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Cardiac Hemangioma: Features on Cardiovascular Magnetic Resonance

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ABSTRACT

We present a case of cardiac capillary hemangioma in a patient who presented with a history of recurrent episodes of syncope. Cardiovascular magnetic resonance played an important role in the diagnosis of cardiac hemangioma in our patient.

CASE REPORT

A 16-year-old female presented following three episodes of witnessed syncope, each lasting for not more than two minutes. She denied any dyspnea, chest pain, palpitations, or rapid heart rhythm prior to these episodes. Physical examination and routine blood tests were within normal limits. Electrocardiogram and chest x-ray were unremarkable. Syncope work-up included CT pulmonary angiogram, which did not show any evidence of pulmonary embolism but incidentally revealed a mobile, spherical, and hypodense mass in the right ventricular cavity. Trans-thoracic echocardiogram demonstrated a hyperechoic, mobile circular mass in the right ventricular cavity with preserved cardiac function. Cardiovascular magnetic resonance (CMR) was performed on a 1.5 Tesla MR scanner (Magnetom Avanto, Siemens Medical Solutions, Malvern, Pennsylvania, USA) to further characterize the mass and its anatomical relation to tricuspid valve, and right ventricular free wall. Steady State Free Precession (SSFP) breath-hold cine CMR demonstrated a hypo-intense, one centimeter highly mobile pedunculated soft tissue mass with a stalk attached to the right ventricular free wall, located approximately 2 cm away from the tricuspid annulus, without attachment to tricuspid valve leaflets or the annulus (Figure 1). The mass demonstrated intermediate (Figure 2) and high signal on T1- and T2-weighted dark blood turbo spin-echo imaging, respectively. T1-weighted inversion recovery gradient-echo perfusion imaging demonstrated contrast filling of the mass, suggesting hypervascular nature of the lesion (Figure 3). In addition, 10 minutes following injection of 0.2 mmol/kg of body weight of gadodiamide (Omniscan, GE Healthcare, Waukesha, Wisconsin, USA), late gadolinium enhancement (LGE) T1-weighted, fat-saturated, inversion recovery CMR was performed. This demonstrated a peripheral rim enhancement of the mass, indicating delayed blood filling, which is suggestive, but not pathognomonic for hemangioma (Figure 4). Based on the above CMR findings, a diagnosis of cardiac hemangioma, although rare, was considered. The tumor was surgically excised through a midline sternotomy. At surgery, the mass was 1 cm in diameter attached to the right ventricular free wall by a 3 mm diameter and 3 mm long muscular stalk. Following excision, cryoablation of the mass base was performed without any perioperative complications. The patient was discharged 3 days after surgery in stable condition. Histopathology confirmed a 11 mm × 10 mm capillary hemangioma composed of innumerable capillary-sized blood vessels (Figure 5). The patient remained asymptomatic during the one year follow-up without evidence of recurrence or residual tumor on echocardiography.

DISCUSSION

Primary cardiac neoplasms are considered rare with a reported prevalence of 0.001 % to 0.03 % based on autopsy series (1). Approximately 75% of all primary cardiac tumors are benign (2). Cardiac hemangiomas can present in the age range from infancy to late adulthood and account 5%–10% of benign cardiac tumors (1).

Most cardiac hemangiomas are discovered incidentally by echocardiography, CT, MRI or at autopsy. In symptomatic cases, most common presentations are arrhythmias (3), pericardial

