

## Original Article

# Rare Benign Cardiac Tumors and Tumor-Like Conditions in Children and Adults: A 5-Year Histopathological Study From Rajaie Cardiovascular Institute

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## ABSTRACT

**Background:** Cardiac tumors are extremely rare conditions encompassing a diverse range of mass lesions, including primary tumors originating from the heart and great vessels, metastatic tumors, and tumor-like lesions that do not fit the conventional definition of a tumor or neoplasm. In contrast to metastatic tumors, primary cardiac tumors and tumor-like lesions are rare, with most primary neoplasms being benign.

**Methods:** A histopathological study was conducted among all patients who presented to Rajaie Cardiovascular Institute between 2020 and 2025. Data were collected from surgical pathology records to identify relevant cases.

**Results:** Among 28 patients diagnosed with benign cardiac tumors and tumor-like conditions (excluding myxomas), 15 were male, and 13 were female. The identified benign tumors included rhabdomyoma, fibroma, papillary fibroelastoma, lipoma, lymphangioma, capillary hemangioma, and cavernous hemangioma. Additionally, two cystic lesions—a pericardial mesothelial cyst and a hydatid cyst—were noted, along with a case of a fungal ball.

**Conclusions:** All cardiac tumors should undergo histologic examination to confirm the diagnosis and rule out malignancy, thereby aiding the development of the most effective treatment strategy. (*Iranian Heart Journal 2026; 27(1): 37-51*)

**KEYWORDS:** rare benign tumors; rhabdomyoma; papillary fibroelastoma; pericardial cyst; fibroma; fungal ball; hydatid cyst; lymphangioma; hemangioma

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Cardiac tumors are extremely rare, encompassing a diverse range of mass lesions, including primary tumors originating from the heart and great vessels, metastatic tumors, and tumor-like lesions that do not fit the conventional definition of a

neoplasm.<sup>1, 2</sup> These lesions vary substantially in appearance, location, size, number, and age at presentation, with many cases linked to genetic syndromes. This diversity complicates classification.<sup>1, 2</sup> Overall, cardiac tumors occur in approximately 0.001% to 0.3% of

individuals in autopsy studies, with nonmalignant tumors accounting for 75% of cases.<sup>11</sup> Benign tumors encompass various types, including rhabdomyomas, fibromas, papillary fibroelastomas, hemangiomas, pericardial cysts, lipomas, hamartomas, teratomas, mesotheliomas, paragangliomas, and pheochromocytomas.<sup>3, 4</sup> The occurrence of these benign cardiac tumors varies across age groups; for example, in children, rhabdomyomas and fibromas are the most common types.<sup>5, 6</sup> The predominant type of primary cardiac tumor in children is benign, with approximately 10% classified as malignant. The incidence and classification in adults differ, with 75% being benign and 25% malignant.<sup>7</sup>

Previously, various primary cardiac tumors, including fibromas, angiofibromas, myofibroblastic tumors, rhabdomyomas, hemangiomas, spindle cell sarcomas, liposarcomas, and lipomas, have been reported in Iran.<sup>8-10</sup> For primary cardiac tumors, clinicians should avoid assuming masses are benign based solely on intracavitary location. Histologic evaluation is essential for all cardiac tumors to confirm diagnosis and rule out malignancy, ensuring appropriate treatment planning.<sup>11</sup> In this study, eight types of benign cardiac tumors were assessed pathologically. We provide essential clinical insights and gross and histologic descriptions of rare benign tumors from Rajaie Cardiovascular Institute. Note that myxoma tumors were excluded from this study.

## METHODS

### Case Selection and Clinical Information

The present study followed the guidelines of the declaration of Rajaie Cardiovascular Institute (Tehran, Iran) and received

approval from its Medical Ethics Committee. Over the past 5 years (2020 through 2025), 152 cardiac mass samples were submitted to the pathology department. For this study, all cases of benign cardiac tumors and tumor-like lesions other than myxomas were reported from the hospital surgical pathology service. Clinical data were extracted from medical records and included patient age, sex, tumor size, site of occurrence, and clinical symptoms.

### Special Staining and Immunohistochemistry

All tumor sections stained with hematoxylin and eosin (H&E) were examined under a light microscope. Immunohistochemical analysis was conducted on paraffin-embedded tissue using antibodies directed against various antigens, with negative and positive controls routinely performed.

