

Pericardial Effusion as an Early Indicator of Breast Cancer Recurrence: A Case Report and Discussion

Abstract:

Background: Pericardial effusion, though uncommon, poses a significant threat to patient well-being, particularly when associated with underlying malignancies such as breast cancer recurrence. Timely recognition and intervention are crucial for improved prognosis and patient outcomes.

Case Presentation: We present the case of a 51-year-old woman with a history of treated breast cancer who presented with rapidly worsening dyspnea. Clinical examination and diagnostic tests revealed a large pericardial effusion secondary to breast cancer recurrence, highlighting the diagnostic and therapeutic challenges associated with this condition.

Discussion: Breast cancer recurrence involving the pericardium signifies advanced disease and presents significant management complexities. Evaluation typically involves transthoracic echocardiography and pericardiocentesis, with treatment strategies focusing on systemic chemotherapy and symptom management.

Conclusion: Pericardial effusion can serve as an early indicator of breast cancer recurrence and requires a multidisciplinary approach for optimal management. Early recognition and intervention are paramount in improving patient outcomes and quality of life.

Key words: pericardial effusion, tamponade, breast cancer recurrence, cytology, pericardiocentesis.

Introduction:

Pericardial effusion is the accumulation of the pericardial fluid between the two layers of the pericardium. It can present as pericarditis or, if the fluid is abundant, it can cause tamponade and pose a life-threatening risk [1]. The etiologies are multiple, it can be idiopathic or secondary to various etiologies, including infection, inflammation, trauma, and malignancy[1]. Among these neoplasms, breast cancer is the most prevalent malignancy in women worldwide, and despite advancements in treatment, recurrence remains a significant concern [2]. Recurrence can manifest at multiple sites, including the pericardium, presenting diagnostic and therapeutic challenges [3]. Pericardial effusion secondary to breast cancer recurrence is rare, but it carries substantial morbidity and mortality, especially when it is complicated by a tamponade. We report a case where breast cancer recurrence

was detected through a large pericardial effusion, highlighting the importance of early recognition and intervention for improved patient outcomes.

Case presentation:

A 51-year-old postmenopausal woman, known to have type 2 diabetes mellitus managed with oral antidiabetic agents, presented to the emergency department with rapidly progressive dyspnea worsening at rest. In her past medical history, she was treated for infiltrating ductal carcinoma (HER-2 positive) of the right breast, for which she underwent a right PATEY mastectomy 9 years ago, followed by radiotherapy and 6 sessions of chemotherapy 8 years ago, along with hormonal therapy. She was declared cured and had regular follow-ups without any notable issues, also the subsequent cardiac assessments following radiotherapy did not observe any post-radiation pericardial effusions. Her medical history dates back to 15 days before admission with worsening dyspnea progressing to NYHA stage IV dyspnea, orthopnea evolving against a background of unspecified weight loss, and generalized asthenia for the past 2 months, without other associated symptoms.

Clinical examination on admission found the patient conscious, hemodynamically stable with a blood pressure of 130/80 mmHg; tachycardic at 113 beats per minute, tachypneic at 30 cycles per minute, SpO₂ was 94% on room air, afebrile at 37.2°C, with jugular vein distention, diabetic ketoacidosis: capillary blood glucose: 3.96 g/L and 3 crosses of glucose and ketones on urine dipstick test managed with insulin therapy. Cardiovascular examination revealed muffled heart sounds, and pulmonary examination revealed a right-sided pleural effusion of low to moderate abundance. The rest of the clinical examination was unremarkable except for the scar from the right mastectomy.

The ECG showed sinus tachycardia at 120/min, narrow QRS complexes, low QRS voltage in peripheral leads, and a reduction of the R wave in the antero-septal territory with biphasic T waves in the septo-apical-lateral area (FIGURE 1).

Chest X-ray revealed cardiomegaly with a moderate right-sided pleural effusion (FIGURE 2). And the thoracic CT showed the same results and confirming pericardial effusion.

