Echo-Guided Pericardiocentesis

Let the Bubbles Show the Way

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A 75-year-old man with coronary artery disease, atrial fibrillation, sick sinus syndrome with permanent pacemaker, hypertension, dyslipidemia, and previous exertional dyspnea related to moderately severe mitral regurgitation from myxomatous degeneration and bileaflet prolapse presented with progressively worsening dyspnea several weeks after undergoing successful mitral and tricuspid valve repair with insertion of annuloplasty rings in addition to 2-vessel coronary artery bypass surgery. On presentation to the hospital he was found to have dyspnea at rest, hypotension, and jugular venous distension. A transthoracic echocardiogram demonstrated normal left ventricular function, no significant valvular stenosis, or regurgitation and a moderate sized pericardial effusion measuring 1.4 cm anteriorly and 2.7 cm posteriorly (Figure A through C). Significant inferior vena cava dilatation was noted, but no convincing chamber collapse to suggest overt cardiac tamponade. His symptoms persisted with no alternate cause discovered; therefore, therapeutic pericardiocentesis was requested. The location and distribution of pericardial fluid was reestablished, and a lateral apical approach provided the best window to access the effusion. Under echocardiographic guidance, a sheathed needle was inserted into the pericardial space with aspiration of sanguineous fluid. Agitated saline bubbles confirmed that the needle tip was in the pericardial space (Figure D and online-only Data Supplement Movie I). The needle was removed and the sheath advanced. Prior to dilatation, repeat injection of agitated saline revealed bubbles in the right ventricle; therefore, the procedure was stopped (Figure E and online-only Data Supplement Movie II). A subsequent attempt was performed using the same technique, and this resulted in entry of the catheter sheath into the left ventricle (Figure F and online-only Data Supplement Movie III). The procedure was abandoned, and serial echocardiograms showed no worsening of the pericardial effusion.

Discussion

Echocardiography-guided pericardiocentesis has been performed since the late 1970s, when it was first performed at the Mayo Clinic in Rochester, Minnesota. Echocardiographic guidance for placement of a sheathed catheter into pericardial effusions has supplanted the previously performed blind subxiphoid approach as the preferred procedure for the diagnosis and management of most large or hemodynamically significant pericardial effusions. The blind technique used for years prior to the introduction of echocardiography was associated with exceedingly high rates of morbidity and mortality.[1] The echocardiography-guided technique involves indentifying the location and distribution of pericardial fluid and entering with a needle at a point on the chest wall where the largest fluid accumulation is closest to the skin while avoiding vital structures.[2] Once the sheathed needle is inserted into the pericardial space, only the sheath is advanced, and the steel needle is removed. Sheath position is routinely verified by instillation of agitated saline through the sheath and imaging from another window. In large, symptomatic, or hemodynamically significant pericardial effusions, this technique is associated with near perfect procedural success rates and low incidence of minor complications (3.5%) or major adverse events requiring intervention (1.2%).[2] Our attempted pericardiocentesis initially revealed saline bubbles in the pericardial space but subsequently showed bubbles entering the right and left ventricular cavities. No intervention was required after these inadvertent entries into cardiac chambers. Ultimately, the procedure was abandoned and further attempts were not performed. Although not attempted in our case, real-time echocardiography-guided pericardiocentesis with a probe-mounted needle has been studied and appears to be very safe, and may be useful for smaller or difficult-to-access effusions.[3] The authors of this study argue that constant visualization of the needle during insertion reduces the likelihood of perforating cardiac chambers.

This case highlights the importance of administering agitated saline after attempted needle insertion into the pericardial space as to help avoid inadvertently dilating into a ventricular cavity or other undesired space.

Disclosures

None.

