Echocardiographic Reflections on a Pericardium

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A 66-year-old man with coronary artery disease was scheduled for coronary artery bypass grafting. A standard four-chamber image of the heart was obtained at the time of surgery by two-dimensional transesophageal sonography. An unusually echogenic pericardium was noted, prompting an increase in depth of field of view. When the depth was increased to 24 cm, a round mass, which at first appeared to be extra-pericardial, was observed to be pulsating in synchrony with the heart. An image misleadingly reminiscent of the transgastric short-axis view of a left ventricle is apparent in Figure 1 in the far field of the image just to the right of the apex of the pericardium. The phenomenon is best appreciated in a video clip. (Please see video clip available at www.anesthesia-analgesia.org).

Perhaps because of calcification resulting from pericarditis, the pericardium of this patient was especially reflective and so permitted unusual mirror images to be viewed. As sketched in Figure 2, the pulsatile round mass is probably a mirror image of parts of the right ventricle. Sound beams reflected from the pericardium were carried up to the right ventricle. Echoes from right ventricular tissues were carried back to the transducer via another bounce on the pericardium. Because the pericardium functions as a mirror, the artificial image is displayed on the monitor as if it were beyond the pericardial reflector. As in the case of optical mirrors, the image may be said to be a “virtual.”

Mirror artifacts can pose diagnostic dilemmas (1–3). Our example richly illustrates the physics of this potential problem in echocardiography.

REFERENCES

Figure 1. Reflections on a pericardium.

Figure 2. A forward path of the ultrasound beam (dotted line) and the virtual images of the right heart are sketched (dotted lines). The extrapericardial image seen in Figure 1 and seen beating in an accompanying video clip (on www.anesthesia-analgesia.org) involves sound beam reflection by a pericardial mirror in both the forward and return paths. Mirror images of the right atrium and ventricle are labeled by RA and RV, and a mirror image of the pulmonary artery catheter is designated PAC.

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