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ORIGINAL ARTICLE

LUDWIG'S ANGINA-A NIGHTMARE: OUR EXPERIENCE

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ABSTRACT: INTRODUCTION: Patients with ludwig's angina present challenging airways for anesthesiologist and may die as a result of inability to manage the airway effectively. Successful airway management is critical, but a safe method to control the airway in these patients is yet to be established. **METHODS:** We retrospectively studied airway management techniques used in 17 patients of Ludwig's Angina, who required surgical drainage over a period of 12 months from January 2010 to December 2010. **RESULTS:** Of the 17 patients studied, 13 patients were intubated tracheally while 4 patients needed surgical tracheostomy for maintenance of airway. Two patients were intubated using fiberoptic intubation scope, while 11 patients were successfully intubated by direct laryngoscopy. **CONCLUSION:** Sound clinical judgement is critical for timing and for selecting the method for airway intervention.

KEYWORDS: Ludwig's Angina, Emergency Tracheostomy, Fiberoptic Intubation.

INTRODUCTION: Ludwig's Angina is a potentially fatal condition because of its tendency to cause edema, distortion and obstruction of the airway. The definitive treatment of Ludwig's angina involves securing airway early and a combination of broad spectrum antibiotics and surgical decompression of a firmly indurated submandibular space.[1] Despite a significant drop in the mortality rate from Ludwig's angina since the preantibiotic era, this condition remains a therapeutic emergency because of its inherent life-threatening complication of airway obstruction.[2] This is reflected in the old terminology for Ludwig's angina where it has been described as angina maligna (Latin: angere=to strangle), morbus strangularis and garotillo (Spanish for Hangman's loop).[3,4]

Various techniques are available to secure the airway, but the success and safety of these techniques in patients with Ludwig's angina are yet to be established. Tracheostomy under local anaesthesia has been shown to be safe and effective,[5] and is considered by some to be the standard of care for managing airway compromise in patients with Ludwig's angina,[6] but may be difficult or impossible in advanced cases of infection. Other methods of airway management including endotracheal intubation using a rigid laryngoscope under general anesthesia, awake blind nasal intubation and awake fiberoptic intubation have been reported, but with disappointingly frequent failures.[7,8] This article summarizes our experience with various airway techniques used in managing 17 patients with ludwig's angina over a period of 12 months.

METHODS: We examined retrospectively the medical and anesthetic records of all the patients admitted in the hospital in which surgical drainage of Ludwig's angina was done during a period of 12 months from January 2010 to December 2010. The perioperative anesthesia records from patients were noted to extract the following parameters i.e., age, gender, presence of trismus, predisposing factors, comorbid conditions, days of presentation, method used to secure the airway, steroid use, complications, need for re intubation, duration of hospital stay and outcome. The diagnosis of Ludwig's angina was made by the surgeon based on clinical and radiological findings. (Figure1) The anesthetic technique used for induction and maintenance of anesthesia was recorded.

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RESULTS: 17 patients who had surgical drainage for Ludwig's angina were identified over a period of 12 months starting from 1st January 2010 to 31st December 2010. Of the 17 patients, 10(58.9%) were men and 7(41.1%) women (Table1). The ages ranged from 9 years to 64 years. Almost 53% of patients were in their fourth or fifth decade of life (Table 2). Symptoms and signs duration ranged from one day to 2 weeks with average duration being 6 days. In the patients who needed tracheostomy for airway maintenance, the average duration of presentation was 8.25 days indicating the increased severity of disease. The duration of hospital stay ranged from 3 days to 2 weeks, average duration being 6.4 days (Table 3).

Odontogenic infection was the commonest aetiologic factor observed in 13 (76.47%) cases, trauma was responsible for 1(5.9%) while in the remaining 3(17.6%) patients, the cause could not be determined (Table 4). The comorbid conditions noted were diabetes mellitus, hypertension, cardiac disease, alcoholism and smoking. Of these diabetes mellitus was the found to be the most common associated systemic disease, occurring in 5(29.41%) patients (Table 5).

