



Diagnosis and Management of Pericardial Cysts

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Abstract

Background: Pericardial cyst located in the mediastinum can turn into a potentially life-threatening disease in some patients over time. Clinical close follow-up of these patients who may go to surgery is essential.

Material and Methods: Clinic symptoms and radiological findings in patients with pericardial cysts can help to determine early surgery or clinic follow-up. This study was single-center, and all patients were diagnosed with the characteristic image of the pericardial cyst on Magnetic Resonance Imaging (MRI) or CT. This retrospective study collected age, gender, symptoms, localization of the pericardial cyst, the largest diameter of the cyst, the density of the cyst content, and approach methods for pericardial cysts.

Results: I followed up with 14 patients between 2015 and 2022. Of these, 11 (79%) were female, and 3 (21%) were male, with a mean age of 63.2 ± 15.9 years. Most of the patient with pericardial cyst had no symptoms. The most common location of the cyst was in the right hemithorax (%71.42). Most of patients (%71.44) did not change in cyst size. The density of the cysts was approximately 14.22+14.21HU.

Two patients have been operated on with complete resection with the minimally invasive surgical technique. In the pathological examination of the mass, monolayer mesothelial cells and increased vascular structures in the fibrous wall were seen as typical indicators of pericardial cyst.

Conclusions: If the pericardial cyst does not compress the patient's lung and heart, it should follow every four years, and these patients follow up with MRI. If surgery is to be performed on a pericardial cyst, the pericardial fatty tissue must be examined during the operation.

Keywords: Pericardium; Cyst; Mediastinum

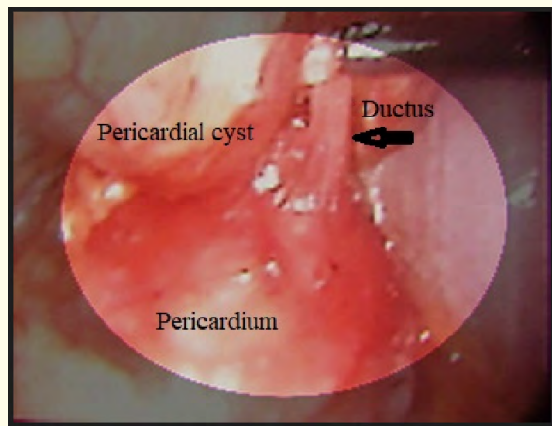
Introduction

The causes of the pericardial cyst are very different. It can occur in congenital, post-traumatic and post-cardiac surgery [1,2]. The pericardial cyst was described in the 19th century [3].

The pericardial cyst is a rare benign cyst usually discovered as incidental on radiographic inspection. Rarely, pericardial cysts cause symptoms and can cause complications too. Complications related to the localization and neighborhood of the cyst are as follows: syncope, chronic cough caused by compression of adjacent

bronchus, tissue erosion after caused by compression of vena cava or right atrium, and pericardial tamponade due to cyst rupture, atrial fibrillation, and sudden death [1,4,5].

The pericardial cyst should be differentiated from Morgagni hernia, diaphragmatic tumors, hydatid pericardial cyst, cardiac hemangioma, encapsulated pericardial effusion, pericardial diverticulum, bronchogenic cyst, and thymic cyst, which can also develop adjacent to the pericardium [6,7]. The cystic lesion can be connected with the pericardial sac (Figure 1). While this connection can sometimes be measured in centimeters in CT, sometimes it is millimetric and cannot be seen in CT. When evaluating CT, you should examine vertical slices and sagittal and horizontal planes. Sometimes, the cyst protrudes directly from the pericardium, called a pericardial diverticulum [4,6].



Figures 1: Connection canal between the cyst and pericardial sac.

When patients are symptomatic, the content of the cyst located in the anterior mediastinum can do repetitive aspirations. The cyst cells produce a clear and non-allergic fluid. Therefore, after thoracentesis, does not have an allergic reaction as cyst hydatid [2]. In the symptomatic patients, after aspiration of the cyst contents and washing with a chemical substance (Ethanol), 30% of patients may relapse within three years. However, it mainly shrinks with sclerosis and disappears over time. Sometimes it can disappear spontaneously even if no action is taken [8-12].

