

Case Report

An unusual cause for empyema

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Abstract

Ludwig's angina is a rapidly progressing polymicrobial cellulitis of the sublingual and submandibular spaces that can result in life-threatening airway compromise. The dissemination of the infection can lead to mediastinitis, necrotizing fascitis or sepsis. In this report we describe a rare case of Ludwig's angina presenting with empyema and mediastinal abscess.

Case Report :

A fifty year old male with recently detected diabetes presented to us with complaints of dyspnoea on exertion grade 2 modified medical research council (mMRC) since 2 days. He was being treated from a local hospital for fever, pain on swallowing and a swelling in submental region of 1 week duration. His fever was high grade with chills and rigor and associated with painful swallowing. There was no history of chest pain, cough, orthopnea, paroxysmal nocturnal dyspnoea or hemoptysis. In spite of a detailed enquiry he did not give



Fig. 1

any history of local trauma or any dental procedures. He was a hypertensive on treatment and a current smoker with a significant smoking score.

On examination he was febrile and dyspnoeic with normal blood pressure and oxygen saturation. Multiple pus discharging sinuses were seen sublingually with presence of multiple dental caries (figure1).

There was no paranasal sinus tenderness. He had right supraclavicular fullness with decreased chest movements on right side. A stony dull percussion note was noted in right mammary, axillary, infra axillary and infra scapular areas. The intensity of breath sounds and vocal resonance were also reduced in above areas with no added sounds. Heart sounds were muffled.

Hematological investigations revealed elevated total leukocyte count (18700/mm³) and ESR was 56mm in first hour. Chest X ray (figure 2) showed a homogenous opacity involving right middle and lower zone whose lateral border was abutting the chest wall and medial pencil sharp border was making an obtuse angle with the chest wall superiorly. Another homogenous opacity was seen medial to former opacity whose medial border was continuous with the mediastinum and lateral pencil sharp

border was making obtuse angle with mediastinum. There was evidence of cardiomegaly. There was no evidence of retropharyngeal space widening on lateral neck xray.

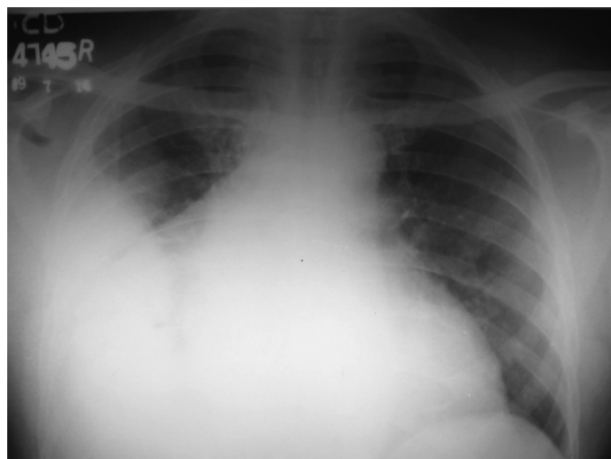


Fig. 2

Patient was started on parenteral antibiotics (Amoxicillin clavulanate and Clindamycin) after drawing blood for blood culture and sensitivity. An ENT consultation was done and pus drained by a submental transverse incision and alternate day wound cleaning and dressing was done. Haemorrhagic fluid was aspirated on thoracentesis which was an exudative, neutrophilic effusion. The blood culture yielded Methicillin sensitive *Staphylococcus aureus* and Ciprofloxacin and Cloxacillin were added. Pus from sinus and pleural fluid culture were sterile. USG and Doppler neck showed hyperechoic foci in the Right carotid sheath indicating air foci with possibility of spread of infection with abscess along right carotid sheath with a normal flow in right carotid artery and Internal Jugular Vein (IJV). A contrast enhanced CT thorax (figure 3) showed bilateral submandibular space abscesses tracking along the right carotid sheath to the mediastinum with mediastinal abscess, right empyema, pyopericardium, and compression of right ventricle. His echo showed good LV function, moderate pericardial effusion with no cardiac tamponade. Patient was transferred to cardiothoracic surgery department for decortication and pericardial drainage. With prompt antibiotics and effective pus drainage, the floor of mouth infection subsided.

