



Supraventricular Tachycardia Associated with Cardiac Hemangioma on the Anterior Mitral Valve Leaflet: A Case Report

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Abstract

Background: Cardiac hemangiomas are exceedingly rare benign vascular tumors, representing <2% of primary cardiac tumors.

Case Presentation: A 65-year-old female patient with a history of palpitations, hypothyroidism, and hypoparathyroidism presented with an acute onset of palpitations and dyspnea. On physical examination, the patient had regular tachycardia with clear and equal bilateral air entry. Initial laboratory tests and chest X-ray showed no acute abnormalities. An electrocardiogram (ECG) showed narrow-complex supraventricular tachycardia (SVT) with a heart rate of 170 bpm and a QRS duration of 80 ms, consistent with atrioventricular nodal reentrant tachycardia (AVNRT), which was unresponsive to vagal maneuvers but was successfully converted with 6 mg of intravenous adenosine. Multimodality imaging, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), and cardiac magnetic resonance imaging (CMR), was performed. TTE showed a fixed, normoechoic mass (1-1.2 cm) at the aortomitral junction involving the A2 segment of the anterior mitral leaflet; TEE described a nonobstructive heterogeneous echodensity (17 × 6 mm) at the leaflet base near the intervalvular fibrosa; CMR showed a 13 × 11 mm arched structure on the anterior mitral leaflet, beneath the aortic valve, with cavity-like perfusion, T2 hyperintensity, and late gadolinium enhancement. Surgical resection was performed 3 weeks after the diagnosis, and histopathology showed a remodeled remnant hemangioma. Postoperatively, continuous telemetry and long-term clinical and serial ECG follow-up confirmed complete resolution of the arrhythmia without tumor recurrence.

Conclusion: We report a cardiac hemangioma on the left atrial side of the anterior mitral leaflet, extending slightly into the left atrial cavity without obstructing blood flow, in a patient with episodes of supraventricular tachycardia. She recovered well after tumor resection, with no clinical signs of arrhythmia recurrence.

Keywords

Cardiac Hemangioma, Mitral Valve, Supraventricular Tachycardia, Atrioventricular Nodal Reentrant Tachycardia,

Cardiac Magnetic Resonance Imaging, Surgical Resection

Introduction

Cardiac tumors are among the rarest types of tumors. Most are secondary metastases with a very limited prognosis. Primary heart tumors are rare as well. They are found in autopsy studies with an incidence of just 0.002-2.8%. Of these tumors, about 75% are benign, while the remaining 25% are malignant. Among the benign tumors, myxomas comprise about 50%. Other benign tumors include lipomas, which constitute 19%, and papillary fibroelastomas, which constitute 17%. Vascular tumors, including hemangiomas, account for less than 3%, and hamartomas are very rare [1].

Of these benign vascular tumors, hemangiomas are the most common, and they most often present in infants. They typically appear shortly after birth in soft tissues such as the skin, mucosa, and muscle, most commonly in the head and neck. They proliferate quickly in the first year of life and then regress over the course of childhood. There is a lack of consensus surrounding hemangiomas of the heart, and most classification systems divide the tumors based on the area of the body in which they present. These systems include Abramson 1962, Shafer 1993, WHO 1996, and Fletcher 2003. These systems highlight just how complex the diagnosis of cardiac hemangiomas is [2].

Hemangioma is the most common type of blood vessel tumor that can occur in children. It first appears shortly after birth in soft tissue areas such as the skin and muscles, especially in the areas of the head and neck. It grows rapidly over the first year of life and then shrinks throughout childhood. Although multiple systems exist to classify the condition based on anatomy and histology, among other factors, in cardiac hemangioma, including Abramson 1962, Shafer 1993, WHO 1996, and Fletcher 2003, there is no clear consensus, as it is a complex condition that is difficult to diagnose [2].

With hemangiomas accounting for only 2% of primary heart tumors, cardiac hemangiomas are also considered benign vascular tumors, characterized by an overgrowth of the blood vessel lining within the heart [2,3].

They can also be seen to have vascular tubes that are traced from the lining of the blood vessel to the nuclei, where there are weak, small nuclear structures that are not frequently seen. They may also form what appear to be remnant connections to the heart. Hemangiomas can also be classified into different types, such as cavernous, capillary, or arteriovenous forms [2].

