



(CASE REPORT)



FROM THE MOUTH TO THE MEDIASTINUM: DESCENDING NECROTIZING MEDIASTITIS SECONDARY TO AN ODONTOGENIC ABSCESS: A CASE REPORT

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ABSTRACT

Descending necrotizing mediastinitis (DNM) is a rare but potentially fatal infection, usually secondary to deep odontogenic infections. Its rapid progression through the deep cervical spaces into the mediastinum requires timely diagnosis, early control of the infectious focus, and multidisciplinary management.

We present the case of a 20-year-old male patient from a rural area, with no relevant medical history, no history of substance abuse, HIV-negative, and no evidence of diabetes mellitus or other immunosuppressive factors. He presented with a seven-day history of molar pain associated with progressive edema, unquantified fever, and subsequently dysphagia with deterioration of his general condition. Upon admission, he exhibited a systemic inflammatory response with predominantly neutrophilic leukocytosis, elevated C-reactive protein and procalcitonin, with preserved renal and hepatic function. A cervical computed tomography scan revealed an odontogenic abscess with gas in the deep tissues of the neck. Initial treatment included tooth extraction, abscess drainage, cervicotomy with debridement and cervical lavage, and broad-spectrum antibiotic therapy. Due to persistent fever and unfavorable evolution, a follow-up CT scan showed extension of the infection to the mediastinum, classified as descending necrotizing mediastinitis type IIA according to Endo. Mediastinal drainage was performed via video-assisted thoracoscopic surgery (VATS), along with pleural drainage for empyema. During the procedure, the patient developed septic shock requiring vasopressors and was admitted to the intensive care unit, with subsequent favorable evolution following comprehensive management.

This case highlights that MND can occur in young, immunocompetent patients and demonstrates the importance of early diagnosis, a multidisciplinary approach, and the use of minimally invasive techniques such as VATS to achieve adequate infection control and a satisfactory outcome.

Keywords: Descending Necrotizing Mediastinitis; Odontogenic Abscess; Video-Assisted Thoracic Surgery; Odontogenic Infection; Deep Neck Infection; Septic Shock.

1 INTRODUCTION

Descending necrotizing mediastinitis (DNM) is one of the most serious mediastinal infections and represents a medical-surgical emergency with high morbidity and mortality. It is characterized by the rapid spread of an infection originating in the oropharyngeal region, deep cervical region, or oral cavity to the mediastinum through the cervical fascial planes. Although it is a rare condition, its progression can be fulminant, favoring the development of sepsis, septic shock, and multiple organ failure when diagnosis and treatment are delayed. Despite advances in diagnostic imaging, antimicrobial treatment, and surgical techniques, mortality continues to range between 10% and 40%, depending on the anatomical extent of the infection and the timeliness of controlling the infectious focus (1, 3).

Odontogenic infections are a major cause of descending necrotizing mediastinitis. Abscesses originating in the mandibular molars can spread to the submandibular, parapharyngeal, and retropharyngeal spaces, as well as the so-called "danger space," allowing the dissemination of microorganisms to the mediastinum, facilitated by gravity, respiratory movements, and negative intrathoracic pressure. The microbiology is usually polymicrobial, with *Streptococcus group*, *Streptococcus viridans*, *Staphylococcus aureus* and anaerobic bacteria of the oral flora, such as *Prevotella*, *Fusobacterium* and *Bacteroides*, which justifies the initial use of broad spectrum antibiotics with coverage for aerobes and anaerobes (1, 4).

Early recognition of this condition remains a challenge because initial clinical manifestations can be nonspecific. Patients typically present with fever, odynophagia, dysphagia, neck pain, neck swelling, trismus, and signs of deep neck infection, subsequently progressing to chest pain, dyspnea, subcutaneous emphysema, pleural effusion, and systemic involvement. Contrast-enhanced computed tomography of the neck and chest is the preferred study, as it allows for confirmation of the diagnosis, delineation of the extent of the disease, identification of mediastinal and pleural fluid collections, demonstration of the presence of gas in the soft tissues, and planning of the surgical approach. Furthermore, the diagnostic criteria described by Estrera et al. remain the basis for the diagnosis of this condition and have been validated by contemporary reviews (1, 2, 5, 8).