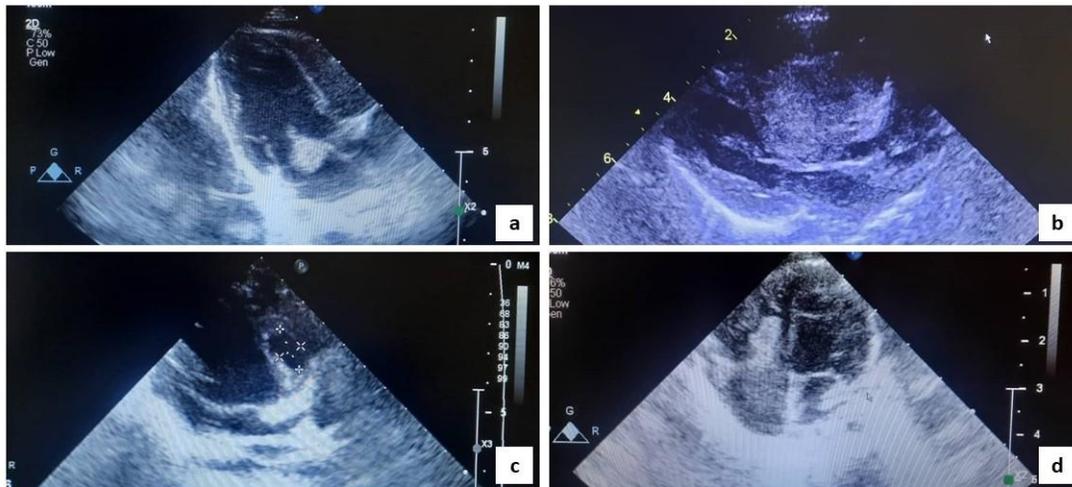
## RESULTS

### Clinical findings

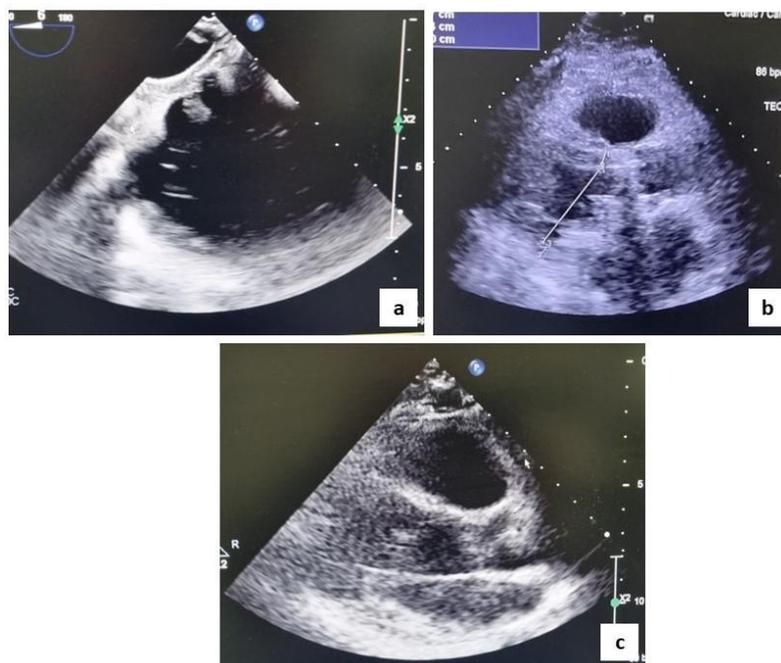
We identified 28 benign tumors spanning 2020 through 2025. Of 28 cases, four were rhabdomyomas, four papillary fibroelastomas, three cardiac fibromas, two pericardial mesothelial cysts, one lymphangioma, six hydatid cysts, four hemangiomas, three fungal balls, and one lipoma. Patients ranged in age from 18 days to 72 years (15 males and 13 females). Eight types of benign cardiac tumors and tumor-like conditions were recorded; each is detailed below.

### Echocardiographic findings

Echocardiographic images are provided with pathological findings described in this paper (Figures 1 and 2).



**Figure 1.** Transthoracic echocardiographic results. **A**, Rhabdomyoma: large, round echogenic mass with a broad base on the atrial surface of the anterior mitral leaflet (1.5 × 1.1 cm). **B**, Fibroma: large, round homogeneous echogenic mass in the RVOT (3.6 × 2.5 cm). **C**, Hydatid cyst: well-defined cystic lesion with heterogeneity and echogenic particles (4 × 2.5 cm) extending from the LV lateral wall to the interventricular septum and pulmonary artery. **D**, Fungal ball: large, broad basilar mass (2.4 × 1 cm) attached to the interatrial septum (adjacent to the IVC orifice).  
ROVOT: right ventricular outflow tract; LV: left ventricle; IVC: inferior vena cava



**Figure 2.** Transthoracic echocardiographic results. **A**, Papillary fibroelastoma: large oval-shaped mobile gelatinous and homogeneous echodensity (2 × 1.6 cm) in the RA attached to the posterior part of the TV annulus adjacent to the CS orifice. **B**, Lymphangioma: large semimobile hypodense mass (3.2 × 3 cm) in the RA at the entrance site of the IVC with a well-defined border and severe smoke resulting in narrowing and turbulent flow in the IVC entrance. **C**, Pericardial hemangioma: very large heterogeneous mass (9.4 × 7 cm) with substantial vascularity superior and lateral to the RA.  
RA: right atrium; TV: tricuspid valve; CS: coronary sinus

## Pathological findings

### 1. Rhabdomyoma

Tumor locations varied among patients: in the right ventricular outflow tract adjacent to the

pulmonary valve (case 1); in the left ventricular outflow tract near the aortic valve (case 2); as a mass on the mitral valve (case 3); and in the right ventricular outflow tract with attachment to the pulmonary cusps (case 4) (Table 1). All tumors morphologically presented as single ovoid masses with a creamy whitish color and firm consistency. Histologically, photomicrographs revealed sheets of packed large polygonal cells with abundant eosinophilic cytoplasm with centrally located round vesicular nuclei. Some cells exhibited vacuolated cytoplasm with strands of eosinophilic cytoplasm displaced toward the periphery (spider cells) with thin fibrous septa. Nuclear atypia, mitotic activity, and necrosis were not observed (Figure 3).

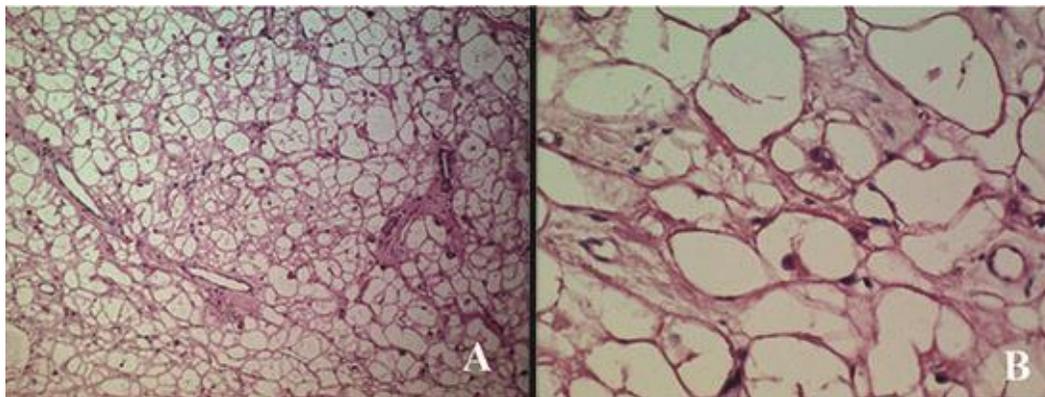
## 2. Papillary fibroelastoma

Tumor locations varied among patients: in the right atrium attached to the anterior tricuspid valve annulus with some attachment to the base of the tricuspid valve

