International Journal of Medical Science and Clinical Research Studies

ISSN(print): 2767-8326, ISSN(online): 2767-8342

Volume 04 Issue 01 January 2024

Page No: 149-154

DOI: https://doi.org/10.47191/ijmscrs/v4-i01-33, Impact Factor: 6.597

Anesthetic Management with Intubation in Awake Patient with Ludwig's Angina Using Dexmedetomidine and Ketamine: A Case Report

Francisco Rodolfo Esquivel-Diaz[1], Silvia Hernández-Flores[2], Alexis Emir Noguera-Echeverría[3], María Fernanda Ibarra-Guerrero[4], Víctor Rodrigo Islas-Canto[5]

[1,5]Anesthesiology Resident. Clínica Hospital Mérida, ISSSTE. Facultad de Medicina de la Universidad Autónoma de Yucatán.
[2]Anesthesiologist, Clínica Hospital Mérida, ISSSTE. Hospital General Regional No. 12 IMSS, Lic. Benito Juárez.
[3]Surgical Resident. Clínica Hospital Mérida, ISSSTE. Facultad de Medicina de la Universidad Autónoma de Yucatán.
[4]MD. Universidad Anáhuac Mayab.

ABSTRACT

Introduction: Ludwig's Angina (LA) is a bacterial infection of the submandibular space that can cause airway obstruction. Prompt surgical treatment and antimicrobial therapy are crucial. Airway evaluation is important to identify risk factors for difficult intubation and anatomical distortion that may require awake endotracheal intubation.

Case presentation: A 22-year-old female presented to the emergency department with left submandibular pain, edema, increased skin temperature, and erythema with a history of grade III caries of 6 months evolution without treatment. Physical examination revealed extension to the left lateral neck region and mild respiratory distress. Classified as ASA grade III, the patient underwent awake intubation using dexmedetomidine (DXM) and ketamine (KET), followed by balanced general anesthesia for the surgical procedure.

Clinical discussion: The patient's condition predicted high difficult airway, therefore awake intubation was performed to maintain spontaneous ventilation and reduce cardiac arrest risk. In this case, DXM was used to avoid anxiety and respiratory depression, while KET was employed for its analgesic, bronchodilator, and tachycardic effects.

Conclusion: Ketamine and dexmedetomidine allow adequate spontaneous ventilatory mechanics, without respiratory depressant effect. Further research is needed to find more anesthetic drugs that can be used for intubation without suppressing autonomic ventilation, and to develop guidelines to prevent respiratory depressant effects in patients with LA.

KEYWORDS : Ludwig's Angina**,** airway obstruction , awake intubation, dexmedetomidine, ketamine, treatment

ARTICLE DETAILS

Published On:
29 January 2024

Available on:
https://ijmscr.org/

INTRODUCTION

Ludwig's angina (LA) is a known, but rare, life-threatening surgical emergency unless recognized early and treated aggressively. [(1)] It is currently known as an uncommon pathology that affects children to elderly patients regardless of gender, although in a few reports, it has been described more frequently in women. The prevalence of infections on the floor of the mouth varies between 4 to 17%, with odontogenic infections being the main cause in 52 to 97% of the cases. [(2)]

LA usually originates in a recently infected or extracted tooth, most commonly in the second and third lower molars. Airway management is the main basis of treatment in these cases. Despite this, there are no specific guidelines and treatment depends largely on criteria and clinical experience. **(1)**

Early surgical intervention may improve the condition of the patient airway. This includes debridement of necrotic tissue and drainage of all collections of pathological fluid. Indications for surgery include patients who do not improve with antibiotics, soft tissue fluctuation detected on physical examination, and the presence of abscesses that are visible on imaging. **(3)**

