

CASE REPORT

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Necrotizing descending mediastinitis by *Acinetobacter Baumannii* in an out-patient: a case report

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Abstract

Background: Complicated cervico-facial cellulitis is an infectious disease which can have fatal prognosis. Necrotizing descending mediastinitis is a rare and fatal complication of cervico-thoracic cellulitis. This is the case of necrotizing descending mediastinitis complicating by a multi-resistant *Acinetobacter Baumannii* in a 27-year-old female, with early management of hemodynamic, respiratory and surgical emergencies, and very careful post-operative care, resulting in very satisfying outcome.

Case presentation: The patient presented was first treated with broad spectrum antibiotics for Ludwig's angina for 10 days, then presented with a swelling of sub-mandibular, sub-mental, and cervical regions, a mild respiratory distress, with clinical enhancement of dyspnea in proclive position, tachycardia of 100 beats per minute, and arterial blood pressure of 10/5.

Clinical exam showed a tight trismus, with oral opening inferior to 1 cm, no inflammatory signs in facial and cervical swollen areas, and a saturation of 95% in proclive position. Auscultation suspected a pericardial effusion. CT scan with and without injected contrast medium showed diffuse abscesses of sub-mental, sub-mandibular, retro-pharyngeal, para-pharyngeal regions, along with mediastinal abscesses and pericardial effusion. Trans-thoracic ultrasound showed 2 cm pericardial effusion, preserved function of myocardium, and without signs of tamponade. The diagnosis of necrotizing descending mediastinitis with pericardial effusion was established.

The patient underwent a course of wide spectrum antibiotic therapy, low doses of catecholamine, and a surgical drainage through cervical approach of all implicated zones. The surgical dissection was thorough and difficult due to diffuse fibrosis found in tissues of cervical regions. Two hundred milliliters of pus was evacuated, with a placement of surgical drains and Delbet blades.

Bacteriological exam found an *Acinetobacter Baumannii* sensitive to colistin only.

The post-operative outcome showed clinical and biological enhancement; however, a residual mediastinal collection appeared in control CT scan after 48 h, which indicated a surgical revision through mediastinoscopy.

The post-operative outcome was satisfying with stabilized clinical, biological, and radiological aspects.

Conclusions: Necrotizing descending mediastinitis is an infectious disease correlated with a very elevated mortality rate, and management is based on airway control, antibiotic therapy, and surgical treatment, as well as the post-operative intensive unit care.

Early diagnosis and appropriate management enhances outcome and decreases mortality significantly.

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Background

Cervico-facial cellulitis is an infectious disease which can be fatal [1–3]. Management of complicated cervico-facial cellulitis is based on three very important components: surgery, medical therapy, and resuscitation techniques, especially airway control [1].

This is a rare case of necrotizing descending mediastinitis due to a multi-resistant germ, with delayed multi-disciplinary management but very satisfying outcome.

Case presentation

A 27-year-old woman came to the emergency room for a complicated cervico-thoracic cellulitis.

She presented diffuse swelling in the cervical areas as well as sub-mental and sub-mandibular areas, with difficulties in mouth opening and swallowing.

The patient was seen 10 days before for Ludwig's angina of dental origin and was initially started on broad spectrum oral antibiotics: Clavulanate amoxicillin 1 g, three times a day and stage 1 analgesics and Paracetamol 1 g three times a day for 10 days. Besides, the patient was self-medicating with non-steroid anti-inflammatory drugs (NSAID): Tiaprofenic acid 200 mg a day for 10 days.

Ten days later, she came back with a complicated cellulitis. She presented with swollen chin and neck areas (Fig. 1). Furthermore, the patient presented a breathing difficulty that increased critically in supine position, tachycardia, and low arterial blood pressure of 10/5. The patient presented a biological infectious syndrome, without gravity factors.

Blood test showed microcytic hypochromic anemia, hyperleukocytosis of 20,000 with a predominance of polynuclear neutrophils. C-reactive protein (CRP) of 350. No other abnormalities were found.

Cytological exam of pericardial effusion specimen discovered a yellow liquid, with predominantly neutrophilic leucocytosis. The bacteriological culture was sterile.

CT scan showed multiple abscesses in cervico-thoracic regions: sub-mental, sub-mandibular abscesses, retro-pharyngeal phlegmon, per-tonsillar phlegmon, multiple adeno-phlegmons in the jugular, and carotid regions bilaterally. Moreover, the patient presented abscesses in superior and posterior mediastinum, associated with pericarditis (Fig. 2).