Laboratory tests revealed an inflammatory syndrome (CRP: 64.3 mg/L, leukocytes: 12400/mm³, neutrophils: 8900/mm³, lymphocytes: 2500/mm³, fibrinogen: 5.28 g/L), negative procalcitonin, negative high-sensitivity troponins, normal thyroid function, electrolytes, renal function, and the rest of the plasma panel.

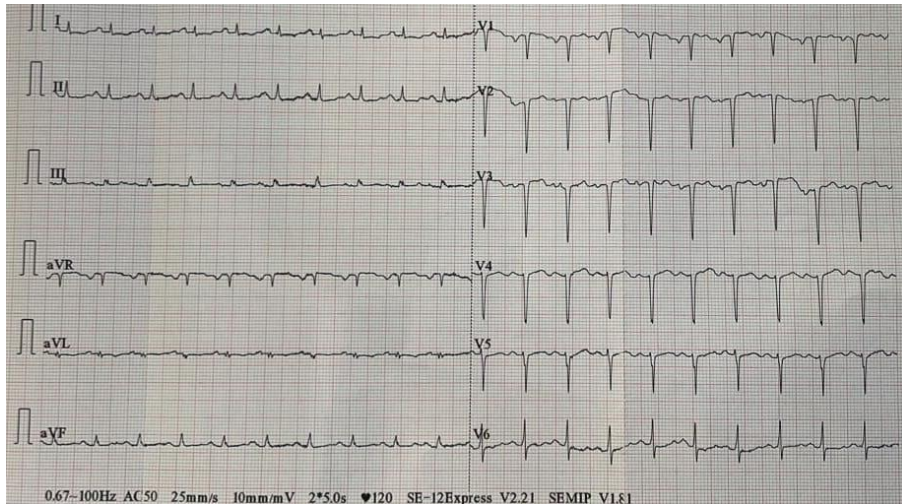


FIGURE 1: EKG made in the emergency department showing sinus tachycardia and low QRS voltage

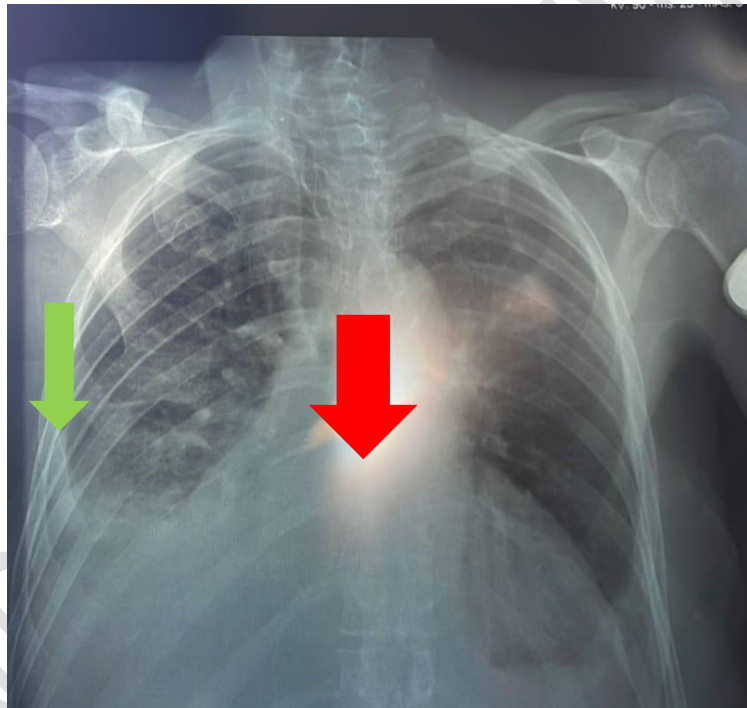


FIGURE 2: Chest X ray at admission showing minim to moderate right pleural effusion (green arrow) and enlarged cardiac silhouette (red arrow).