Faced with a difficult airway the decision of the device for intubation depends on the characteristics of the patient and the experience of the anesthesiologist. These devices include direct laryngoscopy, video laryngoscope, intubation with a flexible endoscope, airway exchange catheter, retrograde guide cable, or placement of a supraglottic airway, supraglottic airway combined with an optical stylus with video, intubation with a flexible endoscope or retrograde intubation equipment. If none of these alternatives achieves adequate orotracheal intubation there are invasive interventions such as surgical cricotrotomia, needle cricotrotomia with a regulated pressure device, cricothyrotomy with large caliber cannula, surgical tracheotomy, guided retrograde intubation, and percutaneous tracheotomy. [(4)]

In this document we present the clinical case of a 22-year-old patient with the diagnosis of Ludwig's angina, who underwent left submandibular open drainage, using ketamine (KET) and dexmedetomidine (DMX) as the anesthetic plan while being awake.

KET is an anesthetic that blocks N-methyl-D-aspartate (NMDA) receptors, making it different from other anesthetic agents. It has a lower cardiorespiratory depressant effect, preserves oxygenation, and has a powerful bronchodilator effect. It can be used for sedation in spontaneous ventilation in many situations even for complicated procedures after the deterioration of the patient. [(5)]

On the other hand, Dexmedetomidine is an α-2 adrenergic receptor agonist with sedative, anxiolytic, sympatholytic, and hypnotic effects that allow the integrity of respiratory functions to be preserved. At the respiratory level, it induces a minimum depressant effect, allowing a wide margin of safety in various surgical scenarios. It has a wide spectrum of clinical applications from "cooperative sedation" to the intubation process in difficult areas. [(6)]

CASE REPORT

A 22-year-old female,1.55 m in height and 75 kg weight, housewife, went to the medical emergency department referring left submandibular pain of 7 days of evolution, accompanied by edema, increased skin temperature, and erythema, with difficulty swallowing and mild respiratory distress. As a history of importance, the patient did not report chronic diseases or drug use regularly, unknown family history, without surgical and allergies history, and transfusions denied.

History of grade III caries in the third left molar of 6 months of evolution, which did not receive timely treatment by its own decision.

During the initial evaluation at the emergency department, the patient had stable vital signs, conscious and oriented, with mild respiratory distress. At the physical examination she presented edema and generalized erythema in the left submandibular region *(Image 1)*, which extended to the left lateral region of the neck *(Image 2)*, the patient's ventilation was compromised, without involving respiratory failure.

Image 1. Generalized edema and erythema in the left submandibular region.

Image 2. Left lateral region of the neck, with generalized edema and increased volume.

On laboratory findings, Leukocytosis (13,400) with neutrophilia (85%) was reported in blood biometrics. While glucose, urea, creatinine, and serum electrolytes were not altered.

The evaluation was requested by the maxillofacial surgery service, who, due to the clinical picture and history integrated the diagnosis of Ludwig's angina, Therefore, it was decided to urgently perform an open drainage of the left submandibular abscess in the operating room.

The evaluation was requested by the anesthesiology service and was established in its assessment of the airway: Mallampati modified by Samsoon and Young: Class IV. Interincisive distance: Class IV. Patil-Aldreti: Class II. Sternonomentonian distance: Class III. Belhouse-Dore: Grade III. Upper Lipe Bite Test: Class II.

Mild respiratory distress was detected on physical examination of the head and neck; with edema and erythema in the left submandibular region and extension to the left lateral neck region, symmetrical thorax, with difficulty in amplexion and amplexation movements, remaining physical examination without major alterations. The physical state of the patient was classified employing the classification of the *American Society of Anesthesiology* (ASA) establishing grade III.

It was decided as an anesthetic plan intubation with an awake patient using intravenous drugs that would not compromise spontaneous ventilation and then use balanced general anesthesia to perform the surgical procedure.