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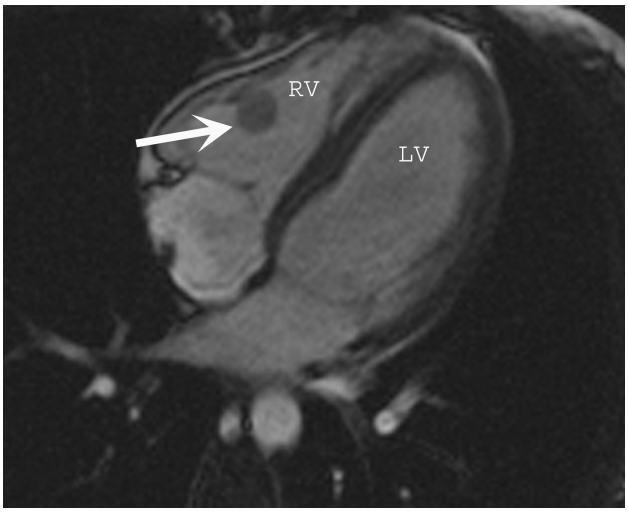


Figure 1. A single frame of four-chamber cine SSFP CMR (diastolic phase) demonstrates a hypo-intense, spherical, and pedunculated soft tissue mass within the mid right ventricle, which is attached to the RV free wall via a short stalk (arrow).

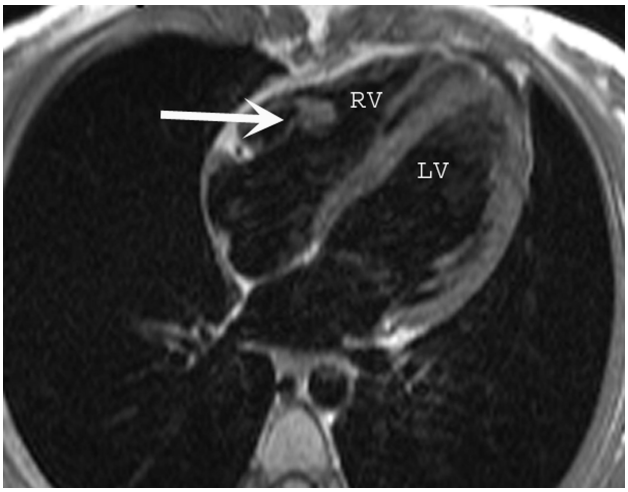


Figure 2. Four-chamber T1-weighted dark blood turbo spin-echo CMR image demonstrates intermediate signal of the right ventricular mass (arrow).

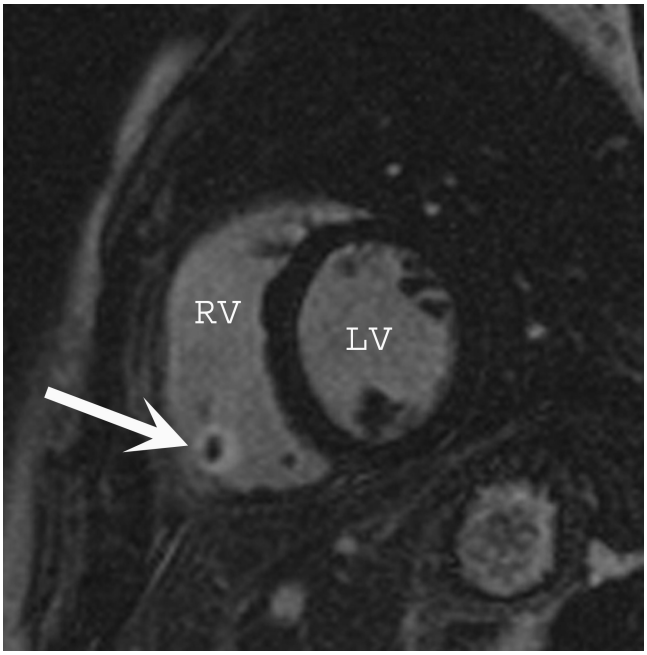


Figure 4. Short axis view of a 10-minute late gadolinium enhancement (LGE) fat-saturated inversion-recovery CMR demonstrates peripheral enhancement of the RV mass (arrow). Presence of this finding favors the diagnosis of cardiac hemangioma.

effusion (3, 4), congestive heart failure (5), right ventricular outflow tract obstruction (6), coronary insufficiency (7), and sudden death (5, 8). Hemangiomas can be pericardial, intramyocardial or subendocardial in location. Cardiac hemangiomas have unpredictable outcomes and can proliferate indefinitely, remain stable, or rarely demonstrate regression (9). However, cardiac tumors of any type need to be resected due to the associated complications, including embolic stroke, pulmonary embolism, and arrhythmia resulting in sudden death. Histological classification of cardiac hemangioma is described as cavernous (multiple thin-walled, detailed vessels), capillary as in our case (smaller capillary-like vessels) or arteriovenous (thick-walled dysplastic arteries, venous-like vessels, and capillaries) (3).

