A REVIEW ON MANAGEMENT OF LUDWIGS ANGINA

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Abstract

Ludwig's angina is a rapidly progressing, life-threatening deep neck infection that primarily affects the submandibular, sublingual, and submental spaces. It is most commonly caused by odontogenic infections and can lead to airway obstruction, sepsis, and death if not promptly managed. Early recognition and a multidisciplinary approach are critical for improving outcomes. Airway management remains the top priority, with awake fiberoptic intubation being the preferred method, while emergency tracheostomy may be required in severe cases. Broad-spectrum intravenous antibiotics, surgical drainage, and removal of the primary infection source are essential components of treatment. Imaging modalities such as contrast-enhanced CT help assess the extent of infection, guiding surgical intervention. Although conservative management may suffice in select cases, timely surgical decompression reduces airway compromise and hospital stay. With prompt intervention, the prognosis has improved significantly. This review emphasizes the importance of early diagnosis, aggressive treatment, and multidisciplinary coordination in managing Ludwig's angina.

Keywords: Ludwig's Angina, Airway Obstruction, Surgical Drainage, Deep Neck Infection, Odontogenic Infection.

Introduction

Ludwig's angina is a severe and potentially life-threatening deep neck infection primarily affecting the submandibular, sublingual, and submental spaces. If not promptly treated, it can result in airway obstruction, sepsis, and death. This condition is most commonly associated with odontogenic infections, trauma, or post-operative complications. First described in 1836 by the German physician Wilhelm Friedrich von Ludwig, Ludwig's angina was initially characterized as a rapidly progressive and often fatal gangrenous cellulitis or necrotizing fasciitis of the neck and floor of the mouth.[1] The infection primarily involves three key compartments of the floor of the mouth: the sublingual, submental, and submandibular spaces. The hallmark cause of Ludwig's angina is infection originating from the lower molars, particularly the second and third mandibular molars. However, the term is sometimes used

more broadly to describe any floor-of-the-mouth infection that spreads to the sublingual or submandibular spaces.[2] The condition can rapidly extend to surrounding tissues, leading to severe complications such as airway obstruction, aspiration pneumonia, and carotid artery rupture or sheath abscess. Early diagnosis and management, including airway protection, antibiotic therapy, and surgical drainage in well-established infections, are essential to prevent fatal outcomes.[3] Dental infections, particularly periapical abscesses in the mandibular molars, are responsible for approximately 90% of Ludwig's angina cases. Less common causes include oral piercings, lacerations, mandibular fractures, traumatic intubation, osteomyelitis, peritonsillar or parapharyngeal abscesses, submandibular sialadenitis, otitis media, and infected thyroglossal cysts.[4] Poor oral hygiene, dental caries, and recent dental procedures increase the risk of developing the condition. Although Ludwig's angina often arises in otherwise healthy individuals, certain factors such as diabetes, alcohol use disorder, malnutrition, and immunosuppression (e.g., AIDS or post-organ transplant) may predispose individuals to the infection. There is no significant gender predilection for Ludwig's angina, with airway compromise being the primary cause of mortality. Clinically, Ludwig's angina presents with symptoms such as painful swallowing (odynophagia), swelling (edema), and difficulty opening the mouth (trismus).[5] In some cases, a second-look surgery may be required for further debridement and drainage.[6] This review aims to surgical treatment in oral and maxillofacial surgery.

Review of literature

In a Case Report by Candamourty R et al, A 25-year-old male with restricted mouth opening, pain, and swelling in the lower jaw and neck was examined, revealing respiratory distress, toxic appearance, and elevated vital signs, leading to a confirmed diagnosis of Ludwig's angina. Emergency surgical decompression under general anesthesia was performed, with an elective tracheostomy conducted for airway management. Pus drainage, antibiotic therapy, and postoperative care facilitated a successful recovery, and the tracheostomy tube was removed on the fifth postoperative day.[7] Larawin et al. reported that 34% of Ludwig's angina cases were successfully treated with medical therapy alone.[8] This finding was further supported by Kurien et al., who observed that 70% of pediatric cases were managed conservatively without surgical intervention.[9] Additionally, it was noted that tracheostomy was more frequently required in adults compared to children. Hasan et al. proposed an airway management protocol for Ludwig's angina, categorizing patients into two groups based on their initial airway assessment: those with severe airway compromise and those with a stable airway.[10] A nine-year study by Greenberg et al. analyzed 29 cases of deep neck space infections, finding that 21 patients (72%) were initially managed with conservative treatment based on clinical assessment. However, one patient later experienced deterioration, necessitating emergency intubation. Among those requiring nonconservative management at presentation, seven patients (24%) underwent successful intubation using fiberoptic nasoendoscopy, while one patient (3%) required a tracheostomy under local anesthesia.[11] In a review by M. Ambikavathy and S. Kumar, 40 cases were analyzed, comprising 24 males (60%) and 16 females (40%), with ages ranging from 16 to 80 years. Symptom duration varied between three days and two weeks. The most common cause was dental infections, observed in 23 cases (57.5%), including one pregnant patient. Six cases (15%) resulted from habitual