The patient was monitored -type 1 monitoring- in the recovery area, before the surgical procedure an anesthetic premedication was performed for intubation with atropine 1 mg for an antisialagogue effect, administered intravenously, 50 minutes before she went into surgery. In addition, DXM was indicated intravenously at doses of 0.7 mcg/kg in continuous perfusion, to be administered for 20 minutes, and nebulization with lidocaine at 2%, 75 mg in 2 ml of 0.9% saline, was initiated for 5 minutes; later the patient entered the operating room to begin the surgical procedure.

DXM was maintained at a perfusion dose of 0.7 mcg/kg/hour and gradually adjusted within the range of 0.2-1 mcg/kg/hour. Non-invasive monitoring was initiated in the operating room, recording vital signs within normal parameters. Supplemental oxygen was administered through nasal tips at 5 liters per minute, two large-bore permeable peripheral pathways were secured, and analgesia was initiated with 150 mcg of intravenous fentanyl, at this time the patient continued with spontaneous ventilation, which was only supported by a face mask that administered oxygen at 5 liters per minute, maintaining a 100% SpO2.

Hypnosis continued with 75 mg intravenous ketamine, maintaining spontaneous ventilation and 100% SpO2; direct laryngoscopy was performed with Mac blade #4 (Cormack Lehane Class III), and was not possible to channel with orotracheal tube #7.5. Then it was decided to administer 50 mg of KET IV in addition to 50 mcg of Fentanyl IV, the laryngoscope blade was changed to a straight Miller blade #4, and the second attempt of intubation was performed by performing direct laryngoscopy (Cormack Lehane Class II) and achieving intubation with orotracheal tube #7.5 (*Image 3)*, sealing pneumopackaging with 5 ml of air.

The proper location of the endotracheal tube was verified by physical examination of the pulmonary regions and corroborated with capnography observing a CO2 of 35 mmHg. Anesthetic induction was performed with Propofol at 1.5 mg/kg and myoremediation with 10 mg of Cisatracur; In addition, analgesia was administered with 200 mcg of Fentanyl IV.

Image 3. Second attempt at difficult airway intubation.

Controlled mechanical ventilation was initiated with the following parameters: Tidal volume: 400 ml, respiratory rate: 10 breaths per minute, 1:2; Positive pressure at the end of expiration: 6 cmH2O, CO2: 35 mmHg, FiO2: 60%, Sevoflurane at 3%, minimum alveolar concentration 1.0

The patient was maintained with adequate hemodynamic and ventilatory parameters during the surgical procedure (*Images 4-5*), hypnotic management during the transanestesic period was with sevoflurane maintaining minimum alveolar concentration between 0.7 and 0.8, analgesia was managed with Fentanyl in continuous perfusion between 2.0 - 3.0 mcg/kg/h. Additionally were administered as adjuvants: Paracetamol 1 g IV, Ketorolac 30 mg IV, Ondansetron 7 mg IV, and Dexamethasone 8 mg IV.

Image 4. An incision on the area in which greater fluctuation of purulent contents was palpated.

Image 5. Open drainage of 60 ml of purulent material.

The surgical procedure was terminated (*Image 6*) and then extubation was performed with the patient awake in the surgical room and without eventualities, emersion by pharmacological redistribution, presented protective reflexes of the airway with spontaneous ventilation. The patient was successfully discharged from the operating room with a 1/10 Analog Visual Pain Scale plus a 9-point Aldrete. Oxygen was administered by nasal tips at 4 liters per minute and was kept under surveillance with continuous non-invasive monitoring in the postoperative care unit without surgical anesthesia complications.

Image 6. Surgical procedure completed; intubated patient initiated postoperative period.

After surgery, the patient remained hospitalized for 72 hours with surgical wound care with soap and water every 24 hours, antibiotic management with ceftriaxone 1 g IV every 12 hours and metronidazole 500 mg IV every 8 hours, in addition to analgesic treatment with acetaminophen 1 g IV every 8 hours plus ketorolac 30 mg IV every 8 hours. She was subsequently discharged satisfactorily, with outpatient medical follow-up by the maxillofacial surgery service.

