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Case Report

CASE REPORT

Systemic air embolism as a complication of gastroscopy

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Abstract

Gastroscopy is a common medical procedure with a low complication rate. Most complications are related to respiratory or cardiovascular incidents, especially in sedated patients. Systemic air embolism secondary to gastroscopy is one of the most serious complications, which has been described in few case reports. We describe an interesting case of gastroscopy-related systemic air embolism in a 73-year-old patient.

INTRODUCTION

Vascular air embolism arises secondary to entrainment of air (or exogenously delivered gas) from the operative field or other communication with the environment into the venous or arterial vasculature, producing systemic effects. The true incidence of venous air embolism is unknown, because many cases of venous air embolism are subclinical, and thus unreported [1].

Air embolism is a rare endoscopic complication with a high fatality rate and manifests as cardiopulmonary instability and neurologic symptoms. The diagnosis can be challenging and symptoms can overlap with sedation-related cardiopulmonary problems or neurologic symptoms possibly attributed to an ischaemic or haemorrhagic cardiovascular accident [3].

We herein present a case of gastroscopy-related systemic air embolisation in a 73-year-old patient.

CASE REPORT

A 73-year-old man was referred for gastroscopy because of epigastric pain, nausea and recurrent vomiting. Physical examination revealed a palpable mass in the epigastric region.

His medical history was significant for gastric malignancy with metastases to the transverse colon and regional lymph nodes, for which total gastrectomy with transverse colon resection was performed. Following resection, abdominal computed tomography (CT) demonstrated an 18-mm heterogeneous nodular area, suggestive of residual tumour. The patient did not attend scheduled appointments and was lost to follow-up for 2 years.

Gastroscopy was performed using room air. The oesophagus appeared normal, and a completely obstructing mass was found distal to the jejuno-jejunal anastomosis. Several biopsies from the mass were obtained and self-limiting bleeding was noted.

Shortly after the procedure, the patient collapsed and was immediately placed in the Trendelenburg position and admitted to the intensive care unit. On physical examination he was somnolent, bradycardic and hypotensive, with pallor, diaphoresis and a weak pulse. Electrocardiography showed signs similar to acute myocardial ischaemia affecting the inferior wall with ST-elevation in leads II, III and aVF (Fig. 1). Urgent transthoracic echocardiography (TTE) and abdominal ultrasound (Figs 2 and 3) showed many air emboli in both the right and left heart and signs of pneumobilia.

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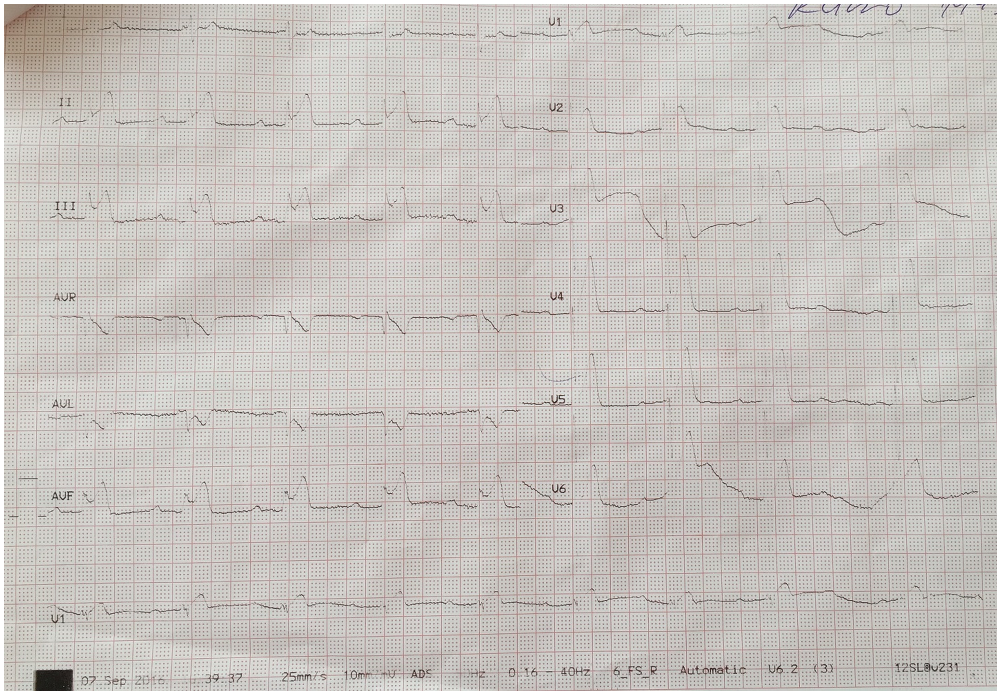

Figure 1: Electrocardiography after the procedure with signs of acute myocardial infarction of inferior localization.

