

## An Uncommon Cause of Diffuse ST-Segment Elevation: A Case Report of Descending Necrotizing Mediastinitis

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**Abstract:** Descending necrotizing mediastinitis (DNM) is a rare, rapidly progressive complication of oropharyngeal infections that spreads deep into the mediastinum through loose retropharyngeal spaces, resulting in necrosis and destruction of the mediastinum structure. Recognition of unexpectedly wide-spreading infection in the mediastinum is difficult without appropriate CT imaging, and diagnosis is often delayed. We present a case of a 69-year-old man with DNM successfully treated with a multidisciplinary approach, including aggressive surgical debridement. The patient manifested diffuse ST-segment elevations in twelve-lead electrocardiogram on the day of admission. In our case, acute electrocardiogram changes were useful in early recognition of pericardial involvement and contributed to appropriate surgical debridement.

**Keywords:** Acute pericarditis; Deep neck infection; Descending necrotizing mediastinitis; Electrocardiogram; ST-segment elevation.

### INTRODUCTION

Descending necrotizing mediastinitis (DNM) is an uncommon and fatal complication of oral and pharyngeal infections, where infections rapidly progress caudally into the mediastinum through loose retropharyngeal spaces resulting in necrosis and destruction of mediastinum soft tissues, vessel walls, and surrounding organs [1].

Early recognition of wide-spreading infection and extensive surgical debridement are key to survival in this life-threatening disease [2]. In patients with pericardial involvement, electrocardiogram (ECG) may show acute ECG changes as acute pericarditis [3]. We present a patient with DNM who manifested acute ECG changes.

