Despite of continuation of the atrial tachycardia in the recipient atrium, sinus rhythm in the donor heart was restored by obtaining an electric isolation during radiofrequency ablation of the connection between both atria (Figure 2B). See text for further explanation.

**Figure 2** Electrogram recordings during an electrophysiological study, showing 2-to-1 conduction from the recipient atrium to the donor heart (A) followed by complete block between both atria after radiofrequency ablation of the breakthrough-connection (B). See text for further explanation.

**CASE REPORT**

Acute pericardial tamponade due to screw-in atrial lead heart perforation

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A case of peri-procedural perforation of right atrium following the implantation of atrial screw-in lead in a 74-year-old man is reported. The perforation caused acute pericardial tamponade and worsening of the patient’s clinical and haemodynamic conditions. Urgent surgical intervention with lead extraction was performed.

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Introduction
Intraoperative and early post-operative heart perforations occur in 0.6–1.2% of the patients when active fixation leads are used.\(^1\) We report a rare case of peri-procedural atrial perforation and acute pericardial tamponade following screw-in atrial lead implantation.

Case report
A 74-year-old man presented with symptomatic bradycardia because of sick sinus syndrome. A dual-chamber pacemaker was implanted with Medtronic screw-in atrial (model 5076-52) and ventricular (model 5076-58) leads.

The atrial lead was screwed in the anterior atrial wall and the ventricular lead in the interventricular septum by rotating the connector pin up to 10 turns; normal sensing and pacing parameters were achieved and post-implantation stable lead position was confirmed by fluoroscopy (Figure 1A, B). Temporary stimulation at 10 V output did not show any extra cardiac stimulation.

Shortly after the procedure the patient complained of vague chest discomfort; blood pressure was 140/80 mmHg. Two hours later he started to complain of chest pain, especially during deep inspiration, but blood pressure remained stable. A transthoracic echocardiogram revealed mild to moderate pericardial effusion without signs of tamponade. Four hours after the implantation the patient became hypotensive; a repeated echocardiogram revealed a large pericardial effusion and evidence of tamponade (Figure 1C). The patient was referred to a hospital with a thoracic surgical backup. Immediately after arrival, because of profound shock, a median sternotomy was preferred over pericardiocentesis, with drainage of a large amount of unclotted blood; a 1 mm tear was found on the anterior wall with active bleeding where the tip of the atrial lead helix was protruding. The atrial lead was removed and, because of ongoing bleeding, the tear was sutured. A new atrial lead was not implanted at that time. The patient recovered uneventfully; at 3-month follow-up the patient was asymptomatic.

Discussion
Pericardial tamponade due to cardiac perforation is the most serious and life-threatening complication following pacemaker implantation.

In case of delayed pericardial tamponade (>30 days after device implantation), some authors\(^2\) advise drainage of the effusion followed by a conservative strategy.\(^3\)

In acute cardiac tamponade prompt pericardiocentesis and lead reposition are the therapies of choice,\(^3\) however, in rare cases characterized by rapid clinical and haemodynamic deterioration, like ours, urgent surgical intervention with lead extraction/reposition is warranted for treatment.

Unlike ventricular perforations that may seal after the lead retraction, the atrial ones may not, because of the thin atrial wall and require open drainage; closed pericardiocentesis is rarely successful (<25%).\(^1\)

Overscrewing of the lead and distal stylet insertion are mechanisms that are associated with atrial wall perforation. In our patient, overscrewing was unlikely due to the measured number of turns under fluoroscopic control. Perhaps an excessive pressure exerted through the lead with a distally inserted stylet may have caused the penetration of the helix through the atrial wall.

Active fixation atrial leads have advantages and disadvantages: they allow more choices for lead placement, but the implanter has to be aware of the risks, although rare, of pericarditis and heart perforation when choosing them.

Conflict of interest: none declared.

References
Successful ablation of sinus node reentrant tachycardia using remote magnetic navigation system

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Ablation of sinus node reentrant tachycardia (SNRT) may be difficult with risk of sinus node injury by using conventional catheters. We report successful ablation of SNRT by using remote magnetic navigation system (Stereotaxis).

Case report

A 50-year-old female was referred from another hospital for symptoms of paroxysmal palpitations. She was on beta-blocker for frequent palpitation. Holter monitoring revealed frequent paroxysmal episodes of narrow complex tachycardia at rates of 140–150 bpm. Echocardiogram, thyroid function tests, and other routine lab parameters were normal.

During electrophysiological evaluation, a narrow complex tachycardia (cycle length of 393 ms) was easily induced by programmed atrial stimulation. The surface electrocardiogram (ECG) P wave morphology during tachycardia was similar to sinus rhythm. The atrial activation sequence during tachycardia was earliest in the high right atrium followed by the His-atrial and coronary sinus atrial electrograms suggesting an origin in or around the region of the sinus node. Premature ventricular extrastimuli introduced during tachycardia when the His bundle was refractory did not advance the subsequent atrial cycle length or change the atrial activation sequence. An appropriately timed atrial premature extrastimulus delivered during tachycardia from a right atrial catheter reproducibly terminated tachycardia. Ventricular pacing was able to dissociate ventricular activity without affecting the atrial rate. These findings strongly suggested the diagnosis of sinus node reentrant tachycardia (SNRT). With remote magnetic navigation system (Stereotaxis, Inc, St Louis, MO, USA) and CARTO (Biosense Webster, Inc, Diamond Bar, CA, USA), mapping was performed during the tachycardia. The earliest atrial activation noted in the high lateral right atrium at the region of the sinus node. At this site, the atrial electrogram was 50 ms in duration and fragmented, initially negative in the unipolar tip electrogram, and 35 ms before onset of the surface ECG P wave.1

At this site, ablation done with the irrigated tip catheter (Celsius RMT, Biosense Webster) using 30 W radio frequency (RF) energy and a maximum temperature of 45°C. After initial acceleration, tachycardia terminated within 8.2 s. Radio frequency applications continue up to 60 s. After first RF application there was non-sustained SNRT induced using atrial-programmed stimulation. Further RF ablation was done at the region around the site of earliest activation to augment the ablation (Figure 1). Subsequently, the tachycardia could not be re-initiated with atrial or ventricular pacing even with the presence of isoproterenol infusion. Total fluoroscopy time was 7.2 min. Follow-up 48 h telemetry monitoring revealed no recurrence of tachycardia.

Sinus node reentrant tachycardia is an uncommon, but likely under diagnosed, form of supraventricular tachycardia, being easily confused with sinus tachycardia. Catheter ablation of SNRT is associated with risk of sinus node injury and thermal injury to the right phrenic nerve. Remote magnetic navigation provides enhanced catheter stability and substrate contact for the precise ablation. As per best of our knowledge we describe the first reported case of SNRT successfully ablated by using remote magnetic catheter navigation.