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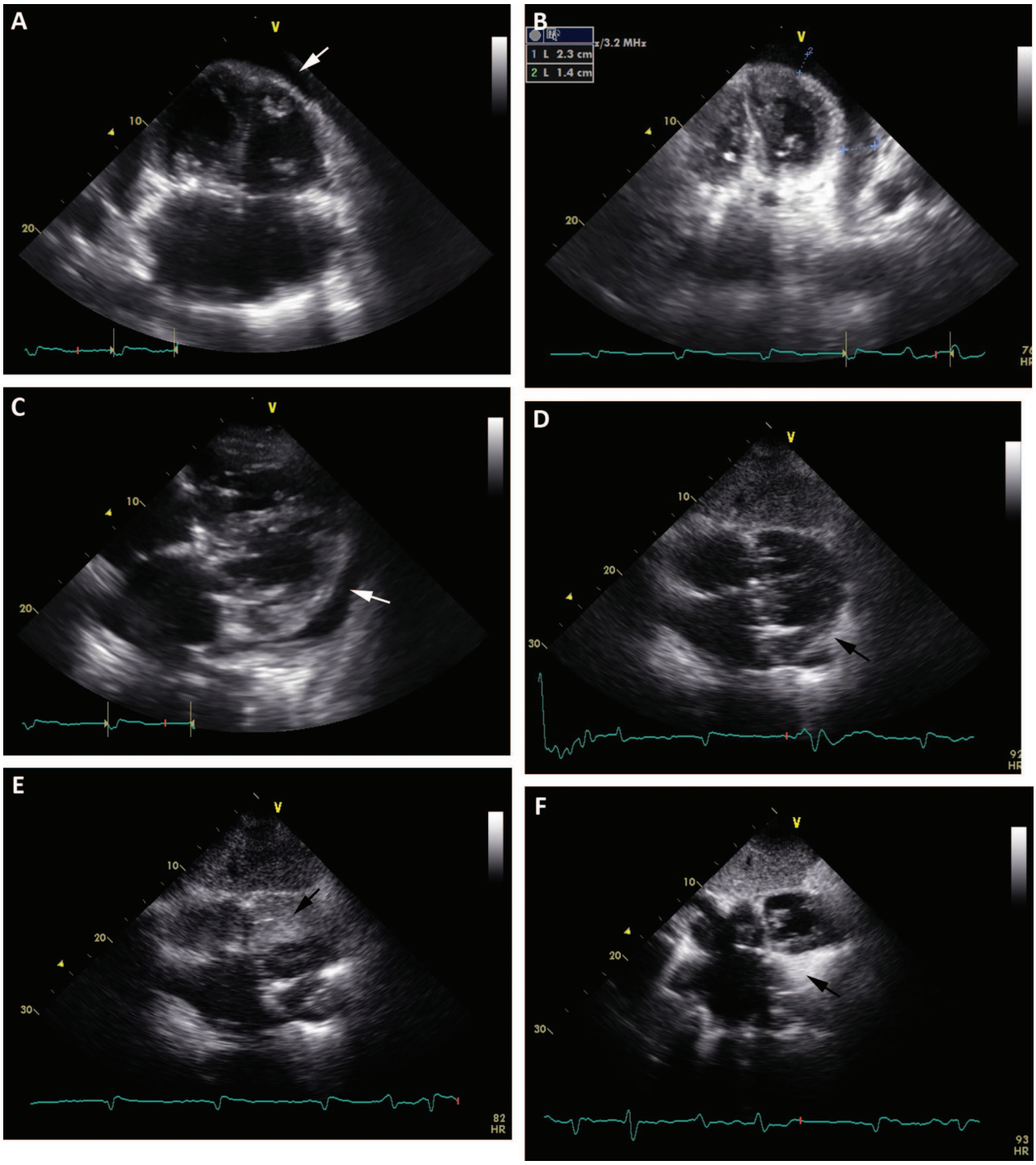

Figure. Transthoracic echocardiogram images obtained before and during attempted pericardiocentesis. (A and B) apical 4-chamber views detailing size and location of pericardial effusion. (C) subcostal view showing posterior fluid collection. (D) agitated saline contrast injected through needle inserted in apical area seen entering pericardial space as imaged from subcostal window. (E and F) subcostal views depicting agitated saline entering right and left ventricular cavities respectively.

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