern without pronounced borders and without increased vascularity in color doppler examination (Figure 3).

Case 4

4-month-old infant which arrived with difficulty in breathing, inability to feed and very high fever. The unusual in

this case is the origin of the inflammation since LA is considered to be mostly of odontogenic origin. In this case of infantile inflammation, the condition was attributed to tonsillitis and was not of odontogenic origin. Though the initial image of the infant was of acute tonsillitis, the rapid expansion of the inflammation and its extent to adjacent tissues, the rapid deterioration of the condition of the infant, the high number of inflamed lymph nodes led to the diagnosis. Both submandibular spaces were affected. What was very characteristic of the inflammation expansion was the presence of continuous lymph nodes with abscesses and high vascularity forming a block of nodes, the content of the nodes was a thick and nonclear cystic fluid. There was edema under the skin and extended inflammation. The infant was intubated (Figure 4).

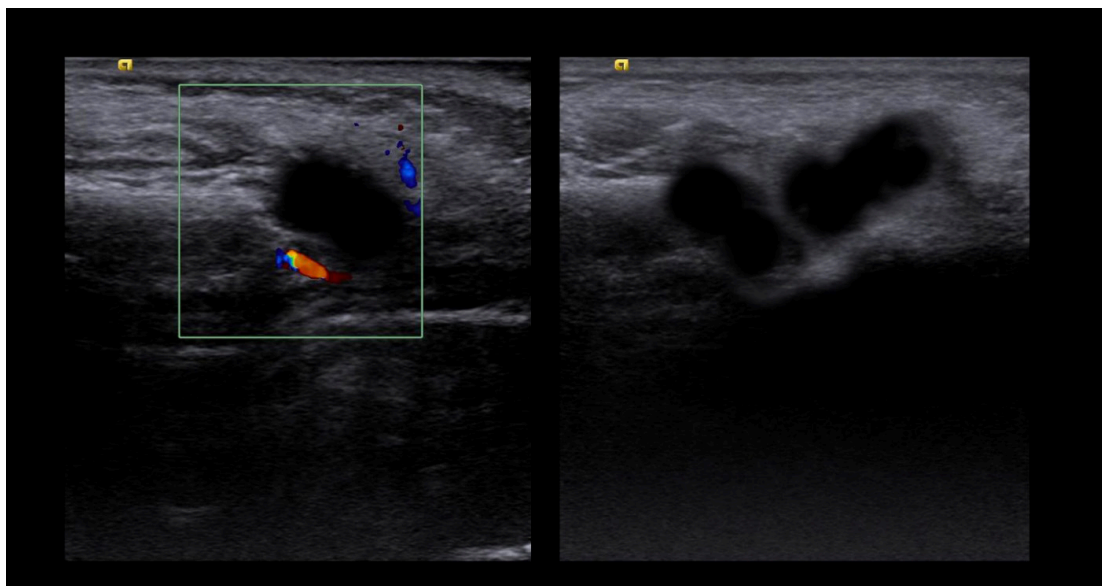


Figure 3: USG showed a pus filled localized swelling in the soft tissue with deep tissue extension. The lesion had a hypoechoic echo pattern without pronounced borders and without increased vascularity in Color Doppler examination.

