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Outcomes in Conservative Versus Surgical Treatments in Ludwig's Angina Cases: A Comparative Study

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ABSTRACT

Rapid airway impairment brought on by Ludwig's angina may require careful antimicrobial treatment or surgery. **Objective:** To compare the airway compromise and hospital stay in conservative versus surgical approach in cases with Ludwig's Angina. **Methods:** This experiment was conducted at Liaquat University using a non-probability consecutive sampling technique to recruit 76 patients, aged 18 to 40, diagnosed with early-stage Ludwig's angina without airway obstruction. Quasi-experimental study.There were 38 patients in each group, and participants were randomized to either the surgery group or the conservative treatment group.Outcomes such as airway compromise and length of hospital stay were recorded and compared between groups using t-tests and Fisher's exact tests. **Results:** The conservative group's mean age was 30.58 ± 5.52 years, while the surgical group's was 31.34 ± 5.92 years.There were 11 females (28.95%) and 27 males (71.05%) in the conservative group and 8 females (21.05%) and 30 males (78.95%) in the surgical group. There was a statistically significant difference ($p < 0.001$) in the length of hospital stay between the surgical group (6.97 ± 1.10 days) and the conservative group (5.05 ± 0.89 days).Five patients (13.16%) in the surgical group and three patients (7.89%) in the conservative group experienced airway impairment; however, this difference was not statistically significant ($p = 0.706$). **Conclusion:** Conservative treatment, being less invasive, can be effective in mild cases, leading to shorter hospital stays and a reduced risk of airway compromise.

INTRODUCTION

The severe ailment known as Ludwig's angina, or "Angina Ludovici," is characterized by extensive cellulitis that affects the neck, the floor of the mouth, and the submandibular areas on both sides, which may restrict the airway [1]. Ludwig's angina, also known as "Angina Maligna" or "Morbus Strangularis," gets its name from the Latin verb "angere," which means to strangle, and reflects the feeling of choking it induces. Ironically, it was first documented by German physician Wilhelm Frederick Von Ludwig in 1836. However, he passed away in 1865 from inflammation in his neck, which was thought to be related to the illness. It has a notoriously high mortality rate due to its rapid progress and because of this airway may very quickly become compromised if acute treatment is not given [2]. Patients with a history of dental infections, mainly from the lower second and third molars, are more likely to develop Ludwig's angina [3]. Additionally, it can exacerbate diseases like sialolithiasis, peritonsillar and

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parapharyngeal abscesses, or submandibular gland sialadenitis [4]. Mandibular trauma, penetrating injuries to the floor of the mouth, oral malignancies, lymphangiomas, and cultural customs such as tongue piercing are additional contributing factors [5]. The swelling that results may cause the tongue to move backward and upward, which could restrict the airway and cause asphyxiation. The infection usually starts in one side but quickly spreads to both sides causing very quick swelling of tissue that can block the airway and manage saliva [6, 7]. The identification and treatment for Ludwig's angina urgently is important as delayed intervention may increase morbidity considerably with a 10 % to the 50 % reported case fatality rates [8]. The management of Ludwig's angina most commonly involves two principal routes, as follows: conservative treatment and surgery [9]. The conservative treatment mainly depends on broad-spectrum intravenous antibiotics, supportive care and close airway status monitoring [10]. This approach is one used to successfully control the infection, reduce immediate complications and provide an avenue for spontaneous resolution of swelling. The 2022 study on Ludwig's angina found that 20% of patients required tracheostomy and 10% experienced mortality despite aggressive treatment, emphasizing the importance of early surgical intervention [11]. However, surgery is typically recommended for significant risk of airway involvement or when conservative measures are inadequate. Surgical therapy may include drainage of any abscesses, submandibular space decompression and for severe cases tracheostomy to secure the airway [12]. The choice of the best treatment is still a matter for discussion in medical schools, although these treatments appear to be available.The decision depends on the severity of infection, clinical status of patient as well as risks and benefits associated with both. Clearly there are theoretical implications for patient outcome, most importantly time to first waking and therefore length of stay in hospital stress has been placed on having a secure airway at the end of surgery.To compare conservative and surgical interventions for hospital stay in patients with Ludwig's angina, this randomized controlled trial was conducted that included the airway compromise at some point during treatment as an additional important outcome measure. Through a systematic analysis of these important variables, the study aims to provide evidence that allow clinicians to make data-driven decisions based on individual patient situations.Ultimately, the purpose of this research was to inform on how management strategies for Ludwig's angina can progress so patients receive best and timely care when required without significant complications that arise with such a critical condition.

