The "Airgap" and "Swirling Bubbles" signs in a Patient with Esophageal Carcinoma

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Abstract

Introduction: Pneumopericardium is a dreaded complication in esophageal carcinoma. Case description: We report a case of a 62 year old patient with past history of esophageal cancer with spontaneus pneumopericardium, without hemodynamic compromise. Admission echocardiogram that revealed a pneumopericadium with the presence of the "swirling bubbles" and the "air gap" sign. A small esophagopericardial fistula was postulated as the cause of the pneumopericardium. He underwent esophageal stent placement with resolution of the pneumopericardium. Discussion: Pneumopericardium is usually a sign of marked clinical deterioration in neoplasia and leads to patients' death few weeks. Here we presented a case, in which a more fortunate and unusual outcome happened.

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Data Availability Statement

The data presented in the manuscript was extracted from electronic health records and exam reports, with the informed consent of the patient, as presented at the end of the manuscript.

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Case description: We report a case of a 62 year old patient with past history of esophageal cancer with spontaneus pneumopericardium, without hemodynamic compromise. Admission echocardiogram that revealed a pneumopericadium with the presence of the "swirling bubbles" and the "air gap" sign. A small

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Discussion: Pneumopericardium is usually a sign of marked clinical deterioration in neoplasia and leads to patients' death few weeks. Here we presented a case, in which a more fortunate and unusual outcome happened.

Case description

We present a case of a 62 year old patient, with a past history of esophageal cancer with pulmonary metastases undergoing palliative chemotherapy treatment and with 2 palliative esophageal stents.

Other past medical history included active hepatitis B, arterial hypertension and dyslipidaemia. He was an ex smoker of 80 pack-year units).

He was sent by the outpatient oncology clinic to perform a routine echocardiogram that revealed a pneumopericadium with the presence of tiny bright echogenic spots in the pericarial sac

and the "air gap" sign(*figure 1, 2 and 3 and video 2*). There was no presence of echocardiographic data suggesting hemodynamic compromise.

Upon presentation he had no complaints. There was no history of dyspnea, chest pain, or vomiting. Physical examination was unremarkable. Routine laboratory investigations, including haemoglobin and HS troponin, were within normal limits. Electrocardiogram (ECG) showed normal sinus rhythm, without ST segment alterations.

He underwent a whole body CT scan that confirmed pneumopericardium, pneumomediastium and a presence of an oesophageal-pericardial fistula.

Multidisciplinary discussion followed, in which an upper endoscopy was agreed, since the fistula was thought to be caused by erosion of tumoral growth. However, he was started on piperacillin-tazobactam for the high risk of mediastinitis.

The exam corroborated the clinical suspicion where a stenosis was observed in the region of the proximal stent, which was being caused by tumoral growth. Mediastinum compatible gastrointestinal contrast was injected between the esophageal stents and the oesophageal wall, and a small flow fistule was seen. Endoscopic balloon dilation was performed and a third stent was placed successfully.

He remained hemodynamically stable and asymptomatic during the whole stay. A control echocardiogram and CT both revealed a significant reduction of the pneumopericardium. He was discharged after a 16-day inpatient stay.No complications have happened since.

Discussion

Pneumopericardium is the accumulation of air-fluid level in the pericardial cavity. It can occur with varied causes such as penetrating or blunt chest trauma, invasive procedures, pericardium infections and abnormal communications such as fistula between the pericardium and the mediastinum, pleura or oesophagus. It has been reported to occur spontaneously without any underlying etiology in healthy adults.

At clinical presentation patients are often asymptomatic. When symptomatic, symptoms tend to correlate with the the extent and the underlying etiology of the pneumopericardium. The characteristic auscultation sound is the mill wheel murmur "bruit de moulin" heard as a succession splash and shaking movement of the heart within pericardial cavity.

However, it can be relatively easy diagnosed with TTE. The latter has two pathognomic signs: "The air gap sign"(*figure 1, 2 and 3 and video 2*) traducing a cyclic disappearance of the cardiac shape during systole coinciding with a cycling appearance of air within the pericardium and "The swirling bubbles sign"(*figure 4 and video 1 and 3)* , in diastole, representing the presence of an air-fluid interface with continuous churning movements in pericardial cavity due to heart activity. The latter is revealed in echocardiography by several

small bright echogenic spots evoking micro air bubbles in the pericardial sac. Chest CT can quickly confirm the diagnosis if in doubt, and it offers further information about its' possible etiology and mechanisms.

Pneumopericardium can present and evolve in different manners. Usually, if asymptomatic and without hemodynamic compromise, it can have a benign course. However, it can be life threatening if cardiac tamponade is present.

Comparing with current literature[1-6], cases of pneumopericardium have variable prognosis. In the setting of an esophago-pericardial fistula, it may resolve with therapy directed to the condition responsible for the fistula formation and scarring by second intention, but it is still a dreaded situation. In our case, the fistula and the pneumopericardium resolved after stent placement, and possible infection was treated early with piperacillin. Liao et al[5] reports a similar case where after, a perdicardiocentesis because of cardiac tamponade, an esophageal stent placement, leading to the resolution of the fistula.

We believe that what may possibly have led to the pneumopericardium was the fact that the large volume pericardiocentesis performed one week before, opened a latent communication canal due to a rapid decrease in pericardial pressure.

The same fistula that was present between the esophagus and the pericardium in pericardial space allowed the air to enter and exit throughout the cardiac and respiratory cycle without significantly increasing pericardial pressure. Hence, there was no hemodynamic impairment or clinical signs of cardiac tamponade with our patient. Miller et al[1] also reports a patient where a esophagopericardial fistula with pyopneumopericardium could not be ruled on first contrast imaging, but minuscule one was later revealed in meglutamine diatriozate radiographic contrast study.

The treatment of pneumopericardium is also dependent on its presentation. Patients with hemodynamic instability require emergent pericardiocentesis[1, 2, 5, 7]. Watchful waiting may be considered if asymptomatic and hemodynamically stable, as it happened to our patient and with Caselli et al[3] and Durães-Campos et al[6], as it can resolve spontaneously or by treatment of the underlying condition[8].

Although most pericardiocenteses undergo successfully, the underlying condition that creates pneumopericardium usually is a sign of marked clinical deterioration in neoplasia and leads to patients' death few weeks. Here we presented a case, in which a more fortunate and unusual outcome happened.

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Figure legends

Figure 1: M mode, showing the "airgap" phenomenon, as denoted by the orange arrows.

Figure 2: Modified subcostal view in diastole evidencing pneumopericardium (yellow arrow) and the "airgap" phenomenon (orange arrow and orange line). LV=Left Ventricle, RV=Right Ventricle, PC= Pericardial Cavity

Figure 3: Modified subcostal view in systole evidencing pneumopericardium (yellow arrow) and the Airgap phenomenon (orange arrow and orange line), as evidenced by the increase in length of the orange line and the disappearance of the RV. LV= Left Ventricle, RV=Right Ventricle, PC= Pericardial Cavity

Figure 4: multi-angle view (Apical 2 chamber left and short axis view right) showing air in the PC. LV= Left Ventricle, RV=Right Ventricle, PC= Pericardial Cavity

Video 1: "Swirling bubbles" sign in multi-angle view

Video 2: "Airgap" sign in modified subcostal view

Video 3: "Swirling bubbles" sign in apical 2 chamber view