Benign Intramyocardial Mesothelial Cyst in the Right Ventricular Outflow Tract

Computed Tomography and Cardiovascular Magnetic Resonance Imaging Appearances

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A 51-year-old man presented to the emergency department with chest pain. The patient had undergone a cavitricuspid-isthmus ablation 2 weeks prior, after which he was placed on anticoagulant therapy. He was investigated with a contrast-enhanced thoracic computed tomography (CT) scan that revealed a well-defined, ovoid, low-density, nonenhancing right ventricular outflow tract lesion abutting the septum (Figure 1). The lesion was not visualized on transthoracic echocardiography. On cardiac MRI, the lesion was homogenously bright on steady-state free precession images (Figure 2, Movies I and II in the online-only Data Supplement) and of intermediate to low signal intensity on T1-weighted images (Figure 3). The lesion did not enhance on first-pass perfusion imaging (Figure 4, Movie III online-only Data Supplement) and was hypointense to myocardium on delayed postgadolinium phase-sensitive inversion recovery images (Figure 5). The differential diagnosis included gelatinous myxoma and blood cyst. The patient was already anticoagulated, making thrombus unlikely. The lesion was surgically excised. Intraoperatively, a thin layer of myocardium (Figure 6) was seen covering it. Pathological evaluation revealed a thin-walled cyst (Figure 7) containing clear serous-type fluid, lined by a single layer of columnar epithelial cells with minimal adjacent myocardial fibrosis. The cells were strongly positive for cytokeratin-7, low-molecular-weight keratin, and calretinin (Figure 8) and negative for cytokeratin-20, thyroid transcription factor-1, and podoplanin. The findings were consistent with a benign mesothelial cyst. The patient had an uneventful postoperative recovery.

Intramyocardial cysts are an uncommon occurrence, and intramyocardial cysts are rarer still. Various types of intramyocardial cysts have been reported in literature, the most common being parasitic, such as hydatid cysts. Other rare cysts include bronchogenic cysts, blood cysts, intracardiac epithelial cysts (occurring in isolation or as part of a congenital polycystic tumor of the atrioventricular node or of a teratoma), and pericardial and epicardial mesothelial cysts. However, no reference to an intramyocardial mesothelial cyst was found in recent literature.

Herein, we describe what we believe to be the first reported case of an intramyocardial mesothelial cyst mimicking a benign cardiac tumor.

Mesothelial cysts are usually congenital, lined by a single layer of mesothelial cells, and they contain clear water-like fluid. Pericardial mesothelial cysts have been described to be more commonly unilocular, as opposed to multilocular.

On echocardiography, cysts are anechoic to hypoechoic. On CT images, they have low density, and, on MRI, they have low signal intensity on T1 and high signal intensity on both T2-weighted and steady-state free precession images. However, the most consistent characteristic of true cysts is that they do not enhance after the injection of intravenous contrast media. T2-weighted imaging was not performed in our patient. However, all the other characteristic features of a cyst were present in our case.

On imaging, intracardiac cystic lesions need differentiation from solid benign neoplasms including myxomas, which may also appear as well-circumscribed lesions of lower density or signal than the blood pool, and no significant early contrast uptake on CT images. Heterogeneity within a myxoma may occur owing to necrosis, calcification, hemorrhage, or cystic degeneration, and may cause a myxoma to mimic a true cyst. However, most myxomas are echogenic on echocardiography, and heterogeneous, mild delayed enhancement on CT and MRI is common.

Grossly, the lesion in our patient consisted of a unilocular cyst containing clear serous fluid. Microscopically, the cyst was lined by flattened cells, which on immunohistochemistry, were strongly positive for cytokeratin-7, low-molecular-weight...
keratin, and calretinin, consistent with mesothelial origin. The cells did not stain for thyroid transcription factor-1 and podoplanin, reducing the possibility of a bronchogenic cyst and lymphangioma, respectively. The surrounding musculature had minimal microscopic fibrosis, but there were no signs of acute or chronic inflammation.

Much of the surgical literature on right ventricular outflow tract lesions is centered on patients with either pulmonary stenosis or insufficiency returning after successful infant repairs of various congenital disorders like tetralogy of Fallot. There is a paucity of published knowledge concerning how to approach the right ventricular outflow tract without replacing the pulmonary valve in cases such as ours. An anterior opening of the pulmonary artery via a longitudinal incision and deflection of the pulmonary leaflets was used to approach the right ventricular outflow tract in our case.

**Figure 1.** Contrast-enhanced computed tomography (CT) sagittal image showing the low density (average 16.6 HU) of the lesion.

**Figure 2.** Cine Steady State Free Precession (SSFP) axial image showing the lesion to have homogenously high signal intensity (arrow).

**Figure 3.** T1 black blood sagittal image showing the lesion to have intermediate to low signal intensity (arrow).

**Figure 4.** First-pass perfusion sagittal image showing no enhancement (arrow) of the lesion.

### Disclosures
None.

### References
Figure 5. Fifteen minutes postgadolinium phase-sensitive inversion recovery (PSIR) short-axis image showing uniform suppression (arrow) of the lesion signal.

Figure 6. Intraoperative image showing a thin retracted layer of myocardium (arrow) covering the lesion.

Figure 7. Gross pathology image showing a thin-walled cyst (arrow) containing clear serous-type fluid.

Figure 8. Microscopic section of lesion showing strong staining with calretinin (arrow).
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