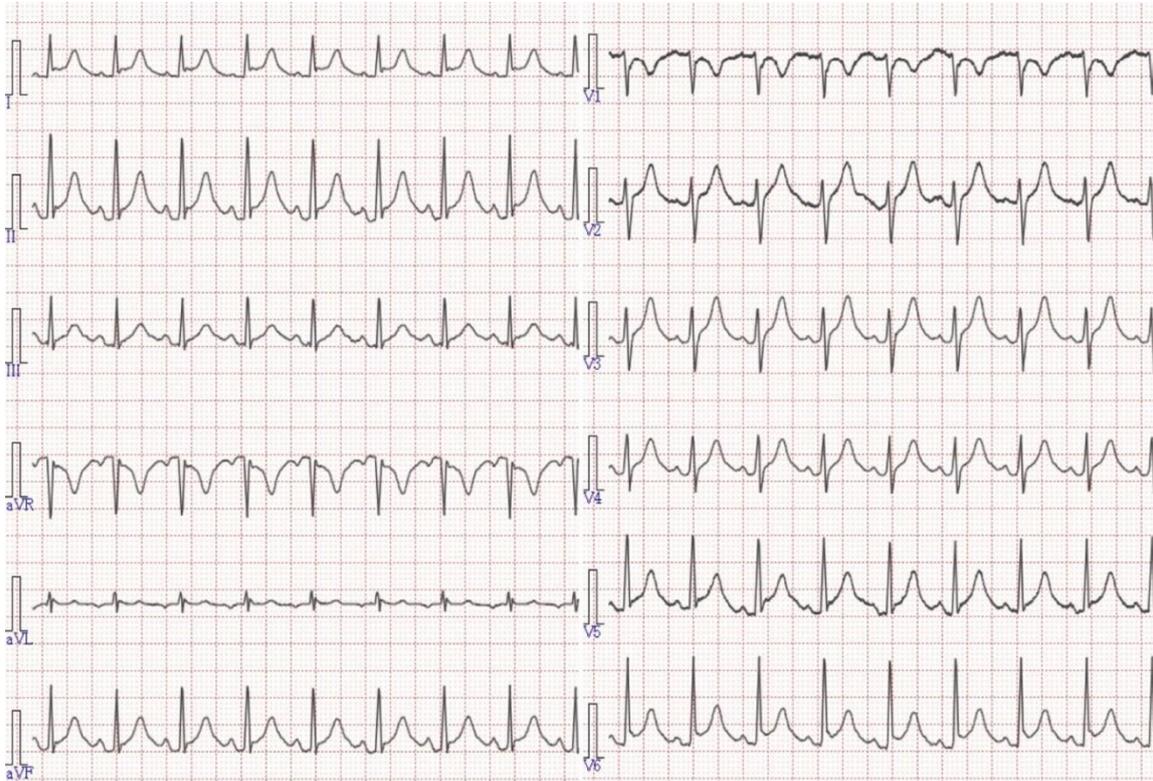
### CASE REPORT

A 69-year-old man presented to the emergency department with a one-week history of swelling in the right jaw. Three days before admission, the patient started to have pain in swallowing and chewing and was able to consume only a liquid diet. On the day of admission, the swelling in the right jaw increased and spontaneously discharged pus. The patient had no relevant past medical history and history of administration of medication. The patient had quit smoking 40 years previously and consumed alcohol occasionally. The patient was a retired engineer and lived with his wife. On admission, the patient was exhausted and disoriented. The blood pressure was 120/66 mm Hg, heart rate was 116 beats/min,

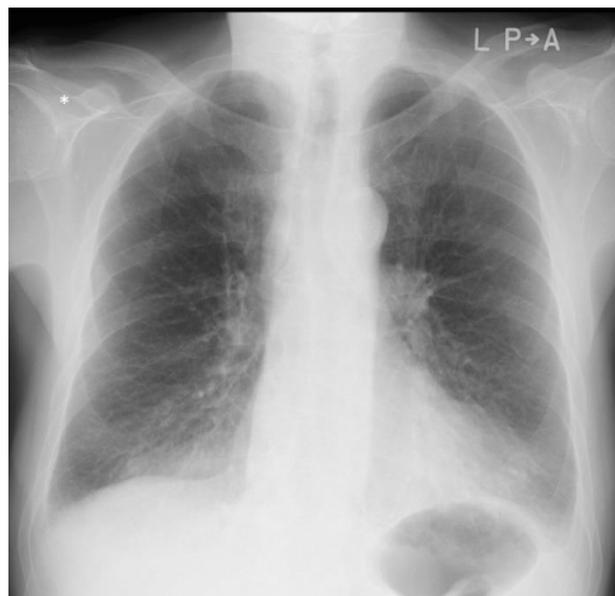
respiratory rate was 24 breaths/min, temperature was 35.2°C, and oxygen saturation was 92% at room air. The right angle of the jaw was swollen, erythematous, and tender. Several lymph nodes were palpable and tender on the right side of the neck. Dental caries and periodontal swelling with discharged pus were observed at the right back of the mouth. The sinus cavity was not tender, and the tonsils were normal. There was faint skin erythema around the sternum on the chest. The heart beats were regular, and the heart sounds were normal. A grade 2/6 systolic murmur was best heard at the second left intercostal space. Friction rub was not heard. Inspiratory sounds were diminished in the base of the both lungs. The results of laboratory tests were as follows: the white blood cell count, 3400/μL; haemoglobin, 14.9 g/dL; platelet count, 124,000/mm<sup>3</sup>; blood urea nitrogen, 78 mg/dL; serum creatinine, 1.25 mg/dL; total bilirubin, 1.5 mg/dL; albumin, 1.7 g/dL; C-reactive protein, 25.07 mg/dL (normal range 0.0–5.0); blood glucose, 87 mg/dL; and haemoglobin A1c, 5.7 %. ECG showed diffuse ST-segment elevations and PR-segment depressions. Reciprocal PR-segment elevations in aV<sub>R</sub> and v<sub>1</sub> were present (Figure-1). Chest

radiography showed bilateral pleural effusion and increased haziness in the bilateral cardiophrenic angles. (Figure-2). Echocardiography showed normal left ventricular systolic function with normal valvular functions. No pericardial effusion was present. Computed tomography (CT) of the neck and chest

showed the right periodontal abscess with gas formation. The abscess and gas spread into the superior mediastinum through the retropharyngeal space (Figure-3A). The pericardial fat was dirty. The CT showed no enhancement in the pericardium and no pericardial effusion.