Transthoracic echocardiography revealed a large circumferential pericardial effusion with anterior predominance and respiratory variation of mitral, aortic and tricuspid flow with collapsus of right ventricular, the left ventricular function was good, left ventricular ejection fraction: 55% (FIGURE 3).

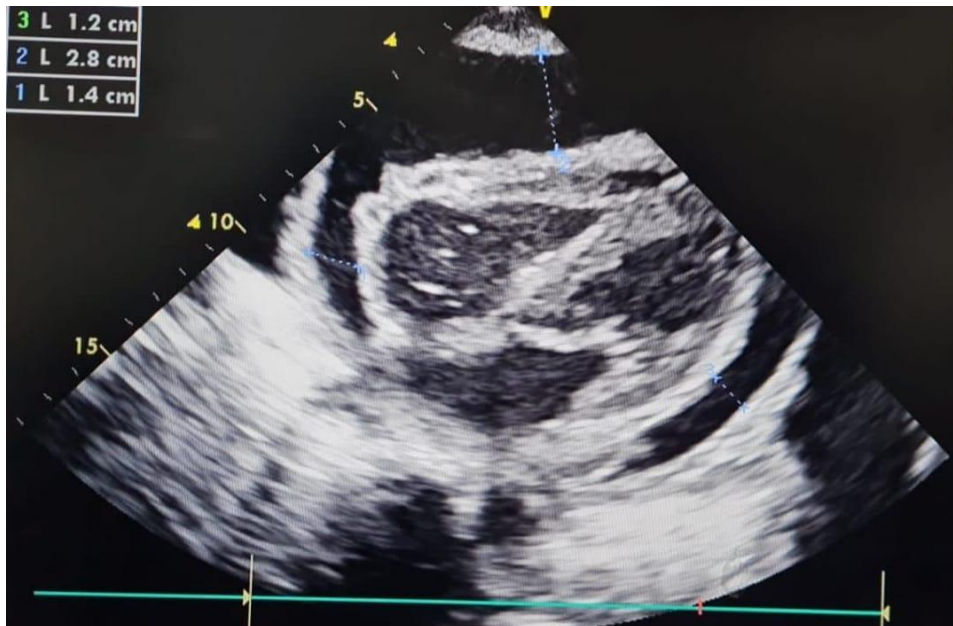


FIGURE 3: TTE showing pericardial effusion dominant in front of anterior cavities.

The patient was admitted to the cardiac intensive care unit where she underwent a subxiphoid pericardiocentesis with removal of 1 liter of serosanguinous fluid.

Analysis of the pericardial fluid showed:

- Inflammatory fluid with neutrophil predominance
- Protein: 53 g/L
- LDH: 582 IU/L
- Absence of organisms
- Negative culture
- Histopathology: presence of clusters of carcinoma cells

Analysis of the pleural fluid showed:

- pH: 8
- Glucose: 4,62 g/L
- Protein: 23,80 g/L
- LDH: 99 UI/L
- Leucocytes and hematies were at the normal range
- Culture negative

Twenty-four hours later, the patient developed hemodynamic instability (blood pressure 80/50 mmHg and tachycardia 150 beats per minute) with ECG showing electrical modifications and a narrow QRS tachycardia especially atrial tachycardia at 145/min (FIGURE 4) and high-sensitivity troponins positive at 784.8 ng/L. Blood electrolytes including magnesium and calcium were normal, thyroid function was normal as well. Atrial fibrillation was pharmacologically controlled with a loading dose of amiodarone 300 mg over 30

minutes intravenously followed by maintenance dose over 24 hours, then switched to oral amiodarone and bisoprolol 2.5 mg/day, and insulin therapy was initiated for diabetes. The CHA2DS2-VASc score was 1, not favoring anticoagulation.

