Successful removal of migrated acupuncture needles in a patient with cardiac tamponade by means of intraoperative transesophageal echocardiographic assistance

Jae-Hyeong Park, MD,^a Hong Ju Shin, MD,^b Suk Jung Choo, MD,^b Jae Kwan Song, MD,^c and Jae-Joong Kim, MD,^c Jeonju and Seoul, Korea

Cardiac tamponade is a potentially life-threatening condition that can cause death if not diagnosed and treated promptly. Here we describe a case of cardiac tamponade caused by penetration of the right ventricular free wall by migrated acupuncture needles. The needles were detected and successfully removed with intraoperative transesophageal echocardiographic assistance.

Clinical Summary

A 49-year-old woman was admitted to our hospital after having chest pain and was then hospitalized 2 hours later after syncope. She had a history of recurrent episodes of pulmonary thromboembolism that arose from deep vein thrombosis. A Bird's Nest filter (Cook Co, Leechburg, Pa) was implanted in her inferior vena cava for the prevention of embolism about 6 years ago. Four weeks before admission, she felt bilateral shoulder pain and subsequently received acupuncture treatments to relieve the pain. She was treated with acupuncture on her shoulder and upper back 2 hours before symptom onset. Her blood pressure was 70/48 mm Hg in the emergency department, where a transthoracic echocardiogram showed a large amount of pericardial effusion with tamponade features. After detecting fine and linear foreign material sized approximately 5 cm penetrating the interventricular septum and right ventricular wall (Figure 1, A), a pericardiocentesis was immediately performed. After draining about 600 mL of fresh blood from the pericardial cavity, blood pressure was normalized. The foreign material was seen in the fluoroscopic and computed tomographic examinations (Figure 1, B and C); however, there was no evidence of migration of Bird's Nest filter (Cook Inc, Bloomington, Ind).

The emergency cardiac operation was done to remove the foreign bodies with intraoperative transesophageal echocardiographic guidance (Sonos 2000; Hewlett-Packard Co, Andover, Mass) with a multiplane probe. The transesophageal echocardiogram showed a needle-shaped mass crossing the interventricular septum. After the pericardiectomy, the needle-shaped foreign material was seen penetrating the right ventricular wall and was removed successfully. Despite of the removal, an intraoperative transesophageal echocardiography revealed another needle-shaped foreign body crossing from the interventricular septum to the left ventricular cavity (Figure 2, A). After a cardiopulmonary bypass, her left atrium was opened, and the foreign body was successfully removed. The removed foreign bodies were thin, needle-shaped materials (Figure 2, B).

The materials were proved to be acupuncture needles after a comprehensive analysis from the Department of Acupuncture, College of Oriental Medicine, Kyung Hee University and the Department of Biomedical Engineering, Inje University. She was discharged after the operation without any complication.

Discussion

Acupuncture is an ancient Chinese treatment used to relieve pain from different causes.¹ It is known to be a safe procedure, but serious complications, such as cardiac tamponade and endocarditis, do occur in rare cases.² Cases with cardiac tamponade usually experience direct injury of the coronary artery or pericardium by the acupuncture needle. However, in this case cardiac tamponade occurred as a result of the migrated acupuncture needles.³ Reported cases of needle embolisms can be found, and previously, we submitted a case with cardiac tamponade caused by needle-shaped acrylic bone cement after a percutaneous vertebroplasty. Fortunately, cases with cardiac tamponade caused by migratory intravascular needles are extremely uncommon.

Transesophageal echocardiography is useful in cardiopulmonary resuscitation, management of hemodynamic instability after cardiovascular operation,⁴ detection of pericardial tamponade, and identification of foreign bodies.⁵ In our case the second needle could be successfully removed with the assistance of an intraoperative transesophageal echocardiography. An intraoperative transesophageal echocardiographic examination can be useful in the diagnosis, characterization, localization, and guidance of the removal of foreign bodies.

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From the Division of Cardiology, Department of Internal Medicine,^a Chonbuk National University Medical School, Jeonju, Korea; the Department of Cardiovascular Surgery,^b University of Ulsan, College of Medicine, Asan Medical Center, Seoul, Korea; and the Division of Cardiology, Department of Internal Medicine,^c University of Ulsan, College of Medicine, Asan Medical Center, Seoul, Korea.

