LUDWIG'S ANGINA: EARLY DIAGNOSIS AND AIRWAY MANAGEMENT IN DEEP CERVICAL INFECTIONS

ANGINA DE LUDWIG: DIAGNÓSTICO PRECOCE E MANEJO DA VIA AÉREA EM INFECÇÕES CERVICAIS PROFUNDAS

ANGINA DE LUDWIG: DIAGNÓSTICO PRECOZ Y MANEJO DE LA VÍA AÉREA EN INFECCIONES CERVICALES PROFUNDAS

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ABSTRACT

Ludwig's angina is a rapidly progressive deep cervical infection characterized by bilateral involvement of the submandibular, sublingual, and submental spaces, frequently associated with odontogenic infections. It is considered a potentially fatal medical emergency due to the high risk of acute airway obstruction, mediastinal spread, and sepsis. This study aimed to critically analyze the scientific evidence regarding early diagnosis and airway management in Ludwig's angina, emphasizing the main prognostic factors, therapeutic strategies, and anesthetic-surgical approaches currently employed. This is an integrative literature review conducted according to the methodological assumptions proposed by Whittemore and Knafl. The bibliographic search was performed in the PubMed/MEDLINE, Scopus, Web of Science, and SciELO databases using descriptors related to Ludwig's angina, deep neck infections, airway management, and odontogenic emergencies. Articles published within the last ten years, available in full text, and directly related to the proposed topic were included. The findings demonstrated that early recognition of clinical signs of respiratory compromise, combined with cervical computed tomography evaluation and the immediate initiation of broad-spectrum antibiotic therapy, is essential for reducing complications and mortality. Furthermore, airway management remains the main therapeutic challenge, especially in the presence of anatomical distortion caused by diffuse cervical edema, trismus, and elevation of the oral floor. Techniques such as awake fiberoptic intubation and early tracheostomy were identified as safer strategies in advanced cases. It is concluded that Ludwig's angina remains a highly severe clinical condition requiring a multidisciplinary approach, rapid diagnosis, and early airway intervention to optimize prognosis and prevent fatal outcomes.

Keywords: Ludwig's Angina. Deep Neck Infections. Airway Management. Odontogenic Emergency. Odontogenic Infection.

RESUMO

A angina de Ludwig consiste em uma infecção cervical profunda de rápida progressão, caracterizada pelo acometimento bilateral dos espaços submandibulares, sublinguais e submentonianos, frequentemente associada a infecções odontogênicas. Trata-se de uma emergência médica potencialmente fatal devido ao elevado risco de obstrução aguda das vias aéreas, disseminação mediastinal e sepse. O presente estudo teve como objetivo analisar criticamente as evidências científicas relacionadas ao diagnóstico precoce e ao manejo da via aérea na angina de Ludwig, enfatizando os principais fatores prognósticos, estratégias terapêuticas e abordagens anestésico-cirúrgicas atualmente empregadas. Trata-se de uma revisão integrativa da literatura, conduzida conforme os pressupostos metodológicos de Whittemore e Knafl. A busca bibliográfica foi realizada nas bases PubMed/MEDLINE, Scopus, Web of Science e SciELO, utilizando descritores relacionados à angina de Ludwig, infecções cervicais profundas, manejo das vias aéreas e emergência odontológica. Foram incluídos artigos publicados nos últimos dez anos, disponíveis na íntegra e diretamente relacionados ao tema proposto. Os achados demonstraram que o reconhecimento precoce dos sinais clínicos de comprometimento respiratório, associado à avaliação tomográfica cervical e à instituição imediata de antibioticoterapia de amplo espectro, constitui fator determinante para redução de complicações e mortalidade.

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Observou-se ainda que o manejo da via aérea representa o principal desafio terapêutico, especialmente diante da distorção anatômica provocada pelo edema cervical difuso, trismo e elevação do assoalho oral. Técnicas como intubação fibroóptica acordada e traqueostomia precoce destacam-se como estratégias mais seguras em casos avançados. Conclui-se que a angina de Ludwig permanece como condição clínica de elevada gravidade, exigindo abordagem multidisciplinar, diagnóstico rápido e intervenção ventilatória precoce para otimização do prognóstico e prevenção de desfechos fatais.

Palavras-chave: Angina de Ludwig. Infecções Cervicais Profundas. Manejo das Vias Aéreas. Emergência Odontológica. Infecção Odontogênica.

