

Original Research Article

Comparative study of the outcome of surgical decompression in Ludwig's angina by conventional skin incision versus multiple interrupted skin incisions

Kulkarni Manik Rao, Navneeth T. P.*, Vivek S., Sonu S. Rathod

Department of Otorhinolaryngology Head and Neck Surgery, Combined Hospitals of MCH, VIMS, Ballari, Karnataka, India

Received: 29 August 2020

Revised: 09 October 2020

Accepted: 12 October 2020

***Correspondence:**

Dr. Navneeth T. P.,

E-mail: navnee23@gmail.com

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ABSTRACT

Background: Ludwig's angina is a potentially life threatening infection characterized by a rapidly progressing, bilateral gangrenous cellulitis of all the three primary mandibular spaces namely submental, submandibular and sublingual. If left untreated the cellulitis can progress swiftly to produce obstruction of airway and death. Despite that, no specific guidelines exist and management is greatly dependent on clinical judgement and experience.

Methods: Forty cases of patients with Ludwig's angina, attending the department of otorhinolaryngology were included in this study and were randomly allocated into conventional incision (CI) and multiple incisions (MI) groups. Following informed written consent, either conventional incision or multiple small incisions were used for drainage and the outcomes analysed.

Results: The mean age of patients was 28.4 years and majority of the patients belonged to 20-40 years age group. Male to female ratio was 2.3:1. The most common etiology was odontogenic. The outcome of both the conventional group and multiple small incisions group were comparable. The mean hospital stay of the conventional group was 10.25 days and multiple incisions group was 5.31 days which was statistically significant.

Conclusions: Multiple small incisions for the drainage of Ludwig's angina is a safe and less invasive alternative method, with the advantages being shorter hospital stay and better cosmesis without an increase in complications.

Keywords: Conventional incision, Ludwig's angina, Multiple incisions

INTRODUCTION

Ludwig's angina is a form of bilateral diffuse cellulitis that spreads rapidly, affecting the submandibular, sublingual and submental spaces. It is named after the German physician Karl Friedrich Wilhelm von Ludwig, who first described the condition in 1836. It begins as a cellulitis, then turns into fasciitis, and finally becomes a true abscess.^{1,2}

The term "angina" is derived from the Latin word for choke (angere) and the Greek word for strangle

(ankhōnē) and typically refers to pain of cardiac origin. Here it refers to the feeling of strangling and choking due to airway obstruction, which is a dangerous complication that accompanies severe cases of Ludwig's angina.³

The most common etiology is odontogenic infections in about 70% of cases. The submandibular space is subdivided by the mylohyoid muscle into the sublingual space superiorly and submaxillary space inferiorly. Infection may spread freely through tissue planes because of communicating spaces resulting in the bilateral nature of Ludwig's angina. The closeness of these spaces to the airway cause rapid onset airway obstruction. Infection

may even extend to parapharyngeal and retropharyngeal spaces.⁴

Treatment comprises of airway maintenance, antibiotics and surgical drainage. About one-third of the patients require immediate fiber-optic nasotracheal intubation or tracheostomy. The oedema of the tongue and trismus precludes oral intubation and a blind attempt can be catastrophic.⁴ Broad spectrum antibiotics are started, which can be later changed, going with the culture and sensitivity report.

Surgical drainage is indicated for patients with impending complications and in cases where there is no improvement after 24 to 48 hours of parenteral antibiotics. There is usually very minimal pus drained, but surgical drainage is believed to improve the local perfusion, decrease the hydrostatic pressure and the introduction of superficial mucosal flora is said to decrease the spread of the invading pathogens.⁴

If left untreated the cellulitis can progress swiftly to produce obstruction of airway and death. Despite this, no specific guidelines exist and management is greatly dependent on clinical judgment and experience. In this study, we aim to compare the outcomes of surgical drainage of Ludwig's angina using single incision extending from one angle of mandible to other, with the multiple interrupted stab skin incisions over the submandibular spaces bilaterally and the submental space.

METHODS

This clinical trial was carried out at Medical College Hospital, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, India, which spanned over a period of 2 years from March 2017 to February 2019.

Statistically calculated sample size ($N = Z\alpha^2 \times P(1-P) / d^2$; $P=1.2$)⁵ of 40 patients diagnosed with Ludwig's angina, attending the department of otorhinolaryngology were included in this study and were randomly allocated into conventional incision (CI) and multiple incisions (MI) groups [$Z\alpha^2 =$ Standard normal variate ($5\% = 1.96$), $P =$ Expected proportion from population, $d =$ Absolute error(5%)].

The conventional incision is a single incision extending from one angle of mandible to other, through the skin and subcutaneous tissue, separating platysma muscle and the superficial layer of the deep cervical fascia, thus decompressing all three perimandibular spaces (Figure 1a).

