

Prospective study of Ludwig's angina and its management

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Abstract

Background: Ludwig's angina is a rapidly spreading, potentially fatal diffuse gangrenous cellulitis and edema of the soft tissues of the neck and floor of the mouth. The incidence of Ludwig's angina is not uncommon albeit the advent of antibiotics and advanced dental care. **Material and Methods:** A total of 30 patients with the clinical diagnosis of Ludwig's angina were enrolled in this prospective study. Various parameters like clinical features, comorbid conditions, complications and management options were analysed. **Results:** Maximum numbers of cases were seen below the age of 30 years with a slight male predominance. The most common presenting symptom was neck swelling (100%). The duration of symptom ranged from 2-20 days. Common clinical finding was neck swelling (90%) followed by caries teeth (80%). Dental infections (93.3%) were the most common underlying cause. 23.3% patients had history of diabetes mellitus, they were on irregular treatment. One patient (3.3%) had HIV infection. Necrotising fasciitis was the only complication noted in this study, 5 patients out of 7 with diabetes mellitus developed necrotising fasciitis (71.4%). **Conclusion:** Early presentation of the patients to the hospital, energetic conservative management and early surgical intervention has decreased the complications and need for tracheostomy in our study. DM was the most common co morbidity associated, should be treated with high index of suspicion for impending fatal life threatening complications like necrotising fasciitis, even in less critical cases early surgical intervention should be carried out in these patients. **Key Words:** Ludwig's angina, Odontogenic, Diabetes mellitus, Necrotising fasciitis.

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INTRODUCTION

In 1836, Ludwig's angina was first described by Wilhelm Von Ludwig's (1790-1865) for a characteristic condition involving the floor of the mouth which usually arises from infection of molar teeth.¹ Ludwig's angina is a rapidly spreading, potentially fatal diffuse gangrenous cellulitis and edema of the soft tissues of the neck and floor of the mouth. The primary site of infection in

Ludwig's angina is the submandibular space. Prior to the advent of antibiotics the mortality rate of the disease exceeded 50%. With the advent of antibiotics, better oral and dental hygiene, improved imaging modalities and aggressive surgical techniques have significantly reduced the mortality rate.^{2,3,4} Irrational and improper use of antibiotics and changing bacteriological pattern leads on to elusive clinical picture and delay in diagnosis of this life threatening condition.^{5,6} Early diagnosis and treatment of Ludwigs angina is most crucial secondary to the myriad of complications associated with it like airway obstruction, carotid arterial rupture or sheath abscess, thrombophlebitis of the internal jugular vein, mediastinitis, empyema, necrotising fasciitis, pericardial effusion, osteomyelitis, subphrenic abscess, aspiration pneumonia, and pleuraleffusion^{7,8}. Ludwig's angina is a potentially fatal disease with a mortality of 8%² Many clinicians have limited experience of Ludwigs angina since it is rare nowadays,³ hence this study enriches the knowledge on clinical characteristics and management of

Ludwig’s angina and thereby creating awareness about Ludwig angina among medical professionals.

MATERIALS AND METHODS

Thirty clinically confirmed cases of Ludwig’s angina were enrolled in this study, which included all age groups and both genders. This prospective study was conducted on patients presenting with complaints of neck pain, odynophagia, fever, neck swelling, trismus, halitosis, change in voice and confirmed clinically using the criteria, A spreading cellulitis with or without abscess formation involving both submandibular and sublingual spaces usually bilaterally, at a tertiary medical centre for a study period of 2 years. Superficial skin abscesses, abscesses due to infections of the external neck wounds and abscesses in relation to the mastoid and facial bone fractures, patients with congenital and benign neck swellings were excluded after detailed clinical evaluation from the study. Incision and drainage was done at the earliest stage in majority of the patients, pus was sent for culture and sensitivity analysis prior to start of antibiotics. All patients were initially started on empirical antibiotics which were later modified on culture sensitivity reports or clinical unresponsiveness if required. Supportive therapy in the form of intravenous fluids, analgesics, antipyretics, mouth washes etc were given. All patients were kept under observation for impending respiratory distress. Radiology and dental references were sought in appropriate cases. Ethical clearance was obtained from the institutional ethics committee. Informed consent was obtained from the patients participated in this study.