tooth pricking with a broomstick, while three cases (7.5%) were due to submandibular duct stenosis caused by calculi. Five patients (12.5%) had underlying diabetes, two cases (5%) were linked to facial trauma, and one case (2.5%) was associated with carcinoma of the buccal mucosa. All patients received systemic broad-spectrum antibiotics, intravenous fluids, and analgesics. Tracheostomy with surgical decompression through small incisions under local or general anesthesia was performed in 20 patients (50%). Another 10 patients (25%) underwent incision and drainage with removal of diseased teeth, while the remaining 10 patients (25%) were managed conservatively with antibiotics and analgesics under close airway monitoring. No complications or mortalities were reported.[12] A study by Nikhil M. John examined 30 patients with Ludwig's angina, analyzing factors such as age, sex, etiology, systemic diseases, microbiology, antibiotic therapy, hospital stay duration, and social background. The majority of cases occurred in the third decade of life, with a higher prevalence among females. Dental infections were the leading cause (70%), and common symptoms included neck swelling (100%), pain (83%), fever (75%), and trismus (33%). Streptococcus viridans was the most frequently isolated pathogen (36.6%), followed by Staphylococcus aureus (16.6%), Streptococcus pyogenes (13.3%), and Klebsiella species (10%). Most patients (80%) were discharged within two weeks of admission. The study concluded that managing Ludwig's angina requires a proactive approach involving aggressive antibiotic therapy, surgical decompression when necessary, and removal of infected foci to halt disease progression and prevent complications.[13]

Clinical Presentation and Evaluation of Ludwig's Angina

Patients with Ludwig's angina often present with a history of recent dental pain and systemic symptoms such as fever, fatigue, chills, and weakness. Trismus is a common complaint, indicating disease progression and potential extension into the parapharyngeal space. Respiratory involvement may manifest as tripod positioning, drooling, and dysphagia. Additional symptoms include mouth pain, hoarseness, tongue swelling, and neck stiffness. Clinically, the condition is characterized by a "bull neck" appearance, with submental fullness and loss of mandibular angle definition.[14] On examination, patients typically exhibit fever, submental and submandibular swelling, tenderness, tongue elevation, and induration of the submental and upper neck regions, though lymphadenopathy is generally absent. Diagnosis is primarily clinical, as imaging studies do not play an immediate role in the initial assessment. In cases of airway compromise, management decisions, including intubation, are based on clinical parameters rather than imaging, as delays can be detrimental. Once the airway is secured, contrast-enhanced CT of the neck is the preferred imaging modality to evaluate the extent of the infection and detect abscess formation. Findings may include soft tissue gas, fluid collections, muscle edema, subcutaneous fat attenuation, loss of fat planes in the submylohyoid space, and soft tissue thickening. Ultrasound, particularly point-of-care ultrasound, can also be useful for airway assessment. Laboratory testing has limited immediate diagnostic value, as Ludwig's angina is primarily diagnosed clinically. However, blood cultures should be obtained to assess for hematogenous spread, while cultures from the affected area via swab or needle aspiration are of limited diagnostic benefit.[15]

Comprehensive Management of Ludwig's Angina

Effective management of Ludwig's angina necessitates a coordinated, multidisciplinary approach, with airway protection as the foremost concern due to the heightened risk of obstruction. Awake fiberoptic intubation is typically favored for securing the airway during procedures, while an emergency tracheostomy may be required if the patient experiences severe oxygen desaturation. The choice between conservative and aggressive airway strategies hinges on the patient's clinical status and the anesthesiologist's proficiency. Infection control is primarily achieved through antibiotic therapy, commonly involving broad-spectrum intravenous agents like vancomycin and metronidazole. Prompt administration of antibiotics is vital to prevent serious complications such as sepsis. Surgical drainage of abscesses is often necessary to relieve symptoms and halt the progression of the disease. When the condition is linked to a dental origin, procedures such as tooth extraction or endodontic therapy may be warranted. Effective treatment relies on close collaboration among anesthesiologists, surgeons, and infectious disease experts. Continuous monitoring and preparedness for urgent intervention are crucial to managing potential rapid patient decline.[16]