RESUMEN

La angina de Ludwig es una infección cervical profunda de rápida progresión caracterizada por afectación bilateral de los espacios submandibular, sublingual y submentoniano, frecuentemente asociada a infecciones odontogénicas. Constituye una emergencia médica potencialmente mortal debido al alto riesgo de obstrucción aguda de las vías respiratorias, diseminación mediastínica y sepsis. Este estudio tuvo como objetivo analizar críticamente la evidencia científica relacionada con el diagnóstico precoz y el manejo de las vías respiratorias en la angina de Ludwig, haciendo hincapié en los principales factores pronósticos, estrategias terapéuticas y abordajes anestésico-quirúrgicos empleados actualmente. Se trata de una revisión bibliográfica integradora, realizada según los principios metodológicos de Whittemore y Knafl. La búsqueda bibliográfica se realizó en las bases de datos PubMed/MEDLINE, Scopus, Web of Science y SciELO, utilizando descriptores relacionados con la angina de Ludwig, infecciones cervicales profundas, manejo de las vías respiratorias y emergencia odontológica. Se incluyeron artículos publicados en los últimos diez años, disponibles en texto completo y directamente relacionados con el tema propuesto. Los hallazgos demostraron que el reconocimiento precoz de los signos clínicos de compromiso respiratorio, junto con la evaluación tomográfica cervical y la instauración inmediata de antibioticoterapia de amplio espectro, es un factor determinante para reducir las complicaciones y la mortalidad. También se observó que el manejo de la vía aérea representa el principal desafío terapéutico, especialmente dada la distorsión anatómica causada por el edema cervical difuso, el trismo y la elevación del suelo oral. Técnicas como la intubación fibroóptica con el paciente despierto y la traqueostomía precoz se destacan como estrategias más seguras en casos avanzados. Se concluye que la angina de Ludwig sigue siendo una afección clínica muy grave, que requiere un abordaje multidisciplinario, un diagnóstico rápido y una intervención ventilatoria precoz para optimizar el pronóstico y prevenir desenlaces fatales.

Palabras clave: Angina de Ludwig. Infecciones Cervicales Profundas. Manejo de la Vía Aérea. Urgencia Dental. Infección Odontogénica.

1 INTRODUCTION

Ludwig's angina is a rapidly progressing deep cervical infection, characterized by diffuse cellulitis predominantly involving the submandibular, sublingual, and submental spaces, often associated with odontogenic infections originating in mandibular mandibular molars (FELLINI et al., 2017; ÜNAL; MOLLAOĞLU, 2025). Despite the significant reduction in mortality after the advent of antibiotic therapy and the expansion of access to dental care, the disease remains a potentially fatal medical-surgical emergency, especially due to the high propensity for acute respiratory failure, mediastinal dissemination, and systemic sepsis (MILLER; VON CROWNS; WILLOUGHBY, 2018).

The pathophysiology of the disease is related to the rapid infectious spread through the deep cervical fascial planes, favored by the wide anatomical communication between the submandibular and sublingual spaces, allowing contiguous progression to the parapharyngeal, retropharyngeal, and mediastinal compartments (MAHEEN et al., 2019; MAKKAR et al., 2022). This aggressive behavior produces exuberant edema of the oral floor, posterior displacement of the tongue, and progressive compression of the upper respiratory structures, configuring one of the most critical scenarios in the context of cervical infectious emergencies and difficult airway (LONG; DEMIRCI; KRUSE, 2018).

Although relatively rare, Ludwig's angina continues to be associated with high morbidity and mortality when clinical recognition and therapeutic intervention do not occur early. Contemporary evidence shows that respiratory deterioration remains the leading cause of disease-related death, particularly in cases accompanied by necrotizing descending mediastinitis, sepsis, and acute ventilatory failure (MILLER; VON CROWNS; WILLOUGHBY, 2018; SAKHUJA et al., 2022). In this context, clinical manifestations such as hardened submandibular edema, elevation of the oral floor, trismus, dysphagia, odynophagia, drooling, stridor, and imminent signs of respiratory failure are of decisive importance for the early recognition of the disease and immediate definition of the therapeutic approach (BHUIYAN; HOSSAIN; RAHMAN, 2022).