Although hemangiomas of the heart are benign, the rarity of the condition and possible complications, such as obstruction, arrhythmias, and embolization, make diagnosis and treatment challenging. While many cases are asymptomatic, there are symptomatic cases that require surgery. The first-line imaging method is echocardiography, although it provides limited vascular characterization. Contrast-enhanced ultrasound (CEUS) and cardiac magnetic resonance imaging (CMR) can demonstrate persistent intense enhancement, T2 hyperintensity, and strong post-contrast enhancement, which help distinguish the condition from myxomas, fibroelastomas, thrombi, or vegetations [2,3].

When the condition is symptomatic, surgical excision is the only option and provides an excellent prognosis. Surgical techniques are designed to maximize the preservation of cardiac chambers, avoid tearing or damaging valves, and avoid injury to the conduction tissues. Improvements in magnetic resonance imaging and echocardiography techniques have made the diagnosis of hemangiomas more frequent, with some being detected incidentally [3].

One such case is a cardiac hemangioma located on the left atrial side of the anterior mitral leaflet, extending slightly into the left atrium without obstruction and manifesting with acute AVNRT-type supraventricular tachycardia, successfully managed by complete surgical resection.

Case Presentation

A 65-year-old female patient experienced an acute, recent onset of palpitations and dyspnea. At the initial examination, no other medical issues were apparent, and the patient presented with regular tachycardia. She had a history of undocumented palpitations, along with

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hypothyroidism and hypoparathyroidism. She had no prior documentation of structural heart disease or documented arrhythmias.

Cardiac auscultation revealed a rapid, regular rhythm with normal single S1 and S2 sounds and no murmurs. Pulmonary examination demonstrated clear, equal bilateral breath sounds. Laboratory findings showed no abnormalities, and the chest X-ray appeared normal, with the exception of the patient's vital signs.

An immediate 12-lead electrocardiogram (ECG) showed a regular, narrow-complex tachycardia at a rate of 170 bpm, a QRS duration of 80 ms, sharp peaked waves, no identifiable P waves, and regular R-R intervals, consistent with atrioventricular nodal

reentrant tachycardia (AVNRT) (**Fig-1**). Vagal maneuvers were unsuccessful. A rapid 6 mg intravenous (IV) push of adenosine achieved immediate pharmacologic cardioversion to regular sinus rhythm. The patient was stabilized and transferred to the ward.

Multimodality Imaging:

Transthoracic Echocardiography: Transthoracic echocardiography (TTE) clearly demonstrated a stationary, normoechoic mass at the aortomitral junction, primarily involving the A2 segment of the anterior mitral valve leaflet, measuring 1-1.2 cm (**Fig-2**). The differential diagnoses were papillary fibroelastoma, myxoma, and hemangioma.

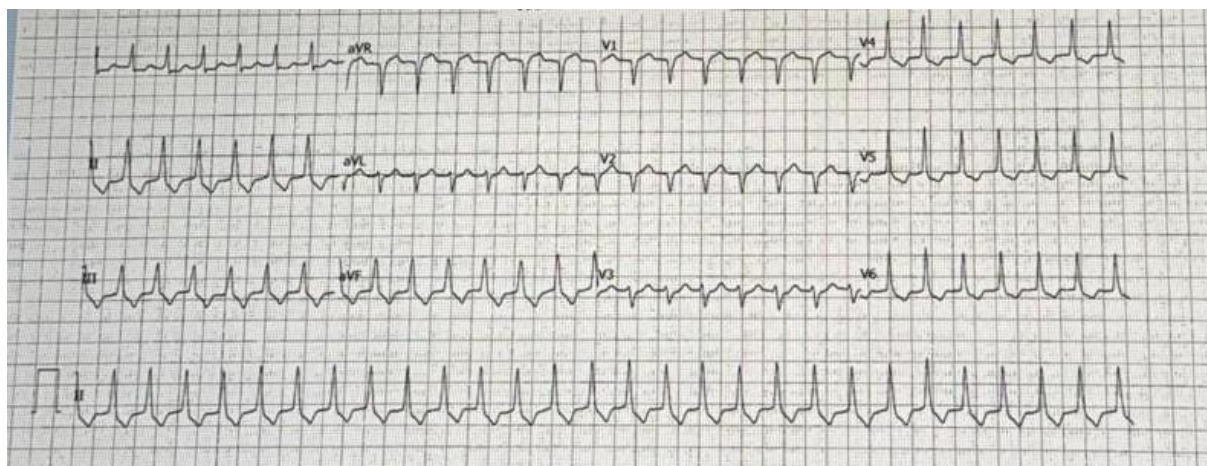


Fig-1: EKG

Initial 12-lead ECG demonstrating regular, narrow-complex supraventricular tachycardia consistent with atrioventricular nodal reentrant tachycardia (AVNRT) at a rate of 170 bpm, with a QRS duration of 80 ms, sharp peaked waves, and no visible P waves.