Statistical Methods: Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two groups.

Statistical Software: The Statistical software namely SPSS 18.0 ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

This study consisted of thirty clinically confirmed cases of Ludwig’s angina in which 16 were men and 14 were women. The age of the patients ranged from 3-75 years. It was observed that the maximum number of cases were seen below the age 40 years. The number of cases in the extremes of age were minimal. The mean age of presentation was 36.47±19.00years. Duration of symptoms before presentation to the hospital ranged from

2-20 days. The most common symptoms with which the patients presented were neck swelling (100%) followed by odynophagia (70%) trismus (63%) toothache (43.3%) neck pain (40%) halitosis (10%) history of tooth extraction (10%) sore throat (3.3%) (Fig 1).

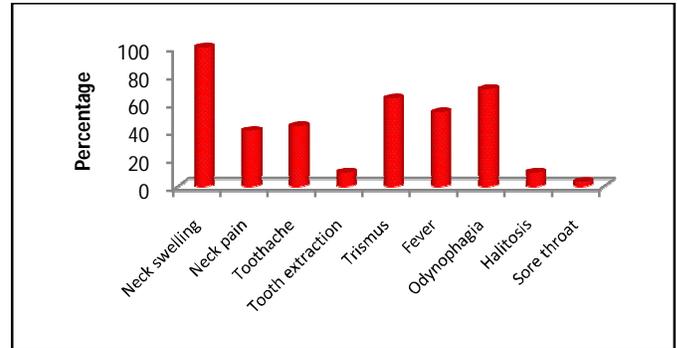


Figure 1: Presenting complaints

Majority of the patients had neck swelling (90%), caries teeth (80%), elevation of the floor of the mouth (76.7%), poor oral hygiene(63.3%), trismus (56.7%) fever (36.7%) followed by stridor (10%) . (Table 1)

Table 1: Physical examination findings in Ludwig’s angina.

Examination	No. of patients (n=30)	%
Neck swelling	27	90.0
Trismus	17	56.7
Fever	11	36.7
Poor oral hygiene	19	63.3
Stridor	3	10.0
Caries teeth	24	80.0
Elevation of floor of the mouth	23	76.7

Odontogenic infections are the most common underlying cause in 93.3%, etiology was not known in 6.7% of the patients. 10% of the patients had multiple space involvement, 6.7% with parapharyngeal abscess and 3.3% with retropharyngeal abscess. Of the 30 patients chosen for the study, 96.7% were managed by incision and drainage, 3.3% were managed on conservative lines. (Fig 2).

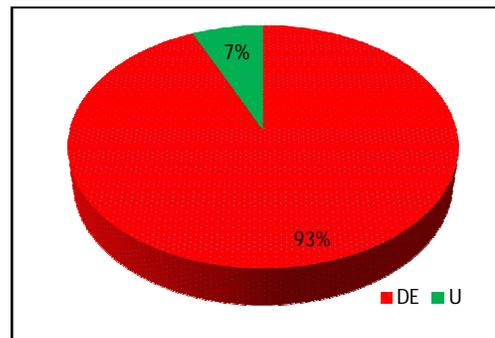


Figure 2: Causes of Ludwig's angina

Out of 30 patients involved in this study, 23.3% had history of diabetes mellitus, they were on irregular treatment. One patient (3.3%) had HIV infection. (Table 2)

Table 2: Underlying disease distribution

Underlying disease	No. of patients	%
Nil	22	73.3
DM	7	23.3
HIV	1	3.3
Total	30	100.0

Pus for culture sensitivity was sterile in 43.3%, organisms were isolated in 53.4%. streptococci pneumonia, E-coli, Klebsiella pneumonia are the most common organism isolated. In diabetic patients with positive culture Klebsiella pneumonia was the organism isolated. Necrotising fasciitis was the only complication noted in our study, 5 patients out of 7 with diabetes mellitus developed necrotising fasciitis with prolonged hospital stay. (Table 3 and 4).