In the operating room routine monitors including Electrocardiography, Non-invasive blood pressure, Oxygen saturation, end tidal carbon dioxide were attached and baseline vital signs were recorded. All the patients were given aspiration prophylaxis with 50mg ranitidine and 10mg metoclopramide. Out of 17 patients, 13 patients were intubated tracheally while four patients required tracheostomy (Figure 2). Of the intubated patients, 11(84.6%) patients were intubated successfully by direct laryngoscopy, while 2(15.3%) patients were intubated using fiber optic intubation scope. The anesthetic technique used for direct laryngoscopy was inhalational induction in 8 patients with halothane being used in 2 patients and sevoflurane in 6 patients without muscle relaxants. Intravenous induction with propofol-fentanyl mixture was used in 5 patients. The grade of laryngoscopy and ease of intubation specifics are shown in Table 6 and Table 7. Fiber optic intubation was done using local anesthetic technique with fentanyl-midazolam. All the patients were given injection dexamethasone intraoperatively. Reintubation was needed in 1(5.8%) patient because of occurrence of intracerebral bleed. In all the cases where endotracheal intubation was attempted, difficult airway cart and tracheostomy set were kept ready with surgeon scrubbed in case of need for emergency tracheostomy.

Of the four patients who required tracheostomy, three were done as elective tracheostomies and one patient needed to be tracheostomized emergently because of complete airway obstruction and cardiac arrest. Of the three patients, in one patient fiber optic nasal intubation was not attempted because of presence of nasal mass on direct nasal examination which later proved to be inverted papilloma on biopsy. In other two patients direct laryngoscopy was attempted but intubation could not be done so airway was maintained with laryngeal mask airway and tracheostomy was done. Of the four tracheostomized patients, 3(75%) patients were successfully decannulated and finally discharged with average duration of decannulation being 9 days.

Of the 17 patients, 3(17.6%) patients needed admission to the intensive care unit. All patients except two were discharged in satisfactory condition without major sequelae. One patient developed retropharyngeal and parapharyngeal space infection with mediastinal spread which was drained successfully and finally patient was discharged in a satisfactory condition. Other patient who developed Ludwig's angina secondary to mandibular fracture had complete airway obstruction with cardio respiratory arrest in the emergency room. Airway was maintained with needle cricothyrodotomy with emergent tracheostomy. Patient was revived but developed bleeding complications, sustained hypoxic ischemic encephalopathy and finally succumbed to respiratory

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complications. Third patient had preoperative Coronary artery disease with pericardial effusion& diabetes mellitus. She was extubated on 4th day of surgery but had to be reintubated due to intracerebral bleed (Table 8).

DISCUSSION: Ludwig's angina was first described by German surgeon Karl friedrich Wilhelm von Ludwig in 1836, as rapidly progressive and frequently fatal gangrenous cellulitis and edema of soft tissues of the neck and floor of the mouth.[9] It is bilateral inflammation of the sublingual, submental and submandibular spaces. The disease spreads by continuity rather than lymphatic spread. It typically originates from an infected or recently extracted tooth, most commonly from the lower second and third molars.[10] It has, also been reported as a result of the mandibular fracture, submandibular sialadenitits, peritonsillar abscess, epiglottitis,[11] and oral malignancies.[6] Predisposing factors include dental caries, recent dental treatment, systemic illnesses such as diabetes mellitus, malnutrition, alcoholism, compromised immune system such as AIDS, and organ transplantation and trauma.[6,10-12] In our study post dental extraction sepsis was found to be the commonest predisposing factor and diabetes mellitus was the most common associated systemic disease. Early recognition of the disease is of paramount importance. Painful neck swelling, tooth pain, dysphagia, dyspnoea, fever and malaise are the most common complaints.[9] Swelling of the floor of the mouth, trismus, edema and abscess formations may occur leading to the loss of the airway and asphyxia.[12] Another common cause of death is the acute loss of airway during interventions to control the condition.[6] Stridor, difficulty managing secretions, anxiety, cyanosis, and sitting posture are late signs of impending airway obstruction and indicate the need for an immediate artificial airway.[13] Other complications may include the spread of infection to the mediastinum, carotid sheath, skull base, and meninges reaching a mortality rate of 20% to 50%.[10] In our study, one patient developed retropharyngeal and parapharyngeal space infection with mediastinal spread which was drained later.