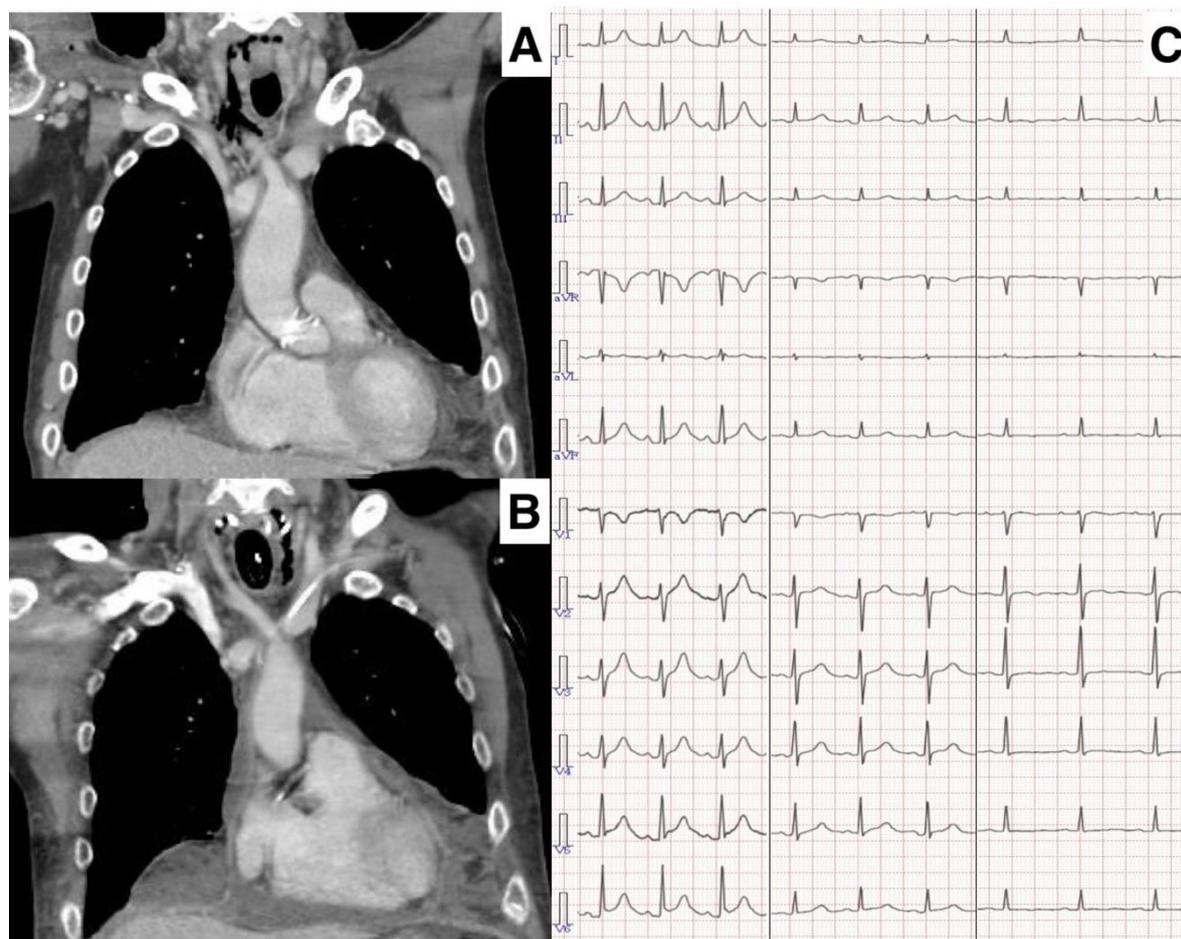
**Fig-1: Twelve-lead electrocardiogram showed diffuse ST-segment elevations and PR-segment depressions. Reciprocal PR-segment elevations in aV<sub>R</sub> and V<sub>1</sub> were present**



**Fig-2: Chest radiography showed bilateral pleural effusion and increased haziness in the bilateral cardiophrenic angles**

The patient was diagnosed with descending mediastinitis from a periodontal abscess. Emergent surgical debridement of the deep neck abscess with drainage of the superior mediastinum was performed. The patient was admitted to the intensive care unit (ICU) and received antibiotics, ventilator management, and lavage of the abscess cavity twice daily. The pus culture was positive for *Streptococcus mutans* and *Fingoldia magna*. Despite treatment in the ICU, the patient had been febrile for two weeks. CT on the 14th ICU day revealed that the infection progressed deep into the inferior mediastinum. Pericardial, intrapleural, subphrenic, and intraabdominal wall abscesses had formed. The CT also showed contrast enhancement of the pericardium and pericardial effusion (Figure-3B).