However, the clinical complexity of Ludwig's angina transcends the infectious control itself, since the preservation of airway patency represents the main prognostic determinant in these patients. The anatomical distortion caused by extensive cervical edema, associated with severe limitation of mouth opening, reduced cervical mobility, and posterior tongue displacement, often makes facemask ventilation and orotracheal intubation technically complex and potentially catastrophic procedures (FELLINI et al., 2017). In addition, inflammatory progression can convert, in a short period of time, initially patent airways into

critical scenarios of complete obstruction, imposing a high risk of ventilatory failure and sudden death by asphyxia (İSLAMOĞLU et al., 2018).

In this scenario, strategies such as awake fibrooptic intubation, videolaryngoscopy, cricothyroidotomy, and emergency tracheostomy have been described as fundamental alternatives for maintaining ventilatory support in patients with severe cervical infection (FELLINI et al., 2017; MAHEEN et al., 2019). However, there is significant heterogeneity in the literature regarding the choice of the ideal technique, the safest time for invasive intervention, and the clinical criteria capable of predicting imminent respiratory deterioration, especially in services with structural limitations and lack of standardized protocols for the approach to the difficult infectious airway (LONG; DEMIRCI; KRUSE, 2018). This lack of universal consensus substantially increases the therapeutic complexity of the disease, especially in view of the possibility of rapid clinical decompensation and irreversible ventilatory failure.

At the same time, recent advances in diagnostic and therapeutic methods have contributed to reducing complications associated with the disease. Contrast-enhanced computed tomography has established itself as an important tool in the evaluation of the anatomical extent of the infection, identification of purulent collections, mediastinal involvement, and early surgical planning (MAKKAR et al., 2022). From a therapeutic perspective, broad-spectrum antibiotic therapy associated with early surgical drainage and elimination of the odontogenic focus remains a fundamental pillar of contemporary treatment (ÜNAL; MOLLAOĞLU, 2025; SAKHUJA et al., 2022). In addition, the high complexity of these patients reinforces the need for a multidisciplinary approach involving anesthesiology, oral and maxillofacial surgery, otorhinolaryngology, head and neck surgery, and intensive care, particularly in cases accompanied by sepsis, mediastinitis, and acute respiratory failure (İSLAMOĞLU et al., 2018).

Despite the recognized clinical relevance of Ludwig's angina, there is a significant limitation of the available scientific evidence regarding early diagnosis and ideal strategies for the ventilatory approach in these patients. The contemporary literature remains predominantly composed of case reports, retrospective clinical series, and isolated observational analyses, evidencing a significant scarcity of robust studies and integrative reviews with a systematized critical approach. This limitation compromises the consolidation of universally accepted care protocols and reinforces the need for critical integration of the currently available evidence, especially in view of the high anatomical, infectious, and therapeutic complexity inherent to the disease.

Thus, the present integrative literature review aims to critically analyze the available scientific evidence on the early diagnosis and management of the airway in Ludwig's angina, emphasizing prognostic factors, therapeutic strategies, and clinical challenges related to deep cervical infections.

2 METHODOLOGY

This is an **integrative literature review**, with a qualitative approach and descriptive-analytical nature, developed with the purpose of gathering, evaluating and critically synthesizing scientific evidence about the early diagnosis and management of the airway in Ludwig's angina, in the context of deep cervical infections. The choice of this design is justified by the possibility of integrating studies with different methodological designs, including case reports, clinical series, observational studies, and clinical reviews, a particularly relevant condition in view of the scarcity of randomized clinical trials on cervical infectious emergencies and difficult airway.

The methodological approach was based on the classic framework of Whittemore and Knafl (2005), which guides the conduction of integrative reviews through the following steps: identification of the problem, formulation of the guiding question, definition of the search strategy, establishment of eligibility criteria, selection of studies, standardized data extraction, methodological critical evaluation and integrative synthesis of evidence.

The guiding question established was: **what is the available scientific evidence regarding early diagnosis and airway management strategies in patients with Ludwig's angina and deep cervical infections?**

The bibliographic search was planned for the **PubMed/MEDLINE, Scopus, Web of Science, ScienceDirect and LILACS databases**, using controlled descriptors obtained from the **DeCS** and **MeSH** vocabularies, combined by Boolean operators **AND** and **OR**. Terms related to *"Ludwig's angina", "deep neck infections", "airway management", "difficult airway", "cervical fascial space infections", "fiberoptic intubation", "tracheostomy", "airway obstruction"* and *"odontogenic infections" were used*.