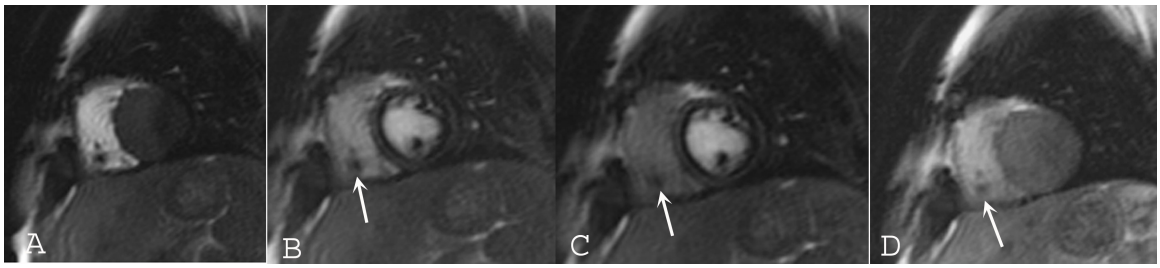
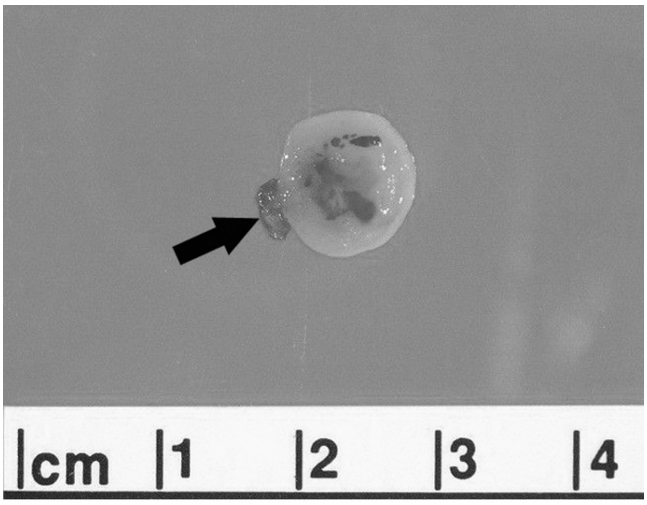


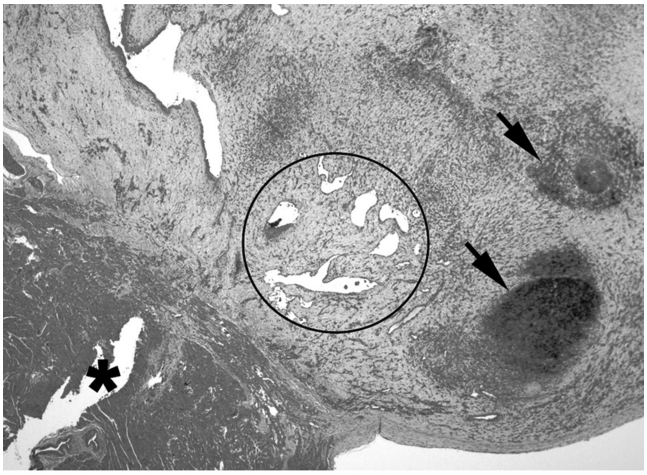
Figure 3. Short axis T1-weighted inversion recovery gradient-echo perfusion imaging demonstrates first pass contrast arrival in the RV (A), and peripheral contrast enhancement of the mass (B and C, arrow), with subsequent complete filling of the tumor on the second pass arrival of the contrast in the RV (D, arrow), which indicate vascularity of the lesion. Intra-cardiac thrombus is an avascular lesion and typically does not show perfusion.



