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CASE REPORT

# Ludwig's angina in a child: a rare clinical case with complication of mediastinitis

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## Abstract

S.M.R.S., male, 8 years old, presented with odynophagia, prostration, fever, and dental caries, progressing to cervical pain and swelling in the cervical region, without respiratory insufficiency. A CT scan of the neck and chest was performed, showing an infectious process in the submandibular and submental regions, with cervical and left retro-pharyngeal extension and involvement of the mediastinal area. A diagnosis of Ludwigs angina was made, with complications leading to mediastinitis. Treatment was carried out with antibiotic therapy and surgical intervention, without airway compromise, resulting in complete improvement. The aim of this report was to describe a case of a serious and potentially fatal condition in pediatrics, highlighting the rapid diagnostic and therapeutic approach. Methodologically, clinical data were collected to correlate with the literature, supporting scientific evidence. Ludwigs angina (LA) is an infectious pathology affecting the primary mandibular spaces (submandibular, sublingual, and submental), initially stemming from odontogenic infections and upper airway infections. Clinically, it presents with fever, dysphagia, odynophagia, cervical edema, sialorrhea, cervical pain, and dysphonia, and may progress to respiratory insufficiency due to extrinsic airway compression and sepsis. The diagnosis is based on clinical evaluation, supplemented by imaging studies. Treatment involves airway management, antibiotic therapy, and surgical intervention in certain cases. Due to the risk of potentially fatal complications, it is a medical emergency that stands out in the differential diagnosis of cervical masses in children.

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## INTRODUCTION

Ludwig's angina (LA) is an infectious disease that affects the primary mandibular spaces (submandibular, sublingual, and submental). Its prevalence is higher in adults, accounting for 75% of cases, and is less frequent in pediatrics, accounting for only 25% of cases[1-4]. In children, the primary etiology is related to odontogenic infections, especially dental caries, as well as upper respiratory tract infections. The clinical course is progressive and rapid, with a risk of airway obstruction and potential mediastinal involvement, as well as progression to septic shock. The main pathogen isolated in culture is Streptococcus viridans. Diagnosis is based on clinical manifestations, with the aid of cervical tomography as an imaging test. Treatment involves hemodynamic and ventilatory support, focusing on airway patency, as well as early antibiotic therapy. The primary objective is to report the case of a pediatric patient with an odontogenic infection, which progressed to Ludwig's angina and complicated mediastinitis. The patient was adequately treated, required surgical intervention, and presented a favorable clinical outcome. This study collected data from electronic medical records and conducted a literature review based on a case report of Ludwig's angina and complicated mediastinitis in a pediatric patient admitted to a hospital in southern Brazil, aiming to correlate clinical data with the literature.

## CASE REPORT

SMRS, male, 8 years old, 26 kilos, previously healthy, vaccinations updated according to the National Immunization Plan.

The patient began experiencing odynophagia and prostration three days ago. The following day, he developed a daily fever (maximum 38.6°C) every six hours, which partially subsided with antipyretics, as well as neck pain, with worsening of previous symptoms. He continued having feverish episodes for two days, progressing to worsening pain complaints, associated with loss of appetite and prostration. He denied previous respiratory and gastrointestinal symptoms. He sought care at the emergency room of a pediatric hospital on the third day of symptoms due to persistent fever and worsening neck pain. Upon hospital admission, he was in fair general condition, febrile, flushed, dehydrated, but normal-bodied and eupneic, with no changes in oxygen saturation, and no signs of respiratory distress. Glasgow Coma Scale score ( GCS) was[5]. Cardiac and pulmonary auscultation were unremarkable, and the abdominal examination was normal. The extremities were warm, and the filling time was 2 seconds. The patient presented with nuchal rigidity and limited cervical movement, but with negative Kernig and Brudzinski signs. An oroscopy revealed dental caries in the lower left first and third molars, with no limitation in mandibular opening. The physical examination showed no other abnormalities. Laboratory tests were performed and a lumbar puncture was performed to rule out meningitis. Leukocytosis was observed (25,340 leukocytes - VR 5,000-14,000, with a predominance of segmented leukocytes and a left shift), increased C-reactive protein (CRP) levels, with an initial value of 177.11 (VR <5.0), and a normal cerebrospinal fluid sample. The initial diagnostic hypothesis of cervical abscess was formulated. The patient was admitted for diagnostic elucidation and empirical antibiotic therapy was initiated with ceftriaxone 100mg/kg/day.

