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CASE REPORT
Arrhythmias/Electrophysiology

Oesophageal perforation: an unexpected complication during extraction of a pacing lead. A case report

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Background Peri-procedural transoesophageal echocardiography (TOE) is important in monitoring and minimizing major complications during pacing lead extraction. It is a widely accepted precautionary measure, especially in extractions considered to be higher risk. Pacing lead extraction may be challenging, and it is associated with significant risk of major bleeding from vascular trauma.

Case summary We present a case of an 87-year-old woman who had an extraction of a ventricular pacing lead that had perforated to an extra-cardiac location, most likely to the left pleural space. Peri-procedural TOE was used as a precaution. The entire pacing lead was successfully extracted with gentle traction using standard equipment (mechanical technique). Extraction was followed by development of pneumomediastinum and a left pleural effusion, initially attributed to pulmonary injury from the pacing lead but which proved to be related to oesophageal injury from the TOE.

Discussion Transoesophageal echocardiography-related complications are uncommon but should be considered in cases of unexpected post-procedural deterioration. Clinical deterioration after a seemingly uneventful procedure should prompt a thorough case review. A systematic approach should be applied to identify the offending cause and enable corrective measures to be undertaken. This case report is an important reminder to all operators utilizing TOE for peri-procedural purposes that this precautionary measure itself also independently exposes the patient to additional risk.

Keywords Case report • Transoesophageal echocardiography • Complication • Pacing lead extraction • Oesophageal perforation • Vascular trauma

Learning points

- Any procedural component, even if precautionary, may itself have the ability to cause harm or expose the patient to additional risk. These need to be accounted for during careful preparation and evaluation of the procedure.
- Unexpected clinical deterioration after a seemingly uneventful procedure should prompt a thorough systematic review to identify the underlying cause and facilitate appropriate treatment.
- When consenting for a procedure, all procedural aspects involved should be adequately covered.

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Introduction

Pacemaker lead extraction carries a significant risk of venous or cardiac injury resulting in haemothorax or pericardial effusion.[1–3] Although there is no expert consensus recommendation on peri-procedural cardiac monitoring with transoesophageal echocardiography (TOE), it is widely accepted practice to enable the rapid diagnosis of major vascular structural trauma.[4] Early recognition of this major complication is required for optimal patient outcomes. Transoesophageal echocardiography equipment and suitably trained operators are readily available in the cardiac catheter lab, and its use is considered to be integral to many procedures including pacing lead extraction.

Timeline

Time	Events
Two months prior to urgent transfer to our cardiac centre	Permanent pacemaker implantation at another centre for 2:1 2nd degree atrioventricular block
Current admission	
Day 1	Urgent inpatient device extraction and new system re-implant, under general anaesthesia (GA)
Day 5	Surgically placed left sided chest drain
Day 10	Video-assisted thoracoscopy procedure
Day 13	• Food contents noted in drain • Barium swallow confirmed oesophageal perforation with persistent communication to left pleural cavity • Interventional radiology guided nasogastric tube placement; patient is nil by mouth
Day 14	Transfer for consideration of urgent surgery under the Upper gastro-intestinal (GI) surgical team. The outcome was that no surgery was performed and the patient was managed totally conservatively
1-year post-event: outpatient clinic review	Patient is independently mobile and stable but physically more limited compared to baseline with reduced exercise capacity

Case presentation

An 87-year-old woman was transferred to our centre for revision of a pacing lead 2 months after implantation of a dual chamber pacemaker. After finding failure of capture on the passive fixation ventricular lead, chest radiography had been performed and showed the lead to be outside the cardiac silhouette, apparently in the left pleural space. The patient had no significant comorbidities and her recorded observations were stable, including height of 156 cm, weight of 64 kg, and a body mass index of 26.3 kg/m^2.

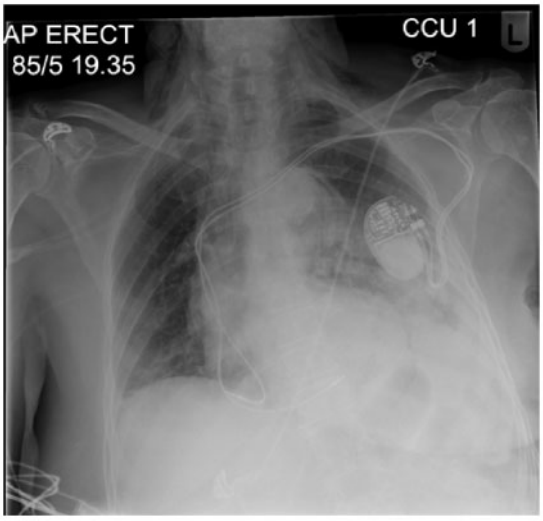

Figure 1 Chest radiograph demonstrating the pneumomediastinum and left pleural effusion, post-extraction.

