

Ludwig's angina – evaluation of its medical treatment in 47 cases

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Abstract

This is a retrospective study of 47 cases suffering from Ludwig's angina who received treatment at Manipal Teaching Hospital, Pokhara, between March 2005 and December 2010. Objective of this study was to compare the treatment efficacy of two intravenous antibiotic regimens for the treatment of Ludwig's angina. 27 cases who received crystalline Penicillin G + Metronidazole were placed in group A, while 20 patients who received Ceftriaxone + Clindamycin were placed in group B. The efficacy results based on the disease progressing to abscess formation were analyzed.

17 (63%) cases in group A and 18 (90%) cases in group B responded well to medical treatment and did not develop an abscess. 10 (37%) cases in group A progressed from cellulitis stage to abscess formation while only 2 (10%) cases in group B eventually developed an abscess. This shows that patients in group B had better response to medical treatment ($p = 0.036$). All cases of abscess formation were treated by incision drainage. Common organisms found in pus culture were Staphylococcus (46.1%) and Streptococcus (15.4%). 5 (38.5%) patients had a sterile culture with no growth. 4 patients in group A developed laryngeal edema and were treated with intravenous Dexamethasone. 2 out of 4 of these patients developed acute stridor and had to undergo emergency tracheostomy under local anesthesia. There was no mortality in this series.

Morbidity of Ludwig's angina can be reduced and mortality can be avoided with early diagnosis, aggressive intravenous antibiotic therapy, periodic evaluation for asphyxia, timely surgical intervention and elimination of source of infection. A combination of Ceftriaxone + Clindamycin gives better results when compared to crystalline Penicillin G + Metronidazole.

Keywords: Ludwig's angina, ceftriaxone, clindamycin

Introduction

Wilhelm Fredrick von Ludwig first described this condition in 1836.¹ The infection usually starts in the submaxillary or sublingual division of submandibular neck space and then gradually spreads to involve both

spaces. It begins as cellulitis, turns into fasciitis and ultimately may end in a true abscess. A retrospective study of 47 cases suffering from Ludwig's angina is presented. A comparison based on treatment efficacy has been made between two intravenous antibiotic regimens.

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Materials and methods

This is a retrospective study of 47 cases suffering from Ludwig's angina who received treatment at Manipal Teaching Hospital, Pokhara, Nepal. The study period was between March 2005 and December 2010. All patients had antero-posterior and lateral X-rays of the neck (to rule out extension to parapharyngeal and retropharyngeal spaces) and chest (to rule out mediastinitis).

Inclusion criteria

1. Patient admitted with Ludwig's angina without abscess formation.
2. Absence of other deep neck space infections that could alter the treatment outcome.

Patient records were reviewed for age, sex, duration of symptoms before admission, clinical presentation, etiology, other systemic disease, culture + sensitivity of aspirated pus, treatment received, requirement of surgical drainage or tracheostomy, duration of hospital stay and complications. The patients were divided in two groups according to the intravenous antibiotics that they had received immediately after admission. 27 cases who received crystalline Penicillin G + Metronidazole were placed in group A, while 20 patients who received Ceftriaxone + Clindamycin were placed in group B. The dosage of intravenous crystalline Penicillin G was 4 million international Units given every 6 hours. Intravenous Metronidazole was given in a loading dose of 1 gram followed by 500 mg every 6 hours. Intravenous Ceftriaxone was given in the dose of 1 gram every 12 hours. Intravenous Clindamycin was given in the dose of 600 mg every 8 hours. For children the following dosage was used: crystalline Penicillin G 300,000 U/kg/day,

Metronidazole 30 mg/kg/day, Ceftriaxone 50 mg/kg/day and Clindamycin 30 mg/kg/day.

The efficacy results based on the disease progressing to abscess formation were analyzed. The statistical analysis was done by Fisher's exact test. A *p* value of 0.05 or less was considered significant.

