CASE REPORT

Pneumomediastinum, ST elevation and urgent cardiac catheterisation: a crucial triad?

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SUMMARY

Pneumomediastinum (PNMD) entails the presence of air or other gas in the mediastinum and is also known as mediastinal emphysema. PNMD may cause a wide variety of signs and symptoms, as well as ECG abnormality, including ST segment changes. We present a 56-year-old man admitted to our hospital after a *facial* trauma. After undergoing tracheostomy, he complained of chest discomfort. A chest X-ray in the posteroanterior view showed PNMD, and an ECG was suggestive of inferior-lateral wall myocardial infarction. An urgent cardiac catheterisation identified a critical obstruction at the origin of the right coronary artery. Following a balloon angioplasty, chest discomfort continued; and the ECG ST segments did not show any dynamic change during the subsequent 72 hours. We urge clinicians to perform a comprehensive workup for every patient presenting with PNMD and ST segment changes, to prevent unnecessary invasive procedures.

BACKGROUND

This presentation alerts physicians to the possibility of ST segment elevation, mimicking myocardial ischaemia, in patients with pneumomediastinum (PNMD).

CASE PRESENTATION

A 56-year-old man with a history of peripheral vascular disease was admitted to our hospital after a *self*-inflicted accident at work, with severe facial trauma. A physical examination on arrival to the emergency room showed that he was alert, oriented and diaphoretic. Blood pressure was 134/66, heart rate 104, respiratory rate 14 and saturated oxygen 95% in room air.

INVESTIGATIONS

Facial deformity was noted—and the patient was taken directly for a CT scan. The CT scan demonstrated multi facial bone fractures, with no abnormal findings in the brain, neck or chest. On the same day of admission, the patient underwent an open reduction and fixation surgery of facial bones, ending with tracheostomy. After the procedure he was admitted to the critical care unit. On admission, a routine chest X-ray demonstrated a PNMD, which was thought to be related to the tracheostomy operation (*figure 1*). A few hours later, the patient complained of chest discomfort. ECG performed at rest showed normal sinus

rhythm, normal axis, heart rate 80—with ST elevation in leads I, II, aVF, V5, V6 (*figure 2*). These ECG changes were suggestive of inferior-lateral wall myocardial infarction. Troponin T level was 21 ng/L (normal range: 0–14 ng/L).

The patient was taken for an urgent cardiac catheterisation, which identified a critical obstruction: a single 99% lesion at the origin of the right coronary artery. Balloon angioplasty was performed, with drug eluting stent implantation in the right coronary artery. Despite the intervention, the patient continued to complain of chest discomfort, and the ECG ST segments did not show any dynamic change for the subsequent 72 hours (*figures 3–24* hours after catheterisation). Serial troponin levels were taken at 4 hour intervals, with no significant changes: 29 ng/L, 30 ng/L, 36 ng/L after 4, 8 and 12 hours, respectively. Transthoracic echocardiography revealed good left ventricular systolic function without segmental contraction defects, with normal right ventricle appearance. Seventy-two hours later, ST changes disappeared, as did the PNMD, according to a plain chest X-ray.

DIFFERENTIAL DIAGNOSIS

ST elevation in leads I, II, aVF, V5, V6, and a troponin level of 29 ng/L accompanying chest discomfort – are suggestive, first and most importantly, of inferior-lateral wall ST-elevation myocardial infarction. The differential diagnosis includes conditions with secondary ischaemia of the myocardium, like dissection of the aortic wall, as well as conditions without ischaemia of the heart muscle, like pulmonary emboly, pneumothorax, pericarditis, myocarditis and electrolyte imbalance. Rarely, mediastinal masses, such as hematomas, may cause this presentation.¹

OUTCOME AND FOLLOW-UP

Five days after the ST changes and PNMD disappeared, the patient was discharged from the hospital to a rehabilitation centre. Approximately 4 months after he was discharged from the rehabilitation centre – a repeated transthoracic echocardiography revealed similar findings, with good left ventricular systolic function and estimated left ventricular ejection fraction of 55%–60%.

DISCUSSION

The precise mechanism of ST-segment changes in patients with PNMD has not been fully elucidated.

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Figure 1 Chest X-ray showing pneumomediastinum.

However, possible mechanisms have been cited. Feldman and January² suggested that air in the thoracic cavity could contribute to cardiac rotation, right ventricular dilatation and the accumulation of air between the heart and chest wall; the latter may exert an insulating effect. The notion that air may alter electrical conductance in the chest wall, and thus serve as an insulator was proposed over 70 years ago.³

Another possible explanation relates to the effect of 'tense PNMD'. Myocardial stretch causes secondary stretching and narrowing of the coronary arteries, while this effect on the right coronary artery can explain the ST elevation in leads I, II, aVF, V5, V6, and the mild troponin elevation in the current case.

Indeed, it is well known that ST elevation is not specific for myocardial ischaemia. Non-ischaemic causes of ST elevation include early repolarisation, acute pericarditis, myocarditis, left ventricular hypertrophy, acute cor pulmonale, and left or right pneumothorax.^{4,5} Still, though many case reports describe pneumothorax as a cause of ST segment changes – we have found only a few reports that describe ECG changes in patients with PNMD.^{4,6}

In the rare case described here, chest discomfort accompanied by ST elevation, both caused by PNMD, prompted us to perform an urgent percutaneous transluminal coronary angioplasty. Since the acute signs and symptoms remained unchanged after the

Figure 2 ECG suggestive of inferior-lateral wall myocardial infarction.

Figure 3 ECG 24 hours after catheterisation.

balloon angioplasty with stent implantation, we presume that the right coronary artery stenosis was an incidental finding. In conclusion, we urge physicians to perform second level cardiac diagnostics, such as urgent CT coronary angiogram in similar cases of PNMD with ECG changes, in order to avoid unnecessary coronary angiography.

Learning points

- Physicians should be alert to the possibility of ST segment elevation, mimicking myocardial ischaemia, in patients with pneumomediastinum (PNMD).
- A comprehensive workup (cardiac enzymes, echocardiography, etc) is important for every patient who presents with PNMD and ST segment changes.
- Such workup may prevent unnecessary invasive procedures.

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