anterior leaflet (case 1); in the left ventricle (case 2); in the right atrium attached to the posterior part of the tricuspid valve annulus adjacent to the coronary sinus orifice (case 3); and in the left atrium, on the inferior side of the interatrial septum (case 4) (Table 2). Morphologically, all tumors appeared as single ovoid masses with a cream to creamy-yellow color and multiple small fronds with soft consistency. In case 3, five mass fragments were presented (Table 2 and Figure 4). Histologic analysis revealed the tumors consisted of multiple fronds of paucicellular, avascular fibroelastic tissue lined by a single layer of endocardium, with areas showing hydropic changes (Figure 4). In case 2, where the mass was attached to the papillary muscle, histologic examination identified cardiac myocytes with attached avascular papillary structures lined by a single layer of endocardium, without evidence of cellular atypia (Figure 4).

**Table 1.** Information on cases with rhabdomyoma

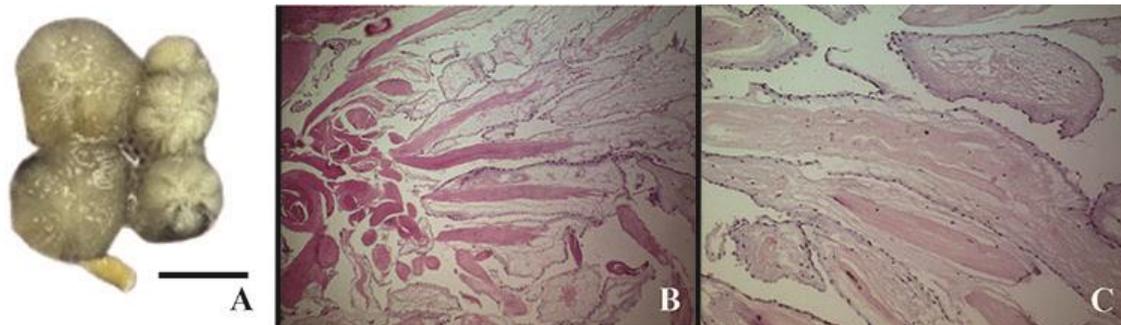
Case No.	Age	Sex	Size, cm	Symptom	Surgery
1	1 mon	F	0.8 × 0.4 × 0.5	n/a	Subpulmonary valve mass, attached to the right ventricular outflow tract, resection
2	2 mon	M	1.0 × 0.7 × 0.5	Tuberous sclerosis	Subaortic mass, attached to the interventricular septum, resection
3	10 mon	M	1.5 × 1.0 × 0.5	Arrhythmia	Mass resection
4	18 d	M	1.0 × 0.7 × 0.5	Tuberous sclerosis	Atrial septal defect closure, right ventricular muscle band, mass resection



**Figure 3.** Specimens from a 10-month-old boy with a mitral valve mass. **A and B,** Nests of enlarged vacuolated cells with centrally located nuclei and strands of eosinophilic cytoplasm to the periphery (spider cells) without nuclear atypia.

**Table 2.** Information on cases with papillary fibroelastoma

Case No.	Age, y	Sex	Size, cm	Symptom	Surgery
1	64	M	3.0 × 3.0 × 1.0	Cardiac mass detection in preoperative workup for prostatectomy for benign hypertrophy	Tumor resection
2	72	M	0.8 × 0.8 × 0.5	Pulmonary embolism, history of ischemic heart disease, now with true vertigo, falling, weight loss	Tumor on left ventricle (on anterolateral papillary muscle), resection of tumor and papillary muscle, mitral valve excision
3	40	M	0.5 up to 1.5	Chest pain	Resection of the tumor on the posterior leaflet of the tricuspid valve
4	65	F	1.8 × 1.0 × 0.5	Left atrial mass	Left atrial mass resection



**Figure 4.** Specimen from a 40-year-old male with a right atrial tumor attached to the posterior part of the tricuspid valve annulus. **A**, Five pieces of creamy, well-defined masses with multiple small fronds (sea anemone appearance) in water. **B and C**, Multiple fronds of paucicellular avascular fibroelastic tissue lined by a single layer of the endocardium with foci of hydropic changes (scale bar: 1 cm).

### 3. Fibroma

Three cases of the tumor were evaluated, with each presenting in a different location. In case 1, the tumor was located in the right ventricular free wall. In case 2, it was found at the apex, adjacent to the posteromedial papillary muscle. In case 3, the tumor was situated in the interventricular septum (Table 3). All tumors were morphologically ovoid in shape with white to cream color and firm consistency. Histologically, photomicrographs demonstrate bland fibroblastic cells with ovoid nuclei, inconspicuous nucleoli, and sparse cytoplasm in collagenous stroma. Focal calcification and infiltrative margins into the cardiac myocytes were observed. There was no evidence of cellular atypia or increased mitotic activity (Figure 5).

