



To: Cardiovascular surgeons, intensivists, specialized nurses, and other healthcare professionals involved in the postoperative care of open-heart surgery patients

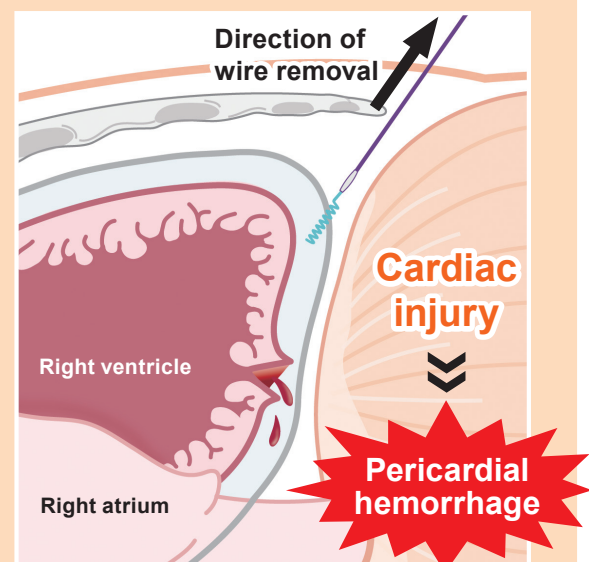
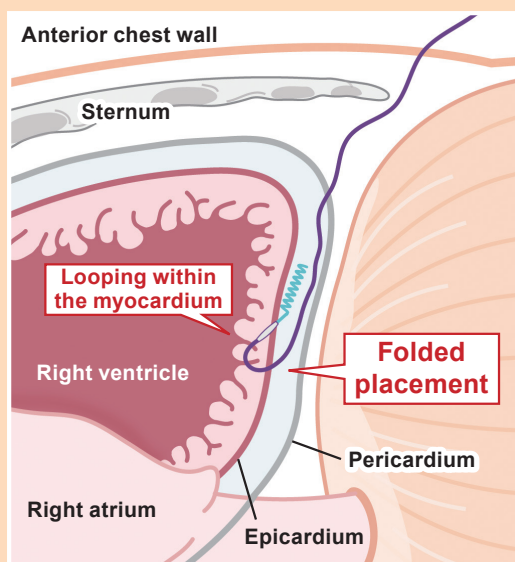
## Deaths due to Cardiac Injury Associated with Pacing Wire Removal

Three fatal cases have been reported in which patients suffered massive pericardial hemorrhage due to cardiac injury following the removal of temporary epicardial pacing wires placed during cardiac surgery.

### ! Presumed Contributing Factors

#### Placement techniques

- **Placement of pacing wires at excessive depth, reaching into the cardiac chambers**
- **Looping or folding of wires** within the myocardium or pericardial space



\*Image diagram

### ! Illustrative Cases

#### Case 1

- Surgery: Thoracoscopic mitral valve repair and tricuspid valve repair
- Pacing wire placed on diaphragmatic surface of right ventricle
- Ten minutes post-removal: precordial discomfort, hypotension (50–59 mmHg), cardiac arrest
- Imaging: Echocardiography showed chamber collapse, X-ray showed hemothorax
- Emergency re-sternotomy revealed 3–5 mm epicardial laceration with massive bleeding
- Outcome: Death two days post-removal

#### Case 2

- Surgery: Mitral valve replacement and tricuspid valve repair
- Symptoms five minutes after removal: left shoulder pain, hypotension
- Imaging: Pericardial effusion up to 8 mm noted; no immediate echocardiographic changes
- Re-sternotomy revealed active bleeding from the diaphragmatic surface of the right ventricle
- Outcome: Death two days post-removal

\* The illustrative cases were prepared by the Expert Analysis Subcommittee by organizing information based on the in-hospital investigation report. For other reported cases, please refer to the website.

# [Lessons Learned and Preventive Measures]

—To prevent deaths due to cardiac injury associated with pacing wire removal—

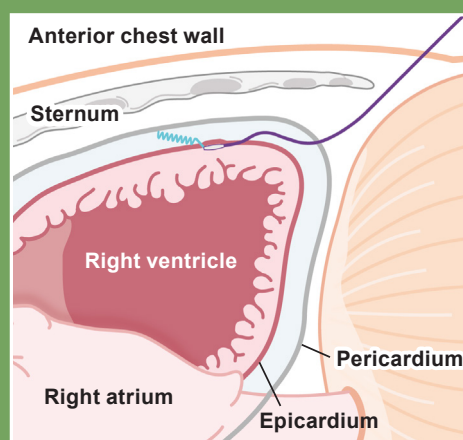
Placement procedures presumed to have led to cardiac injury

- Deep positioning of the pacing wire reaching the cardiac chamber
- Looping or folding of wires within the myocardium or pericardial space

## ! To prevent cardiac injury

### Safe Placement Techniques

- Place wires **at a shallow depth** just beneath the epicardium
- Ensure the wire axis **aligns straight** with the intended direction of removal
- Avoid folding or looping the wire within the myocardium



\*Image diagram

## ! To avoid death

### Early Detection of Pericardial Hemorrhage

- Suspect pericardial bleeding in any case of sudden hemodynamic instability on the day of wire removal

\* Imaging (echo/CT) may fail to detect hematoma depending on its position

- Clinical decisions (e.g., re-sternotomy) should involve multiple clinicians reviewing imaging findings together

#### Timing and Conditions for Removal

- Remove pacing wires during daytime hours and weekdays, when immediate re-exploration is feasible
- Avoid removal during on-call hours or weekends unless under controlled conditions

### Call to Action for Academic Societies

Development of standardized guidelines on pacing wire placement and safe removal techniques is highly recommended

#### Important Notice

This report has been developed by an Expert Analysis Subcommittee and approved by the Committee for the Prevention of Recurrence. It is intended to aid clinical decision-making and does not impose mandatory obligations or limit the discretion of individual healthcare professionals.