Especially in symptomatic patients, while thoracoscopic resection of pericardial cysts gives a curative result. Thus operation may prevent the possible complications of cysts, such as rupture, infection, and press [2].

Aim; In this article, I wanted to share my experiences with patients who had pericardial cysts and were followed up on or surgery between 2015 and 2022.

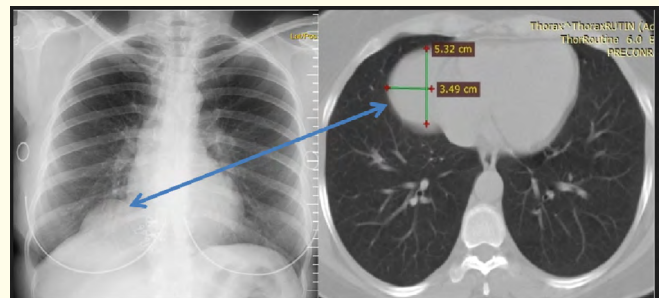
Patients and Method

Ethics

This study was conducted according to the provisions of the Helsinki Declaration. Ethical approval for the study was obtained from The Ethical Review Board in Malatya Turgut Özal University School of Medicine (Dnr: 2022-32).

Data collection

Age, gender, symptoms, localization of the cyst, the largest diameter of the cyst, the density of the cyst content, and treatment information were gathered (Table 1). These data were analyzed univariate statistically. 14 patients were followed up on between 2015 and 2022. Of these, 11 (79%) were female, and 3 (21%) were male, with a mean age of 63.2 ± 15.9 years. Most of the patients with pericardial cysts had no symptoms. The patients' diagnoses were found incidentally on the radiographs taken (Figures 2). Only two of these patients had dyspnea and palpitations.



Figures 2: Partial elevation was observed in the PA chest X-ray, while a cystic structure was observed in the computerized tomography.

Case	Age	Sex	Diagnosis Time	Size (mm)	Last Control	New size (mm)	Density (HU)	Mediastinum Side	Operation/ mode
1	47	M	2021 2. month	56.00	2021 6.month	56.00	12.55	Right	No
2	73	F	2016	20.54	2019	30.44	7.82	Right	No
3	78	F	2018	18.94	2021	18.95	48.00	Left	No
4	70	F	2020	30.12	2021	30.12	15.75	Right	No
5	62	F	2021	101.00	2022	-	4.73	Right	VATS
6	39	F	2019	36.65	2020	36.66	41.77	Left	No
7	76	F	2017	33.07	2021	33.07	3.94	Middle- Left	No
8	52	F	2018	102.50	2022	-	6.52	Right	VATS
9	45	F	2021	10.57	2021	10.57	21.25	Right	No
10	66	M	2016	23.00	2021	23.00	0.15	Left	No
11	92	F	2017	55.78	2018	60.2	16.48	Middle- Right	No
12	66	F	2019	60.36	2019 6.month	60.36	8.18	Right	No
13	77	F	2018	45	2021	32.88	5.56	Right	No
14	42	M	2015	21.13	2021	35.13	6.43	Middle- Right	No

Table 1: Distribution of cases and their measurable values.

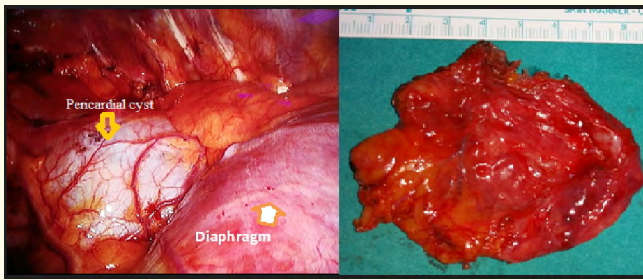
The most common location of the pericardial cyst was in the right hemithorax, with a rate of 10(71,42%). The mean diameter of the cysts was 43.90 ± 28.88 mm 11(71.44%) patients' cyst diameter saw no significant change. Cyst diameter decreased in 1 (7.14%) patient and increased in 3(21.42%) patients in the follow-up. The density of the cysts was approximately $14.22 + 14.21$ HU.