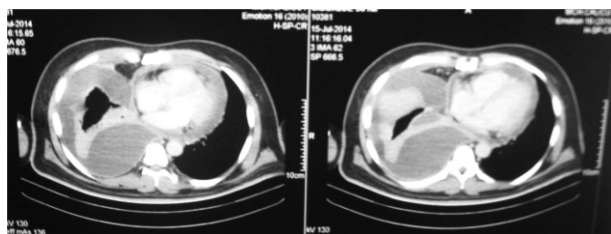


Fig. 3

He underwent right posterolateral thoracotomy draining about 500ml of multiloculated thick pus with right lung decortication. Pericardium could not be opened due to adhesions. The post operative period was uneventful. Immediate post operative Chest x ray (figure 4) showed clearance of the opacity with minimal lung collapse. He was discharged after 2 weeks of inpatient care.

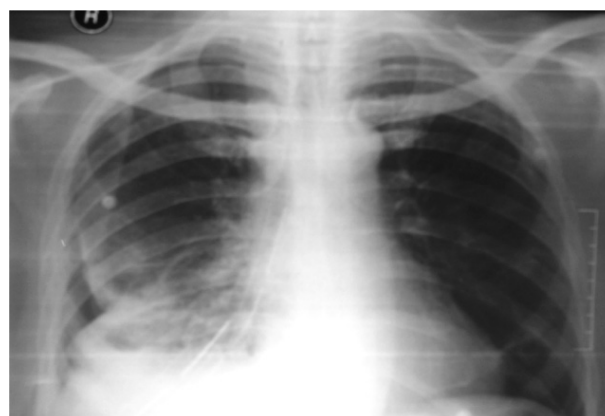


Fig. 4

Immediate post operative Chest x ray

DISCUSSION :

Ludwig's angina is a serious, potentially life-threatening infection of the neck and the floor of the mouth. It is a rapidly progressing cellulitis of the floor of the mouth characterized by firm induration and elevation of the tongue leading to severe airway obstruction¹. Ludwig's angina first described by Wilhelm Freidrich von Ludwig in 1836 (the name derives from the Latin word *angere* "to strangle"), accounts for about 13% of all the deep neck tissue abscesses. The majority of cases arise from dental infection with the second mandibular molar being the most common source. Following the initial infection in the submandibular space, the disease can spread along the tissue planes as far as the mediastinal space. The infection is often polymicrobial in origin, reflecting the mixed organisms found inside the human mouth. Common pathogens include group A *Streptococcus*, *Staphylococcus*, *Bacteroides*, *Haemophilus* and *Fusobacterium*. The mortality of Ludwig's angina is currently estimated at 0-8.5%².

The treatment concentrates around four attitudes: maintenance of the airways, incision and drainage of primary site, antimicrobial therapy and elimination of other infectious sites. Although no specific guidelines are present, decisions regarding airway protection are largely dependent on the "Practice Guidelines for Management of the Difficult Airway" that were adopted by the

American Society of Anaesthesiologists in 1992 and updated in 2003. Surgical drainage is indicated when there is suppurative infection, clinical fluctuance, crepitus, radiologic evidence of fluid collection or soft-tissue air, or a purulent needle aspirate. The execution of multiple incisions may be necessary¹.

