Two-stage hybrid repair with over-the-scope clip for atrioesophageal fistula after catheter-based ablation

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Atrioesophageal fistula (AEF) is an extremely rare but life-threatening complication after catheter-based ablation (CA). Although it requires emergency surgical intervention, the associated mortality is high.

In this report, we present a case in which we successfully performed a two-stage hybrid repair of heart surgery and endoscopic treatment with over-the-scope-clip (OTSC; Ovesco Endoscopy GmbH) system for this fatal complication.

A 49-year-old man presented to our emergency department due to a high fever and vomiting. He had received radiofrequency CA for paroxysmal atrial fibrillation 22 days before this admission. His vital signs on admission were a blood pressure of 86/60 mmHg, pulse rate of 130 bpm, and body temperature of 40.1°C. His blood test data are shown in Table 1. In his contrast-enhanced computed tomography (CT) at the admission, we could not detect free air around the left

| TABLE 1 Blood test data on admission |
|--------------------------------------|
| Total bilirubin | 1.5 mg/dl | RBC | 575 *10^6 |
| ALP          | 258 U/L  | Hemoglobin | 16.7 g/dL |
| AST          | 27 U/L   | Hematocrit  | 48.8%  |
| ALT          | 23 U/L   | Platelet    | 16.6 *10^4 |
| LDH          | 222 U/L  | WBC        | 3000   |
| γ-GTP        | 125 U/L  | neut% (band/seg) | 80 (18/62) |
| AMY          | 57 U/L   |            |        |
| CPK          | 58 U/L   | PT-INR     | 1.22   |
| Total protein| 7.1 g/dl | PT (%)     | 67.9%  |
| Albumin      | 4.2 g/dl | PT (s)     | 14.3 s |
| BUN          | 20 mg/dl | APTT (s)   | 30.1 s |
| Creatinine   | 1.33 mg/dl | Fibrinogen | 500 mg/dl |
| Na           | 142 mmol/L | FDP       | 5.4 μg/ml |
| K            | 4.1 mmol/L |            |        |
| Cl            | 103 mmol/L |            |        |
| CRP          | 13.17 mg/dl |            |        |
| Glucose      | 146 mg/dl |            |        |
| Procalcitonin| 2.79 ng/ml |            |        |
| Lactate      | 3.2 mmol/L |            |        |

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atrium and he was admitted with a diagnosis of septic shock. On the next day after admission, his consciousness was impaired. Chest CT and cranial magnetic resonance imaging assisted in diagnosing the patient with multiple air embolization due to AEF.

Emergency surgery was performed under cardiac arrest. After the right side left atriotomy, a 10 mm × 10 mm perforation was detected at the posterior wall of the left atrium that was closed with a bovine pericardial patch (Figure 1). By lifting up the apex to the cranial side, the perforated pericardium was revealed. The pericardium just behind the left atrium perforation was also perforated, and a perforated esophagus was detected behind the pericardium. The perforated pericardium was closed with a bovine pericardial patch. Concomitant intervention for the esophagus was abandoned because the procedure was highly invasive for this hemodynamically unstable patient.

After the cardiac operation, the patient became dependent on mechanical ventilation, a high dose of inotropic agent, broad-spectrum antibiotics, and yglobulin agent. His postoperative bacterial culture of samples from the drainage tube around the esophagus and atrium was negative, and the CT scan showed no evidence of abscess existence (Figure 2A). His hemodynamic status improved 2 days after surgery. Esophageal perforation was detected endoscopically, and endoscopic closure with the OTSC system seemed to be possible.

His esophageal perforation was successfully closed endoscopically with the OTSC system 6 days after surgery (Figures 2B and 3). He underwent percutaneous tracheostomy and percutaneous endoscopic gastrostomy. He was weaned from a mechanical ventilator, and his consciousness improved such that he could communicate using easy words. He was transferred to another hospital in order to continue further rehabilitation 3 months after surgery.

AEF is an uncommon but lethal complication related to CA. Its incident was reported to be 0.02%–0.11% of CA.1 This is the second common fatal complication after CA following cardiac tamponade.2 In a retrospective review of 65 AEFs, the mortality of nonsurgical and surgical treatment was 93.5% and 20.6%, respectively.3 Although emergency surgery is essential, the mortality after surgery is over 20% because of preoperative septic status and systemic, especially cerebral, multiple air embolization and the need for a highly invasive procedure for both cardiac and esophageal perforation.

Although primary esophageal repair is a highly invasive procedure, the risk of suture breakdown for esophageal perforation ranges from 25% to 50%.4 In this case, primary esophageal perforation repair via median sternotomy approach after heart surgery seemed to be impossible. Additional procedure for the esophagus via thoracotomy was not feasible because of hemodynamic instability. We abandoned the concomitant esophageal procedure and adopted a two-stage strategy.

The OTSC is an endoscopic method for the mechanical compression of gastrointestinal tract. This system can be adopted not only for bleeding but also for full-thickness perforations and can be applied to a noncontaminated esophageal perforation. The success rate of the OTSC for perforations was reported at 85%, and its complication, such as migration, perforation, and stenosis, was reported at 1.7%.5
Other treatment options for residual esophageal perforation are esophagectomy and esophageal stent. Although esophagectomy is more popular in this situation, the endoscopic procedure is less invasive and we considered esophagectomy as the final option in case the endoscopic strategy failed. The esophageal stent was also considered an endoscopic strategy, though its risk of migration seemed higher than the OTSC.

In our case, the patient recovered from septic shock after cardiac surgery, and the negative bacterial culture of the drained sample and findings of the CT scan supported esophageal perforation closure without open esophageal surgery.

He received endoscopic esophageal perforation closure with the OTSC system successfully without postprocedural complications.

Though emergency surgery for cardiac perforation cannot be avoided, the procedure for esophageal perforation can be delayed as long as the contamination is controlled. The endoscopic procedure for the AEF before the closure of left atrium perforation is contraindication because it can worsen air embolization. Endoscopic evaluation and treatment strategy are reasonable after cardiac perforation closure.

This hybrid strategy is a low-invasive, safe, and effective option for selective patients of the AEF after CA.

**CONFLICT OF INTEREST**
The authors declare that they have no conflict of interest in this article.