The following day, while still febrile, he developed edema and progressive bulging in the left cervical region, with local hyperemia, associated with dysphagia and worsening neck pain. A neck and chest CT scan was performed, and the report revealed an infectious process in the submandibular and submental regions, extending to the left cervical and retropharyngeal regions and mediastinal involvement, with associated mediastinitis. Due to clinical worsening consistent with the imaging findings, clindamycin 40 mg/kg/day was added to the treatment regimen. Based on the clinical progression, laboratory findings, and CT scan, a diagnosis of Ludwig's angina was made, with complications of mediastinitis. The head and neck surgery team performed an uneventful surgical approach, with drainage of cervical and mediastinal contents and a sample sent for culture. The surgical procedure and post-anesthesia recovery were uneventful, and the postoperative period did not require intensive care. There was no progression to acute respiratory failure, and the patient did not meet the Phoenix Sepsis Score criteria for sepsis. During hospitalization, an echocardiogram was performed to rule out cardiac involvement, but no evidence of endocarditis or pericarditis was found. The patient improved clinically and laboratory results, remaining afebrile, with resolution of edema and bulging, improved neck pain and cervical mobility, and no dysphagia. She remained in the pediatric ward throughout her hospitalization. Laboratory tests also showed progressive improvement, with a normal leukocyte count (7,800, segmental predominance, and no left shift) and a decreasing CRP (19.5) on the tenth day of hospitalization. Cervical secretion culture results were positive for multisensitive Streptococcus viridans, and blood cultures were negative. On the fifteenth day of hospitalization, after completing two weeks of antibiotic therapy, he was clinically stable, without complaints, with only persistent dental caries on oroscopy and residual cervical edema, and no other changes on physical examination. He was discharged for outpatient follow-up with a head and neck surgeon, a dentist, and a pediatrician.

## DISCUSSION

Ludwig's angina (LA), by definition, is characterized as an infectious process that extends to the primary spaces of the mandible, namely the submandibular, sublingual, and submental spaces[1,2]. The course is usually rapidly progressive, with extension to underlying tissues, retropharyngeal involvement, and progression to airway involvement due to

extrinsic compression[1,2]. The main etiology is dental, with primary odontogenic infections, particularly in the involvement of the mandibular second and third molars[1,2]. In addition to this factor, LA can also be triggered by mandibular trauma, lesions of the floor of the mouth, sialolithiasis, parotitis, and upper airway infections, such as bacterial pharyngotonsillitis, peritonsillar abscesses, and acute otitis media[1-3]. In the pediatric age group, dental etiologies and previous respiratory tract infections stand out[2]. As reported, the patient's etiology is common within his age group, with the initial infectious focus being odontogenic, as evidenced on physical examination. However, the pediatric population is more vulnerable to complications arising from the condition, with a risk of sequelae inherent to the disease and also secondary to prolonged hospitalization[3].

The microbiology involved in the pathogenesis of AL is predominantly composed of microorganisms from the oral cavity flora, with a polymicrobial involvement prominent. The main bacterium isolated in culture samples was Streptococcus viridans[1]. However, Staphylococcus aureus, Fusobacterium, and group A beta-hemolytic Streptococcus[1,5] also stand out. This microbiological indicator corroborates the case, in which the patient's secretion culture sample isolated multisensitive Streptococcus viridans.

The pathophysiology of AL, particularly in odontogenic cases, is explained by the proximity of the submandibular space to the roots of the molars, which is the first space affected. Therefore, the infectious process spreads contiguously, affecting other spaces and may extend to adjacent tissues, with bilateral involvement of the mandible. The infection has a rapid and progressive course and may affect the tongue, pharynx, palate, and, in more severe cases, the parapharyngeal, retropharyngeal, and mediastinal spaces[1,4,5]. The reported case corroborates the literature, with a rapid and progressive progression of the condition. The patient described sought care on the third day of symptoms due to clinical worsening, with insidious onset of fever, prostration, and odynophagia, in which an odontogenic focus was identified. However, 24 hours after hospital admission, on the fourth day of symptoms, the patient presented clinical progression to neck pain and cervical bulging, with worsening of the general condition and mediastinal involvement already evident on imaging.

Clinically, the main initial manifestations are fever, dysphagia, odynophagia, cervical edema, sialorrhea, neck pain, and dysphonia[1,2,5]. As clinical progression progresses, trismus may develop due to involvement of the parapharyngeal space, involving the masticatory muscles. Furthermore, as extrinsic airway involvement develops, the patient may experience dyspnea and respiratory distress[1,2,5]. On physical examination, findings vary depending on the disease's progression. Submandibular edema may be found, with associated hyperemia and redness, tenderness on cervical palpation, and palpable crepitus at the site. Oroscopy may reveal a possible etiology, including odontogenic infection in the molars, peritonsillar exudate and abscess, or local trauma, as well as lingual edema. Consequently, the patient may assume a forward-leaning position with an open oral cavity, both in an attempt to facilitate air entry. Furthermore, as the condition progresses and the airway becomes compromised, the patient may experience tachypnea, audible stridor, use of accessory muscles, and develop hypoxemia. In these cases, if severe impairment occurs, there may be an altered level of consciousness due to prolonged hypoxemia. Complications may arise from acute respiratory failure due to airway compromise or from the progression of the infectious condition, leading to septic shock[1,2,5].