Improved dental care and medical management with antibiotics and dexamethasone in the early stages of the disease have minimized the need for surgical intervention to control the airway.[14] However when medical management fails; unrecognized airway obstruction can result in severe complications.[7,15] Therefore, airway management is the primary therapeutic concern.

Endotracheal intubation may be attempted before tracheostomy in most patients with Ludwig's angina. The distorted airway anatomy, tissue immobility, and limited access to the mouth because of trismus make orotracheal intubation with rigid laryngoscope difficult.[8,16] However, in the early stages of the disease, general anesthesia may overcome trismus and allow the mouth to be opened for rigid laryngoscopy. In a case series of 10 patients with Ludwig's angina, tracheal intubations were successful in 90% of patients after the induction of general anesthesia.[8] However, in advanced cases, induction of anesthesia is dangerous, because complete airway closure may be precipitated leading to "cannot ventilate, cannot intubate" situation and thus necessitating emergency tracheostomy. Rupture of an abscess and aspiration of pus have been reported during an attempted orotracheal intubation under general anesthesia.[16] In our study, endotracheal intubation was possible in 13 out of 17 patients () and only one patient needed reintubation later. Endotracheal intubation has the advantages of faster airway control and avoidance of the risks associated with a surgical procedure. However, in comparison with patients who received tracheostomies, intubated patients have been shown to have longer hospital stays, spend more time in ICU, have higher mortality from airway loss, and have 60% greater overall hospital expenses.[17] Moreover, both

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planned and unplanned extubation risk the airway management secondary to worsening laryngeal edema and subsequent inability to reintubate, which is an unavoidable source of mortality.[1]

Inhalational induction with halothane or sevoflurane in oxygen has been used with success on a number of occasions in patients with Ludwig's angina. The advantage of inhalational anesthesia is that we can overcome the trismus and mouth can be assessed properly for insertion of laryngoscope and assessment of ease of intubation. Intubation can then be performed under direct vision with or without suxamethonium with minimum trauma to soft tissues of the larynx.[8] The inherent danger of using intravenous induction agent is apnea which may lead to inability to intubate or ventilate the patient. In our review it is apparent the both intravenous and inhalational inductions were employed but success rate with both the techniques was found to be similar, though the degree of relaxation and mainatinence of hemodynamic stability was best achieved with the use of sevoflurane.

Awake fiber optic laryngoscopic intubation has been widely recommended as a first line approach in upper airway obstruction. The first successful fiber optic nasotracheal intubation in a patient with Ludwig's angina was reported in 1974;[18] however subsequent reports of fiber optic intubations were associated with frequent failures: two of three in one report.[7,12] In our case series, two patients were intubated using fiberoptic intubation scope. Tissue edema and immobility, a distorted airway, and copious secretions, common in patients with Ludwig's angina, contribute to the difficulty of fiber optic intubation. However, more often, the failure to intubate is caused by inadequate preparation of the patient, use of a poor quality fiber optic bronchoscope, and inadequate experience with the procedure.[7] However, in a study by Ovassapian and colleagues,[6] all 25 attempts at fiber optic nasotracheal intubation in adult patients who had deep neck infections were successful using careful titration of intravenous diazepam or midazolam with or without fentanyl to reduce laryngeal spasm before application of topical anesthesia, which can have irritating effect on airway. Application of topical anesthesia enables the patient to tolerate the procedure with greater comfort. Neff et al recommended awake fiber optic intubation to secure the airway if CT scan showed significant airway deviation or narrowing.[16]

Blind nasal intubation is to be avoided as, besides having a high failure rate; it could cause catastrophic bleeding, laryngospasm, airway edema, rupture of pus into the oral cavity, and aspiration. Complete airway obstruction could be precipitated, potentially necessitating an emergency cricothyrotomy.[19,20] Besides it is time consuming. Cricothyrotomy, or emergent tracheotomy, can provide urgent airway access when complete loss of the airway necessitates immediate surgical intervention. Cricothyrotomy needs to be converted to a standard tracheostomy within 24 to 48 hours to avoid long term complications.[5] In one of our patients airway had to be maintained with cricothyrotomy which was converted immediately to tracheostomy.