Multiple incisions consisted of three stab incisions: two incisions of 1.5 to 2 cm extension, 2 cm below the border of the mandible bilaterally, to decompress the submandibular and sublingual spaces; and a similar incision below the symphysis of the mandible, through

which the submental space was drained. All spaces were connected in subplatysmal plane (Figure 1b).

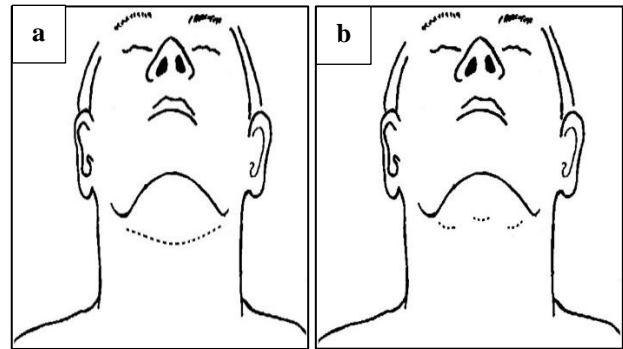


Figure 1: Diagrammatic representation of: a) Conventional incision and b) Multiple incisions (Dotted lines denote the incisions).

Patients who didn't give consent and patients who were lost to follow up were excluded from the study.

Following written informed consent, either conventional incision or multiple small incisions were used for drainage and the outcomes analysed. Approval from the ethical committee was obtained before starting the study.

Statistical analysis using Chi square test for categorical variable and independent sample t test for quantitative variable was done using SPSS software version 20.0.

RESULTS

A total of 40 patients were enrolled in this study, which comprised 28 males and 12 females. The male gender was most affected, with a ratio of 2.3:1 (Table 1).

Table 1: Sex distribution.

Gender	Frequency	Percentage (%)
Male	28	70.0
Female	12	30.0
Total	40	100.0

The age of patients ranged from 2 to 55 years with a mean age of 28.4 years. Majority of the patients (n=22) were in 20-40 years range (Table 2).

Table 2: Age distribution.

Age (in years)	Frequency	Percentage (%)
< 10	8	20.0
10-19	2	5.0
20-29	10	25.0
30-39	12	30.0
40-49	2	5.0
50 and above	6	15.0
Total	40	100.0

The odontogenic origin of infection was found in 33 (82.5%) patients and the source of infection was impossible to identify in 5 (12.5%) patients (Table 3).

Table 3: Etiology.

Etiology	Frequency	Percentage (%)
Odontogenic	33	82.5
Sialadenitis	1	2.5
Trauma	1	2.5
Unknown	5	12.5

All the 40 (100%) patients received surgical drainage within the first 12 hours of hospital admission. Of these, 24 patients were included in the conventional incision (CI) group and 16 patients entered the multiple incisions (MI) group. 23 patients in the conventional group were cured of the disease and one patient succumbed to the complications. In the multiple incisions group, 14 patients were cured and in 2 patients the incision had to be converted to the conventional type, as they didn't show clinical improvement with small incision technique (Table 4). The p-value was 0.326 and shows the outcome to be comparable in both groups.

Table 4: Outcome analysis.

Surgical method	Cured	Not cured
Conventional incision	23 (95.8%)	1 (4.16%)
Multiple incision	14 (87.5%)	2 (12.5%)

The mean hospital stay of conventional group was 10.25 days and multiple incisions group was 5.31 days. The p-value here was less than 0.0001 showing that it is statistically highly significant.

DISCUSSION

In our study, the mean age of patients was 28.4 years, with the most frequently affected age group being 20 to 40 years. The study also showed male patients to be more frequently affected. This is similar to studies done by Nguyen and Jorba et al.⁷

In this study, most of the patients had an odontogenic focus as the primary origin of infection, followed by unknown origin. This corresponds with the reviewed current literature. Peritonsillar or parapharyngeal abscess, mandibular fracture, oral laceration or piercing and submandibular sialadenitis are the other causes listed in literature. In our study, one patient had submandibular sialadenitis and one had a traumatic cause.^{8,9}

The primary purpose of this study was to compare the outcomes of surgical drainage of Ludwig's angina using conventional single skin incision (Figure 2) with that of multiple interrupted stab skin incisions (Figure 3). 95.8% of the patients in the conventional incision group and 87.5% of the patients in the multiple incisions group were

cured. The p-value was 0.326, which is not significant. This shows that both the methods have comparable results.



Figure 2: Conventional skin incision from one angle of mandible to other.



Figure 3: Multiple small incisions connected in the subplatysmal plane.