Table 3: Underlying disease in relation to Complications in days

Underlying disease	Complication		Total
	Nil	Necrotising fasciitis	
Nil	20(87%)	2(28.6%)	22(73.3%)
DM	2(8.7%)	5(71.4%)	7(23.3%)
HIV	1(4.3%)	0(0%)	1(3.3%)
Total	23(100%)	7(100%)	30(100%)

P=0.003**, Significant, Fisher Exact Test

Table 4: Underlying disease in relation to Hospital stay in days

Underlying disease	Hospital stay				Total
	Up to 7 days	8-14 days	15-21 days	More than 21 days	
Nil	4(80%)	12(92.3%)	5(83.3%)	1(16.7%)	22(73.3%)
DM	1(20%)	0(0%)	1(16.7%)	5(83.3%)	7(23.3%)
HIV	0(0%)	1(7.7%)	0(0%)	0(0%)	1(3.3%)
Total	5(100%)	13(100%)	6(100%)	6(100%)	30(100%)

P=0.002**, Significant, Fisher Exact Test

DISCUSSION

As summarised by Malgaign, a French anatomist in 1838, The cervical fascia appear in a new form under the pen of each author who attempts to describe them.⁹ The fascial planes were first described by Grodensky and Holyoke in 1938.⁹ The primary site of infection in Ludwig's angina is the submandibular space,² bounded anteriorly and laterally by the mandible, superiorly by the mucosa of the mouth, inferiorly by the superficial layer of the deep cervical fascia and posteriorly by the hyoid bones. It comprises of the sublingual space, located above the mylohyoid muscle and the submaxillary space located below the mylohyoid

cleft infection can readily spread from submaxillary space and sublingual space.¹¹ Angina is originated from the Latin word angere which means strangle. Ludwig's angina aptly describes deep neck abscesses in which the swelling of critical spaces threaten to elevate the floor of the mouth displacing the tongue posteriorly and strangling the patient.¹² With increasing availability of potent antibiotics and improvement in oral hygiene LA incidence is less, making it difficult to diagnose quickly.³ Crucial to the occurrence of Ludwigs angina is the relationship of the mandibular dentition, second and third molar roots are routinely below the mylohyoid ridge and approach the lingual surface of the mandible which is thinner than the outer cortex, hence apical infections of the mandibular teeth have a tendency to extend lingually.¹¹ In correlation with study by Britomost of the patients were young below the age of 40 years, in contrast to a recent study by Tripathy SM 76% of the patients were above 40 years.^{13,14} In agreement with most of the studies male preponderance was noted.^{13,14,15} In consistent with other studies Odontogenic infection was the most common cause in majority of our patients.^{16,17,18} 70-90% of adult cases have an odontogenic etiology where as in children only 50% of cases are odontogenic.¹⁹ Other potential causes of LA are peritonsillar or parapharyngeal abscesses, mandibular fractures, submandibular sialadenitis, oral malignancy, otitis media, oral mucosal lacerations. Tongue piercing, herpetic gingivostomatitis, lymphatic vascular malformation have been noted as causes of LA in case reports.²⁴ A case report has noted ludwigs angina following self application of an acidic chemical.²⁰ Patients with Ludwig's angina usually present with focal and systemic signs and symptoms. Focal symptoms include neck and tooth pain, neck swelling throat pain, dysphagia, trismus, dysphonia, and drooling, and on clinical examination bilateral submandibular and submental neck swelling, firm induration of the floor of the mouth, and edematous posterior and superior displacement of the tongue is noted. Commonly seen systemic signs and symptoms include fever, chills, malaise, dehydration, and an ill appearance. Dyspnea, cyanosis, stridor, and tongue displacement imply an impending airway crisis.⁴ The spread of infection is limited by the deep cervical fascia, mandible and hyoid thus tongue and floor of the mouth are elevated and posteriorly displaced leading to airway obstruction. Imaging evaluation plays a significant role in the diagnosis and rational therapeutic management in deep neck infection. Contrast computed tomography (CT) is the investigation of choice to delineate the exact anatomical location, extent, identify the possible sources of the infections and detects complications. CT is also beneficial in differentiating between cellulitis and abscess