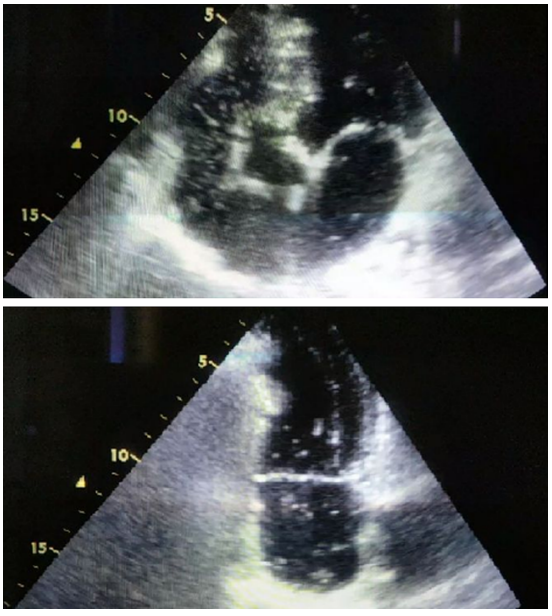

Figure 2: Air emboli in heart.

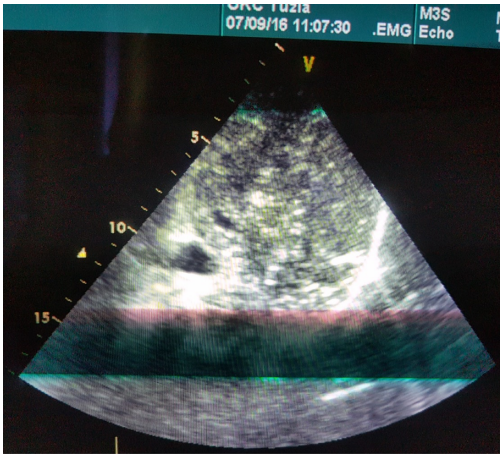

Figure 3: Transabdominal ultrasound of liver showing pneumobilia.

High-flow (100%) oxygen therapy was immediately administered along with low-molecular weight heparin, anti-platelet therapy and hydration with isotonic saline solution.

Shortly after resuscitation, the patient regained consciousness and became normotensive, with a regular heart rhythm and rate 100 beats/min. Follow-up electrocardiography showed no signs of ischaemia (Fig. 4.). Repeated TTE showed fewer air emboli. The troponin level was normal. The next day, head CT showed no signs of acute ischaemia, while abdominal CT confirmed a solid expansive lesion of the pancreas with infiltration of the liver, transverse colon and nearby large vascular structures. The patient remained haemodynamically stable and was discharged 14 days later.

DISCUSSION

Gastrointestinal endoscopy has transformed all aspects of diagnosis and treatment of patients with the gastrointestinal tract diseases. Each endoscopic procedure has specific indications and contraindications. The major contraindications to gastroscopy include perforation, haemodynamic instability, cardiopulmonary distress and inadequate patient co-operation [4]. Cardiopulmonary complications account for approximately half of morbidity and mortality related to endoscopic procedures, most of which are seen in sedated patients [4, 5]. None of the above-mentioned contraindications were present in our patient, and the procedure was not performed under general anaesthesia.

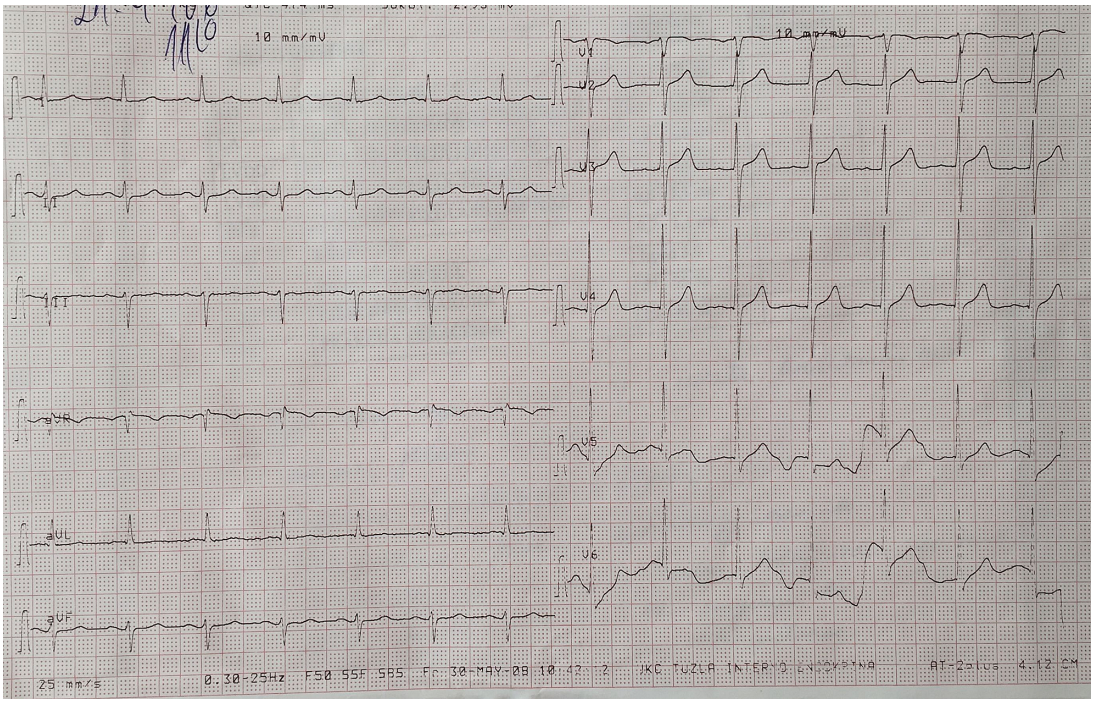

Figure 4: Electrocardiography after the treatment.