Treatment should be initiated immediately and requires a multidisciplinary approach involving maxillofacial surgeons, head and neck surgeons, thoracic surgeons, intensivists, infectious disease specialists, and anesthesiologists. Therapeutic pillars include airway management when necessary, early administration of broad-spectrum intravenous antibiotics, eradication of the odontogenic focus through drainage and tooth extraction, and aggressive surgical drainage of cervical and mediastinal fluid collections. The European consensus Association for Cardio- Thoracic The European Association for Surgery (EACTS) recommends individualizing the surgical strategy according to the anatomical extent determined by computed tomography, prioritizing early and complete control of the infectious focus (1, 3, 6, 9).

In recent years, video-assisted thoracic surgery (Video- Assisted) Thoracoscopic Virtual thoracotomy (VATS) has acquired an increasingly important role in the treatment of descending necrotizing mediastinitis. Several studies have demonstrated that, in appropriately selected patients, this minimally invasive technique allows for effective mediastinal and pleural drainage, excellent visualization of fluid collections, less surgical trauma, less postoperative pain, a reduction in respiratory complications, and a faster functional recovery compared to conventional thoracotomy, without compromising adequate control of the infectious focus. Recent evidence supports the use of VATS as a safe and effective alternative, especially in patients with involvement of the inferior mediastinum and pleural extension (1, 2, 7, 10).

We present the case of a patient with descending necrotizing mediastinitis secondary to an odontogenic abscess, treated with cervical drainage, broad-spectrum antibiotic therapy, and mediastinal drainage via video-assisted thoracic surgery (VATS), with a favorable clinical course and satisfactory recovery. This case highlights the importance of early diagnosis, early CT evaluation, a multidisciplinary approach, and the timely use of minimally invasive surgical techniques to improve the prognosis of a potentially fatal disease, providing further evidence on the usefulness of VATS in the management of this complex pathology (1, 2, 7, 11).

2 CASE REPORT

We present the case of a 20-year-old male patient from a rural area with no significant past medical history. He denied any history of diabetes mellitus, hypertension, cardiovascular disease, neoplasms, autoimmune diseases, or immunodeficiencies. He also denied tobacco, alcohol, and illicit drug use. As part of the etiological workup, serology for human immunodeficiency virus (HIV) was negative, and glycated hemoglobin was within normal limits, ruling out diabetes mellitus. He had no other known immunosuppressive factors.

The patient presented to the emergency department with a seven-day history of symptoms initially characterized by intense pain localized to the lower molar region, associated with gingival swelling and progressive edema of the ipsilateral side of the face. She reported an unquantified fever, without a specific time of day, accompanied by general malaise. During the following days, the edema progressed to the cervical region, the pain intensified, and progressive dysphagia developed, limiting oral intake. Fever persisted, and her general condition deteriorated, prompting her to seek medical attention.

On admission, the patient was febrile, hemodynamically stable, and presented with significant cervical edema. Physical examination revealed an odontogenic abscess involving the lower molars, associated with cervical swelling, local erythema, and intense pain on palpation, with no initial signs of neurological involvement. Laboratory studies showed leukocytosis with a predominance of segmented neutrophils, a C-reactive protein level of 100 mg/L, and a procalcitonin level of 10 ng/ mL, consistent with a significant systemic inflammatory response. Renal and liver function tests were within normal limits.

Due to suspected deep neck infection, the patient underwent multidisciplinary evaluation by the Maxillofacial Surgery, General Surgery, and Internal Medicine departments. A contrast-enhanced computed tomography scan of the neck was performed, which revealed multiple cervical fluid collections with gas in the deep neck spaces, findings consistent with a complicated odontogenic abscess and necrotizing cervical infection.