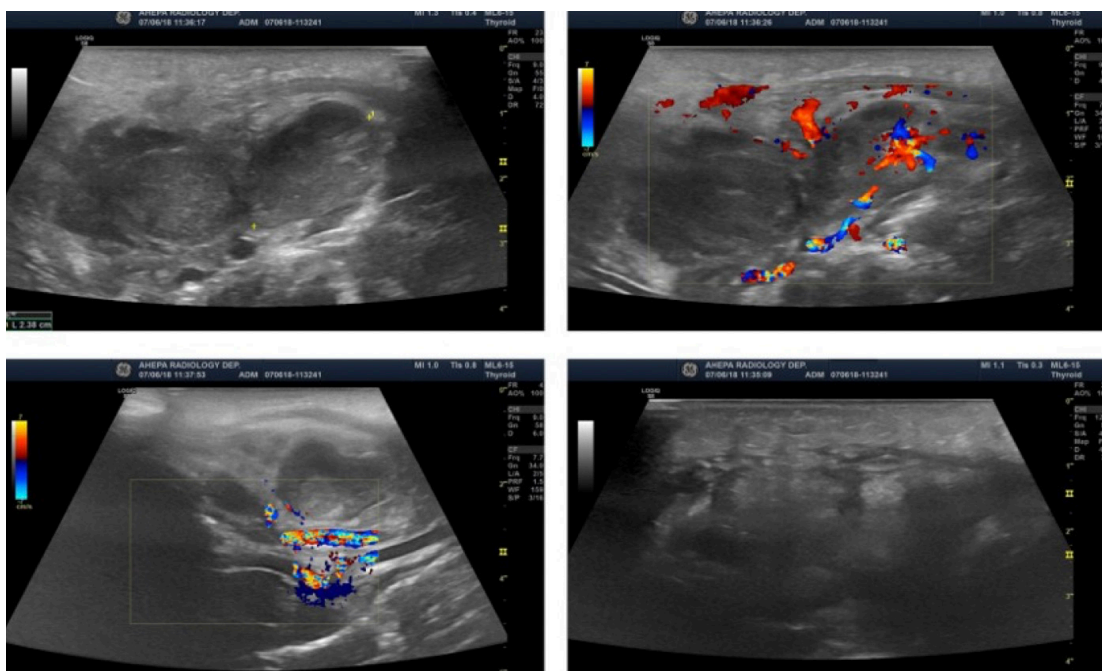


Figure 4: USG images of an infant which revealed expansion of the inflammation to the submandibular spaces with high vascularity and thick viscous fluid content.

Discussion

Ludwig's Angina is a condition well established in the literature and first described by Wilhelm Frederick von Ludwig. Clinically LA is characterized by diffused abscesses and coexisting swelling of the upper cervical triangles³⁻⁵. When the submandibular and submental spaces are involved to the expansion of the inflammation, intense rigid and painful, hard upon palpation swellings are observed in the involved spaces in most of cases. Though it is not common to be able to palpate organized swelling and abscesses, there are small in size focal inflammatory areas that spread in all tissues involved and their enlargement and growth makes them palpable clinically. When there is sublingual space involvement, there is swelling of the floor of the mouth of the posterior section of the tongue. This swelling, when accompanied by uvula swelling may lead to airway obstruction and cause a threat for the patients' life, making the need of tracheotomy imperative⁸⁻¹⁰. Patients often complain of difficulty in swallowing and breathing, and in few cases even talking. The importance of proper diagnosis is crucial for the patient and the evolution of the inflammatory process. The infection progresses rapidly and can disseminate to the parapharyngeal space, retropharyngeal space, and also mediastinum⁸. Early diagnosis and treatment of the LA are important to avoid the complications that may occur due to LA. Airway obstruction, necrotizing fasciitis, osteomyelitis, mediastinitis, empyema, carotid arterial rupture or sheath abscess, pericardial effusion, thrombophlebitis of the internal jugular vein, aspiration pneumonia subphrenic abscess, and pleural effusion are the complications of LA. The radiographic findings of the condition are well described however the diagnosis is rarely set by ultrasonography. This is partly due to the fact that LA is not a frequently presenting condition particularly with the often instructed early use of antibiotics to fight it and prevent its expansion¹⁰. The panoramic radiograph is usually an important radiographic feature which depicts the most frequent to the condition dental origin of the inflammation. Anteroposterior and lateral skull projections are often taken to observe initial inflammations of the adjacent spaces, while in advanced and potentially life-threatening cases, CT and/or MRI are selected. Computed tomography of the neck or focused ultrasound is essential for surveying the details of involved structures or newly formed well defined inflammatory areas caused by the expansion of the underlying pathology. As compared with computed tomography, ultrasound is a portable and without radiation tool with the ability of real-time evaluation for patients. Ultrasound however provides usually adequate information to set the diagnosis and establish the etiology without giving any radiation to the patient. With the newest machines of linear high frequency transducers, the diagnosis is very easy to set and in high detail particularly when high vascularization is involved. In the cases studied the patients had ultrasonographic fea-

tures that set the diagnosis of LA. Although the diagnosis of Ludwig's angina is more clinical, ultrasound is a necessary complementary examination to delineate the extent of the inflammation and to highlight its most common complications, such as obstruction of the airway, abscess formation, osteomyelitis, and vascular clots which are indications for more immediate treatment. At any case the following ultrasonographic features indicative of inflammation must present and help establish the diagnosis: Soft tissue edema, Cellulitis, Skin thickening and infiltration, Swollen lymph nodes, Possible abscesses, High vascularity.

LA is a rare but rapidly evolving form of toxic cellulitis with heavy clinical symptoms and the potential of a rapid spread to adjacent cervical triangles. Before presenting to the hospital the most common symptoms the patients complain of include tooth pain (79%), neck swelling (71%), dysphagia (52%), and neck pain (33%)¹¹⁻¹².