METHODS

Using a non-probability successive sampling technique, this quasi-experiment was carried out in the Department of Oral and Maxillofacial Surgery, Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad, from January 27, 2024, to October 1, 2024.Following an explanation of the study's goals, all participants provided written informed permission, and CPSP and the hospital's ethical review committee granted their ethical approval(CPSP/REU/DSG-2020-166-32240). The WHO calculator was used to determine the sample size using the following formula:

$$n = 2 \times \left(Z_{\alpha/2} + Z_{\beta}\right)^2 \times \frac{\delta^2}{\alpha^2}$$

Parameters included a 90% confidence level, 5% alpha error, an anticipated proportion of airway compromise in the conservative group of 26.3%, and 2.9% in the surgical group [13]. A total of 76 Ludwig's angina patients were included in the study, with 38 instances per group being the determined sample size. Included were patients with Ludwig's angina of either sex, ages 18 to 40, who had early-stage symptoms such as neck pain, neck erythema or swelling, swollen jaw, cheeks, or tongue, painful tongue, or an abscessed tooth. Patients with a history of maxillofacial trauma or prior submandibular surgery, those with systemic diseases such as diabetes mellitus or immunosuppression, and individuals unable to provide informed consent at the time of the procedure were excluded. Using the lottery approach, patients who met the aforementioned criteria were chosen and split into two groups: Group A (conservative treatment) and Group B (surgical treatment), each of which had 38 patients. Each patient gave their informed written consent, with translations available upon request. All procedures were performed by a resident maxillofacial surgeon under the supervision of a consultant, and study variables were recorded on a standardized proforma. Patients with early-stage Ludwig's angina, in which the airway was uncompromised, made up the sample; patients with airway blockage were not included. Without any concurrent infections, all groups were given the same antibiotics for the same amount of time. Airways were assessed through clinical examination and pulse oximetry, with respiratory compromise identified by symptoms such as anxiety, cyanosis, stridor, tachypnea, low oxygen saturation level, inable to lie supine, alar flarness, and intercostal or supraclavicular indrawing. For five days, Group A was given intravenous cefotaxime (1g twice day) and metronidazole (500 mg three times daily), with dosages modified in accordance with culture findings. Group B underwent surgical decompression with stab incisions and drain placement in the submandibular and submental spaces. Monitoring was done for patients for the airway compromise, and if needed emergency tracheostomy was

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performed. Outcomes, including airway compromise, mortality, and length of hospital stay, were assessed over a 15-day follow-up. Inter observer variability in airway compromise assessment was minimized using standardized protocols, with good agreement observed (k = 0.91). SPSS version 22.0 was used to analyze the data. While categorical data, such gender and airway impairment, were presented as frequencies and percentages, continuous data, like age and length of stay, were summarized as means and standard deviations. Both the t-test and Fisher's exact test were used to compare the outcome variables (length of stay and airway compromise) between the two groups. The length of hospital stay was evaluated using the Shapiro-Wilk test, which revealed that it was regularly distributed (p=0.16). Statistical significance was defined as a p-value of less than 0.05.

RESULTS

Patients in the surgery group were 31.34 ± 5.92 years old on average, compared to 30.58 ± 5.52 years old in the conservative group. The conservative group included 11 females (28.95%) and 27 males (71.05%), while the surgical group comprised 8 females (21.05%) and 30 males (78.95%) (Table 1).