Broad-spectrum empirical antibiotic therapy was initiated immediately, and surgical control of the infectious focus was performed by extracting the affected teeth, draining the odontogenic abscess, performing a wide cervicotomy with debridement of devitalized tissue, thorough irrigation, and placement of cervical drains. Due to resource limitations at the hospital, it was not possible to obtain microbiological cultures of the purulent material.

Despite initial management, the patient's clinical course deteriorated over the following hours, with persistent fever and elevated inflammatory markers. A follow-up computed tomography (CT) scan of the neck and chest was performed. The study revealed spread of the infection to the mediastinum with the presence of gas and mediastinal fluid collections, confirming the diagnosis of descending necrotizing mediastinitis. According to the Endo classification, the disease was categorized as type IIA, as it was limited to the anterior inferior mediastinum.

Considering the progression of the infection, it was decided to perform mediastinal drainage using video-assisted thoracic surgery (Video- Assisted Thoracoscopic Surgery (VATS), complemented by extensive lavage of the pleural cavity. Pleural empyema was also documented during the procedure, so a thoracostomy tube was placed for continuous drainage.

During the surgical procedure, the patient experienced hemodynamic deterioration consistent with septic shock, characterized by persistent hypotension requiring vasopressor support. He was therefore transferred to the Intensive Care Unit (ICU) for monitoring and comprehensive management. In the ICU, continuous hemodynamic assessment was performed, and treatment was initiated according to the recommendations for sepsis and septic shock. He remained hospitalized for four days.

Empirical broad-spectrum antibiotic therapy was initiated with a carbapenem for coverage of gram-negative bacilli, including extended-spectrum β - lactamase- producing microorganisms and anaerobes, associated with coverage of gram-positive cocci, including *Staphylococcus*. methicillin -resistant *Staphylococcus aureus*, considering the odontogenic origin of the infection and the severity of the clinical presentation. Due to limitations at the hospital, it was not possible to obtain microbiological cultures to guide antimicrobial therapy.

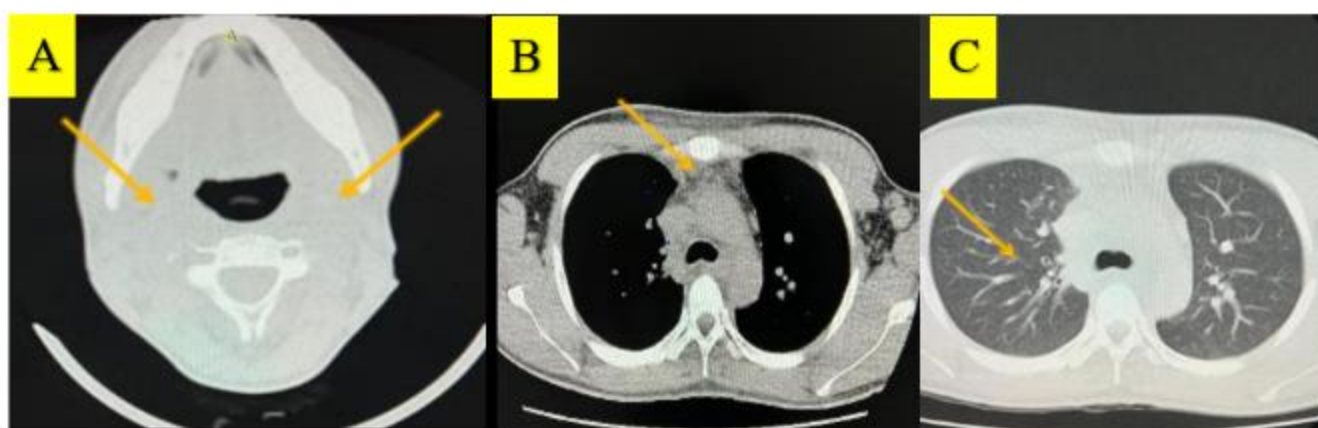
Following cervical drainage, thoracic access via video-assisted thoracic surgery (VATS), adequate control of the infectious focus, and the initiation of antibiotic treatment, the patient showed a favorable clinical course. Vasopressor support could be discontinued 48 hours after the procedure due to the restoration of hemodynamic stability. Furthermore, the fever resolved, leukocytosis and inflammatory markers progressively decreased, the patient's general condition improved, and the clinical course remained satisfactory during their stay in the ICU, without the development of new infectious or surgical complications.