Airway Management in Ludwig's Angina

Effective airway management is paramount in patients with Ludwig's angina, given the potential for sudden airway obstruction. When signs of hypoxia are present, prompt administration of supplemental oxygen is critical. However, due to pronounced neck swelling, mask ventilation can be difficult, making adequate pre-oxygenation an essential preparatory step before any airway procedure. The combination of tongue swelling and trismus further complicates airway access, often rendering oropharyngeal airway placement unfeasible. Flexible nasotracheal intubation is generally preferred, as it allows for precise airway control while minimizing the risk of spreading infection. Performing this procedure with the patient awake and seated, using a flexible fiberoptic scope, helps preserve spontaneous breathing and reduces the chance of complete obstruction. However, this technique demands a skilled and experienced clinician.[17]

If flexible intubation is not viable, emergency surgical airway options—such as cricothyrotomy or tracheostomy—must be readily available. Early airway management is essential; waiting until severe symptoms like stridor or cyanosis appear reflects advanced disease and significantly increases risk. Blind nasotracheal intubation is strongly contraindicated in Ludwig's angina, as it can provoke bleeding, rupture abscesses, increase edema, or trigger laryngospasm, further worsening the airway. Likewise, supraglottic devices like laryngeal mask airways (LMAs) are often ineffective due to extensive swelling in the oral and pharyngeal regions, which may result in poor fit and inadequate ventilation. Given the high likelihood of airway compromise, a collaborative approach involving anesthesiologists, otolaryngologists, and maxillofacial surgeons is essential. Continuous assessment, proactive planning, and preparedness for emergency airway procedures are crucial to improving patient outcomes and minimizing complications.[18]

Surgical Drainage in Ludwig's Angina

The necessity of surgical drainage in Ludwig's angina remains a subject of clinical discussion, yet early intervention can markedly enhance airway stability and improve overall patient outcomes. The main goal of surgical decompression is to alleviate pressure in the submandibular region, enabling the tongue to shift forward and downward, which can help reopen the airway. This reduction in tongue elevation and oropharyngeal compression may ease breathing and make airway management less challenging. The standard surgical technique involves making an incision approximately two fingerbreadths below and parallel to the angle of the mandible. In more severe or widespread infections, multiple incisions may be needed to ensure sufficient drainage of all affected fascial compartments.[18]

Following the initial incision, the procedure entails precise dissection to identify and retract the submandibular gland. A critical step is the division of the mylohyoid muscle, which separates the submandibular and sublingual spaces. Cutting this muscle allows for effective decompression of the infected fascial planes, improving drainage and reducing intraoral pressure. Decompression of the mouth's floor through this method can offer several benefits, including less need for prolonged airway support and a shorter hospital stay. The procedure is generally considered safe, with no significant complications documented in the literature. However, the decision to proceed with surgery should be based on the patient's clinical status and radiologic findings.[19]

Surgical drainage is specifically indicated when imaging identifies a distinct abscess, when physical examination reveals fluctuance suggestive of pus, or when broad-spectrum antibiotics fail to control the infection. In such cases, delaying intervention can result in worsening airway compromise, systemic infection, and increased morbidity. Due to the potentially life-threatening nature of Ludwig's angina, coordinated care involving otolaryngologists, oral and maxillofacial surgeons, and anesthesiologists is crucial to determining the appropriate timing and extent of surgical management.[20]

Conclusion

With early diagnosis and aggressive management, the prognosis of Ludwig's angina has significantly improved. However, delayed intervention increases morbidity and mortality risks. Ludwig's angina remains a surgical emergency requiring a multidisciplinary approach involving oral and maxillofacial surgeons, anesthesiologists, and infectious disease specialists. Timely airway management, surgical drainage, and targeted antibiotic therapy are key to reducing complications and improving patient outcomes. While the primary focus is on immediate and effective management to prevent airway obstruction and systemic infection, it is also important to consider the potential for unusual pathogens and comorbid conditions that may complicate treatment. Early recognition and intervention are key to improving outcomes and reducing the mortality rate associated with Ludwig's angina

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