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Address for reprints: Jae-Joong Kim, MD, PhD, Division of Cardiology, Department of Internal Medicine, University of Ulsan, College of Medicine, Asan Medical Center, 388-1, Pungnap-dong, Songpa-gu, Seoul, 138-736, Korea (E-mail: jjkim@amc.seoul.kr).

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Figure 1. A, Transthoracic 4-chamber view. A 5-cm, linear, needle-shaped mass is identified penetrating the ventricular septum and right ventricular wall (arrow) and surrounding large amount of pericardial effusion with tamponade features (arrowhead). B, The computed tomogram revealed needle-shaped masses in the interventricular septum and the distal part of the left bronchial artery. C, The needle was seen in the interventricular septum in the enhanced tomographic scan. *PE*, Pericardial effusion; *RV*, right ventricle; *LV*, left ventricle.

Figure 2. A, Intraoperative transesophageal echocardiograms: modified transgastric view demonstrating another needle-shaped mass penetrating the interventricular septum after removal of a needle-shaped mass penetrating the right ventricular wall. B, Removed masses were proved to be acupuncture needles. *RV*, Right ventricle; *LV*, left ventricle.

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Ross procedure with a quadricuspid pulmonary autograft

Sebastian-Patrick Sommer, MD, Christoph Bara, MD, Theo Kofidis, MD, Axel Haverich, MD, PhD, and Uwe Klima, MD, PhD, Hannover, Germany

Aortic valve replacement using the pulmonary autograft as described by Ross¹ in 1967 is an excellent permanent therapy for aortic valve disease, particularly in young patients. This procedure facilitates the omission of anticoagulation. The pulmonary autograft displays a superior longevity and excellent hemodynamic properties in combination with a low incidence of thromboembolism compared with all other aortic valve replacement procedures. However, its success is dictated by the suitability of the pulmonary autograft before the switch to the aortic position; a normal pulmonary valve (PV) without anatomic abnormalities is a prerequisite for the achievement of a satisfying operative and hemodynamic result.

We report on the postoperative outcome and midterm follow-up (4 years) of a 48-year-old female patient who underwent an aortic valve replacement with a quadricuspid pulmonary autograft. A quadricuspid PV is a rare anatomic feature with an incidence of 1 in 1100 individuals.² To our knowledge, the use of a quadricuspid autograft in the Ross procedure has not been reported before.³

Clinical Summary

A 48-year-old female patient presented with signs of congestive heart failure such as peripheral edema and fatigue. Cardiac auscultation revealed a typical systolic murmur with punctum maximum in the third right intercostal space and projection into the carotid arteries. Angiography and echocardiography revealed good left ventricular function (left ventricular ejection fraction 60%) and

severe left ventricular hypertrophy caused by advanced valvular stenosis with a calculated orifice area (aortic valve area) of 0.45 cm² and increased transvalvular gradient of 121/84 mm Hg (peak/mean). The ascending aorta showed poststenotic dilation with a maximal diameter of 40 mm. The aortic root was normal with a diameter of 25 mm.

The patient underwent aortic autograft valve replacement. Preparation of the pulmonary and aortic valve was performed in a standard technique during cardiac arrest on extracorporeal circulation. After the pulmonary autograft was excised, a quadricuspid morphology became evident (PV), which was undetected before surgery. Vigorous irrigation tests demonstrated a patent PV without any sign of regurgitation. The autograft was implanted in a free-root replacement technique. The postoperative course was uneventful, and the patient was discharged on postoperative day 12 in excellent condition. Echocardiography performed intraoperatively and transthoracic echocardiogra-

From the Division of Thoracic and Cardiovascular Surgery, Hannover Medical School, Hannover, Germany.

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Address for reprints: Uwe Klima, MD, Division of Thoracic and Cardiovascular Surgery, Hannover Medical School, Carl-Neuberg Strasse 1, 30625 Hannover, Germany (E-mail: klima@thg.mh-hannover.de).

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Figure 1. Transthoracic echocardiography of the quadricuspid autograft 4 years after Ross procedure. The quadricuspid valve is superimposed by lines to demonstrate the margins of the 4 leaflets.