In the case described, despite significant local involvement in the cervical region (bulging, redness, hyperemia, and local pain) and the extension of the infectious process to mediastinitis, the patient did not experience hemodynamic decompensation, airway compromise, or respiratory failure. These data corroborate and reinforce the importance of accurate diagnosis and immediate intervention, especially to halt the progression of the infectious process and prevent clinical deterioration.

The diagnosis is based on clinical evaluation, complemented by imaging studies, with emphasis on computed tomography (CT). As described in other cases, CT combined with clinical findings had a sensitivity of 95% and a specificity of 80%[1,6-8]. This finding was corroborated in the present report. Due to the presence of cervical bulging associated with clinical manifestations, the need for imaging studies was evident, with CT results being mandatory for diagnosis and treatment (Figure 1).

Treatment, from the moment of diagnosis, should be initiated as soon as possible, including appropriate airway management (AIR), antibiotic therapy, and surgical intervention when necessary. Initial clinical treatment is crucial for the progression of severe cases. In patients who develop respiratory compromise, hypoxemia, and consequent respiratory failure, advanced airway management is indicated, primarily by nasotracheal intubation, if possible with fiberoptic visualization, or even emergency tracheostomy, especially in pediatric patients. It should be noted that both blind orotracheal and nasotracheal intubation with a traditional laryngoscope can be difficult to perform and can worsen local edema, with the possibility of severe laryngospasm. Cricothyroidotomy is compromised due to significant cervical involvement[1,2,4,5]. Initial antibiotic therapy involves broad-spectrum coverage for Gram-positive, Gram-negative, and anaerobic bacteria. In immunocompetent patients, the empirical regimen initially includes ampicillin with sulbactam or ceftriaxone combined with metronidazole or clindamycin[1,2,5]. For immunocompromised patients, the therapeutic regimen is escalated to cover resistant gram-negative bacteria, such as Pseudomonas aeruginosa, as well as in cases of patients at increased risk for methicillin-resistant Staphylococcus aureus (MRSA) infection, such as previous MRSA colonization,