DISCUSSION

Ludwig's angina is defined as a bacterial infection of the submandibular space that can rapidly spread to the surrounding subcutaneous tissue. This condition can cause airway obstruction, which can be fatal if proper surgical treatment and antimicrobial therapy are not given. Patients often have initial symptoms of sore throat or submandibular pain and fever. The infection can spread rapidly to the surrounding soft tissues and airways, causing symptoms such as trismus, dysphagia, and drooling. Physical examination may reveal swelling and redness in the submandibular region and leakage of pus from the floor of the mouth. [7]

LA needs to be treated promptly and with an adequate assessment of the airway, the objective of the evaluation of the airway is to identify risk factors that have been associated with laryngoscopy, ventilation, or difficult intubation. The LA conditions an anatomical distortion and a difficult airway, this can be exacerbated depending on the patient's anatomy, which forces a first intensive endotracheal intubation with the patient awake to ensure the airway [8].

In the previous clinical case, we decided to classify the airway as "difficult", using the scale of the predictive index of difficult intubation (IPID), which is an instrument of correlation and the sum of the scales of prediction of the airway difficulty that make it, whose total sum, depending on the class or degree of the scales, provides a score of 5 to 18 points, which are divided as follows: easy intubation (5-7 points), discrete difficulty (8-10 points), frank difficulty (11-13 points), great difficulty (14-16 points) and finally difficult intubation (17-18 points). Several studies have shown a correlation between IPID and Cormack in the diagnosis of difficult intubation in patients undergoing surgery [9]

The scales that make up this predictive index (IPID) include: The Mallampati modified, Patil-Aldreti (thyromentonian distance), sternonomentonian distance, interincisors distance, and mandibular protrusion. [8] In this case, while evaluating the patient, the predictor indicated a difficult intubation, due to a score of 17 points, so preparing for this situation was decisive to achieve an adequate intubation without complications.

On the other hand, awake intubation is the most widely used technique in the presence of a known difficult airway. The main indication for intubation in the awake patient is a planned difficult airway, which will lead to difficult intubation. [10] Failure of the tracheal intubation almost always goes hand in hand with difficulty in ventilation with a facial mask, which generates hypoxemia that becomes an emergency by not being able to intubate and ventilate, which translates into not being allowed to oxygenate the patient properly. [11]

In awake patient intubation one of its main advantages is to maintain spontaneous ventilation in the patient, which gives us the security of spontaneous ventilation itself, even if it is

not possible to intubate it quickly, reducing the risk of cardiac arrest.

In this case, the LA conditioned a high risk of respiratory and ventilatory complications by a high predictive rate of difficult intubation, and for the presence of edema and erythema generalized in the left submandibular region extended towards the left lateral region of the neck and that compromised the adequate ventilation of the patient.

As mentioned before, DXM is a selective alpha-2 adrenergic receptor agonist that can cause sedation, anxiolysis, reduction of analgesics, reduced salivary secretion, and minimal respiratory depression, which is beneficial for patients with a difficult or unstable airway undergoing intubation with an awake patient. [10] We decided to use DXM in perfusion for our patient to respond and be cooperative, avoiding anxiety and respiratory depression, in addition to the minimal respiratory depression that it caused was very beneficial by not starting respiratory depression as would have happened with other anesthetic drugs such as fentanyl, Propofol, and midazolam; which have been used in similar cases, however, have reported higher incidence of respiratory depression. [10]

Another benefit of DXM is that it acts as an adjuvant to improve the duration and quality of analgesia by causing synergistic effects with opioids, improving patient safety, increasing patient satisfaction, and improving clinical efficacy. [12]

On the other hand, KET is a dissociative agent that produces a catatonic state, analgesia, and amnesia. Its mechanism of action is given by NMDA, opioid, muscarinic, GABA, and monoaminergic receptors. It disrupts the thalamocortical and limbic systems, so patients often have nystagmus and abnormal limb movements unrelated to painful stimuli. [13] We used KET in our patient due to the advantage of its additional analgesic property, with little respiratory depression along with preserved airway protective reflexes, bronchodilator effect, and a hemodynamic effect of tachycardia and hypertension by inhibition of catecholamine reuptake, which helped to counteract one of the effects of DMX: bradycardia.