Current and modern therapeutic approaches to LA include in most cases early diagnosis, immediate antibiotic treatment early surgical treatment when needed, and removal of the cause, usually of dental origin, that lead to the inflammation. A 50% mortality is mentioned in the literature in these patients due to upper airway edema. Recent therapeutic advances include antibiotics and aggressive supportive therapy and their early use have lowered this mortality rate to 8%. The condition is due to odontogenic infections in most cases though additional inflammations of the neck may set its presence. Most of the cases involve the roots of the lower molars which are located just below the mylohyoid ridge and therefore, when they have periapical infection and/or abscess, the inflammation can spread directly to the soft tissue spaces of the submandibular, sublingual, and submental regions¹¹⁻¹². One of the major concerns in patients with LA is the maintenance of a clear airway. In the literature though the condition is not so frequent nowadays, there is mention that the patient may die from airway obstruction and not from septicemia as one would expect. The treatment may include a number of operations most frequent which is the surgical excision and drainage of possible abscesses, before they form organized inflammations in the neck area, the treatment with antibiotics and removal of the cause. Ultrasonography can be utilized to predict airway difficulty during the use of general anesthesia. There is a rapidly growing body of evidence showing its benefits. Lakhal et al,¹³ compared the diameter of subglottic upper airway between MRI and ultrasonography on healthy volunteers. They found strong correlation on transverse diameter which is the smallest diameter of the cricoid lumen. In healthy young adults ultrasonography is a secure device to state it. Shibasaki et al found that, subglottic upper airway diameter measured by ultrasonography is a good predictor of endotracheal tube sizes for pediatric patients¹⁴. Particularly with infants and children the diagnosis of the condition is not easy since it is very rare, and it usually is mistaken

for other simpler conditions. However, care should be taken with infants and children on the pattern of inflammation expansion, the clinical condition and possible rapid occurring complications as well as the radiographic difficulties that may present. Ultrasonography is the method of choice in the follow up of children with the condition since it is radiation free and it even helps with the pediatric tracheotomy. More advanced radiographic techniques may be required prior to surgery and puncture of the abscesses, though nowadays most cases are treated conservatively with the use of antibiotics and other anti-inflammatory agents, making the use of ultrasonography adequate for the treatment.

Conclusion

Ludwig angina is a rare, life-threatening condition. Early diagnosis and treatment are important to reduce the rate of mortality. Ultrasonography is an effective way to detect the condition and also useful for critical care procedures.

Ethical approval and informed consent

An informed consent was obtained from all patients whose pictures are shown in this case series. A copy of these informed consents can be delivered on demand. Since the data was retrospectively evaluated, no ethical approval was necessary.

References

1. Goldberg MH, Topazian RG. Odontogenic Infections and Deep Fascial Space Infections of Dental Origin. In: Topazian RG, Goldberg MH, Hupp JR (eds). Oral and maxillofacial infections (4ndedn). Philadelphia, PA: WB Saunders 2002, pp 178-181
2. Larawin V, Naipao J, Dubey SP. Head and neck space infections. *Otolaryngol Head Neck Surg* 2006 Dec;135(6):889-93.
3. Bramwell KJ, Davis DP. Ludwig's angina. *J Emerg Med* 1998; 3:481-483.
4. Har-El G, Aroesty JH, Shaha A, Lucente FE. Changing trends in deep neck abscess. A retrospective study of 110 patients. *Oral Surg Oral Med Oral Pathol* 1994; 77: 446-450.
5. Iwu CO. Ludwig's angina: report of seven cases and review of current concepts in management. *Br J Oral Maxillofac Surg* 1990; 28:189-193.
6. Polat G, Sade R. Radiologic Imaging of Ludwig Angina in a Pediatric Patient. *J Craniofac Surg* Sep 2018; 29(6):e603-e604.
7. Barsamian JG, Scheffer RBQ. Spontaneous pneumothorax: an unusual occurrence in a patient with Ludwig's angina. *J Oral Maxillofac Surg* 1987; 45:157-159.
8. Dugan MJ, Lazow SK, Berger JR. Thoracic empyema resulting from direct extension of Ludwig's angina: a case report. *J Oral Maxillofac Surg* 1998; 56:968-971.
9. Busch RF, Shah D. Ludwig's angina: improved treatment. *Otolaryngol Head Neck Surg* 1997; 117:172-175.
10. Busch RF. Ludwig angina: early aggressive therapy. *Arch Otolaryngol Head Neck Surg* 1999; 125:1283-1284.
11. Schliamser S, Berggren D, Kercoff Y. Ludwig's angina and associated systemic complications. Bacteriology and current therapy. *Scand J Infect Dis* 1986; 18(5):477-81.
12. Moreland L, Corey J, McKenzie R. Ludwig's angina: report of a case and review of the literature. *Arch Intern Med* 1988; 148:461-6.
13. Lakhali K, Delplace X, Cottier JP, Tranquart F, Sauvagnac X, Mercier C, et al. The feasibility of ultrasound to assess subglottic diameter. *Anesth Analg* 2007; 104:611-14.
14. Shibasaki M, Nakajima Y, Ishii S, Shimizu F, Shime N, Sessler DI. Prediction of pediatric endotracheal tube size by ultrasonography. *Anesthesiology* 2010; 113:819-24.