Table 1: Age and Gender Distribution of Conservative and Surgical Approaches (n = 76)

Characteristic	Conservative Mean ± SD/Frequency (%)	Surgical Mean ± SD /Frequency (%)
Age (Years)	30.58 ± 5.52	31.34 ± 5.92
Gender		
Female	11 (28.95)	8 (21.05)
Male	27 (71.05)	30 (78.95)

The average length of stay was 5.05 ± 0.89 days in the conservative group and 6.97 ± 1.10 days in the surgical group, indicating a statistically significant difference ($p < 0.001$). Five patients (13.16%) in the surgical group and three patients (7.89%) in the conservative group had airway impairment; however, the difference was not statistically significant ($p = 0.706$) (Table 2).

Table 2: Comparison of Length of Stay and Airway Compromise between Two Approaches in Ludwig's Angina (n = 76)

Characteristic	Conservative Mean ± SD/Frequency (%)	Surgical Mean ± SD /Frequency (%)	p-Value
Length of Stay (Days)	5.05 ± 0.89	6.97 ± 1.10	<0.001*
Airway Compromise			0.706**
No	35 (92.11)	33 (86.84)	
Yes	3 (7.89)	5 (13.16)	

*Student t test; **Fisher test

DISCUSSION

There is a debate regarding treatment of Ludwig's angina, with the primary goal being to secure the airway and control the spread of infection. The purpose of this study is to evaluate the results of treating Ludwig's angina conservatively versus surgically [14]. According to this research, early-stage Ludwig's angina can be effectively treated conservatively—with antibiotics, corticosteroids, and close observation—to prevent surgery and associated side effects. However, surgical intervention is essential for advanced cases with airway obstruction or rapid disease progression, as it reduces mortality and prevents severe complications, especially when conservative methods fail. Difference in length of hospital stay was statistically significant. The mean LOS for Group A was shorter (5.05 days (SD = 0.89)) compared to Group B (6.97 days (SD = 1.10)) suggesting faster recovery for less severe cases using conservative treatment [15, 16]. Results of the present study indicated that airway compromise was more (13.2%) common in Group B than Group A (7.9%), suggesting vital role of surgical interventions towards better managing cases of Ludwig's angina. The reason for this higher rate of airway compromise in the surgical group may be because by presenting with more advanced stage, patients in this group had already undergone initial conservative measures requiring surgical management. Airway compromise in Ludwig's angina occurs due to swelling and cellulitis of submandibular, sublingual, submental space due to the obstruction of airway [17]. As the extent of Ludwig's angina progresses, there is increased risk of airway compromise [18]. In these cases, it is, therefore, necessary to perform an incision and drainage to relieve the pressure, remove the pus, and to secure the airway. This is in consonance with other researches indicating that it is only advisable to operate to treat severe cases of such insulinomas [18, 19]. However, it may be seen that Group A presented with comparatively less airway compromise implying that the clinical management through antibiotics, corticosteroids and monitoring may therefore be appropriate in early, less severe or localized infection where the airway is not at an imminent risk. Nonetheless, any instance of airway compromise was seen in the conservative group, and therefore underscores on the need to monitor patients closely and not hesitate to move to surgery if needed [20].

CONCLUSIONS

Conservative treatment, being less invasive, may be effective in managing milder cases of Ludwig's angina, and is associated with shorter hospital stays and a reduced risk of airway compromise. However, each patient requires an individualized treatment plan, tailored to their clinical presentation and physician's judgment.

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Writing, review and editing: FI, MS, ZHC, UB, SS