Only two patients with cyst diameter greater than 100 mm (Figure 3) were operated on for dyspnea and palpitation for no response to medical treatment. They have been operated on with approximately 40 minutes of operation using the minimally invasive surgical technique (Figure 4). Small cystic structures can be in the pericardial adipose tissue. While the pericardial cyst was being removed from the pericardial wall, it should be attentive to this fatty area (Figure 5). One of these patients was performed double surgical procedures due to liver pathology (gallbladder stone) in the same session. Two patients were discharged from the hospital on the second day too.

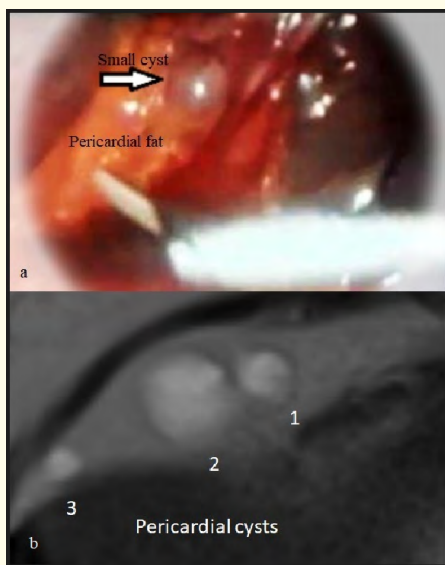
In the pathological examination: macroscopy of the mass, a cystic lesion, regular appearance on the surface, and partly



Figures 3: Giant pericardial cyst(10cm) and density is equal 4.73HU.



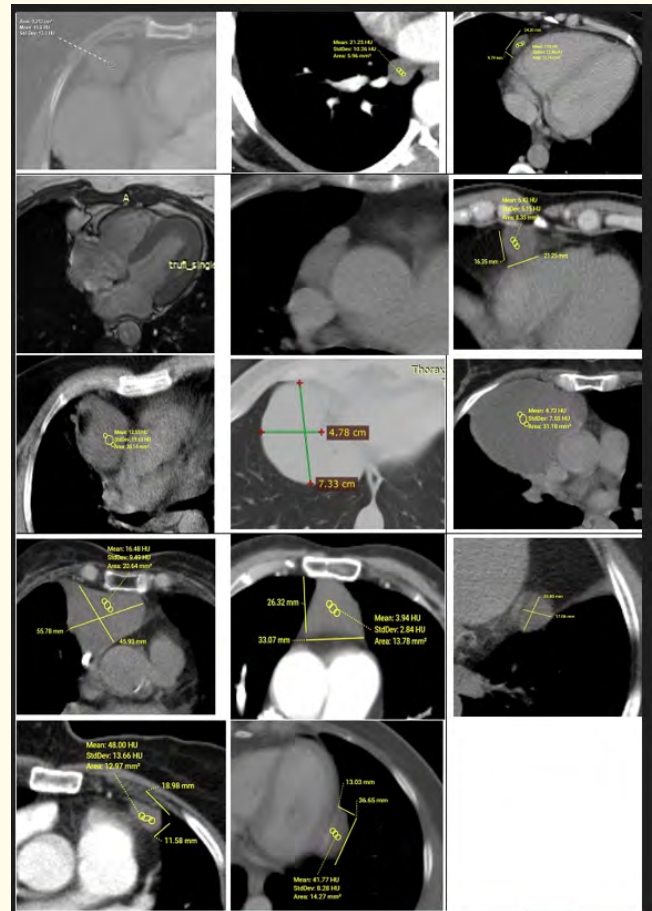
Figures 4: Intraoperative view and postoperative specimen.



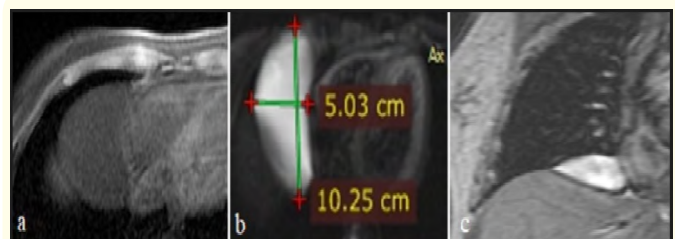
Figures 5: a-b. Small cysts in the pericardial adipose tissue(a) and the appearance of the cyst in the fat pad on thorax tomography(b).

hyperemic on the wall. In the microscopic exam, yellow-pink-colored fluid was observed on the inner surface. Calretinin, WT1, D240, LCA were used for immunohistochemically staining. The studied areas observed monolayer mesothelial cells, increased vascular structures in the fibrous wall, and chronic inflammatory cells.