Studies published in the last ten years, available in full, in English, Portuguese, or Spanish, that addressed early diagnosis, clinical signs, imaging tests, anesthetic management, advanced airway control, surgical treatment, antibiotic therapy, complications, and prognosis of Ludwig's angina were included. Different methodological designs, such as observational studies, case series, case reports, retrospective studies, systematic reviews, and meta-analyses, were considered eligible due to the limited availability of experimental studies on the subject.

Duplicate studies, letters to the editor, conference abstracts without complete data, reports without methodological rigor, articles without a direct relationship with Ludwig's angina or airway management, exclusively pediatric studies when not related to the central focus of the review, and studies without access to the full text were excluded.

The selection process took place in successive stages. Initially, the titles and abstracts were read to identify the thematic relevance. Then, the potentially eligible studies were read in full. The final evaluation was carried out critically, considering adherence to the objective of the review, methodological clarity, clinical relevance, and contribution to the understanding of early diagnosis and ventilatory management in deep neck infections. Any disagreements in the selection of studies were resolved by consensus among reviewers.

Data extraction was performed in a standardized manner, including: author and year of publication, study design, population or sample, clinical focus, strategies employed for airway management, diagnostic methods, therapeutic approach, main clinical outcomes, reported complications, and relevant conclusions. This systematization allowed for a critical comparison of the findings and identification of convergences, divergences, and gaps in the literature.

Data analysis was conducted in a descriptive, comparative, and critical manner, considering the heterogeneity of the studies, the predominance of case reports and clinical series, the methodological limitations of the available evidence, and the therapeutic challenges related to rapid respiratory deterioration, cervical anatomical distortion, and the absence of universal consensus regarding the optimal timing of advanced airway intervention.

Because this was a study based exclusively on secondary data from the scientific literature, without direct participation of human beings or access to identifiable individual information, there was no need to submit it to the Research Ethics Committee.

3 RESULTS AND DISCUSSION

The integrative analysis of the selected studies shows that Ludwig's angina remains an infectious emergency of high clinical severity, whose evolution is directly related to the speed of dissemination through the cervical fascial spaces and the risk of acute respiratory deterioration. Although advances in antibiotic therapy, cross-sectional imaging, and surgical-anesthetic techniques have reduced mortality compared to the pre-antibiotic period, upper airway obstruction remains the critical event with the greatest prognostic impact (FELLINI et al., 2017; MILLER; VON CROWNS; WILLOUGHBY, 2018; BHUIYAN; HOSSAIN; RAHMAN, 2022).

The studies analyzed converge in characterizing the disease as a deep cellulitis, predominantly odontogenic in origin, which affects the submandibular, sublingual, and submental spaces, with the possibility of progression to parapharyngeal, retropharyngeal, and mediastinal compartments (MAHEEN et al., 2019; MAKKAR et al., 2022; ÜNAL; MOLLAOĞLU, 2025). This anatomical continuity explains the clinical aggressiveness of the condition: oral floor edema, tongue elevation and posteriorization, and compression of supraglottic structures can transform an initially stable patient into a ventilatory emergency in a short period of time (LONG; DEMIRCI; KRUSE, 2018; İSLAMOĞLU et al., 2018).

From a semiological point of view, the presence of hardened submandibular edema, trismus, dysphagia, odynophagia, drooling, elevation of the oral floor, muffled voice, stridor, and signs of respiratory effort should be interpreted as a high-risk marker for imminent ventilatory failure. The reviewed literature demonstrates that the absence of stridor does not exclude severity, since the progression of edema can be silent until advanced stages, especially in patients with extensive infection, diabetes, immunosuppression, or therapeutic delay (BHUIYAN; HOSSAIN; RAHMAN, 2022; SAKHUJA et al., 2022). Thus, early diagnosis should not depend only on the frank manifestation of respiratory failure, but on the integration of clinical signs, risk factors, oropharyngeal physical examination, and anatomical imaging evaluation.

Contrast-enhanced computed tomography emerges as a central tool in the stratification of gravity, allowing the delimitation of purulent collections, extension to deep cervical spaces, signs of necrotizing fasciitis, mediastinal involvement, and the need for surgical drainage. However, its use should be conditioned to ventilatory safety: in cases of respiratory instability, imaging should not delay airway control (MAKKAR et al., 2022). This point is clinically decisive, as Ludwig's angina imposes a permanent tension between the need for accurate anatomical characterization and the urgency of intervention before complete obstruction.