### 4. Pericardial mesothelial cyst

The cysts were located in the pericardium. They appeared as single ovoid fragments with a cream color. In case 1, the cyst was

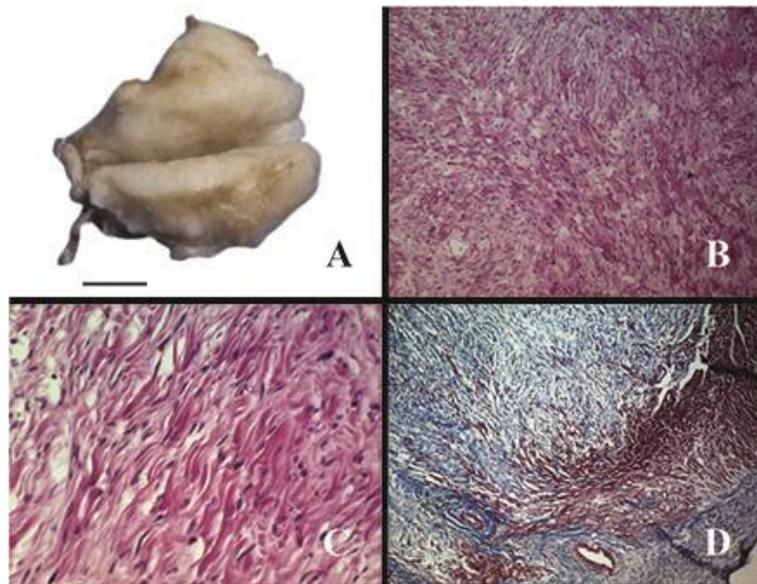
opened, revealing creamy-yellow, soft, multiloculated cystic tissue (Table 4). Histopathologic examination revealed loose connective tissue lined by a single layer of cuboidal cells without atypia, along with scattered lymphocytes (Figure 6).

### 5. Lymphangioma

A single patient was evaluated. The tumor was located in the right atrium, near the entrance of the inferior vena cava. Morphologically, it consisted of three pieces of creamy, whitish, ruptured cystic wall with soft consistency. Pathologic examination revealed fibroconnective tissue lined by a single layer of flat to low cuboidal cells without atypia, scattered lymphocytes, and focal smooth muscle fibers. Immunohistochemical study showed a positive reaction for CD34, a weakly positive reaction for D2-40, and negative reactions for CK34BE12, Panck, synaptophysin, CK5/6, and TTF1 (Table 5, Figure 7).

**Table 3.** Information on cases with fibroma

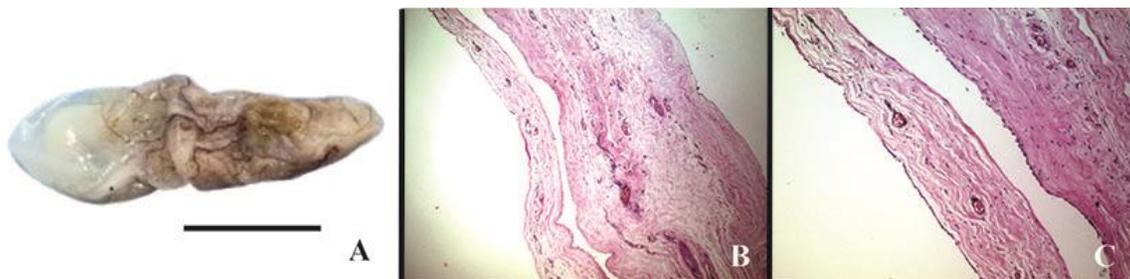
Case No.	Age (y)	Sex	Size (cm)	Symptom	Surgery
1	12	M	6.5 × 6.0 × 4.0	Right ventricular mass	Right ventricular mass resection, atrial septal defect closure
2	6	F	1.4 × 1.0 × 0.5	Ventricular septal defect, aortic prolapse, mild pulmonary hypertension	Partial left ventricular mass resection, ventricular septal defect closure, subaortic web resection, tricuspid valve repair
3	3	F	3.5 × 2.5 × 2.0	Mild left ventricular hypertrophy, mild tricuspid regurgitation, mild right ventricular hypertrophy, severe right ventricular outflow tract and left ventricular outflow tract obstruction due to tumor bulking	Tumor resection, ventricular septal defect and patent foramen ovale closure, tricuspid valve repair



**Figure 5.** Specimen from a 3-month-old female with an interventricular septum mass. **A**, One ovoid white mass with firm consistency. **B and C**, Microscopic examination showing bland fibroblastic cells in collagenous stroma without atypia, mitoses, or necrosis. **D**, Trichrome stain reveals collagenous stroma and focal tumor infiltration into the cardiac myocytes (scale bar: 1 cm).

**Table 4.** Information on cases with pericardial mesothelial cysts

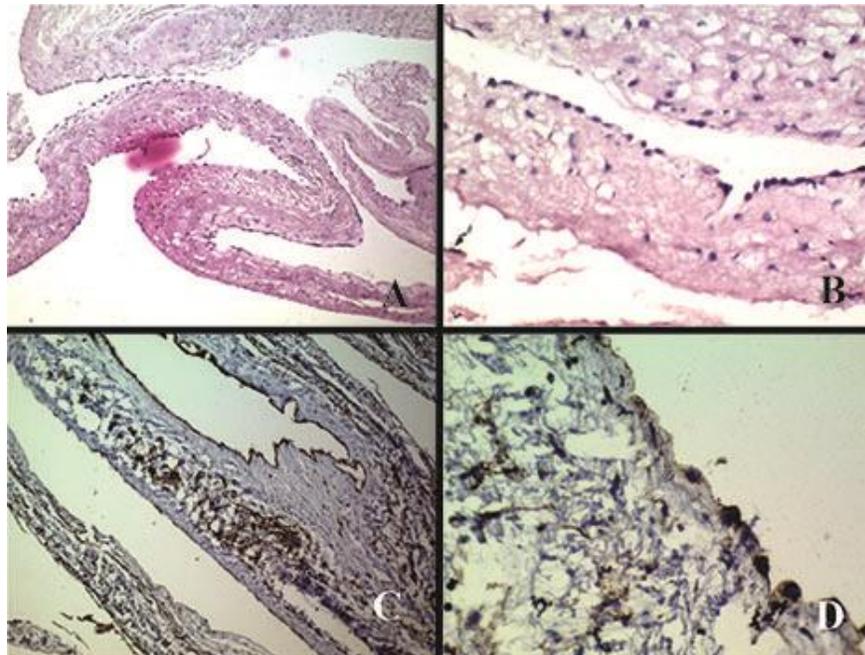
Case No.	Age, y	Sex	Size, cm	Symptom	Surgery
1	22	F	4.5 × 2.5 × 0.5	Fever from 2 months earlier and history of a dental procedure	Pericardial cyst and valve vegetation excision
2	26	F	2.5 × 1.0 × 0.3	Severe aortic insufficiency, Takayasu arteritis	Aortic valve resection and cyst resection



**Figure 6.** Specimen from a 26-year-old female with a pericardial cyst. **A**, One piece of creamy, ovoid cyst with soft consistency. **B and C**, Loose connective tissue lined with a single layer of cuboidal mesothelial cells without cellular atypia (scale bar: 1 cm).