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Satish V, Satheesh C, Abraham PD, Padmashini G, Sinouvassane D, Wong LS *et al.* Case Report: Ludwig's angina-'The Dangerous Space'. F1000Research.2024 Jun; 11: 1511. doi: 10.12688/f1000research.127242.2.
[2] Sahoo NK, Thakral A, Pandey S, Vaswani H, Vashisht S, Maheshwari I. Incidence of Mortality and Its Relation to Comorbidity in Ludwig's Angina:A Retrospective Study. Journal of Maxillofacial and Oral Surgery.2024 Jun; 23(3): 581-8. doi: 10.1007/s12663-024-02116-5.
[3] Owobu T, Ekuase E, Azah OO, Adamu SS, Bamgbose BO. Ludwig's angina-an emergency complication arising from delayed dental treatment:The experience in a Nigerian tertiary institution.Journal of Dentomaxillofacial Science.2020Aug;5(2):129-33. doi: 10.15562/jdmfs.v5i2.1082.
[4] Gunawan F and Ferriastuti W. Ludwig's angina: An alarming radiology challenge.Radiology Case Reports.2022Sep;17(9):3103-6.doi:10.1016/j.radcr.2022.05.085.
[5] Tami A, Othman S, Sudhakar A, McKinnon BJ. Ludwig's angina and steroid use: a narrative review.American Journal of Otolaryngology.2020May;41(3):102411.doi:10.1016/j.amjoto.2020.102411.
[6] Tu A, Gilbert JD, Byard RW. Ludwig angina and sudden death.Forensic Science, Medicine and Pathology. 2021 Sep; 17(3):506-9. doi: 10.1007/s12024-020-00350-0.
[7] Nguyen CD, Pham HV, Tran AT, Tran PTA, Van Dao H, Nguyen KM *et al.* Predicting factors for patients with Ludwig's angina have been treated at Viet Duc University hospital.GSC Advanced Research and Reviews.2022;12(2):069-78.doi:10.30574/gscarr.2022.12.2.0216.
[8] Vallée M, Gaborit B, Meyer J, Malard O, Boutoille D, Raffi F *et al.* Ludwig's angina: A diagnostic and surgical priority. International Journal of Infectious Diseases. 2020 Apr; 93: 160-2. doi: 10.1016/j.ijid.2020.01.028.
[9] Saifeldeen K and Evans R. Ludwig's angina. Emergency Medicine Journal.2004Mar;21(2):242-3. doi:10.1136/emj.2003.012336.
[10] Kovalev V. A severe case of Ludwig's angina with a complicated clinical course.Cureus.2020Apr;12(4). doi: 10.7759/cureus.7695.
[11] Parmar BD, Joshi KJ, Modi AD, Dave GP, Desai RS, Parmar BD *et al.* Management of Ludwig's angina at a tertiary care hospital in Western region of India. Cureus.2022Mar;14(3).doi:10.7759/cureus.23311.
[12] Edetanlen BE and Saheeb BD. Comparison of outcomes in conservative versus surgical treatments for Ludwig's angina.Medical Principles and Practice. 2018 Jun; 27(4): 362-6. doi: 10.1159/000490740.
[13] Maghaireh GA, Alzraikat H, Taha NA. Satisfaction with Dental Appearance and Attitude toward improving Dental Esthetics among Patients attending a Dental Teaching Center. The Journal of Contemporary Dental Practice.2016Jan;17(1):16-21.doi:10.5005/jp-journals-10024-1796.
[14] Pak S, Cha D, Meyer C, Dee C, Fershko A. Ludwig's angina.Cureus.2017Aug;9(8).doi:10.7759/cureus.1588.
[15] Parker E and Mortimore G. Ludwig's angina: a multidisciplinary concern.British Journal of Nursing. 2019May;28(9):547-51.doi:10.12968/bjon.2019.28.9.547.
[16] Urias D, Kim S, Meenan D, Carney W. Successful Management of Ludwig's Angina Only to Encounter Perforated Viscus during Recovery.The American Surgeon.2018Sep;84(9):E381-2.doi:10.1177/000313481808400914.
[17] Chou YK, Lee CY, Chao HH. An upper airway obstruction emergency: Ludwig angina.Pediatric Emergency Care.2007Dec;23(12):892-6.doi:10.1097/pec.0b013e31815c9d4a.
[18] Hammer J. Short case presentation. Subglottal foreign body. Paediatric Respiratory Reviews.2004 Mar; 5(1): 90-2. doi: 10.1542/pir.21-3-86.
[19] Rao K, Navneeth T, Vivek S, Rathod S. Comparative study of the outcome of surgical decompression in Ludwig's angina by conventional skin incision versus multiple interrupted skin incisions.International Journal of Otorhinolaryngology Head Neck Surgery. 2020Nov;6:2054-7.doi:10.18203/issn.2454-5929.ijohns20204631.
[20] Bridwell R, Gottlieb M, Koyfman A, Long B. Diagnosis and management of Ludwig's angina: An evidence-based review.The American Journal of Emergency Medicine.2021Mar;41:1-5.doi:10.1016/j.ajem.2020.12.030.