In 2013, Donepudi *et al.* [2] conducted a systemic review of endoscopic procedure-related air embolisation. They evaluated 26 cases of systemic air embolism after endoscopic retrograde cholangiopancreatography and 8 cases related to gastroscopy. The authors also reported a few cases of systemic air embolism after sigmoidoscopy and colonoscopy and one case that occurred during endoscopic ultrasound. In a review from 2009, Jennifer *et al.* [6] analysed 14 cases of air embolisation related to endoscopic procedures. The authors predominantly described the endoscopic findings and the main symptoms or signs of air embolism. The most common endoscopic finding was mucosal erosion ($n = 9$), followed by vascular erosions ($n = 4$) and oesophageal varices ($n = 1$). The most common clinical presentation of systemic embolisation was cerebrovascular accident ($n = 9$), followed by respiratory collapse ($n = 7$), cardiac arrest ($n = 4$) and haemodynamic instability ($n = 3$). Most authors agree that it is very important to recognise air embolisation as the cause of cardiopulmonary and neurologic symptoms that occur during gastroscopy [2, 7]. However, this may be very difficult because air embolism manifests as a variety of symptoms depending on the amount of air introduced into the circulation. Severe cases are characterised by cardiovascular collapse and/or acute vascular insufficiency of several specific organs, including, but not limited to, the brain, spinal cord, heart and skin [1].

Katzgraber *et al.* [8] described a case of a sudden cardiac arrest during gastroscopy in a patient with epigastric pain and a history of duodenal ulceration. Endoscopy showed numerous ulcers. The autopsy revealed the presence of air in the right ventricle and an open vessel at the base of one of the ulcers. The presence of the lesion as well as numerous other ulcers seen during the gastroscopy in combination with a conventional amount of air insufflated during the procedure most likely forced air into the circulation and caused death. The same authors subsequently published a paper explaining the pathophysiological mechanism of air embolism induced by air insufflation in the field containing a connection with the vascular system.

Herron *et al.* [9] described a case of air embolism after balloon dilatation of a stricture at the hepatoduodenal anastomosis. Shortly after the procedure started, the patient developed ventricular fibrillation. The procedure was immediately aborted, the patient was placed in the Trendelenburg position and cardiopulmonary resuscitation was performed. Given the suspicion of air embolism, a central venous catheter was introduced in the right ventricle and a few millilitres of air was aspirated. After a short hospitalisation period, the patient was discharged. Although electrocardiography has low sensitivity for air embolism detection, the findings closely resemble those seen with venous thromboembolism and include tachycardia, a right ventricular strain pattern and ST-depression. Transient myocardial ischemia may also occur [1], as in our patient.

Transoesophageal echocardiography (TOE) has the highest sensitivity for detecting the presence of air in the right ventricular outflow tract or major pulmonary veins. It can detect as little as 0.02 ml/kg of air administered by bolus injection [1]. One of the most widely accepted and simple diagnostic methods of air embolism is TTE, which was very helpful in our case. Thus, unsurprisingly, many authors have relied on this diagnostic method. Although TOE has the highest sensitivity for detecting the presence of air in the right ventricular outflow tract or major pulmonary veins, TTE has the advantage of noninvasive examination.

CT is sensitive to intravascular air but has low sensitivity and specificity (81% and 47%, respectively) for identifying right heart strain and can be difficult to perform in patients who are critically ill [11]. However, because our patient improved clinically and TTE showed a reduced burden of air emboli, urgent CT was not requested.

Yong *et al.* [10] described a case of air embolism in a woman with ulceration at the hepato-jejunal anastomosis. The authors observed electrocardiographic changes in the form of bradycardia with prolongation of the QRS complex and ST-segment elevation. The procedure was immediately aborted and cardiopulmonary resuscitation was initiated with continuous monitoring of the acid-base status and blood pressure. Upon successful resuscitation, TOE showed a large volume of air in both ventricles, the aorta and the pulmonary artery, with no global cardiac contractility failure or shunting. Similar to our findings, several other authors have also highlighted the significance of echocardiography as a diagnostic tool for detecting air embolism.

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CONFLICT OF INTEREST STATEMENT

None declared.

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ETHICAL APPROVAL

Not applicable as this article does not involve direct human subject involvement. No approval was required.

CONSENT

Patient consent is available and is updated via ScholarOne manuscript. Personal patient data are known to authors only.

GUARANTOR

Guarantor for the article is Emir Tulumović.

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