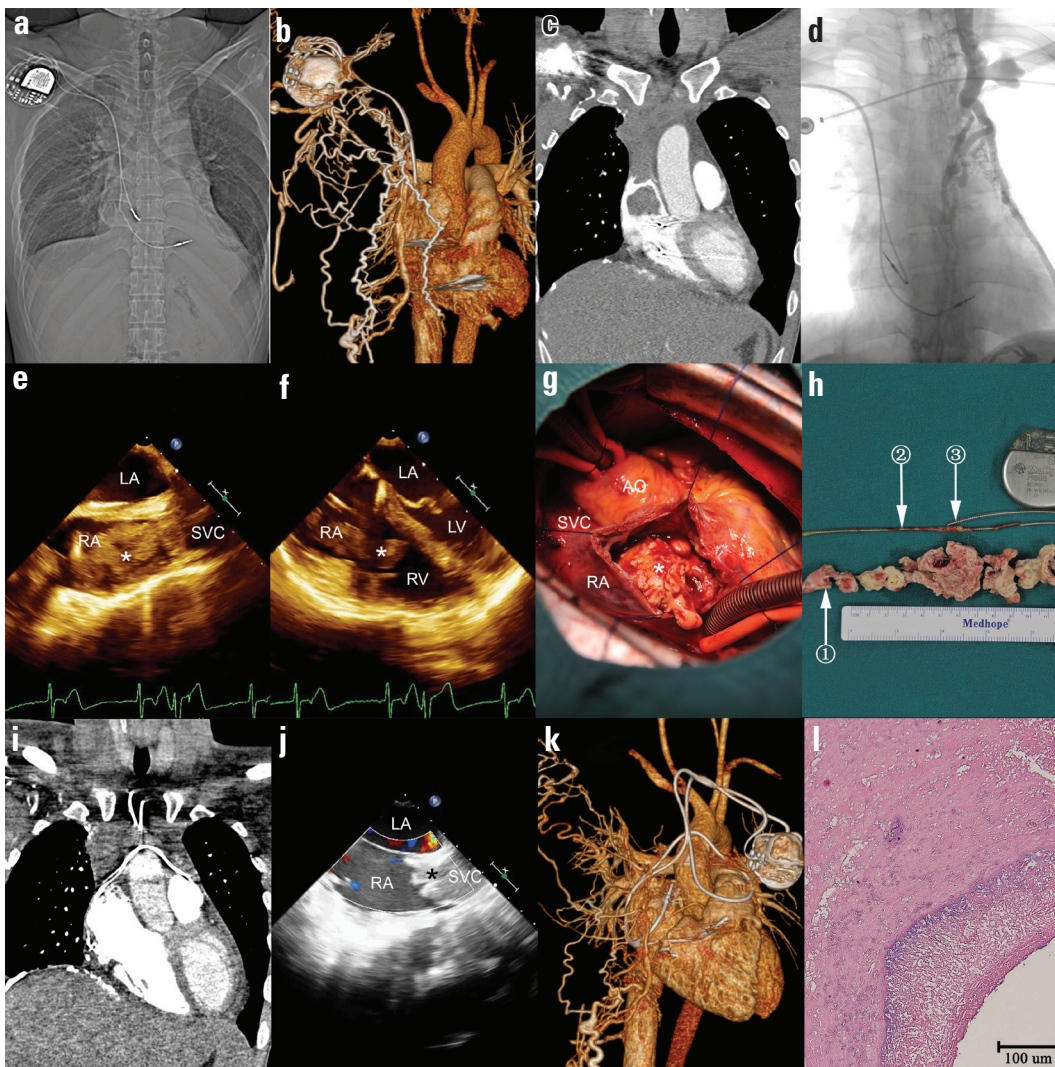


## Multiple images of pacemaker-related endocarditis and superior vena cava syndrome

A 32-year-old male was referred to our institution after developing a persistent fever and symptomatic superior vena cava (SVC) obstruction following implantation of a dual-chamber cardiac pacemaker 4 years earlier due to sick sinus syndrome (Fig. 1a). The physical examination was remarkable for swelling of the face, neck, and right arm and varicosities at the surface of the skin around the upper body. Three-dimensional volume-rendered images demonstrated numerous dilated superficial veins over the right chest (Fig. 1b). Contrast enhanced computed tomography (Fig. 1c) and venography (Fig. 1d, Video 1) revealed occlusion of SVC and

brachiocephalic vein. Transesophageal echocardiography (TEE) further confirmed the obstruction of SVC due to a solid mass (Fig. 1e, Video 2), part of which was located at the right atrium and prolapsed into the right ventricle during diastole (Fig. 1f, Video 3). The patient underwent surgical intervention with the aid of cardiopulmonary bypass. After opening the right atrium, a 40x40x60 mm grey-yellowish mass attached to the pacing leads was identified (Fig. 1g). The mass within the atrial chamber was then completely excised (Fig. 1h-j, Video 4), and no vegetation or thrombus was observed at the tip of the ventricular lead. A new dual-chamber pacemaker with permanent epicardial pacing leads was implanted after the removal of the infected previous pacemaker and intracardiac wires (Fig. 1k). Histopathological examinations of the mass showed a mixture of thrombotic and fibrotic tissues, and cultures yielded no growth (Fig. 1l).



**Figure 1.** Preoperative and post-operative images (a) The pacemaker generator was placed on the right chest wall, and the leads were implanted into the right atrium and ventricle; (b) Three-dimensional volume-rendered images demonstrating numerous dilated superficial veins over the right chest and neck; (c) Contrast-enhanced computed tomography and (d) venography revealed the occlusion of the superior vena cava (SVC) and brachiocephalic vein, and the mass (asterisk) protruded into the right atrium (RA); (e) Transesophageal echocardiography revealed a solid mass located at the junction of SVC and RA; (f) A part of the mass prolapsed into the right ventricle (RV) during diastole. LA - left atrium; LV - left ventricle; (g) A grey-yellowish solid mass (asterisk) attached to the wires; (h) The mass (①) within the atrium was completely excised, and the ventricular (②) and atrial (③) pacing leads were also removed; (i) Contrast-enhanced computed tomography and (j) transesophageal echocardiography confirmed the absence of the right atrial mass, and the lumen of SVC was obstructed by a solid mass (asterisk); (k) A new permanent dual-chamber pacemaker with epicardial leads was implanted; (l) Histopathological examination of the excised mass. AO - aorta

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**Video 1.** Venography through the left jugular vein demonstrated the occlusion of the superior vena cava and brachiocephalic vein.

**Video 2.** Transesophageal echocardiography demonstrated the obstruction of the superior vena cava (SVC) by a solid mass (asterisk). LA - left atrium; RA - right atrium.

**Video 3.** Part of the mass (asterisk) prolapsed into the right ventricle during diastole. LA - left atrium; LV - left ventricle; RA - right atrium; RV - right ventricle.

**Video 4.** Postoperative echo revealed the absence of the right atrial mass, and residual mass (asterisk) located at the junction

of the superior vena cava (SVC) and the right atrium LA - left atrium; RA - right atrium.

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