Figures 1 A, B, C and D: Tomography in different planes showing a odontogenic infection with gas and extension to the neck and mediastinum area, yellow arrows indicating the presence of gas.



Figures A, B, C: Surgical control of mediastinal infection using VATS in descending odontogenic necrotizing mediastinitis.



Figures 2 A, B, C: Follow-up CT scan showing patient evolution after source control, VATS and broad-spectrum antibiotic therapy. Yellow arrows show absence of gas in the neck and mediastinum.

3 DISCUSSION

Descending necrotizing mediastinitis (DNM) remains a rare but highly morbid and deadly condition, despite advances in diagnostic imaging, antimicrobial treatment, and surgical techniques. Its progression depends primarily on early recognition, timely control of the infectious focus, and a multidisciplinary approach. Most cases originate from odontogenic or pharyngeal infections that progress through the deep fascial planes of the neck to the mediastinum,

facilitated by negative intrathoracic pressure and the anatomical continuity of the cervical spaces. In this case, the infection had a clearly identified odontogenic origin, with rapid progression to the deep neck spaces and subsequent mediastinal extension, a pattern widely described in the literature (1, 2, 4).

Unlike most patients described in published series, who present with predisposing factors such as diabetes mellitus, immunosuppression, alcoholism, or chronic kidney disease, our patient was a previously healthy young adult with no relevant medical history, negative HIV serology, normal glycosylated hemoglobin, and no other immunosuppressive factors. This finding demonstrates that odontogenic mycosis can also develop in immunocompetent individuals when the odontogenic focus does not receive timely treatment, a situation described in recent reviews that emphasize that the aggressiveness of the infection depends on both bacterial virulence and the rate of spread through the deep cervical spaces (1, 2).

Contrast-enhanced computed tomography played a fundamental role in both the initial diagnosis and the identification of disease progression. Initially, it demonstrated the presence of gas and fluid collections in the deep cervical spaces, findings highly suggestive of necrotizing cervical infection. Subsequent CT scans revealed extension to the mediastinum with the presence of mediastinal gas, confirming the diagnosis of descending necrotizing mediastinitis. These findings support current recommendations, which consider computed tomography the diagnostic method of choice and an indispensable tool for planning surgical treatment and assessing the need for reinterventions (1, 3).

Early control of the infectious focus is the main prognostic determinant. In this case, the affected teeth were extracted, the odontogenic abscess was drained, and a wide cervicotomy with debridement and cervical lavage was performed immediately after diagnosis. However, despite adequate initial management, the patient progressed to descending necrotizing mediastinitis, demonstrating that isolated cervical drainage may be insufficient when the infection has reached the mediastinum. This behavior is consistent with the recommendations of Endo et al., who propose individualizing the surgical approach according to the anatomical extent demonstrated by computed tomography (6).

Our patient was classified as having type IIA descending necrotizing mediastinitis according to the Endo classification, characterized by involvement of the anterior inferior mediastinum. Although historically these patients were treated via thoracotomy, in recent years video-assisted thoracoscopic surgery (VATS) has demonstrated comparable results with less surgical trauma. In this case, mediastinal drainage using VATS allowed for adequate control of the infectious focus, combined with drainage of the pleural empyema via thoracostomy tube placement. Several recent series have demonstrated that VATS offers adequate mediastinal exposure, less postoperative pain, a lower incidence of respiratory complications, and faster recovery when performed in experienced centers (1, 2, 7).