Results

The mean age was 33.51 years, with a range of 6 to 62 years and commonest age group being the 4th decade (59.6% patients). Most patients were females (63.8%), undernourished (85.1%) and had a poor socio-economic status (83%). The mean duration of symptoms before admission was 7.5 days with a range of 4 to 12 days. The presenting features are summarized in table 1. All patients in this series had fever and bilateral anterior upper neck swelling. Other common presenting features were toothache (85.1%), elevation of tongue (74.5%), halitosis (68%), painful swallowing (63.8%), muffled voice (61.7%), trismus (36.2%) and respiratory distress (8.5%). The primary source of infection was dental (85.1%) followed by pharyngitis (8.5%) and submandibular sialadenitis (6.4%). 19 (40.4%) patients also had a co-existent diabetes mellitus.

27 cases who received crystalline Penicillin G + Metronidazole were placed in group A, while 20 patients who received Ceftriaxone + Clindamycin were placed in group B. The response to medical treatment is summarized in table 2. 17 (63%) cases in group A and 18 (90%) cases in group B responded well to medical treatment and did not develop an abscess. 10 (37%) cases in group A progressed from cellulitis stage to abscess formation while only 2 (10%) cases in group

B eventually developed an abscess. This shows that patients in group B had better response to medical treatment and this result was statistically significant ($p = 0.036$). All cases of abscess formation were treated by incision drainage. Common organisms found in pus culture were Staphylococcus (46.1%) and Streptococcus (15.4%). 5 (38.5%) patients had a sterile culture with no growth. Anaerobic culture was

done in 3 patients but all of them had a sterile culture. Mean duration of hospital stay was 10 days with a range of 6 to 15 days. 4 patients in group A developed laryngeal edema and were treated with intravenous Dexamethasone. 2 of these 4 patients developed acute stridor and had to undergo emergency tracheostomy under local anesthesia. There was no mortality in this case series.

Table 1: Presenting features

Presenting feature	Number of patients	Percentage (%)
Fever	47	100
Bilateral neck swelling	47	100
Tooth ache	40	85.1
Elevation of tongue	35	74.5
Halitosis	32	68
Painful swallowing	30	63.8
Muffled voice	29	61.7
Trismus	17	36.2
Respiratory distress	4	8.5

Table 2: Response to medical treatment

	Group A		Group B	
	Number of patients	%	Number of patients	%
Responded well to treatment	17	63	18	90
Poor response with abscess formation	10	37	2	10
Total	27	100	20	100

p value = 0.036

Discussion

Wilhelm Fredrick von Ludwig first described this condition in 1836 as a rapidly progressive, gangrenous cellulitis originating in floor of the mouth, extending by continuity along fascial planes rather than lymphatic spread and showing no special tendency to form an

abscess.¹ Ludwig described a brawny induration of the involved tissue, hard swelling beneath the tongue, absence of glandular involvement and death occurring within 10 to 12 days. One year later, a colleague suggested that this condition be named 'angina

Ludovici' (Ludwig's angina), derived from the Latin 'angere', meaning 'to strangle'.¹ Ludwig's angina begins in the floor of the mouth and involves both the submandibular and sublingual spaces. The second and third molars are most frequently involved because their roots extend below the level of the mylohyoid muscle, thus crossing both the sublingual and submandibular spaces.²

44 patients in this study were adults and 3 were children. The mean age was 33.51 years, with a range of 6 to 62 years and commonest age group being the 4th decade (59.6% patients). This corresponds with the reviewed literature^{3,4} which shows a peak incidence between 20 and 40 years. Most patients were females (63.8%), undernourished (85.1%) and had a poor socio-economic status (83%). The predilection for females could be explained by their relative lack of prompt medical treatment in this country. The mean duration of symptoms before admission was 7.5 days with a range of 4 to 12 days. All patients in this series had fever and bilateral anterior upper neck swelling. Other common presenting features were toothache (85.1%), elevation of tongue (74.5%), halitosis (68%), painful swallowing (63.8%), muffled voice (61.7%), trismus (36.2%) and respiratory distress (8.5%). These percentages are similar to those in other studies.^{5,6}