thus avoiding extensive surgery.^{13,21} The management of LA involves early and aggressive therapy with antibiotics, incision and drainage of the abscess, securing the airway, in addition dental references were sought for extraction of the offending tooth or teeth. All the patients were administered initially broad spectrum antibiotics 3rd generation cephalosporins, gentamycin and metronidazole and changed later based on culture sensitivity reports. Intravenous steroids helps not only to reduce edema and cellulitis and thereby improving the antibiotic penetration into the fascial spaces but also helps to maintain airway and easier intubation^{3,4}. This remains controversial as no randomised control study exists to prove.²² In contrast to the published studies, all incision and drainage were performed under local anaesthesia and none of our patients required tracheostomy or any form of artificial airway.^{17,18} The microbiological pattern in LA is polymicrobial, including aerobes and anaerobes. Streptococcus group staphylococcus aureus were the most common aerobic organisms isolated.^{22,13,15} A recent study has shown isolation of pseudomonas in 95% of cases.¹⁴ Culture was sterile in 43.3%, may be secondary to the use of antibiotic prior to admission and surgical drainage, improper collection of the specimens and no routine use of anaerobic culture¹⁸. Patients with co morbidities such as DM should be treated with high index of suspicion for impending fatal life threatening complications, even in less critical cases early surgical intervention should be carried out in these patients.¹⁸ A study has shown a mortality rate of 20% in pregnant females with uncontrolled DM presenting with LA.²³ Klebsiella pneumonia is the most common organism isolated in diabetics hence the empirical antibiotics should be sensitive to Klebsiella in diabetic patients. LA complicated by necrotising fasciitis is a surgical emergency with a mortality rate of approximately >50%.²⁴ Necrotising fasciitis is an uncommon soft tissue infection secondary to the death of subcutaneous and fascial tissue. Though rare in the head and neck region infection has the tendency to spread along the fascial planes and extend to the surrounding vessels, nerves and muscle tissue. Extremes of age, immuno suppression, diabetes mellitus, alcohol and tobacco smoking are the predisposing factors for the necrotising fasciitis.²⁵ Early diagnosis of NF can be made by a combination of clinical evaluation and laboratory investigations, it starts with painful oedema and erythema and purplish discoloration of the skin, gas filled bullae, pus formation leading to necrosis of the affected area. Inflammation of the skin and subcutaneous fat, the involvement of more fascia than muscle and the presence gas gangrene in the superficial fascia on a CT scan are suspicious of NF. The mainstay of treatment is aggressive surgical debridement of the

necrotic tissue, appropriate broad spectrum iv antibiotics and improving immunological status²⁵ Respiratory distress is synonymous with LA, airway management is the paramount and is challenging due to patients inability to open the mouth, oedematous airway, extension of infection to periglottic and deep neck spaces.²⁶ Conservative management of airway is indicated in patients who are able to maintain normal oxygen saturation and respiratory rate in room air and no significant airway compromise is evident on fiberoptic examination. It involves meticulous airway observation (oxygen saturation, respiratory rate, and serial fiberoptic laryngoscopy)²² Blind nasal intubation is to be avoided as it can lead to catastrophic bleeding, laryngospasm, airway edema, rupture of pus into the oral cavity and aspiration. It may cause complete airway obstruction, necessitating an emergency Cricothyrotomy. Awake fiberoptic intubation under topical anaesthesia may be the ideal method to secure the airway. When fiberoptic bronchoscopy is not feasible, not available, or has failed tracheostomy under local anaesthesia is preferred² A study has shown the importance of ultrasonography in predicting the airway difficulty during induction of anaesthesia by measuring the diameter of the subglottic upper airway owing to the superficial location of the larynx.²⁶

CONCLUSION

Despite the wide spread use of antibiotics, Ludwig's angina cases continue to occur with elusive clinical manifestations. Dental infections are the most common cause of Ludwig's angina. Prevention of Ludwig's angina can be achieved by regular dental check-up and making the people aware of dental and oral hygiene. Early presentation of the patients to the hospital, energetic conservative management and early surgical intervention has decreased the complications and need for tracheostomy in our study. DM was the most common co morbidity associated, should be treated with high index of suspicion for impending fatal life threatening complications like necrotising fasciitis, even in less critical cases early surgical intervention should be carried out in these patients.

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