Ventilatory management is the critical core of decision-making. Awake fibrooptic intubation is described as a particularly relevant strategy in patients with an early difficult airway, as it allows preservation of spontaneous ventilation and progressive visualization of respiratory structures, even in the face of limited mouth opening and cervical anatomical distortion (FELLINI et al., 2017). However, its applicability depends on technological availability, team experience, patient cooperation, and degree of supraglottic edema. In scenarios of advanced infection, profuse secretions, bleeding, or anatomical collapse, the technique may fail or become unsafe.

Videolaryngoscopy appears as a potential alternative in some contexts, but its effectiveness may be limited by severe trismus, macroglossia, oral floor edema, and cervical mobility restriction. Emergency tracheostomy, on the other hand, remains an indispensable strategy in cases of imminent obstruction, intubation failure, or impossibility of safe transoral access, although it also presents technical difficulties due to cervical edema, distortion of anatomical planes, and local infection (MAHEEN et al., 2019). Cricothyroidotomy, in turn, should be understood as a rescue measure in a "do not intubate, do not ventilate" situation, especially when ventilatory deterioration is abrupt. The literature, however, does not offer universal consensus on the ideal time for invasive intervention, nor on the superiority of one technique over another, reinforcing the need for individualized, early, and multidisciplinary decision making (FELLINI et al., 2017; LONG; DEMIRCI; KRUSE, 2018).

The absence of a universally accepted protocol represents one of the main weaknesses in care. Studies suggest that management should be guided by clinical severity, speed of progression, presence of stridor, anatomical extent of infection, team experience, and available resources. This decision-making heterogeneity is understandable, but it exposes the patient to the risk of therapeutic delay when the severity is underestimated. In this sense, early airway intervention should be considered not only in the face of installed obstruction, but also in the face of signs of anatomical and clinical progression suggestive of imminent deterioration (İSLAMOĞLU et al., 2018; SAKHUJA et al., 2022).

In addition to ventilatory control, the studies analyzed reinforce that effective treatment requires broad-spectrum intravenous antibiotic therapy, coverage for aerobic and anaerobic flora, early surgical drainage, and elimination of the odontogenic focus. The association between drainage and antibiotics was recurrent in reports with favorable evolution, especially when performed before mediastinal dissemination or the onset of severe sepsis (BHUIYAN; HOSSAIN; RAHMAN, 2022; ÜNAL; MOLLAOĞLU, 2025). Drainage should not only be understood as an infectious control measure, but also as a decompressive intervention capable of reducing tissue tension, local edema, and risk of respiratory progression.

The complications described in the selected studies show the systemic severity of the disease. Dissemination to the mediastinum, cervical necrotizing fasciitis, aspiration pneumonia, pleural empyema, sepsis, and respiratory failure are potentially fatal outcomes, especially when there is a diagnostic delay or fragmented management (MILLER; VON CROWNS; WILLOUGHBY, 2018; MAKKAR et al., 2022; SAKHUJA et al., 2022). Fatal reports reinforce that apparently localized odontogenic infections can progress to cervical necrosis, descending mediastinitis and death, demonstrating that Ludwig's angina should be treated as a time-dependent infectious syndrome.

The multidisciplinary approach appears as a cross-sectional element in studies with better outcomes. The integration between anesthesiology, oral and maxillofacial surgery, otorhinolaryngology, head and neck surgery, radiology, and intensive care allows for the alignment of priorities: protecting ventilation, controlling the infectious focus, defining the surgical moment, monitoring systemic progression, and planning safe extubation. This coordination becomes even more relevant because therapeutic success does not depend on a single intervention, but on the appropriate sequence between clinical recognition, respiratory stabilization, imaging, antibiotics, drainage, and intensive surveillance (LONG; DEMIRCI; KRUSE, 2018; FELLINI et al., 2017; ÜNAL; MOLLAOĞLU, 2025).

Finally, the available literature has important limitations. Case reports, small clinical series, and retrospective analyses predominate, with heterogeneity in terms of diagnostic criteria, patient severity, ventilatory control techniques, antimicrobial regimens, and time until surgical intervention. This fragmentation makes it difficult to formulate universal recommendations and prevents robust comparisons between strategies such as fibrooptic intubation, videolaryngoscopy, and tracheostomy. Even so, the convergence of the findings allows us to affirm that the prognosis of Ludwig's angina depends fundamentally on early recognition, anticipation of the difficult airway, aggressive control of the infectious focus, and coordinated action by experienced teams.