**Table 5.** Information on cases with lymphangioma

Case No.	Age, y	Sex	Size, cm	Symptom	Surgery
1	55	M	2.0×2.0×0.4	Recent fall, hypertension, mitral stenosis, mitral insufficiency, aortic stenosis, aortic insufficiency (rheumatic valve disease)	Aortic valve replacement, mitral valve replacement, right atrial tumor resection



**Figure 7.** Specimen from a 55-year-old male with a right atrial mass. **A and B**, Variably sized anastomosing vascular spaces lined by a single layer of flat to low-cuboidal endothelial cells without atypia. **C**, Immunohistochemical study shows a positive reaction for CD34. **D**, Weakly positive reaction for D2-40 and negative reaction for CK34BE12, pan-CK, synaptophysin, CK5/6, and TTF1 (not shown).

## 6. Hydatid cyst

Six cases of hydatid cyst were evaluated, with most occurring in the interventricular septum. In cases 3 and 4, the tumors were located in the left ventricle and the anterior portion of the left ventricle, respectively (Table 6 and Figure 8). Macroscopically, the cysts appeared as rounded, creamy-white, sheet-like tissues, ranging from single to multiple fragments with soft to soft-hard consistency. Histologically, photomicrographs revealed avascular eosinophilic tissue (laminated membrane) with foci of dense fibrovascular tissue, calcification, and a small number of chronic inflammatory cells. Some daughter cysts with protoscolices were observed (Figure 8).

## 7. Capillary and cavernous hemangioma

Four cases of hemangioma were evaluated, including two cases (1 and 4) classified as cavernous hemangiomas (Table 7). Tumor locations varied: the anterior pericardium (case 1), the right ventricular outflow tract attached to the interventricular septum (case 2), the right atrium (case 3), and the left atrium attached to the interatrial septum (case 4) (Table 7). Tumors were mostly gray in color. Cavernous hemangiomas appeared as well-circumscribed, lobulated masses with hemorrhagic red-brown cut surfaces and spongy or soft consistency. The hemangiomas exhibited morphologic variations, ranging from a pedunculated, ovoid-shaped mass to a single ovoid fragment, with firm to soft

consistency. In cavernous hemangiomas, photomicrographs revealed large, cystically dilated blood vessels with thin walls lined by a single layer of bland endothelial cells in a myxoid background, with foci of thrombus, calcification, and scattered lymphocytes (Figure 9, panel 2). In the capillary hemangioma (case 3), anastomosing vascular channels of capillary and cavernous size and proliferation with a prominent amount of mature adipose tissue were seen. The final case microscopically revealed bland-looking spindle cells in myxoid stroma with medium and large vascular channels, without necrosis, atypia, or mitoses. Immunohistochemical study of this tumor revealed a positive reaction for CD31 in endothelial cells. Ki-67 was positive in approximately 7% to 8% of cells (Figure 9, panel 1).

### 8. Fungal ball

Three cases of fungal ball were evaluated; locations varied. In case 1, it was located in the right ventricle and pulmonary artery. In case 2, it was located in the mitral valve and extended from the left atrium to the left ventricle. In case 3, it was presented in the

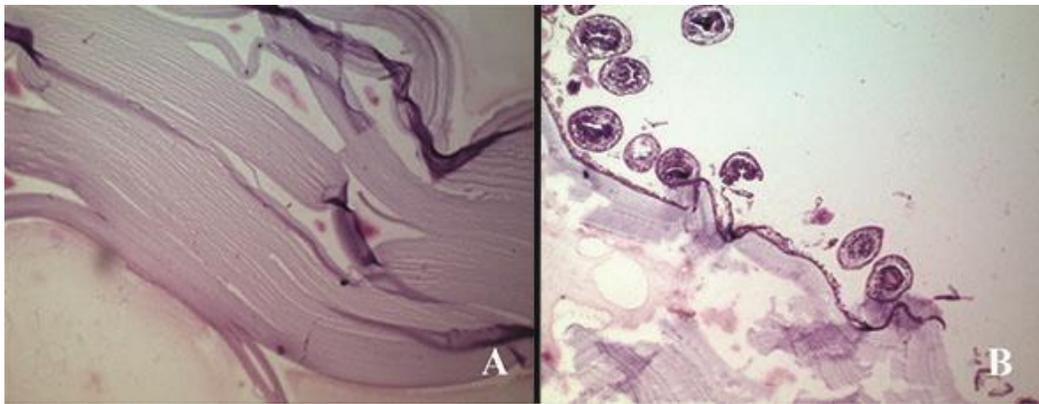
right atrium (attached to the interatrial septum, adjacent to the inferior vena cava orifice) with extension to the tricuspid valve (Table 8). Grossly, specimens ranged in color from cream to brown, appearing as single or multiple fragments with fragile consistency. Histologic examination revealed scattered mixed inflammatory cells accompanied by numerous fungal elements, including hyphae, pseudohyphae, and budding yeasts, consistent with candidiasis (Figure 10). In case 2, the fungal ball was composed of thin, septate hyphae with acute-angle branching and aggregations of budding yeast, consistent with aspergillosis.

### 9. Lipoma

A single patient was evaluated. The tumor was located on the pericardial surface. Morphologically, it consisted of a single fragment of a round, gray mass with yellow, homogeneous cut surfaces and soft consistency. Pathologic examination revealed encapsulated mature adipose tissue with degenerative changes. There was no nuclear atypia (Table 9 and Figure 11).