As for the dose used is supported by the literature that appropriate doses, such as the one used in the patient, a powerful analgesic, generate analgesia comparable to the use of morphine or fentanyl, which gives us the advantage of ensuring an adequate absence of pain since the minimum dose used of fentanyl together with the effect of KET ensured us adequate analgesia without respiratory depression. [14]

The literature showed that these benefits in intubation in awake patients are because of its extreme liposolubility, as it ensures a rapid transfer through the blood-brain barrier and therefore, a rapid onset of action, which usually occurs between 45 to 60 seconds after intravenous administration [15] which in the case of the patient was necessary to achieve intubation in the shortest possible time. KET is also recommended in moderate to severely painful and high anxiety procedures, such as abscess drainage. [13] In this case KET was administered intravenously with a latency time of less than 1 minute and for the short duration of its effect (between 15 and 30 minutes); which along with the effect of DMX assured us that the patient would continue awake and with spontaneous ventilation. [13]

CONCLUSION

Knowledge of the anatomy of the airway, the scales that evaluate it, and the risk factors involved are essential to choosing how to approach the airway, either with a conventional anesthetic induction technique or intubation with an awake patient. This will help us reduce the risk of perioperative complications, taking into consideration the knowledge and skill of the anesthesiologist, who must be always prepared for the correct care of patients with difficult airway. This time a case was presented with a high risk of not being able to intubate and ensure the airway, so it was decided to apply the method considered safer for the patient. The use of drugs such as ketamine and dexmedetomidine allows adequate spontaneous ventilatory mechanics, without the respiratory depressant effect as in cases where opioids and muscle relaxants are used.

The Angina of Ludwig is a potentially lethal pathology, and its diagnosis can be determined by considering the risk factors such as tooth decay, trauma, malnutrition, diabetes mellitus, alcoholism, and immunosuppression. Further studies are needed for the use of anesthetic drugs available in the anesthesia area to know how to achieve intubation with the awake patient without suppressing autonomous ventilation. That's why ketamine and dexmedetomidine should be more studied in the context of difficult intubation and intubation in an awake patient that will allow us to know how patients respond and above all create guidelines that will help not to have the respiratory depressant effect as in the case of opioids and muscle relaxants.

CONFLICTS OF INTERESTS

None.

ACKNOWLEDGEMENTS

None.

REFERENCES

I. Indian J Otolaryngol Head Neck Surg (octubre de 2022) 74 (Supl. 2): S2395 – S2397; https://doi.org/10.1007/s12070-020-02194-0
II. Quintero Margareth, K. G., & Villalobos Guarin, S. (2019). Angina de Ludwig: reporte de un caso en Tolima, Colombia. Ciencia médica, 22(2), 53–57. https://doi.org/10.51581/rccm.v22i2.25
III. Takayama, M., Misawa, M., Shimada, F., & Suzuki, T. (2023). Ludwig's angina and mask use. *Journal*

of General and Family Medicine, *24*(3), 190–191. https://doi.org/10.1002/jgf2.610

IV. Apfelbaum, J. L., Hagberg, C. A., Connis, R. T., Abdelmalak, B. B., Agarkar, M., Dutton, R. P., Fiadjoe, J. E., Greif, R., Klock, P. A., Jr, Mercier, D., Myatra, S. N., O'Sullivan, E. P., Rosenblatt, W. H., Sorbello, M., & Tung, A. (2022). 2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway. Anesthesiology, 136(1), 31–81. https://doi.org/10.1097/aln.0000000000004002