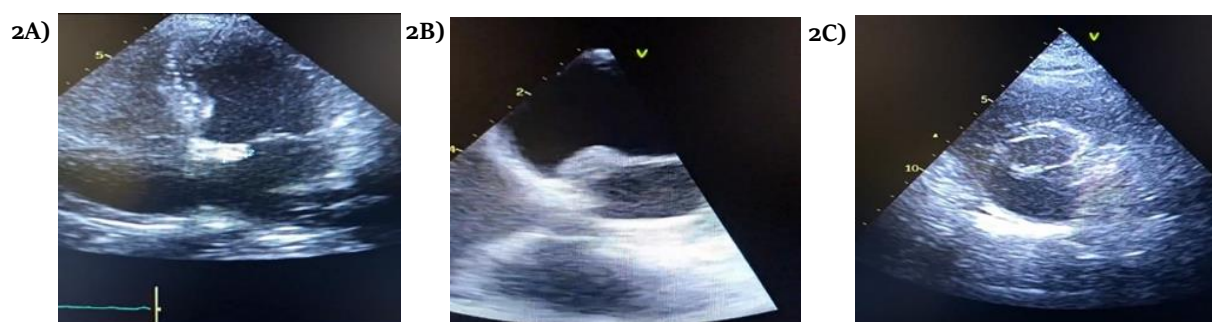


Fig-2: TTE

Transthoracic echocardiographic images of the mitral valve mass. (a) Apical 4-chamber view showing a normoechoic mass on the anterior mitral valve leaflet protruding toward the left atrium. (b) Apical 2-chamber view depicting mobility of the mass toward the left atrium. (c) Parasternal short-axis view demonstrating attachment of the mass at the aortomitral junction.

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Transesophageal Echocardiography: Transesophageal echocardiography (TEE) demonstrated a heterogeneous echodensity (17×6 mm) attached to the base of the anterior mitral leaflet near the intervalvular fibrosa, with extension toward the mid-atrial side without obstruction. No definitive diagnosis was made, with atypical myxoma or hemangioma suggested (**Fig-3**). Findings from left heart catheterization were normal.

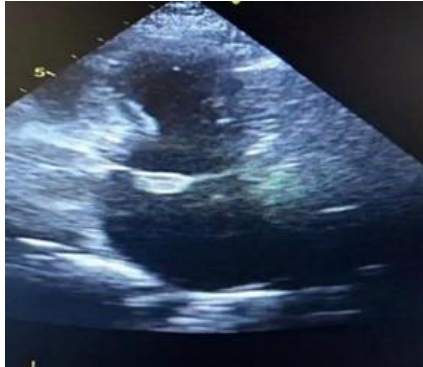


Fig-3: Transesophageal echocardiography (TEE) showing a high-resolution view of the 17×6 mm heterogeneous mass attached to the base of the anterior mitral leaflet near the intervalvular fibrosa, without causing left ventricular outflow tract or mitral inflow obstruction.

Cardiac Magnetic Resonance Imaging: Cardiac magnetic resonance imaging (CMR) showed normal left ventricular (LV) size (interventricular septum 6 mm, end-diastolic diameter 45 mm, posterior wall thickness 5 mm), systolic function (LVEF 63%), and wall thickness; normal right ventricular size, systolic function (RVEF 48%), and wall thickness. Trace

pericardial effusion and a 13×11 mm arched structure were additional findings. This arched structure was attached to the anterior mitral leaflet, to the area beneath the aortic leaflet, and showed cavity-like perfusion (**Fig-4**). Tissue characterization showed high signal intensity on T2-weighted STIR images, dynamic cavity-like perfusion, and late gadolinium enhancement (LGE). The possibilities included infective vegetation, papillary fibroelastoma, and valvular myxoma, but these were considered much less likely. In the basal and mid-inferior LV segments, subtle delayed epicardial enhancement was noted.

There was diagnostic uncertainty and a risk of recurrence of SVT; thus, 3 weeks later, the cardiothoracic surgeon excised the mass from the mitral valve (**Fig-5**).



Fig-5: Gross Pathology Specimen

The completely resected soft vascular mass from the anterior mitral leaflet.