**Table 6.** Information on cases with hydatid cyst

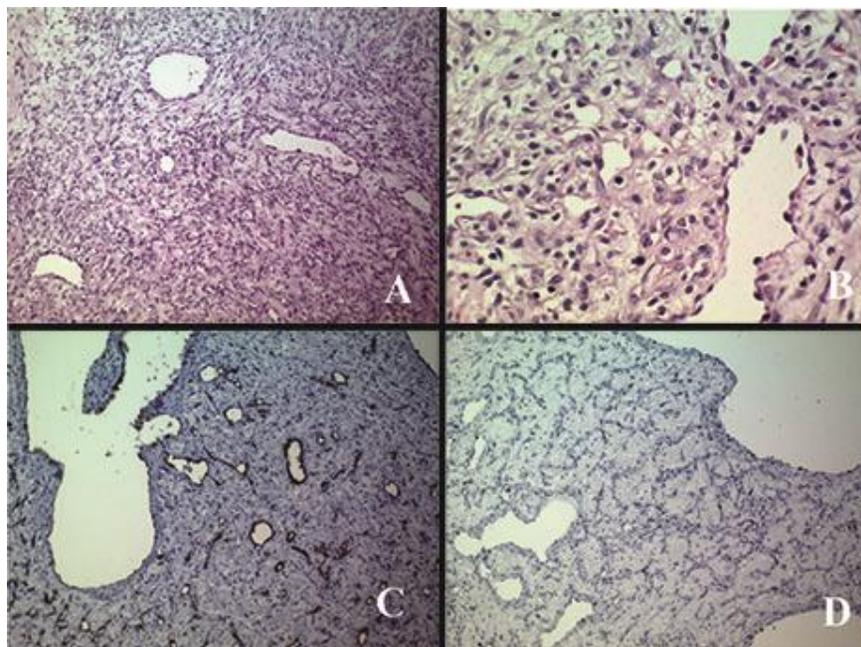
Case No.	Age, y	Sex	Size, cm	Symptom	Surgery
1	42	F	2.5 × 2.0 × 0.3	Asthma	Hydatid cyst drainage and repair
2	36	F	2.0 × 2.0 × 0.4	Known case, lung and heart	Cardiac cyst excision, right lower lobe lung cyst wedge resection
3	21	F	7.5 × 6.0 × 0.5	Recent right lower limb hemiparesis, left ventricular mass, brain cyst, liver cyst	Left ventricular lateral wall cyst (from apex to left ventricular outflow tract) aspiration and excision
4	3	F	4.0 × 2.5 × 0.3	Lung and heart hydatid cyst	Left ventricular cyst excision, left upper lobe and right lower lobe lung cysts wedge resection
5	7	M	4.0 × 4.0 × 0.3	Liver and cardiac cyst	Cyst aspiration and excision, tricuspid valve repair, patent foramen ovale closure
6	32	M	9.0 × 9.0 × 0.3	Multiple cardiac and right lung hydatid cysts, anaphylactic symptoms, history of animal contact	Interventricular septum cyst excision, right lung lobectomy, marsupialization



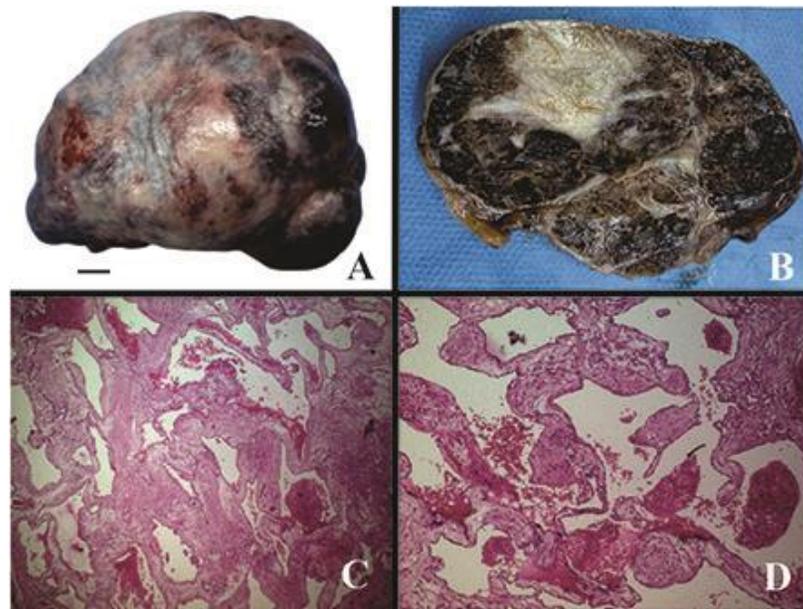
**Figure 8.** Specimen from a 3-year-old female with left ventricular and lung masses. **A and B,** Histologic examination reveals avascular eosinophilic tissue (laminated membrane) and many daughter cysts with protoscolices.

**Table 7.** Information on cases with hemangioma

Case No.	Age, y	Sex	Size, cm	Symptom	Surgery
1	33	F	9.5 × 7.5 × 4.5	Dyspnea	Huge epicardial mass excision
2	47	M	1.7 × 1.5 × 0.5	Right ventricular mass, patent foramen ovale	Right ventricular outflow tract mass resection, patent foramen ovale closure
3	50	M	2.5 × 2.5 × 1.5	Hypothyroidism, liver mass in favor of hemangioma	Atrial septal defect closure, tumor resection
4	55	M	2.5 × 2.0 × 1.0	Coronary artery disease and left atrial mass, mitral regurgitation, tricuspid regurgitation, patent foramen ovale	Coronary artery bypass grafting, mitral valve and tricuspid valve repair, patent foramen ovale and atrial septal defect closure, left atrial roof mass resection