In pre-operative assessment, trans-thoracic ultrasound showed no damage to myocardial muscle, with a 2-cm large pericardial effusion next to the right effusion. The patient did not present any signs of cardiac tamponade. Pericardial puncture showed reactive pericarditis with poly-nuclear neutrophil predominance.

Diagnosis of cervico-thoracic cellulitis complicated with descending mediastinitis associated with reactive pericarditis was established.

The patient was started on antibiotics: 2 g clavulanate amoxicillin in one dose and low doses of vaso-active drugs: Norepinephrin 0.01 µg/kg/min per-during the 2 h of surgical procedure.

She was admitted to surgery under general anesthesia, fiberoptic intubation was planned, and was without incidents; a simple Kocher cervical incision was performed to attain cervical and mediastinal collections. Thorough cervical dissection allowed an exposition of lateral and anterior compartments, as well as sub-mental and sub-mandibular compartment bilaterally. Fibrotic tissue made dissection difficult. A surgical debridement with evacuation of 100 ml of pus was performed. In the second phase, a dissection and drainage of anterior and posterior mediastinum which drained 100 ml of pus was



Fig. 1 Clinical images. **a** Anterior clinical view of the patient. **b** Lateral clinical view of The patient

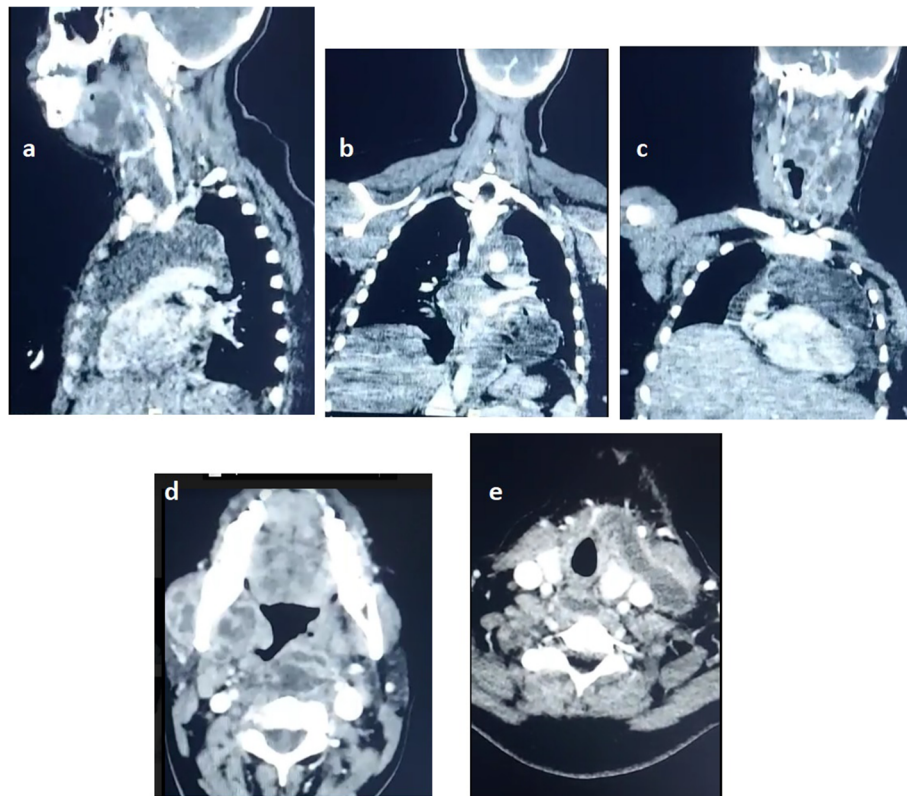


Fig. 2 Preoperative radiological sections. **a** Sagittal reconstruction of cervico-thoracic CT scan. **b** Coronal reconstruction of cervico-thoracic CT scan residual pleural effusion. **c** Coronal reconstruction of cervico-thoracic CT scan showing pericardial effusion, and retro-pharyngeal and parapharyngeal collections. **d** Axial sections of cervico-thoracic CT scan showing sub-mandibular collections bilaterally. **e** Axial sections of cervico-thoracic CT scan showing retro-pharyngeal collections, communicating with anterior collection

carried on. Three surgical drains were placed; two in the mediastinum and one in the cervical region, as well as two Delbet blades.

The immediate post-operative outcomes were hemodynamic instability managed by increasing doses of vaso-active drugs.

The patient was transferred to intensive care unit, for stabilization of hemodynamic state.

Bacteriological exam showed an almost round, rod-shaped gram-negative bacterium.