Another relevant aspect was the development of septic shock during surgical treatment, a situation frequently described in patients with MND due to the intense systemic inflammatory response secondary to polymicrobial infections. The patient required vasopressor support and admission to the intensive care unit, where he received continuous hemodynamic monitoring and comprehensive management according to current recommendations for sepsis and septic shock. The early initiation of broad-spectrum empirical antibiotic therapy with a carbapenem combined with vancomycin provided adequate coverage against Gram-positive, Gram-negative, and anaerobic microorganisms, a widely accepted recommendation as long as microbiological cultures are available. In our case, the lack of cultures represented a limitation stemming from the diagnostic capabilities of the hospital; however, the excellent clinical response allowed us to maintain the empirical regimen until the resolution of the infection (1, 3).

The favorable clinical evolution observed after cervical drainage, thoracic access via VATS, and intensive treatment highlights the importance of coordinated multidisciplinary management among maxillofacial surgery, thoracic surgery, general surgery, internal medicine, and intensive care. Discontinuation of vasopressor support within the first 24 hours after the procedure, resolution of fever, progressive decrease in leukocytosis, and improvement in the patient's general condition suggest adequate control of the infectious focus, considered the main prognostic factor in this disease. This case provides further evidence supporting the early use of minimally invasive techniques in selected patients with descending necrotizing mediastinitis, even in settings with limited microbiological resources, provided there is early surgical intervention and timely intensive management (1, 2, 7).

Finally, this case emphasizes that descending necrotizing mediastinitis should be suspected in any patient with deep odontogenic infection and rapid progression of cervical edema, especially when there is persistence of the systemic inflammatory response despite initial drainage. Early recognition, repeat CT scans in the event of an unfavorable clinical course, broad-spectrum antimicrobial treatment, and aggressive control of the infectious focus through cervical and mediastinal drainage are fundamental strategies for reducing the high mortality associated with this disease (1, 7).

4 CONCLUSION

Descending necrotizing mediastinitis is a rare surgical emergency with high morbidity and mortality, requiring early diagnosis and timely treatment to improve prognosis. This case demonstrates that it can occur in young, immunocompetent patients; therefore, the absence of risk factors should not rule out this condition in cases of rapidly progressing odontogenic infection with cervical involvement.

Computed tomography was crucial in establishing the diagnosis, assessing the extent of the infection, and promptly detecting its progression to the mediastinum. Furthermore, early control of the infectious focus through tooth extraction, cervical and mediastinal drainage via video-assisted thoracoscopic surgery (VATS), placement of a chest tube, and source control through surgical lavage, combined with broad-spectrum antibiotic therapy and intensive management of septic shock, resulted in a favorable clinical outcome.

Although the inability to obtain microbiological cultures was a limitation in this case, the clinical response obtained demonstrates that an early multidisciplinary approach, based on timely surgical control of the infectious focus, broad-spectrum empirical antimicrobial treatment, and comprehensive management in the intensive care unit, can favorably modify the prognosis even in environments with limited diagnostic resources.

This case highlights the importance of a multidisciplinary approach and supports the use of VATS as an effective and minimally invasive alternative for the treatment of descending necrotizing mediastinitis in selected patients. Early recognition of this disease and timely surgical control of the infectious focus remain the main factors associated with improved survival and a lower incidence of complications.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript. No financial, professional, or personal relationships influenced the clinical management, interpretation of the information, or preparation of this report.

Statement of ethical approval

Ethical approval was not required for this case report, as it describes the clinical course and management of an individual patient and does not involve experimental intervention or research procedures. Patient information was handled in accordance with applicable ethical principles, maintaining confidentiality and protecting the patient's identity.

Statement of informed consent

Written informed consent was obtained from the patient for publication of this case report, including relevant clinical information and diagnostic and/or clinical images. The patient was informed that reasonable measures would be taken to protect personal identity and confidentiality.

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