(a)

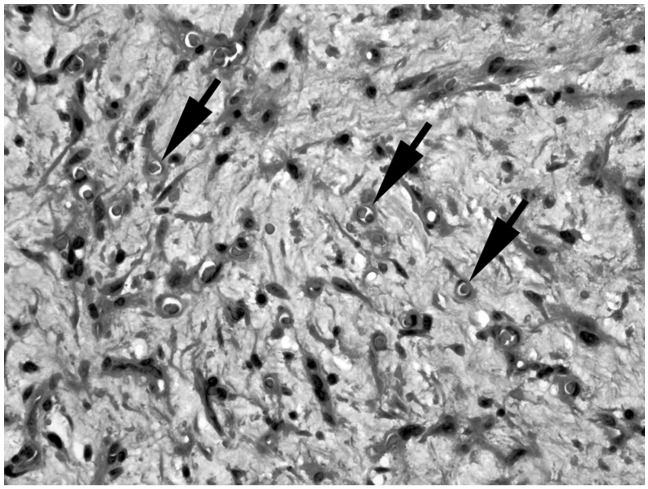
Figure 5a. Gross photograph of the resected tumor specimen exhibits a polypoid, tan, gelatinous, and focally hemorrhagic lesion with a small stalk (arrow).

Cardiac hemangiomas are hyperechoic lesions on echocardiography and are reported to have intense enhancement on CT following contrast administration in most cases (10). Due to higher spatial resolution and multiplanar image acquisition, MRI is superior to other imaging modalities in tissue characterization of cardiac tumors. Cine SSFP and dark blood T1-weighted Turbo Spin-echo imaging are useful for evaluation of anatomic features, whereas first pass and late gadolinium enhancement T1-weighted sequences are important in assessing the vascularity of the tumors (11). As seen in our patient, cardiac hemangiomas typically demonstrate intermediatesignal intensity on T1-weighted images and are hyperintense on T2-weighted images (10). Intermediate to high signal intensity of hemangioma is typically preserved on fat suppressed T1-weighted imaging, whereas there is characteristic signal suppression in cardiac lipoma. Hemangiomas may typically show first pass contrast filling on perfusion imaging, suggesting vascularity of the lesion (12), whereas intra cardiac thrombus and lipoma are avascular in nature and do not demonstrate tissue perfusion. Presence of late gadolinium enhancement is suggestive of vascular nature of the lesion. Although peripheral enhancement of the tumor is not pathonomonic, it favors the diagnosis of hemangioma (12, 13), as seen in our patient. Right ventricular myxoma is rare and can demonstrate heterogeneous contrast enhancement but not peripheral rim contrast filling pattern (10).



(b)

Figure 5b. Low power photomicrograph (original magnification, 40x; H&E stain) shows the interface between the endomyocardium (*) and the tumor, which is comprised mostly of innumerable small and occasional larger, ectatic blood vessels (encircled area). Note the presence of hemorrhagic areas (short black arrows).



(c)

Figure 5c. High power photomicrograph (original magnification, 400x; H&E stain) demonstrates a marked proliferation of capillary-sized blood vessels (short black arrows) within a slightly blue acid mucopolysaccharide ground substance. Some of these blood vessels contain red blood cells. Features are consistent with capillary-type cardiac hemangioma.

Treatment of choice for cardiac hemangioma is surgical resection in the presence of symptoms and diagnostic uncertainty about the nature of the lesion.

CONCLUSION

Utilizing various image acquisition sequences in multiple orientations, CMR has an important role for non-invasive morphological assessment and tissue characterization of cardiac tumors including hemangiomas.

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