Antibiogram susceptibility profile was performed through Kirby and Bauer method as recommended by Clinical Laboratory and Standards Institute (CLSI) (2000), which showed resistance to Ampicillin-sulbactam, Ceftazidime, Ciprofloxacin, Levofloxacin, Doripenem, Imipenem Meropenem, Gentamycin, Tobramycin, Amikacin, Piperacillin-tazobactam, Cefepime, Cefotaxime, Ceftriaxime Doxycycline, Minocycline, Trimethoprim-sulphamethoxazole, and Tetracycline.

Acinetobacter Baumannii was sensitive only to colistin. The patient was started on Tigecyclin and colistin. Tigecyclin, a first dose of 100 mg, followed by 50 mg per day for 7 days.

Colistin: 9 million UI, 3 million UI 3 times a day. For 7 days.

The follow-up CT scan after 48 h showed a good evolution, with a persistence of a residual thoracic mediastinal collection of 20 cc.

The patient underwent mediastinoscopy with drainage and debridement of the residual thoracic collection. Immediate follow-up showed a progressive clinical and biological enhancement in day 7. The patient was extubated in day 7 without incidents. She had a satisfying post-operative follow-up in ENT medical consultation.

Discussion

Descending mediastinitis is a very rare complication of cervico-facial cellulitis. The most important strengths of this case are the complexity of management associated with a limited time to react, and a very high mortality rate due to management delay [1, 2].

The anatomical aspect of the neck is complex, and the contiguity and communication of these spaces allow infection to spread to the different structures [2] (Table 1).

Administration of non-steroid inflammatory drugs (NSAID) sometimes associated with self-medication has

Table 1 Relationships of the most important anatomical regions in deep neck infection spread [2]

Deep neck space:	Characteristics:
-Lateral pharyngeal space. (para pharyngeal space)	Is a space located in the upper neck above hyoid bone. -Base: jugular foramen, -Apex hyoid bone. -Medially: tracheal fascia -Laterally: superficial fascia, including parotid gland, pterygoid muscle, and limited laterally by mandible
- Retro-pharyngeal space.	Directed longitudinally and inferiorly to posterior mediastinum -Posteriorly: pre-vertebral fascia -Anteriorly: posterior aspect of per-tracheal fascia -Inferiorly: T1–T6 level vertebrae
-Sublingual space and sub-mental space	Separated by mylo-hyoid muscles.

been correlated with higher risk of complication. Two theories explain this association: on the one hand, NSAID facilitates the progression of cellulitis into abscesses, and on the other hand, the attenuation of clinical signs due to NSAID delays diagnosis and management [1, 3, 4].

Second and third molar teeth infections are the most frequently found gateways to infection [1, 5].

Different aetiologies are cited: odontogenic, tonsillar infections; salivary gland infections, infections of lymph nodes, chronic otitis media, and post-traumatic lesions. Sometimes the cause remains unknown [6].

The most frequent clinical presentations are fever, odynophagia, edema, and trismus. The most fatal complications are airway obstruction and septic shock [1, 3, 4, 7].

Different localizations have been found: sub-mandibular, sub-mental, parotid, para-pharyngeal, retro-pharyngeal, anterior region of the neck, masticator space, and posterior neck [6]. Ludwig's angina is an inflammation of sub-mental and sub-mandibular spaces between mucosa of the floor of mouth and superficial layer of deep fascia [2].

Discrepancies in pathophysiology and clinical presentation in medical literature lead to disparities in management protocols, and thus delay management and aggravation in mortality rates [1].

Biological findings are mainly hyper-leucocytosis with predominance of polynuclear neutrophils [4].

The most important clinical differential diagnosis is the early manifestation of malignant tumor and scratch disease [7].

Descending necrotizing mediastinitis is a very rare complication, and diagnostic criteria according to Estrera et al. 1983 are the following [7]: clinical manifestation of severe infections; existence of radiological features; documentation of necrotizing mediastinitis in per-operative or post-mortem examination; proven causal

relationship between oropharyngeal infection; and necrotizing mediastinal process.

CT scan with and without injection of contrast medium remains the most efficient diagnostic tool to differentiate cellulitis from abscesses of the neck and to establish complications of both. With a sensitivity of 100% and specificity of 90–100 mg [7].

CT findings in acute mediastinitis are [7] increased attenuation of mediastinal fat; localized mediastinal collections; air bubbles in mediastinum, mediastinal lymph nodes, pericardial effusion, and pleural effusion; and lung infiltrates, sternal dehiscence, and pleuro-mediastinal fistulae.