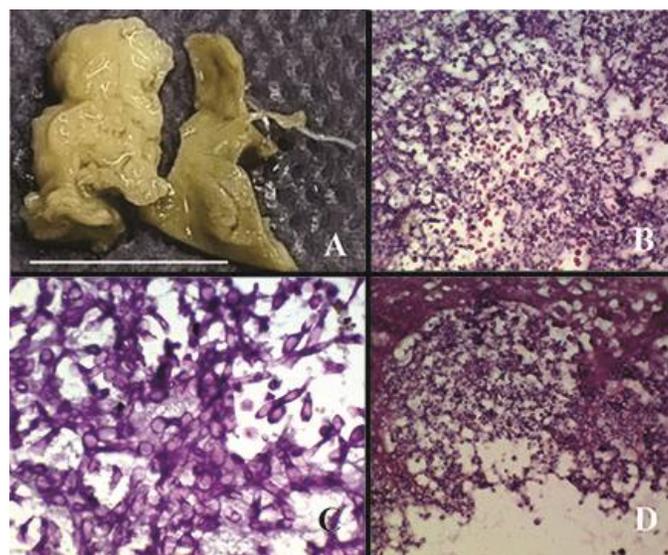
**Figure 9-1.** Specimen from a 47-year-old male with a right ventricular outflow tract mass. **A and B,** Microscopic examination (hematoxylin-eosin stain) showing bland-looking spindle cells in myxoid stroma with small, medium, and large vascular channels; no necrosis or atypia. **C,** Immunohistochemical study reveals a positive reaction for CD31 in endothelial cells. **D,** Ki-67 is positive in 7%–8% of cells.



**Figure 9-2.** Specimen from a 50-year-old female with a pericardial mass. **A and B**, One gray, well-circumscribed, lobulated mass with hemorrhagic red-brown cut surfaces and spongelike consistency. **C and D**, Microscopic examination reveals large dilated blood vessels with thin walls and a single layer of bland endothelial cells in a myxoid background (scale bar: 1 cm).

**Table 8.** Information on cases with fungal ball

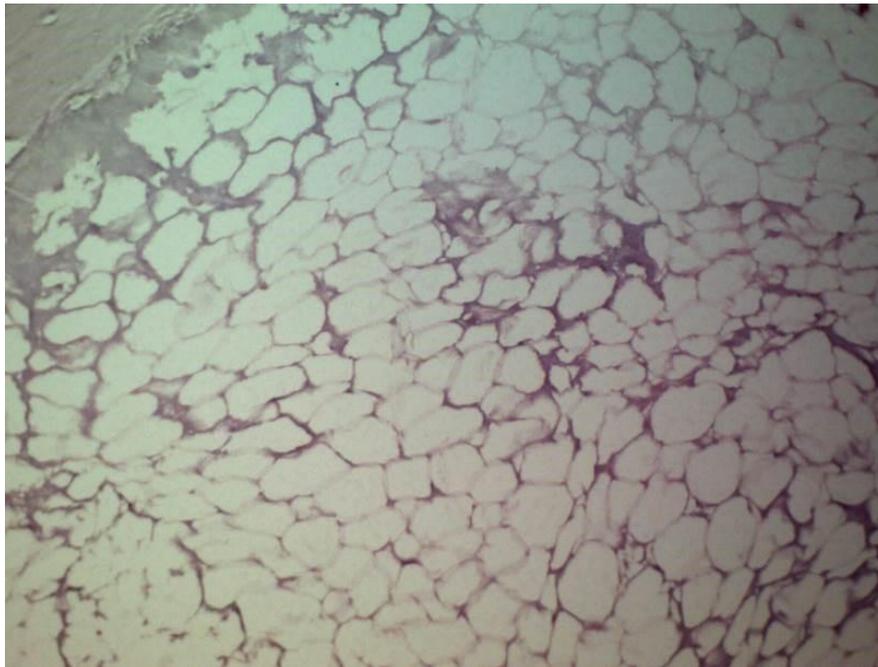
Case No.	Age	Sex	Size, cm	Symptom	Surgery
1	1 y	M	3.5 × 2.5 × 1.0	Endocarditis	Mass resection of right ventricle, pulmonary artery, and tricuspid valve
2	10 y	F	3.0 × 3.0 × 0.5	Left atrial and left ventricular masses, endocarditis	Mass resection
3	1 mon	F	1.0 × 0.5 × 0.5	Right atrial mass, endocarditis	Mass resection



**Figure 10.** Specimen from a 1-month-old female with a right atrial mass extending to the tricuspid valve. **A**, Piece of cream tissue with a fragile consistency. **B–D**, Hematoxylin-eosin and periodic acid–Schiff stains reveal fibrinous material with few mixed inflammatory cells and numerous fungal elements, including hyphae, pseudohyphae, and budding yeast (scale bar: 1 cm).

**Table 9.** Information on the case with lipoma

Case No.	Age, y	Sex	Size, cm	Symptom	Surgery
1	53	M	1.0 × 1.0 × 0.5	Coronary artery disease	Coronary artery bypass grafting and pericardial mass resection

**Figure 11.** Encapsulated mature adipose tissue without nuclear atypia

## DISCUSSION

Patients diagnosed with cardiac tumors typically present with nonspecific symptoms that vary based on tumor location and the degree of invasion into adjacent tissues. All cardiac tumors must undergo histologic analysis to verify the diagnosis and exclude the possibility of malignancy, thereby facilitating the optimal treatment plan. Currently available cardiac imaging methods do not offer a conclusive diagnosis.<sup>6</sup> Primary cardiac tumors are exceedingly rare compared with metastatic tumors, with most primary neoplasms being benign.