V. Mion, G. (2022). Ketamine. EMC - Anestesia-Reanimación, 48(2), 1–18. https://doi.org/10.1016/s1280-4703(22)46403-

VI. Dexmedetomidina, tendencias y actuales aplicaciones. (2022). Revista chilena de anestesia, 51(3). https://doi.org/10.25237/revchilanestv5115031153

VII. Takayama, M., Misawa, M., Shimada, F., & Suzuki, T. (2023). Ludwig's angina and mask use. *Journal of General and Family Medicine*, *24*(3), 190–191. https://doi.org/10.1002/jgf2.610

VIII. Ordaz-Díaz, A., & Martínez-Chiñas, M. del C. (2021). Angina de Ludwig en la paciente embarazada. Reporte de un caso. *Revista Mexicana de Anestesiología*, *44*(1), 63–65. https://doi.org/10.35366/97779

IX. Domínguez-Pérez, M., & González-Dzib, R. D. S. (2023). Correlación entre el Índice predictivo de intubación difícil y el Cormack [Correlation between Predictive Index of Difficult Intubation and Cormack]. Revista médica del Instituto Mexicano del Seguro Social, 61(1), 15–20

X. He, X.-Y., Cao, J.-P., He, Q., & Shi, X. Y. (2014). Dexmedetomidine for the management of awake fibreoptic intubation. The Cochrane Library, 2020(11). https://doi.org/10.1002/14651858.cd009798.pub2

XI. Law, J. A., Duggan, L. V., Asselin, M., Baker, P., Crosby, E., Downey, A., Hung, O. R., Jones, P. M., Lemay, F., Noppens, R., Parotto, M., Preston, R., Sowers, N., Sparrow, K., Turkstra, T. P., Wong, D. T., Kovacs, G., & for the Canadian Airway Focus Group. (2021). Mise à jour des lignes directrices consensuelles pour la prise en charge des voies aériennes difficiles du Canadian Airway Focus Group: 1ère partie. Prise en charge de voies aériennes difficiles chez un patient inconscient. *Journal Canadien d'anesthesie [Canadian Journal of Anaesthesia]*, *68*(9), 1373–1404. https://doi.org/10.1007/s12630-021-02007-0

XII. Lalinde Ruiz, J. C., Duarte Mesa, B. S., Salcedo Gamarra, M. J., Murgas Cañas, C. H., Contreras Diart, C. E., Barón Avila, M. Y., Buendia Gomez, A. F., & Chacón Guerra, M. A. (2023). Uso de Buprenorfina y Dexmedetomidina en Paciente Crítico. *Ciencia Latina Revista Científica Multidisciplinar*, *7*(5), 1127–1144. https://doi.org/10.37811/cl_rcm.v7i5.7791

XIII. Rodriguez Prada, C., Peñaloza Rey, N. F., Parra Córdoba, J. F., & Moreno Carillo, A. (2021). Sedación para procedimientos en el servicio de urgencias. Universitas Médica, 62(1). https://doi.org/10.11144/javeriana.umed62-1.seda

XIV. Pérez-Esparza, R., Kobayashi-Romero, L. F., García Mendoza, A. M., Lamas-Aguilar, R. M., Vargas Sosa, M., Encarnación-Martínez, M., González-Manríquez, L. A., Eternod-Rodríguez, S. A., Maltos-Gómez, F., Vargas-Valencia, K. M., & Fonseca Pérez-Amador, A. (2020). Ketamina, un nuevo agente terapéutico para la depresión. *Revista de la Facultad de Medicina, Universidad Nacional Autonoma de Mexico*, *63*(1), 6–13. https://doi.org/10.22201/fm.24484865e.2020.63.1.02

XV. Torres-Valdés, S. S., Carrillo-Torres, O., & Rascón-Martínez, D. M. (2023). Clínicas de ketamina: usos actuales según la evidencia. *Revista Mexicana de Anestesiología*, *46*(3), 197–203. https://doi.org/10.35366/111076