In order to appreciate the potential of this infection to spread from the floor of the mouth to the neck and mediastinal structures, a brief review of the involved anatomy is helpful. The submandibular space involves part of the space above the hyoid bone. The total space is divided into the sublingual space superiorly and submandibular space inferiorly. The former, located between the geniohyoid and mylohyoid muscles, and the latter, located between the mylohyoid muscle and the superficial fascia and skin, communicate around the free posterior border of the mylohyoid muscle. Once established in the submandibular space, the infection can then spread to adjacent structures. Typically affected structures, in order of most frequent contamination, are the anterior neck, the pharyngomaxillary space (parapharyngeal space), the retropharynx, and the superior mediastinum. There are two theory of spread of infection described below:

- 1) Kruger; Topazian; Ludwigs theory
- 2) Laskin's theory

- 1) Kruger; Topazian; Ludwig theory- The complication of Ludwig's angina usually follows a submandibular space infection caused by a periapical infection or pericoronitis around a 3rd molar. The infection then spread to sublingual space on same side, around deep part of submandibular gland. From there it passes to opposite sublingual space & then to contralateral submandibular region. From submandibular region the spread may rarely extend downward beneath investing layer of deep cervical fascia.
- 2) Laskin's Theory: Infection may spread from sublingual space and spreads bilaterally to extend posterolaterally over edge of mylohyoid muscle to involve submental space. The deep cervical fascia separates the neck into a series of potential spaces. Even though clinically separate the spaces communicate with each other. There are about 13 to 20 deep neck spaces in literature, for convenience sake we consider only the important ones.

Retropharyngeal space : Retropharyngeal space is the potential space created between the visceral division of

the middle layer of the deep cervical fascia, which surrounds the pharynx and esophagus anteriorly and the alar division of the deep layer of the deep cervical fascia posteriorly. Retropharyngeal space infections can extend into the anterior or posterior mediastinum, necessitating drainage by external thoracotomy.

Parapharyngeal space : Parapharyngeal space connects to every other major fascial space and thus occupies a key position in the neck. Infections originating in the parotid, masticator, peritonsillar or submandibular spaces can reach this space and then move to retropharyngeal space and then into the chest.

Danger space : Danger space is a potential space between the alar and the prevertebral divisions of the deep cervical fascia. It lies posterior to the retropharyngeal space and anterior to the prevertebral space. It extends from the base of skull down into the posterior mediastinum to the level of the diaphragm and offers little resistance to the spread of infection.

Complications:

Deep neck space infections can lead to (a) Carotid artery erosion (b) Cavernous sinus and IJV thrombosis (c) Neurologic deficits (d) Mediastinitis (e) Pulmonary edema (f) Pericarditis (g) Aspiration and Sepsis.

One of the most dreaded complications of deep neck space infections is mediastinitis³. Descending necrotizing mediastinitis resulting from oropharyngeal abscess, is a serious, life-threatening infection. Existing strategies for surgical management such as transcervical mediastinal drainage or aggressive thoracotomic drainage, remain controversial. The mediastinal infection, the extent of which has been accurately determined by computed tomograms, necessitates radical cervicotomy followed by pleuromediastinal drainage. Situations where infection has spread to posterior mediastinum, particularly when it reaches in the level of the carina (descending necrotizing mediastinitis-type I), may not always require aggressive mediastinal drainage. In comparison, diffuse descending necrotizing mediastinitis-Type IIB (extending to both anterior and posterior lower mediastinum) demands complete mediastinal drainage with debridement thoracotomy. Subxiphoid mediastinal drainage without sternotomy may provide adequate drainage in diffuse descending necrotizing mediastinitis-Type IIA (extension of infection to lower anterior mediastinum)⁴. Delayed

diagnosis and inadequate mediastinal drainage through a cervical or minor thoracic approach are the primary causes of a high published mortality rate (near 40%)⁵. A CT scan neck typically demonstrates the disease process clearly and facilitates a rapid diagnosis. The initial neck scan should be extended to include the chest if there is any evidence of possible descending infection.

Early diagnosis and aggressive antimicrobial and surgical treatment are essential to successfully treat extensive cervico-mediastinal abscesses of odontogenic origin. Patient management should be performed by experienced clinicians well trained in managing possible complications. Close clinical and radiological postoperative follow-up with early surgical re-interventions if necessary can reduce mortality.

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