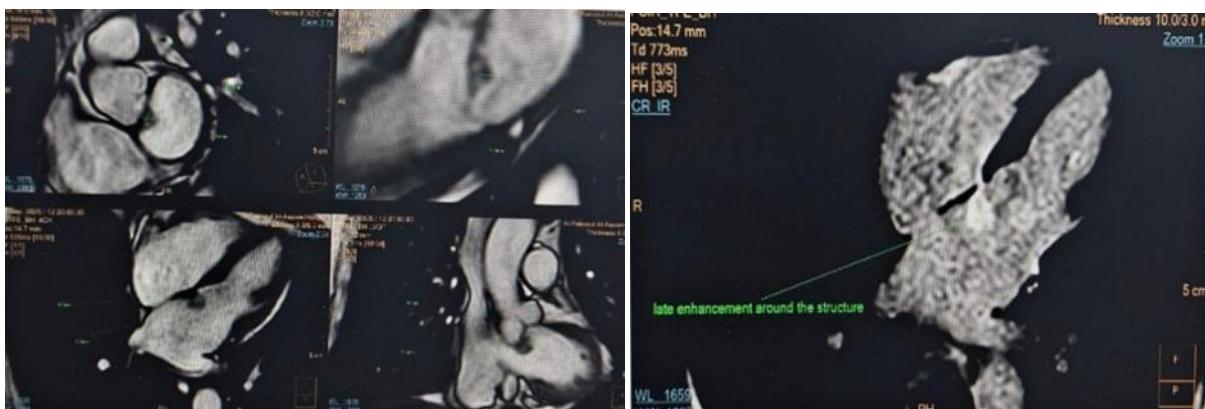


Fig-4: Cardiac magnetic resonance imaging (CMR) with T2-weighted STIR and late gadolinium enhancement (LGE) sequences showing a 13×11 mm hyperintense, enhancing arched structure on the anterior mitral leaflet.

In the postoperative specimens, histopathology showed a well-circumscribed, non-encapsulated mesenchymal lesion bordered by cardiac muscle fibers. It showed vascular-like structures with thick fibrohyaline walls and a myxoid stroma, arranged concentrically around dilated slit-like spaces. Endothelial cells lined the spaces, and a thin elastic lamina highlighted the structures. Fibrin deposition was not seen, and there was no evidence of inflammation or malignancy.

Special Histochemical Stains:

- Masson's Trichrome: Highlighted dense stromal collagen.
- Alcian Blue: Confirmed focal myxoid stromal change.
- Weigert-Van Gieson: Demonstrated intact elastic lamina outlining the vascular architecture.
- Periodic Acid-Schiff (PAS): Visualized basement membrane integrity.

Although endothelial immunohistochemical markers (e.g., CD31 and CD34) were not performed, the distinct vascular architecture and histochemical features established the diagnosis of a remodeled "remnant" cardiac hemangioma.

Postoperative Course and Follow-Up:

The patient was monitored continuously via telemetry in the intensive care unit and telemetry ward for several days postoperatively, exhibiting no recurrence of SVT or ectopy. She was discharged in stable condition. Outpatient follow-up consisted of regular clinical visits accompanied by 12-lead ECGs and symptom monitoring, confirming sustained sinus rhythm and complete absence of arrhythmia recurrence.

Discussion

Cardiac hemangiomas (CH) form an exceedingly small proportion of all primary cardiac tumors, accounting for less than 2%, and are benign vascular tumors of the heart. Still, the clinical intricacies and issues associated with their diagnosis warrant special attention. This case of a left atrial hemangioma, which was attached to the anterior mitral leaflet and had mild prolapse into the left atrial cavity, adds to the knowledge

of this pathology and its clinical presentation.

Currently, CH are documented across a wide age range, from infancy to geriatrics, and there is no clear sex predominance. A systematic review of the literature from 2015 to 2019, consisting of 55 cases, documented a slight female predominance, with a wide age range from infancy to geriatrics [3]. Although more CH cases have been clinically documented in the right atrium and right ventricle, there is also documented involvement of the left atrium and its outflow. CH have been documented across a wide age range, from infancy to geriatrics, with left atrial and left ventricular involvement and associated outcomes [4]. In particular, valvular CH on the mitral leaflet, such as that in our patient, is rare and has received sporadic documentation in the literature [2].

The precise clinical symptoms these patients display largely depend on the exact size, location, and involvement of the CH with the surrounding cardiac structures. Of the patients who have been documented, almost half have been asymptomatic, and these cases have been incidentally discovered during CH evaluation or during evaluations for other unrelated diseases. Symptoms include arrhythmias, which can be both tachyarrhythmias and bradyarrhythmias, embolic strokes, obstructive signs, and heart failure when there is compromised chamber function or valvular obstruction [1]. The supraventricular tachycardia experienced by our patient was probably caused by localized irritation or disruption of the atrial conduction system as a result of the adjacent hemangioma. Other cases of arrhythmia have also been reported in the literature on CH [5].