This infection is mostly due to gram-positive aerobes, gram-negative aerobes, anaerobes, or a combination of these three categories [4, 8]. Clinical presentation could offer an orientation, crepitations, evidence of necrosis, and the presence of tick pus are predictive of anaerobic infection [2, 3, 8] (Table 2).

Acinetobacter Baumannii is a known cause of severe soft tissue infections in hospital environment, and some countries are known to be endemic of *Acinetobacter Baumannii*; the mechanisms behind these severe infections of soft tissue are not yet established, and polymicrobial infections are predictive of worse prognosis. Cases of deep neck soft tissues with good outcome are very rare [9].

Broad spectrum antibiotic therapy should be positive gram bacteria and anaerobes [4], which should be amended to antibiogram results [4, 5, 7, 10]. It has been associated with post-operative infections in oral and cervical and facial surgery. However, cases of infection outside the hospital are exceptional [9]. Second- and third-generation cephalosporins are the most recommended and associated with metronidazole and clindamycin [2, 7].

Management of complicated neck cellulitis is multidisciplinary [1].

Table 2 Common bacterial and fungal flora responsible for complicated neck cellulitis [2, 3, 8]

	Sub-category	Species
Bacteria	Gram-positive aerobes	- <i>Staphylococcus aureus</i> - <i>Streptococcus</i> - <i>Streptococcus beta-hemolytic</i> <i>Streptococcus group A</i>
	Gram-negative aerobes	- <i>Klebsiella</i> - <i>E. coli</i> - <i>Pseudomonas aerogenosa</i>
	Anaerobes:	- <i>Bacteroids</i> - <i>Fusobacterium nucleatum</i> - <i>Peptostreptococcus sp.</i>
Fungal infections	<i>Candida albicans</i>	

Mortality related with airway collapse is elevated. The choice of airway management procedure needs sound clinical judgement [3, 11]. Fiberoptic intubation under topical anesthesia is the procedure of choice. Surgical tracheostomy is indicated: in cases of unavailability of fibreoptic, of skilful clinician, or in case of failure of intubation attempt [3, 4].

Moreover, management of sepsis is part of per-operative and post-operative phases, is a very critical step, and generally is conducted in intensive care unit [4].

Surgical drainage is decided 48 h after a course of broad spectrum antibiotics. Surgery allows debridement, surgical excision of necrotic areas, as well as the drainage of purulent collections through a large approach [1, 4, 5]. However, highly invasive surgical techniques are associated with higher mortality rate [7]. Cervical access has less aesthetic risks and avoids pleural effusion compared to thoracotomy [7].

Transthoracic mediastinal drainage is indicated if [7] the infection spread lower than the carina and or forth vertebra of the chest posteriorly [7] and in the presence of more than one mediastinal compartment, regardless of cranial and caudal extension of infection [7].

Mortality is related to delay in management due to difficulty in establishing early diagnosis [7]. The most important and redoubtful complications are rapid extension to contiguous areas in profound cervical spaces: mediastinitis, severe sepsis, and airway obstruction [11]. Beyond the cervical area, mortality ascends to 31% [7]. The mortality rate can be reduced to 8% when an appropriate management is applied [1].

Prognosis depends on the patient's background, the timing of management, and the nature of the incriminated germ, especially multi-resistant bacterial strains [4], the use of non-steroid-anti-inflammatory drugs, diabetes, and immune-depression [1, 3, 4]. Mediocre dental hygiene, obesity, malnutrition, and alcoholism are also associated with poor prognosis [1].

Most known complications of deep neck infection are thrombosis, phlebitis, internal jugular vein and carotid rupture, meningitis, thrombosis of sinus cavernous, and suppurative mediastinitis [7].

Conclusions

Descending necrotizing mediastinitis is one of the rarest life threatening complications of deep neck infections [7]. The challenge resides in early diagnosis and management, in a multi-disciplinary environment allowing pre-cautious airway control, thorough surgical debridement, and adapted antibiotic therapy. This is a rare case of very aggressive descending mediastinitis, with early diagnosis and management and very satisfying outcome.

Abbreviations

CT scan: Computed tomography; NSAID: Non-steroid inflammatory drugs

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Authors' contributions

K. C. conceived and designed analysis, collected data, performed analysis, wrote the paper, and performed surgery. N.O. performed the surgery. O.T. contributed in the data collection. D.K. supervised surgery and contributed to designing analysis. M.N.E supervised surgery, contributed to data analysis, and supervised writing the paper. All authors have read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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