We extracted and replaced the lead under general anaesthesia with cardiac surgical cover. Due to the anticipated risk of bleeding into the pericardial or pleural cavities, we performed a peri-procedural TOE and used invasive haemodynamic monitoring. The TOE probe was a standard model (Philips X7-2t) and there were no reports of difficulty or undue resistance with probe insertion. The TOE was performed for a total duration of 15 min. This enabled a review of the cardiac structure and function at the start of the procedure, and the TOE probe was left in situ for the rest of the case. The TOE was used again at the end of the procedure to rule out any pericardial effusion or other structural changes. This patient did not have a history of heart failure and TOE confirmed good left ventricular systolic function. The right ventricle was of normal size and systolic function. A new active fixation right ventricular lead (CapSureFix 5076, Medtronic) was placed in a mid-septal position using left cephalic venous access. This new lead achieved satisfactory sensing and pacing threshold parameters.

The perforating lead, a passive fixation model (CapSure Novus, Medtronic) was removed with the aid of a Liberator® Beacon® Tip Locking Stylet (Cook Medical). With gentle traction only, the lead was freed and removed entirely. There was no immediate haemodynamic disturbance and at procedure conclusion, there was no evidence of pericardial or significant pleural collections on repeat TOE. The offending lead, including the tip, was inspected and no overt abnormality was evident.

Upon recovery from general anaesthesia, the patient complained of severe chest pain and became hypotensive, requiring intravenous fluids. Emergency chest radiography showed a pneumomediastinum and pleural effusion (*Figure 1*); a transthoracic echocardiogram showed no pericardial effusion and only a small pleural effusion. The initial clinical impression was that this was pulmonary injury from the original offending pacing lead that perforated into the pleural cavity. A computed tomography thorax was performed and reported as confirming the chest radiograph findings only (*Figure 2*).

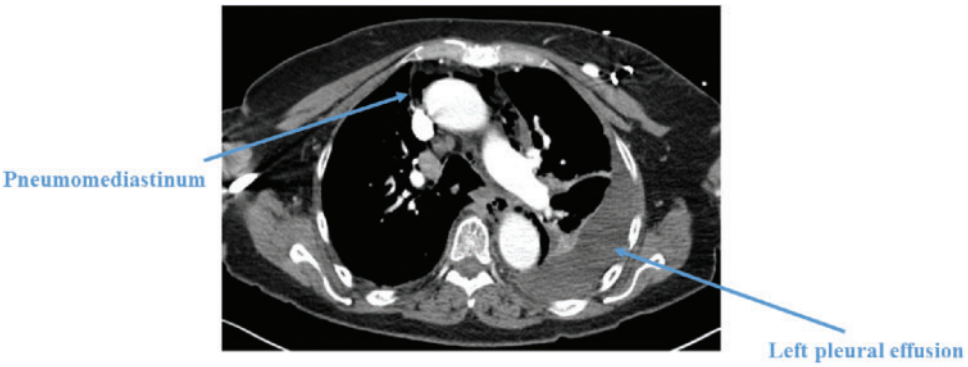

Figure 2 Computed tomography thorax performed post-procedure confirmed pneumomediastinum and pleural effusion. The computed tomography did not reveal any other significant abnormalities upon review by the team or the reporting radiologist.

The patient remained systemically unwell with low grade pyrexia, despite broad spectrum antibiotic therapy (intravenous ertapenem was advised by microbiologists as empirical cover; all blood cultures were negative). Her blood pressure was 102/80 mmHg, and she had episodes of tachycardia, in atrial fibrillation at 150 b.p.m. Without supplemental oxygen, her saturations dropped to 90%. Inflammatory markers were markedly raised with a climbing C-reactive protein (CRP) of 433.3 and white cell count of 16. Albumin was low at 16. In our laboratory, the normal reference range for CRP is 0-10 mg/L, for WCC it is 4-11^9/L and for albumin, the normal range is 35-50 g/L. Kidney function and urine output remained stable and she was cognitively intact. Alongside her deteriorating clinical condition, the pleural effusion also increased in size, raising the possibility of an empyema, so a video-assisted thoracoscopic surgical procedure was performed to drain it. This unexpectedly revealed food material in the chest cavity. A gastrografin study (*Figure 3*) confirmed the presence of oesophageal perforation, with continued communication to the pleural space. The patient was transferred urgently for a surgical review and possible surgery.