Despite being extremely important, diagnostic imaging is very challenging. Transthoracic echocardiography (TTE) is the first-line screening test, but it is nonspecific, and many CH cases are misdiagnosed as myxomas or fibroelastomas because of their echogenicity and shape. Transesophageal echocardiography (TEE) improves visualization of the attachments, but it also cannot reliably differentiate CH from other cardiac masses [3]. By providing tissue characterization, cardiac magnetic resonance imaging (CMR) can improve diagnostic accuracy. CH lesions are usually hyperintense on T2-weighted imaging and

demonstrate marked homogeneous enhancement on post-contrast sequences because of their vascularity. Other CMR findings, such as epicardial late gadolinium enhancement, can also provide diagnostic information. While novel imaging modalities, such as contrast-enhanced ultrasound and positron emission tomography/computed tomography (PET/CT) with ¹⁸F-FDG and ¹⁸F-FAP-2286, have great potential for differentiating vascular tumors, there remains a significant lack of clinical experience [6]. In our case report, slight variations in measurements across modalities, TTE (1.0-1.2 cm), TEE (17 × 6 mm), and CMR (13 × 11 mm), reflect differences between dynamic echocardiographic cross-sectional imaging and static three-dimensional volumetric CMR sequences.

The presence of endothelial-lined vascular channels of varying sizes and configurations is a hallmark of the diagnosis, as described in detail in the histopathology. These findings are consistent with the predominant cavernous subtype, which contains few atypical cells and little to no mitotic activity. Other variants of differentiated vascular tumors, which may also occur in mixed forms, include capillary and arteriovenous hemangiomas [2]. The term "remnant hemangioma" describes a lesion undergoing regressive stromal remodeling, evidenced by hyalinization and myxoid changes. While immunohistochemistry (CD31 and CD34) is frequently used, diagnosis can be established through classical vascular morphology and histochemical special stains, including Masson's trichrome, Weigert-Van Gieson, Alcian blue, and Periodic Acid-Schiff (PAS). We have also noted recent reports in the literature of associations between hemangiomas and systemic inflammatory or rheumatologic diseases, which appear to be rare but may be of potential importance from a systemic inflammatory or rheumatologic disease perspective [7].

The gold standard remains surgical resection, which is the treatment of choice when symptoms are present or when there is diagnostic uncertainty before surgery. To avoid complications, it is important to perform complete surgical resection. Modern surgical techniques, especially those that permit the use of robotic assistance, have also improved the safety of vascular tumor resection with respect to preserving the

conduction system and valves, with a reduction in overall morbidity associated with surgical procedures and lesion resection [8,9]. Our patient's complete resection and smooth recovery from surgery are consistent with positive reported outcomes and support the safety and benefit of surgical treatment in this case.

In the literature, reports of CH involving the right atrium and ventricle are more common and include complications such as right heart failure and ascites [10,11].

The novelty of this report is that it highlights a rare presentation of a cardiac hemangioma arising from the left atrial side of the anterior mitral leaflet (A2 segment/intervalvular fibrosa), particularly with respect to the configuration and imaging of a mitral valve-associated hemangioma, manifesting acutely as AVNRT-type SVT and successfully treated by surgical excision with complete valvular preservation and clinical resolution.

The absence of follow-up imaging after complex resections of cardiac hemangiomas is concerning because, although recurrences have been reported, they are unpredictable and therefore warrant regular imaging surveillance after resection, especially in cases involving the cardiac ventricles. There is a need for greater multicenter collaboration and analysis of cardiac hemangioma registries to determine the natural history of these tumors so that recurrence and associated risk factors can be incorporated into management pathways [3].

Conclusion

Cardiac hemangiomas are rare and should be considered in the differential diagnosis of intracardiac masses. They can be associated with mass effects, arrhythmias, and signs of functional valvular obstruction. Diagnosis can be established through multimodality imaging and surgical histopathological examination, while surgical management can alleviate symptoms. This case documents the rare occurrence of a cardiac hemangioma arising from the anterior mitral valve leaflet and associated with paroxysmal supraventricular tachycardia. It highlights the importance of accurate diagnosis and appropriate

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surgical treatment. Further clinical experience and follow-up may help improve the management and prognosis of this patient population.

Conflict of Interest

The author has read and approved the final version of the manuscript. The author declares no conflicts of interest.

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