The older woman who was not operating is dead due to natural causes in the second year. Other patients are still under follow-up (Figure 6) (This table was made because the texts were seen small in the tomography system).



Figures 6: All of the patients.



Figures 7: a-b-c. Typical pericardial cyst view on CT and MRI.

Discussion

A pericardial cyst is included in about 7% of mediastinal masses and 33% of mediastinal cysts. The pericardial cyst is usually found in the middle stages of life (30y-40y) and is affected equally in both males and females [9,13]. Contrary to the literature, the cases were detected in an older group, and most of them were women.

The patient has complained of chest pain, cough, dyspnea, syncope and tachycardia or palpitation. The cyst has already started to pressure the heart and lungs. As the diameter of the cyst increases, the symptoms become more pronounced, and the patient's complaints may vary from shoulder pain to heart attack [5,14,15]. Except for two patients, most of them were asymptomatic. Their complaints did not recover with medical treatment too.

Most pericardial cysts are detected incidentally. The cyst diagnosis is usually made for the operation of another disease or by routine chest radiographs. This routine radiological exam is insufficient for diagnosis. Therefore, additional examination with CT, echocardiography (ECHO), and MRI are necessary to diagnose this lesion adjacent to the mediastinum. All of the patients were diagnosed incidentally by CT scan of another disease. Suppose there is no bleeding and infection in the cyst. Mainly, it is can be shown as a well-circumscribed, unilocular cyst on CT and does not retain IV contrast material [16]. The patients' CT findings were the same as the literature.

Sometimes MRI was requested in addition to CT in suspicious cases [6,17]. The cyst can be observed in the middle and anterior mediastinum on CT and MRI, mainly in the right hemithorax. Consistent with the literature, it was found more frequently in the right hemithorax in my cases.

An examination of MRI shows homogeneous high intensity on T2-weighted images and low signal intensity on T1-weighted images [16]. While it is scarce that the diameter of the cyst increases, it is more likely that the diameter of the cyst will remain the same or its diameter will decrease [6]. Klein A.L., *et al.* advised that monitoring is generally performed by serial CT or MRI at the asymptomatic cysts every 1 to 2 years. In the follow-up of the cyst, CT and MRI can take during the symptom-free period of the patients. The symptomatic cases must be done percutaneous aspiration or surgical excision of the cyst⁴. With symptomatic and more than

10 cm cyst diameter did not follow up, and they were operated on because of potential malignancy and rupture. Other the followed patients' cyst diameter decreased by 7.14% and increased by 21.42%. The cyst size of the others did not change (71.44%). It will be more convenient for the patient to follow up with MRI instead of CT because it does not include radiation (Figures 7).

While resection with VATS can efficiently perform in patients with rapidly growing or symptomatic pericardial cysts, partial resection can achieve in cases where complete resection cannot execute due to its proximity to the primary vascular and neural structures [18]. Even if the cyst is completely removed, as in my cases, the pericardial adipose tissue should be well examined, and suspicious cystic structures should be removed. Thus, the recurrence of the cyst, albeit very rarely, is prevented.

The cyst wall includes a single layer of cuboidal mesothelial cells. The outer wall of this cyst is covered with a thin fibrous capsule; the interior is lined with a single row of mesothelial epithelial cells and is filled with clear water (spring water) [3]. The operated patients' pathological finding was similar.

Conclusion

In this single-center retrospective study, it was seen that the pericardial cyst should be followed up if it does not put pressure on the lungs and heart of the patient. If it is smaller than 4 cm and asymptomatic, a CT scan can be performed every four years instead of 1-2 years of CT follow-up. Removing the cyst alone may not be enough. Especially the pericardial fatty tissue in the neighboring area should be examined too. It is essential to do this to prevent the recurrence of the cyst.

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