Diffuse ST-segment elevations and PR-segment depressions remained but became less prominent (Figure-3C). Another surgical debridement, lavage of mediastinal abscesses, and thoracoscopic drainage of the intrapleural and pericardial abscesses were performed. The patient underwent repeated surgical debridement four times in total and defect reconstruction by plastic surgery with intensive rehabilitation and nutritional support. The ECG changes were normalized in four weeks (Figure-3C). The patient required a one-month ICU stay and over 3 months of hospital stay. Finally, the patient recovered and was able to ambulate. He was able to communicate using a speech cannula in the tracheostomy site. The patient was then discharged to a rehabilitation facility.



**Fig-3: (A) Sagittal images from chest computed tomography showed gas in the superior mediastinum. Pericardial enhancement and pericardial effusion were not present on the day of admission. (B) The CT showed pericardial, intrapleural abscesses and contrast enhancement of the pericardium with pericardial effusion on the 14th ICU day. (C) Twelve-lead electrocardiogram showed the time course of diffuse ST-segment elevations and PR-segment depressions on the day of admission, on the 14th ICU day, and on the 26th hospital day.**

## DISCUSSION

We presented a severe case of DNM requiring extensive surgical debridement. In our patient, the acute ECG changes suggested the involvement of pericardial tissue and were useful in predicting further progression of the abscesses deep into the mediastinum.

DNM is a rare, rapidly progressive and life-threatening complication of oropharyngeal infections. The most common causes are odontogenic infections and tonsillitis. Mortality in patients with DNM is as high as 40% [1]. Historically, DNM has been characterized by 1) clinical manifestations of severe infection; 2) demonstration of characteristic radiological

features; 3) documentation of the necrotizing mediastinal infection at operation or on postmortem examination; and 4) establishment of oropharyngeal or cervical infection with the development of the necrotizing mediastinal process [4]. Oropharyngeal infections can spread caudally under gravity, facilitated by the loose cervical spaces, such as pretracheal, perivascular, and retropharyngeal spaces. Among the three primary spaces, the retropharyngeal space accounts for 70% of the mediastinal spread and continues from the base of the skull to the diaphragm [2]. Upon downward progression through the retropharyngeal spaces, oropharyngeal infections result in widespread necrosis of the mediastinum structure and formation of multiple abscesses. Delay in diagnosis and insufficient surgical debridement are the leading causes of death [5]. Recurrence and progression of abscesses are common, and aggressive surgical debridement is the mainstay of treatment. Recognition of deep progression into the mediastinum is often difficult without CT imaging [6], and ECG is one of the important clues in identifying mediastinum involvement, as our case.

Pericardial inflammation produces characteristic diffuse ST-segment elevation and concomitant PR-segment depression due to atrial injury current [7]. Although most cases of acute pericardial inflammation are caused by idiopathic or viral pericarditis, considering other aetiologies is important [8]. Acute pericarditis-like ECG changes were reported in a patient with poststernotomy mediastinitis or a patient with DNM [3, 9]. In our case, diffuse ST-segment elevations were useful in early recognition of pericardial involvement and contributed to appropriate surgical debridement.

## **CONCLUSION**

Early recognition of wide-spread mediastinum infection is key to the successful treatment of patients with DNM using a multidisciplinary approach. The case emphasizes the importance of considering an inflammatory aetiology for acute ECG changes. ECG is useful in identifying pericardial involvement in rapidly progressive infections such as DNM.

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## **Conflict of Interest**

The authors have no conflicts of interest.

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## **Ethics approval and Patient consent**

Consent for participation was obtained from this patient.

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