After stabilization, echocardiography showed regression of the pericardial effusion which persisted becoming low adjacent to the right heart chambers (FIGURE 5); good left ventricular function, LVEF: 65% with a slight impairment of LV strain at 17.8%, without mitral or aortic valve pathology, the right ventricle was nondilated with good longitudinal systolic function without pulmonary hypertension.

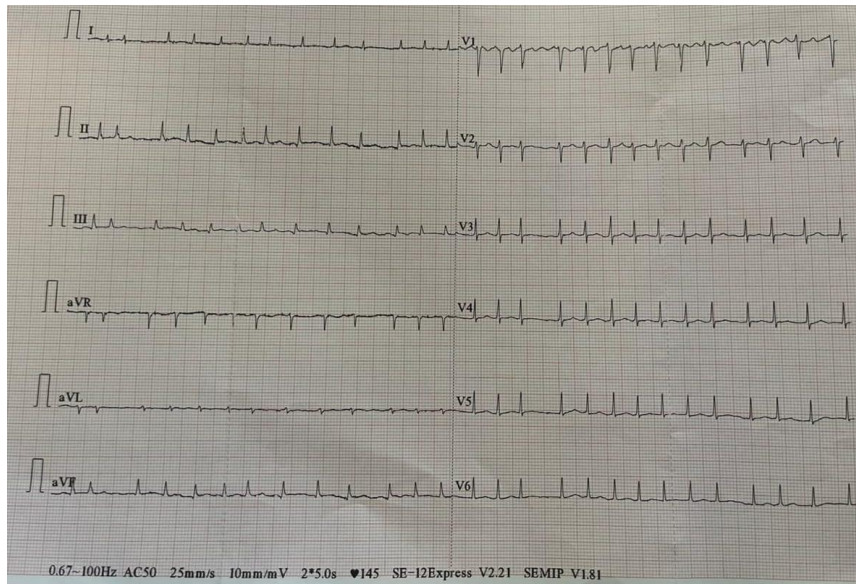


FIGURE 4: EKG modifications showing narrow QRS tachycardia.



FIGURE 5: TTE showing regression of the pericardial effusion after pericardiocentesis.

In the purpose to eliminate ischemic cardiomyopathy, the patient underwent a normal coronary angiography.

Therapeutically, the patient was started on aspirin 1g3/day, colchicine 0.5mg/day for a weight of 62 kg, oral amiodarone 400 mg2/day initially, then 400 mg/day, bisoprolol 5 mg/day, statin, and aspirin because she is at high cardiovascular risk.

The patient was discussed with oncologists, and a PET-SCAN revealed a recurrence of her breast cancer.

The patient was offered a pleuropericardial window due to the risk of recurrence of her effusion, which is of neoplastic origin, specifically a recurrence of breast cancer, but she refused.

After an echocardiographic control that did not show a recurrence of the effusion, the patient was discharged with weekly follow-up of her effusion and follow-up in oncology for chemotherapy.

Six months later, the patient returned with tamponade physiology and underwent surgical drainage with pleuropericardial window, with uncomplicated postoperative course.

Discussion:

Pericardial effusion is a rare pathological condition, with a prevalence of around 5.9% in the Western world [4]. Various types of cancers can be implicated [5].

Effusions, which can result in cardiac tamponade—a potentially lethal condition—serve as crucial clinical indicators of underlying malignancies, such as recurrent breast cancer [6]. Breast cancer metastasizing to the pericardium often signals advanced disease, posing considerable challenges in treatment and prognosis [7]. The recurrence of such effusions and patient survival predominantly hinges on cytology assessments, influencing both the primary cancer prognosis and response to chemotherapy [8]. In this instance, the patient's manifestation of dyspnea at rest and tamponade physiology warranted immediate assessment, culminating in the identification of a significant pericardial effusion linked to recurrent breast cancer following thorough investigations