The primary source of infection was dental (85.1%) followed by pharyngitis (8.5%) and submandibular sialadenitis (6.4%). Odontogenic infections account for 75-90% cases of Ludwig's angina.⁷ However, dental infection was absent in all 3 pediatric patients in this series as noted by Kurien in 1997.⁸ 19 (40.4%) patients also had a co-existent diabetes mellitus but none of them had other systemic illness like

glomerulonephritis, systemic lupus erythematosus, aplastic neutropenia or acquired immune deficiency syndrome. The diagnosis of Ludwig's angina was made clinically although a contrast-enhanced CT scan of neck (including floor of mouth) was done in 7 cases to differentiate between cellulitis and abscess. 27 cases who received crystalline Penicillin G + Metronidazole were placed in group A while 20 patients who received Ceftriaxone + Clindamycin were placed in group B. 17 (63%) cases in group A and 18 (90%) cases in group B responded well to medical treatment and did not develop an abscess. 10 (37%) cases in group A progressed from cellulitis stage to abscess formation while only 2 (10%) cases in group B eventually developed an abscess. This shows that patients in group B had better response to medical treatment and this result was statistically significant ($p = 0.036$). Clindamycin also has the advantage that it can be used in patients with Penicillin sensitivity. Ceftriaxone provides additional coverage against *Eikenella corrodens*, a gram negative anaerobic oral cavity commensal that is resistant to Clindamycin.⁹ All 13 cases of abscess formation were treated by incision drainage. Pus was collected from these cases before the surgery by a 16G needle aspiration & sent for aerobic culture and sensitivity. Common organisms found were *Staphylococcus* (46.1%) and *Streptococcus* (15.4%). Five (38.5%) patients had a sterile culture with no growth. This could be explained by the fact these patients had taken antibiotics before admission to our hospital. Anaerobic culture in Robertson cooked meat broth was done in 3 patients but all of them had a sterile culture. Other causative organisms responsible for Ludwig's angina are *Bacteroides* species, *Peptostreptococci*, *Fusobacterium nucleatum*, *Spirochetes*, *Escherichia*

coli, Klebsiella species, Hemophilus influenzae, Proteus species and Pseudomonas aeruginosa.⁹

Mean duration of hospital stay was 10 days with a range of 6 to 15 days. 4 patients in group A developed laryngeal edema as confirmed by a carefully done flexible fiberoptic laryngoscopy. They were started on intravenous Dexamethasone 4 mg 6 hourly for 2 days. Intravenous steroid when given in non-diabetic patients for 48 hours decreases edema + cellulitis (chemical decompression) and also enhances antibiotic penetration.⁹ 2 of these 4 patients developed acute stridor and had to undergo emergency tracheostomy under local anesthesia. Endotracheal intubation in these cases often requires careful awake nasal intubation using a flexible fiberoptic laryngoscope with the patient placed in an upright position. No patients in this case series developed other complications of Ludwig's angina like pneumonia, empyema, pericarditis, mediastinitis, pneumothorax or septicemia. There was no mortality in this case series. The infected tooth or teeth were extracted in all 40 cases, where dental infection was the etiology. Intravenous Amikacin (10 mg/kg/day in 2 divided doses) was used additionally in all 13 patients who developed neck abscess, as per their culture sensitivity report. Surgical drainage of the abscess was done using a 4 cm horizontal incision made 3 cm below the lower border of mandible. Indications for surgical drainage of neck abscess are neck swelling with fluctuance or crepitus, soft tissue air in radiological examination, presence of a purulent needle aspirate or lack of any response to 24 hours of intravenous antibiotic therapy. Scott in 1998 proposed 3 mechanisms by which surgical drainage of neck abscess improves the resolution of dental infections.³ They were improvement of local perfusion, decrease of hydrostatic pressure and

introduction of superficial mucosal bacteria that help to decrease the spread of invading pathogens.

Conclusions

Morbidity of Ludwig's angina can be reduced and mortality can be avoided with early diagnosis, aggressive intravenous antibiotic therapy, periodic evaluation for asphyxia, timely surgical intervention and elimination of source of infection. A combination of intravenous Ceftriaxone + Clindamycin gives better results when compared to intravenous crystalline Penicillin G + Metronidazole.

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