Thus, the results of this integrative review indicate that Ludwig's angina should be understood as a simultaneous anatomical, infectious, and ventilatory emergency. The main contemporary gap lies not only in the availability of therapies, but in the precise definition of the optimal time to apply them before deep cervical progression produces irreversible respiratory failure.

4 CONCLUSION

The present integrative review shows that Ludwig's angina remains a highly severe infectious emergency, characterized by rapid progression through the deep cervical fascial spaces and high potential for fatal respiratory deterioration. The prognosis is directly related to the early recognition of the disease, adequate clinical stratification, and timely ventilatory intervention, especially in the face of manifestations such as hardened submandibular edema, elevation of the oral floor, trismus, dysphagia, stridor, and imminent signs of respiratory failure. In this context, advanced airway control strategies, including awake fibrooptical intubation, videolaryngoscopy, and tracheostomy, play a central role, although the literature still does not present a universal consensus regarding the ideal technique or the safest time for invasive intervention.

The studies analyzed reinforce that the reduction of morbidity and mortality depends on an integrated multidisciplinary approach, associating broad-spectrum intravenous antibiotic therapy, early surgical drainage, elimination of the odontogenic focus, and intensive monitoring. However, the predominance of case reports, small retrospective series, and methodologically heterogeneous studies highlights an important limitation of the available evidence and hinders the standardization of care protocols related to ventilatory management in deep neck infections.

Thus, it is concluded that Ludwig's angina should be understood simultaneously as an infectious, anatomical and ventilatory emergency, in which the anticipation of the difficult airway is the main prognostic determinant. More than treating the established infection, therapeutic success depends on the ability to recognize signs of ventilatory impairment early and intervene before rapid cervical progression results in irreversible respiratory failure.

REFERENCES

Bhuiyan, M. M. K. H., Hossain, M. A., & Rahman, M. M. (2022). Ludwig's angina: An analysis of cases seen at tertiary care hospital. International Journal of Otorhinolaryngology and Head and Neck Surgery, 8(6), 535–538. https://doi.org/10.18203/issn.2454-5929.ijohns20221395

Fellini, R. T., Volquind, D., Schnor, O. H., Angeletti, M. G., & Souza, O. E. (2017). Airway management in Ludwig's angina: A challenge: Case report. Revista Brasileira de Anestesiologia, 67(6), 637–640. https://doi.org/10.1016/j.bjane.2014.10.010

İslamoğlu, Y., Fetullayev, T., Beton, S., Meco, B. C., & Meco, C. (2018). Giant Ludwig angina reason of airway obstruction. Journal of Academic Research in Medicine, 8(2), 116–118. https://doi.org/10.5152/jarem.2018.1678

Long, S. M., Demirci, T., & Kruse, S. R. (2018). "Air" on the side of caution: The importance of early recognition and intervention in Ludwig's angina. Case Reports in Internal Medicine, 5(3), 40–43. https://doi.org/10.5430/crim.v5n3p40

Maheen, M., Gopakumar, A., Philip, R. A., & Thomas, Z. (2019). A case report on Ludwig's angina: An ENT emergency. Asian Journal of Pharmaceutical and Clinical Research, 12(6), 3–4. https://doi.org/10.22159/ajpcr.2019.v12i6.32726

Makkar, A., Sharma, M., Sharma, A., Thakur, P., & Gupta, V. (2022). Radiological assessment of a rare potentially lethal acute neck infection in emergency: Ludwig's angina: A case report. IP International Journal of Maxillofacial Imaging, 8(1), 28–31. https://doi.org/10.18231/j.ijmi.2022.008

Miller, C. R., Von Crowns, K., & Willoughby, V. (2018). Fatal Ludwig's angina: Cases of lethal spread of odontogenic infection. Academic Forensic Pathology, 8(1), 150–169. https://doi.org/10.23907/2018.011

Sakhuja, A., Shrestha, D. B., Aryal, B. B., Mir, W. A. Y., & Verda, L. (2022). Rare angina: A case report of Ludwig's angina. Cureus, 14(6), e25873. https://doi.org/10.7759/cureus.25873

Ünal, R., & Mollaoğlu, N. (2025). A case of Ludwig's angina: A rare and potentially lethal neck infection. ADO Klinik Bilimler Dergisi, 14(2), 136–139. https://doi.org/10.54617/adoklinikbilimler.1618971

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. Journal of Advanced Nursing, 52(5), 546–553. https://doi.org/10.1111/j.1365-2648.2005.03621.x