Breast cancer is one of the leading causes of cancer-related mortality in women worldwide [7] [9] [10]. Despite advances in diagnosis and treatment, disease recurrence remains a major concern, especially in estrogen receptor-positive subtypes [9] [11]. Metastasis to distant organs, including the pericardium, can occur through various pathways such as hematogenous dissemination, lymphatic spread, or direct extension from adjacent tissues [11]. Although in some instances, the etiology of effusion may be iatrogenic, such as post-radiation effusions, a reported case underscored the revelation of colon cancer via pericardial effusion [12] [13]. It is noteworthy that such effusions may also emanate from a primary malignant origin. The presence of pericardial effusion in patients with a history of

breast cancer should raise suspicion of disease recurrence and prompt thorough investigation. While moderate effusions may be less symptomatic and may present with normal ECG, unlike large effusions [14].

Transthoracic echocardiography (TTE) plays a crucial role in evaluating pericardial effusion, providing real-time visualization and assessment of hemodynamic compromise [1] [4] [5]. Additionally, TTE-guided pericardiocentesis offers both diagnostic information and therapeutic relief of symptoms associated with cardiac tamponade [15]. Analysis of pericardial fluid, including cytological examination and biochemical analysis, helps confirm the etiology of pericardial effusion, as observed in our case [3].

Addressing pericardial effusion resulting from breast cancer recurrence demands a collaborative effort among oncologists, cardiologists, and palliative care specialists [3]. Treatment objectives focus on alleviating symptoms, enhancing quality of life, and extending survival. Systemic chemotherapy stands as the cornerstone therapy, addressing both local and distant disease manifestations and proving superior to surgery for chronic effusions [14]. Hormone receptor-positive breast cancer cases may benefit from endocrine therapy, while HER2-targeted agents offer supplementary treatment avenues. In instances of symptomatic tamponade, prompt pericardiocentesis followed by chemotherapy is viable, whereas recurrent effusions may require interventions such as establishing a pericardial window to prevent further fluid buildup and alleviate symptoms [14].

The outlook for patients with metastatic breast cancer involving the pericardium typically remains grim, with median survival varying from months to years, contingent upon disease severity and treatment response. Despite the generally unfavorable prognosis associated with carcinomatous pericarditis, Ikeda et al. documented a case where a patient with recurrent breast cancer, featuring pericardial effusion progressing to tamponade, achieved long-term survival following a pericardial window procedure [16]. Factors such as the precise cause of effusion, rate of fluid accumulation, cytological findings, and fluid volume serve as prognostic indicators for patients [17]. Palliative care assumes a pivotal role in addressing symptomatic distress, optimizing supportive measures, and ensuring patient comfort throughout the disease trajectory

Conclusion:

The presence of pericardial effusion may act as an initial indication of recurrent breast cancer, urging thorough assessment in individuals with prior breast cancer history. Timely identification, precise diagnosis, and immediate implementation of collaborative care are vital for enhancing patient outcomes and ensuring a better quality of life.

Ethics approval and consent to participate:

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

Consent for publication:

As per international standards or university standards, patient written consent has been collected and preserved by the authors.

Availability of data and materials:

Not applicable.

References:

- (1) Adler, Y.; Charron, P.; Imazio, M.; Badano, L.; Barón-Esquivias, G.; Bogaert, J.; Brucato, A.; Gueret, P.; Klingel, K.; Lionis, C.; Maisch, B.; Mayosi, B.; Pavie, A.; Ristić, A. D.; Sabaté Tenas, M.; Seferovic, P.; Swedberg, K.; Tomkowski, W.; ESC Scientific Document Group; Achenbach, S.; Agewall, S.; Al-Attar, N.; Angel Ferrer, J.; Arad, M.; Asteggiano, R.; Bueno, H.; Caforio, A. L. P.; Carerj, S.; Ceconi, C.; Evangelista, A.; Flachskampf, F.; Giannakoulas, G.; Gielen, S.; Habib, G.; Kolh, P.; Lambrinou, E.; Lancellotti, P.; Lazaros, G.; Linhart, A.; Meurin, P.; Nieman, K.; Piepoli, M. F.; Price, S.; Roos-Hesselink, J.; Roubille, F.; Ruschitzka, F.; Sagristà Sauleda, J.; Sousa-Uva, M.; Uwe Voigt, J.; Luis Zamorano, J.; Zamorano, J. L.; Aboyans, V.; Achenbach, S.; Agewall, S.; Badimon, L.; Barón-Esquivias, G.; Baumgartner, H.; Bax, J. J.; Bueno, H.; Carerj, S.; Dean, V.; Erol, Ç.; Fitzimons, D.; Gaemperli, O.; Kirchhof, P.; Kolh, P.; Lancellotti, P.; Lip, G. Y.; Nihoyannopoulos, P.; Piepoli, M. F.; Ponikowski, P.; Roffi, M.; Torbicki, A.; Vaz Carneiro, A.; Windecker, S.; Shuka, N.; Sisakian, H.; Mascherbauer, J.; Isayev, E.; Shumavets, V.; Van Camp, G.; Gatzov, P.; Hanzevacki, J. S.; Moustra, H. H.; Linhart, A.; Møller, J. E.; Aboleineen, M. W.; Pöder, P.; Lehtonen, J.; Antov, S.; Damy, T.; Schieffer, B.; Dimitriadis, K.; Kiss, R. G.; Rafnsson, A.; Arad, M.; Novo, S.; Mirrakhimov, E.; Stradinš, P.; Kavoliuniene, A.; Codreanu, A.; Dingli, P.; Vataman, E.; El Hattou, M.; Samstad, S. O.; Hoffman, P.; Lopes, L. R.; Dimulescu, D. R.; Arutyunov, G. P.; Pavlovic, M.; Dúbrava, J.; Sauleda, J. S.; Andersson, B.; Müller, H.; Bouma, B. J.; Abaci, A.; Archbold, A.; Nesukay, E. 2015 ESC Guidelines for the Diagnosis and Management of Pericardial Diseases. *Eur. Heart J.* **2015**, *36* (42), 2921–2964. <https://doi.org/10.1093/eurheartj/ehv318>.
- (2) Obeagu, E. I.; Obeagu, G. U. Breast Cancer: A Review of Risk Factors and Diagnosis. *Medicine (Baltimore)* **2024**, *103* (3), e36905. <https://doi.org/10.1097/MD.00000000000036905>.
- (3) Ilerhunmwuwa, N.; Sedeta, E.; Wasifuddin, M.; Hakobyan, N.; Aiwuyo, H. O.; Perry, J. C.; Uche, I.; Okhawere, K.; Torere, B. E.; Burak, E.; Omid, H.; Wang, J. C. Cardiac Tamponade in Patients With Breast Cancer: A Systematic Review. *Cureus* **2022**. <https://doi.org/10.7759/cureus.33123>.
- (4) Lazaros, G.; Vlachopoulos, C.; Lazarou, E.; Tsioufis, K. New Approaches to Management of Pericardial Effusions. *Curr. Cardiol. Rep.* **2021**, *23* (8), 106. <https://doi.org/10.1007/s11886-021-01539-7>.
- (5) Mori, S.; Bertamino, M.; Guerisoli, L.; Stratoti, S.; Canale, C.; Spallarossa, P.; Porto, I.; Ameri, P. Pericardial Effusion in Oncological Patients: Current Knowledge and Principles of Management. *Cardio-Oncol.* **2024**, *10* (1), 8. <https://doi.org/10.1186/s40959-024-00207-3>.