The predominant primary cardiac tumor identified in infants and children is rhabdomyoma, which constitutes more than 60% of all primary cardiac tumors and is predominantly found in males.<sup>7</sup> In the current study, four cases of rhabdomyoma

were reported. This tumor is typically situated within the ventricles; nonetheless, in the present cases, tumors were located in the mitral valve. Rhabdomyoma is frequently observed in individuals diagnosed with tuberous sclerosis,<sup>12</sup> as noted in two cases in this study (Table 1). Fibromas are among the most frequently encountered cardiac tumors and are classified as benign primary cardiac tumors in children. Three cases of fibroma were identified in this study. This tumor typically presents as a solitary lesion predominantly located in the ventricular septum. These tumors originate from fibroblasts within connective tissue. A fibroma has the potential to infiltrate ventricular muscle, replacing functional myocardium, which may lead to severe congestive heart failure or cyanosis. Further, fibroma extension into the ventricular

conduction system may occur, potentially resulting in ventricular arrhythmias.<sup>7</sup>

Papillary fibroelastomas are rare benign neoplasms of the endocardium and constitute the most commonly observed primary tumors of the heart valves.<sup>3</sup> The average age of affected patients has been reported as 60 years,<sup>13</sup> which closely aligns with the average age of patients in this study (Table 2). Morphologically, papillary fibroelastomas resemble a sea anemone when the specimen is placed in a bowl of water (Figure 2). These tumors typically develop on the left-sided heart valves, whereas occurrences on the pulmonary valve are extremely uncommon.<sup>14</sup> Interestingly, in our patients, this tumor was located in the right atrium close to the tricuspid valve (Table 2 and Figure 2). Fibroelastomas located on the right side of the heart, particularly tricuspid tumors, exhibit a less definitive correlation with clinical symptoms. The typically asymptomatic nature of these right-sided lesions may diminish the need for medical intervention, resulting in underreporting.<sup>15</sup> In our cases, the tumor consisted of five fragments, whereas it typically occurs as a single piece, making multiple fragments rare. Most myxomas identified on cardiac valves are papillary fibroelastomas. Myxomas are highly vascular lesions that infrequently appear on the surfaces of valves; specific characteristics of myxoma cells are not present in papillary fibroelastomas.

Pericardial cysts are uncommon abnormalities in the mediastinum. Typically of congenital origin, they can also develop because of cardiothoracic surgical procedures. Life-threatening complications, such as pericardial tamponade, have been reported in association with these cysts. Patients may remain asymptomatic, with the condition discovered incidentally through imaging studies, or they may exhibit symptoms including chest pain, dyspnea, or palpitations.<sup>16, 17</sup>

Cardiac lymphangioma is a rare benign mass formed by an abnormal accumulation of lymphatic vessels, occurring in both children and adults.<sup>18, 19</sup> In our study, the tumor was found in an adult man with various cardiac symptoms (Table 5). Immunohistochemical studies were performed for tumor differentiation. These studies showed positive results for lymphangioma markers and negative results for mesothelial cyst markers. Occurrence of cardiac hydatid cysts is rare; although common in the liver and lung, they are often silent until acute or fatal complications occur, including anaphylactic shock, systemic or pulmonary embolism, dissemination, arrhythmias, valvular dysfunction, or sudden death.<sup>20-22</sup> In our cases, the presence of cysts in the liver and lungs led to cardiac involvement (Table 6). Hydatid cysts result from parasitic infestation caused by ingestion of eggs from *Echinococcus* species.<sup>23</sup>

Hemangioma is an infrequently encountered cardiac tumor that can develop to a substantial size, occurring mostly in adults.<sup>3, 6</sup> While often asymptomatic, it can present with significant symptoms, including arrhythmias, conduction disturbances, congestive heart failure, coronary insufficiency, chest pain, hemopericardium, and cough or dysphagia from compression of adjacent structures.<sup>24, 25</sup> This is an exceptionally uncommon tumor found throughout the cardiac layers, with a slight preference for the ventricular septum and right atrium.<sup>77</sup> Remarkably, on microscopic examination, the tumor appeared spindle-shaped in myxoid stroma and resembled a myxoid tumor. Immunohistochemistry was performed for differentiation and confirmed the diagnosis of hemangioma (Figure 7).

Fungal infective endocarditis is a rare but highly fatal condition. Diagnosis is often delayed because of nonspecific symptoms and negative blood cultures.<sup>26</sup> All three cases of cardiac fungal ball reported in this

study were caused by endocarditis (Table 8) and occurred in infants.

Cardiac lipomas are observed exclusively in adults. This tumor primarily consists of adipose cells, consistent with the findings in our patient (Figure 9), and may be present extensively, though rarely, throughout the heart.<sup>3</sup> These lesions are encapsulated masses located in the pericardium,<sup>27</sup> and may also occur anywhere within the myocardium or as masses arising from the endocardium. Although they typically remain asymptomatic, rare instances may lead to symptoms such as arrhythmias and atrioventricular block.<sup>28</sup>

In our case, a lipoma was identified and resected during coronary artery bypass graft surgery (Figure 9). Notably, previous studies have shown that if resection is not performed, the tumor may grow rapidly or excessively, potentially leading to severe and life-threatening complications, including pericarditis, arrhythmia, and cardiac tamponade.<sup>29</sup>

## CONCLUSIONS

Accurate differential diagnosis is necessary to initiate appropriate treatment for cardiac masses. Benign tumors, including rhabdomyomas, fibromas, and fungal balls, are frequently observed in children. Histologic evaluation is required because cardiac masses cannot be assumed benign based on location alone. This study of eight types of benign cardiac tumors and tumor-like conditions at Rajaie Cardiovascular Institute provides clinical findings for treatment planning. Further research is needed to manage these conditions.

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## Conflict of Interest

No potential conflict of interest was reported by the authors.

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## Ethical Approval and Informed Consent

Ethical approval was granted by the ethics committees of the Cardiovascular Research Center, Rajaie Cardiovascular Institute, Tehran, Iran. Written informed consent was obtained from participants.

## Data Availability Statement

Data sharing does not apply to this article as no data sets were generated or analyzed during the current study.

## Author Contributions

MH: Conceptualization, supervision, and writing—original draft. SH, KM, and SG: Data collection and writing—review and editing.

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