Correspondence from the district general hospital confirmed that the patient was managed conservatively. At 1-year post-event, the patient is well but has not regained her premorbid health status.

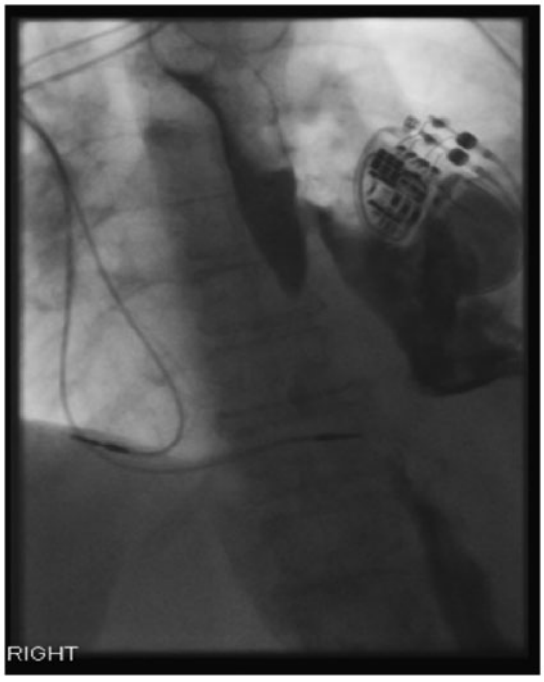

Figure 3 Gastrografin study confirms oesophageal perforation with continued communication into the left pleural cavity.

Discussion

The literature on the utility of peri-procedural TOE for device extraction cases demonstrates differing opinion and study outcomes. Oestreich *et al.*[5] reported on a retrospective series of 100 patients having laser lead extraction with continuous TOE monitoring and had three vascular lacerations; the study authors stated that TOE monitoring had allowed a more rapid diagnosis of these complications. However, one patient suffered an upper gastrointestinal bleed due to the TOE probe. Regoli *et al.*[6] reported on a retrospective series of 168 patients using a predominantly mechanical approach to lead extraction and described one case of superior vena cava laceration. Here, they concluded that continuous TOE monitoring was of limited use.

During consent for a TOE, the procedure would be quoted as low in risk with a major complication rate of <0.5% for oesophageal perforation.[7,8] The benefit of additional continuous intra-cardiac monitoring makes TOE an attractive adjunct during device extraction procedures, especially in technically challenging cases. A TOE will permit rapid detection of blood in the pericardial or pleural space and enable rapid treatment.[9] There is no other form of cardiac imaging that can be used in the cardiac catheter lab with higher levels of imaging quality or safety profile.

The potential risks associated with TOE imaging were overlooked in this case, and it is easy to see how this would be similarly applicable across many cardiac centres. This case is a reminder that there are many potential hazards to the patient in the cardiac catheter lab and what may at first seem to be trivial can actually lead to one of the most serious complications and poor patient outcomes.

This case of oesophageal perforation due to TOE related trauma was the worst complication that we have encountered in more than 400 extraction procedures.[10] In retrospect, the advanced age of the patient and the fact that she suffered a perforation of her heart should have warned us that her oesophagus might also be exceptionally delicate. The fact that her TOE was inserted and performed under general anaesthesia may also have contributed to the risk due to lack of patient warning from associated pain sensation. A published systematic review in 2013 of TOE related perforations found that most cases occurred in an intra-operative setting.[11] All reported cases were not deemed at high risk of oesophageal perforation. This confirms that there is an absence of reliable markers that would clearly define those at higher risk of TOE-related injury. In the same review, most patients were elderly females. The delayed diagnosis could have led to a fatal outcome in a condition that already carries a poor prognosis.

A TOE should always be included in the patient consenting process, for any procedure where it is required. In cases of unexpected clinical deterioration after a seemingly uneventful procedure, a systematic approach should be applied to identify the offending cause and enable corrective measures to be undertaken. This case report is an important reminder to all operators utilizing TOE for periprocedural purposes that this precautionary measure itself also independently exposes the patient to additional risk.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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