Fibrin glue patch for pacemaker lead perforation of the right ventricular free wall: A case report

Satoshi Yamaguchi, MD,* Masaki Tabuchi, MD,† Kageyuki Oba, MD,* Hiroshi Doi, MD,* Osamu Arasaki, MD*

From the *Department of Cardiology, Tomishiro Central Hospital, Okinawa, Japan, and †Department of Cardiac Surgery, Tomishiro Central Hospital, Okinawa, Japan.

Introduction
Pacemaker lead perforation is a complication associated with screwing in the pacemaker lead.1 Nonsurgical management of this complication is limited. Pericardial drainage is performed for the resultant cardiac tamponade, but it is difficult to stop bleeding from the perforation site without surgery. Here, we describe a case in which fibrin glue injected via a 6 F pericardial tube into the pericardium successfully patched a lead perforation.

Case report
An 85-year-old woman experienced some episodes of syncope. Electrocardiography showed a sinus pause of >5 seconds after paroxysmal atrial fibrillation stopped. Thus, the patient was diagnosed with sick sinus syndrome. Treatment with apixaban 2.5 mg twice daily was initiated for the paroxysmal atrial fibrillation. Pacemaker (PM) implantation was performed and apixaban anticoagulation therapy continued. The last intake of apixaban was 3 hours before PM lead screwing. It was planned that a ventricular lead (Revo MRI pacing system 5076-52; Medtronic, Minneapolis, MN,) would be screwed into the right ventricular septal wall via the left subclavian vein, and the position of the lead attachment was confirmed by x-ray fluoroscopy. However, the lead was unintentionally screwed toward the right ventricular free wall, which was revealed by computed tomography after the event. The PM generator (Advisa SR MRI A3SR01; Medtronic) was subcutaneously fixed to the left chest wall. The patient’s blood pressure fell dramatically 3 hours following the procedure, and ultrasonography revealed pericardial effusion.

A 6 F pericardial drainage tube (Pericardiocentesis Kit PC101; Merit Medical Systems, Salt Lake City, UT) was inserted, and 250 mL of blood was drained. The patient’s blood pressure and heart rate stabilized, but computed tomography showed ventricular lead perforation (Figure 1). The blood could not flow normally, suggesting that the drainage tube was occluded. The patient’s blood pressure gradually decreased again. A second 6 F drainage tube was inserted into the pericardium, and 500 mL of blood was drained from the second drainage tube. A liquid form of fibrin glue (BOLHEAL; Kaketsuken, Japan), containing 480 mg fibrinogen, 450 units of factor VIII, 6000 KIE of aprotinin, 150 units of thrombin, and 35.4 mg calcium chloride, was injected through the second pericardium tube under angiographic guidance, and the patient’s blood pressure stabilized immediately. Fresh frozen plasma (FFP) (1440 mL) was administered intravenously 40 minutes after fibrin glue injection. The volume of the bloody drainage diminished immediately and was completely resolved after 26 hours. Ultrasonography with color Doppler revealed a dome-like structure at the right ventricular apex, where there was a PM lead. The intra-dome space was filled with high echoic substances, in which a small cavity without blood flow was observed on postoperative day 29 (Figure 2). The ventricular lead function was available and was within normal limits (lead impedance, 494 ohm; threshold, 1.25 V/0.4 ms; and R wave, 7.3 mm).

Prior to writing this report, we explained the academic worth of publishing this case to the patient. It was difficult for her to sign her name, so documented informed consent was obtained from her family.

Discussion
There were 2 important discoveries in this case. The first is that fibrin glue, which is available for pericardial injection,2 can be used to stop bleeding from a lead perforation hole. A previous report described the transpericardial use of cyanoacrylate glue through an 8 F Judkins right guiding catheter via a 12 F introducer sheath for pacemaker lead perforation.3 In that report, manipulation was required for the
Judkins right tip to engage the perforation site. Our method required only a 6 F pericardial catheter and did not require positioning the tip of the catheter.

The second discovery is related to the dome-like structure, which we assumed was a pseudoaneurysm. There was no blood flowing through this dome-like structure; instead, the intra-dome space was filled with a high echoic mass that was considered to represent thrombosis formation. Color Doppler showed that the lead perforation hole was large enough to facilitate bidirectional flow (Figure 3). Hence, it is likely that the dome had filled gradually. If the hole had been smaller, it is likely that the flow would have only been unidirectional; this could have led to an increase in the intra-dome pressure and, consequently, to dome rupture.

It is likely that apixaban was associated with bleeding from the perforation site. While prothrombin complex concentrates work to reverse Factor Xa inhibition caused by drugs like apixaban and may therefore be effective in such situations, it is possible that the FFP had sufficient coagulation factors to stop the bleeding caused by Factor Xa inhibition in this case. However, this is only hypothetical, as there is no available report addressing FFP clinical use in such cases. Thus, it is possible that it was not only the fibrin glue that acted as a hemostat, but that the FFP did as well. As noted, there has been no report of FFP supplying Factor Xa inhibited by apixaban, but the FFP had a hemostatic effect clinically. It may be that the apixaban concentration decreased because of its own metabolism, the bleeding, and/or infusion. It is uncertain whether cardiac tamponade can be prevented completely. Previous studies supported the use of passive fixation leads and uninterrupted use of warfarin rather than heparin bridging. However, in such cases, it might be better to discontinue apixaban rather than to continue it.

### KEY TEACHING POINTS

- Fibrin glue (BOLHEAL; Kaketsuken, Japan) is available for pericardial injection and can be used to stop bleeding from a lead perforation hole.
- If a lead perforation is not sufficiently large to facilitate bidirectional flow, it is likely that the resultant unidirectional flow could lead to an increase in the intra-dome pressure and, consequently, to dome rupture.
- With massive hemorrhage, fresh frozen plasma may function as a hemostat in patients taking apixaban.

![Figure 1](image_url)  
**Figure 1** Computed tomography showing ventricular lead perforation. The black arrows illustrate the perforation of the right ventricle by the lead of the pacemaker.
Conclusion
The present case suggests that fibrin glue injected via a 6 F pericardial tube into the pericardium could patch a PM lead perforation.

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