Ludwig's angina begins as a mild infection and progresses to induration of the upper neck with pain, trismus and tongue elevation. This is followed by mouth opening and neck distension as it gets severe. Any further increase in size, after the limit of mandibular opening, can only encroach upon the airway causing airway obstruction. Timely surgical drainage aims to prevent this.

It is rare to release any quantity of pus, but the main objective is that the three potential spaces involved should be communicated and exteriorized as the swelling could then expand in a superficial direction away from the pharyngeal airway relieving any pressure on it.¹⁰

The use of the conventional incision from one angle of mandible to other is commonly used to accomplish this. But it has many disadvantages as it takes a long time for closure, longer hospital stay and leads to gross scar formation. This in turn can result in keloid formation,

contractures and neck flexion. Furthermore, a large submandibular incision in the presence of a tracheostomy will increase the risk of chest infection.¹⁰ The use of multiple small incisions involving the three spaces with subplatysmal communication can help in overcoming these difficulties, whilst being equally effective.

In our study, the mean hospital stay was 10.25 days in the conventional incision group. This is in accordance with mean stay of around 11 days in the world literature. In the multiple incisions group the mean hospital stay was 5.31 days. The p-value was less than 0.0001 which is statistically highly significant. This could be explained by the smaller size of incisions and lesser invasive procedure resulting in faster healing.^{11,12}

The incidence of complications such as mediastinitis, necrotizing fasciitis, or death is similar to studies done by Bross et al. There is no increase in complications with the use of multiple small incisions.¹² One patient in the multiple incision group developed necrotizing fasciitis and a patient in the conventional group developed mediastinitis and succumbed to it.

The wound healing was much faster in the multiple incisions group with much better cosmetic results and faster return to routine life. The cost of treatment is much lower compared to the conventional group owing to faster cure and lesser hospital stay.

The lack of long-term outcome assessment, as most patients don't turn up after recovery, may be considered as a limitation of this study

CONCLUSION

Surgical drainage of Ludwig's angina employing multiple small incisions with subplatysmal communication, along with proper airway management and antibiotic treatment, has a very satisfactory outcome without an increase in the number of complications. In addition, it is an easy and less invasive technique offering better cosmesis and reduced hospital stay, leading to better patient compliance.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Candamourty R, Venkatachalam S, Ramesh Babu M R, Kumar G S. Ludwig's angina- An emergency: A case report with literature review. J Nat Sc Biol Med. 2012;3:206-8.
2. Schuman NJ, Owens BM. Ludwig's angina following dental treatment of a five year old male patient: report of a case. J Clin Pediatr Dent. 1992;16:263-5.
3. Shockley D, Williams W. Ludwig angina: a review of current airway management. Arch Otolaryngology Head Neck Surg. 1999;125(5):600-4.
4. Scott AB, Stiernberg CM, Driscoll BP. Deep Neck Space Infections. In: Bailey BJ, Pillsbury HJ, Driscoll BP, eds. Bailey Head and Neck Surgery-Otolaryngology. 2nd edn. 1998, Lippincot-Raven; 1998:819-35.
5. Myla S, Peruri AR. Clinical study of deep neck space infections- retrospective study. Int J Sci Res. 2015;4(3):1739-41.
6. Nguyen VD, Potter JL, Hersh-Schick MR. Ludwig angina: an uncommon and potentially lethal neck infection. Am J Neuroradiol. 1992;13:215-9.
7. Jorba BS, Bross SD, Arrieta GJR, et al. Manage and integral treatment of the Ludwig's angina. 5 years-old experience. Rev Hosp M Gea Glz. 2003;6(1):25-30.
8. Kremer MJ, Blair T. Ludwig angina: forewarned is forearmed. J Am Assoc Nurse Anesth. 2006;74:445-51.
9. Yilmaz S, Adisen MZ, Misirlioglu M, Yorubulut S. Assessment of third molar impaction pattern and associated clinical symptoms in a central anatolian turkish population. Med Princ Pract. 2016;25(2):169-75.
10. Holland CS. The management of Ludwig's angina. Br J Oral Surg. 1975;13(2):153-9.
11. Flynn T. The swollen face. Emerg Med Clin North Am. 2000;18(3):26-35.
12. Bross-Soriano D, Arrieta-Gómez JR, Prado-Calleros H, Schimelmitz-Idi J, Jorba-Basave S. Management of Ludwig's angina with small neck incisions: 18 years' experience. Otolaryngol Head Neck Surg. 2004;130(6):712-7.

Cite this article as: Rao KM, Navneeth TP, Vivek S, Rathod SS. Comparative study of the outcome of surgical decompression in Ludwig's angina by conventional skin incision versus multiple interrupted skin incisions. Int J Otorhinolaryngol Head Neck Surg 2020;6:2054-7.