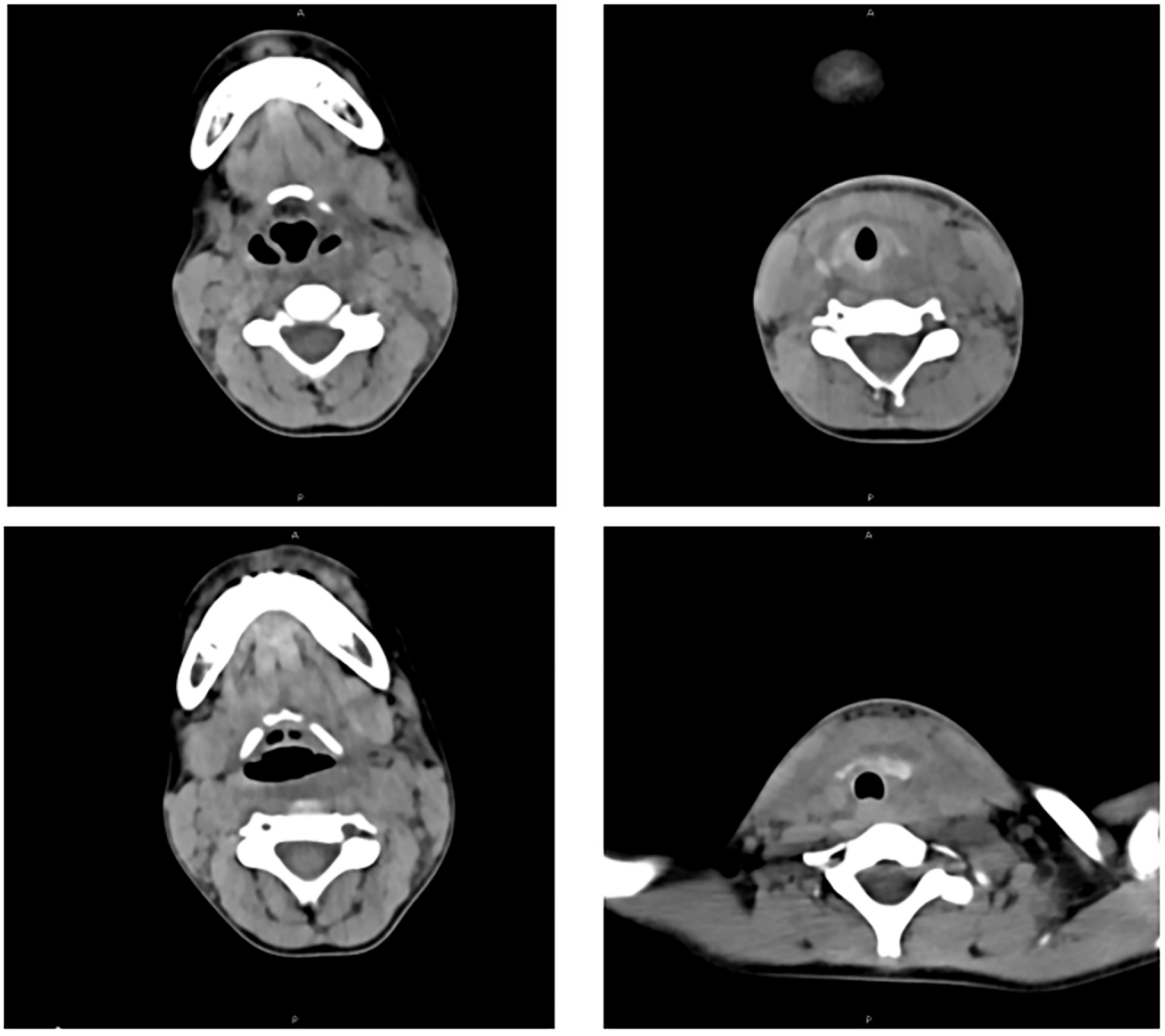


**Figure 1.** Tomography sections of the neck and chest, with obliteration of the soft tissues of the deep planes of the neck, compromising the cervical mucosal and retropharyngeal spaces and the visceral space of the neck on the left, extending to the introitus of the superior mediastinum, with the impression of organized collections, compatible with abscess and mediastinitis.

injection drug use, recent hospitalization, or a condition with rapid progression to septic shock. In these cases, the regimen with cefepime, meropenem, or piperacillin + tazobactam is indicated, combined with an anti-MRSA agent, such as vancomycin or linezolid[1,3,5]. The duration of antibiotic treatment is two to three weeks, depending on the evidence of clinical and laboratory improvement, with sequential assessment of leukocytosis, CRP and procalcitonin levels being useful tools for this determination[1].

Surgical treatment is reserved for cases of initial antibiotic failure, evidence of abscesses, or associated complications, in which external incision and drainage would be beneficial in decompressing and reducing the infectious process[2,5]. In cases where a collection is identified during surgical treatment, culture collection is indicated to identify the pathogen. It should also be noted that in cases with an identified odontogenic source, a specific dental approach and treatment are required.

The patient in question was initially promptly managed in the emergency department. Since there was no respiratory compromise, an advanced airway was not indicated. The antibiotic regimen administered in this case is consistent with other cases described. It was decided to continue the treatment regimen for two weeks due to the good clinical and laboratory response, without the need for extended therapy. In this case, since the neck and chest CT scan revealed an associated purulent collection, a surgical approach was indicated for drainage of the contents, particularly due to the associated mediastinal involvement.

Regarding potential complications of the infectious process, mediastinitis is the main complication highlighted in the literature, particularly due to its potential mortality of up to 29%, which reinforces the need for rapid identification and management. However, other potential complications include septic shock, necrotizing fasciitis, pericarditis, internal carotid artery rupture, jugular vein thrombosis, and pleural empyema.

[2,3,5]. Correa et al.[2] demonstrated that 41.17% of cases progress to mediastinitis and 35.29% to septic shock. Based on the clinical course described, in this case, the patient presented rapid progression of the infectious process. The odontogenic etiology was evidenced on physical examination after seeking medical attention due to acute clinical manifestations. Consequently, contiguous spread was evident early in the hospitalization, with evidence of cervical involvement and complications of the condition to the mediastinal region, without cardiac involvement. Therefore, early diagnosis, effective therapy, and identification of the infectious agent were essential for managing the condition, which constitutes a medical emergency due to the risk of worsening. Furthermore, the case description is noteworthy as a contributor to pediatric literature and clinical practice.

## CONCLUSION

AL is particularly important in the differential diagnosis of infectious processes with manifestations of cervical involvement. Addressing a rare and potentially risky case, it becomes particularly relevant due to the prevalence of odontogenic and airway infections, thus highlighting the importance of pediatricians' understanding of the pathology. Due to its severity and associated mortality, the rapid progression of the condition is crucial as a marker of the importance of prompt diagnosis and prompt treatment. Therefore, this study serves as a valuable resource and contributes to the discussion of AL in pediatrics, particularly given the scarcity of reports in this age group, contributing to a better diagnostic and therapeutic approach.

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