When fiber optic bronchoscopy is not feasible or available or has failed, cricothyrotomy and tracheostomy are the options. Tracheostomy may be difficult or impossible in advanced cases of neck infection because of the position needed for the procedure and anatomical distortion of the anterior neck.[6] Tracheostomy under local anesthesia is indicated for severe or impending airway obstruction when trismus or massive soft tissue edema precludes endotracheal intubation or when repeated attempts at intubation have failed.[5,21] In our series, 4 patients eventually needed tracheostomy with only one elective awake tracheostomy done under local anesthesia and after failed intubation attempts in two patients. In a group of 36 patients with Ludwig's angina, 16 underwent successful elective tracheostomy using local anesthesia; intubation attempts failed in 11(55%) of the other 20 patients and resulted in acute airway loss that required emergency tracheostomy. On the basis of this

outcome, elective awake tracheostomy was suggested for all patients with deep neck infections to avoid the dangers associated with emergency tracheostomy.[19] Although by-passing the supraglottic swelling, tracheostomy is itself associated with a high complication rate and risks spreading the infection to mediastinum.[22] Other complications like aspiration of pus, rupture of the innominate artery, spread of infection to thorax have been reported.[17,20,21]

In patients with Ludwig's angina, various techniques have been recommended with reference to airway management in the literature. We recommend that each technique has its own advantages and disadvantages that must be carefully considered when selecting the safest and most appropriate method. We also recommend that choice of airway maneuvers must be individualized, depending on the judgment and experience of the physician in charge and the availability of equipment.

Being a retrospective study, certain shortcomings were there. All the patients with deep neck infections treated in the hospital during the study period were not included. Only patients with Ludwig's angina who needed surgical drainage under anesthesia were included. The second limitation was that delayed complications were not known because of lack of long term follow up.

CONCLUSION: Death from loss of an airway still occurs in patients with Ludwig's angina. Securing such an airway is challenging and dangerous. Endotracheal intubation using direct laryngoscopy or fiber optic intubation may be used for airway control. Tracheostomy using local anesthesia is recommended if fiber optic intubation is not feasible, if the clinician is not skillful in the use of fiber optic intubation, or if intubation attempts have failed. Management must entail early diagnosis and the immediate aggressive medical approach by the emergency, anesthetic, and otolaryngology teams, with securing airway being the primary goal in all patients with Ludwig's angina.

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Fig. 1: An old lady with Ludwig's Angina

Male	10	58.9%
Female	7	41.1%

Table 1: Gender Distribution

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<10yrs	1	5.88%
10-20 yrs	2	11.76%
20-30 yrs	1	5.88%
30-40 yrs	6	35.29%
40-50 yrs	3	17.65%
>50 yrs	4	23.53%

Table 2: Age Distribution

	Days of presentation	**Duration of hospital Stay**
Mean	6.0	6.41
Median	4.0	4.00
Standard Deviation	4.272	4.317

Table 3: Time periods of presentation & stay in Hospital

Chronic periodontitis	5	29.4
Post extraction sepsis	8	47.1
Trauma	1	5.9
Unknown	3	17.6

Table 4: Predisposing factors

Nil	10	58.8%
DM	1	5.88%
DM with HTN	2	11.8%
DM with Alcoholism	1	5.88%
DM with CAD	1	5.88%
Smoking	2	11.8%

Table 5: Comorbid conditions

Grade I	1
Grade II	1
Grade III	5
Grade IV	3
Unknown	3

Table 6: Grade of Laryngoscopy in attempted Intubations (Total 13)

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Easy	5
Difficult	6
Failed	2

Table 7: Ease of intubation

(Easy-single attempt, Difficult->more than one attempt, Failed-taken up for tracheostomy)

Nil	15	88.2%
Mediastinitis	1	5.9%
Reintubation	1	5.9%

Table 8: Complications

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