- (6) Hakobyan, N.; Ilerhunmwuwa, N.; Aiwuyo, H. O.; Sedeta, E.; Uche, I.; Wasifuddin, M.; Perry, J. C. Breast Cancer Complicated by Cardiac Tamponade in a Patient With Neurofibromatosis Type 1. *Cureus***2023**. <https://doi.org/10.7759/cureus.34095>.
- (7) Lv, X.; He, J.; Shen, Y.; Zheng, H. Malignant Pleural and Pericardial Effusions and Meningeal Infiltrates without Other Metastases in Breast Cancer: A Case Report. *Mol. Clin. Oncol.***2016**, *4* (5), 855–858. <https://doi.org/10.3892/mco.2016.798>.
- (8) Kim, S.-H.; Kwak, M. H.; Park, S.; Kim, H. J.; Lee, H.-S.; Kim, M. S.; Lee, J. M.; Zo, J. I.; Ro, J. S.; Lee, J. S. Clinical Characteristics of Malignant Pericardial Effusion Associated with Recurrence and Survival. *Cancer Res. Treat.***2010**, *42* (4), 210. <https://doi.org/10.4143/crt.2010.42.4.210>.
- (9) Ahmad, A. Pathways to Breast Cancer Recurrence. *ISRN Oncol.***2013**, *2013*, 1–16. <https://doi.org/10.1155/2013/290568>.
- (10) Mettlin, C. Global Breast Cancer Mortality Statistics. *CA. Cancer J. Clin.***1999**, *49* (3), 138–144. <https://doi.org/10.3322/canjclin.49.3.138>.
- (11) Pedersen, R. N.; Esen, B. Ö.; Mellemkjær, L.; Christiansen, P.; Ejlersen, B.; Lash, T. L.; Nørgaard, M.; Cronin-Fenton, D. The Incidence of Breast Cancer Recurrence 10–32 Years After Primary Diagnosis. *JNCI J. Natl. Cancer Inst.***2022**, *114* (3), 391–399. <https://doi.org/10.1093/jnci/djab202>.
- (12) Neves, M. B. M.; Stival, M. V.; Neves, Y. C. S.; Da Silva, J. G. P.; Macedo, D. B. D. R.; Carnevalli, B. M.; Silva, A. M. F. E.; Sette, C. V. D. M.; Da Luz, S. T.; Cubero, D. D. I. G. Malignant Pericardial Effusion as a Primary Manifestation of Metastatic Colon Cancer: A Case Report. *J. Med. Case Reports***2021**, *15* (1), 543. <https://doi.org/10.1186/s13256-021-03085-w>.
- (13) Uprety, D.; West, H. (Jack). Malignant Pericardial Effusion, or Fluid Around the Heart Due to Cancer. *JAMA Oncol.***2024**, *10* (1), 148. <https://doi.org/10.1001/jamaoncol.2023.4500>.
- (14) Petrofsky, Ms, Rn, Acnp, M. Management of Malignant Pericardial Effusion. *J. Adv. Pract. Oncol.***2014**, *5* (4). <https://doi.org/10.6004/jadpro.2014.5.4.5>.
- (15) Mandavia, D. P.; Hoffner, R. J.; Mahaney, K.; Henderson, S. O. Bedside Echocardiography by Emergency Physicians. *Ann. Emerg. Med.***2001**, *38* (4), 377–382. <https://doi.org/10.1067/mem.2001.118224>.
- (16) Ikeda, H.; Kikawa, Y.; Nakamoto, Y.; Takeo, M.; Yamamoto, M. A Patient with Recurrent Breast Cancer Showing Long-Term Survival after Developing Pericardial Effusion and Cardiac Tamponade Caused by Carcinomatous Pericarditis. *Breast Care***2013**, *8* (1), 71–73. <https://doi.org/10.1159/000346831>.
- (17) Edoute, Y.; Kuten, A.; Ben-Haim, S. A.; Moscovitz, M.; Malberger, E. Symptomatic Pericardial Effusion in Breast Cancer Patients: The Role of Fluid Cytology. *J. Surg. Oncol.***1990**, *45* (4), 265–269. <https://doi.org/10.1002/jso.2930450411>.