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Research Article

Chronic Constrictive Pericarditis: Epidemiological, Diagnostic and Therapeutic Aspects in a Low-income Country

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Abstract

Objective: To describe the epidemiological, diagnostic and therapeutic aspects of chronic constrictive pericarditis (CCP) in a multicentre hospital setting in sub-Saharan Africa. Methods: This was a retrospective descriptive study conducted over a 12-year period that included patients with a confirmed diagnosis of CCP. Data on clinical, paraclinical, aetiological, therapeutic and evolutionary characteristics were collected from medical records. The analysis focused on demographic characteristics, medical history, clinical signs, additional tests, aetiologies, management strategies and hospital outcomes. Results: A total of 20 patients were included in the study. The mean age was 46.5 ± 19.1 years, with a male predominance (sex ratio 1.5). All patients were symptomatic, with dyspnoea present in all cases (NYHA III 66%, NYHA IV 34%). The past medical history included tuberculosis (40%), acute pericarditis (35%), and breast neoplasia (10%). Echocardiography revealed pericardial thickening in all cases, with calcifications present in 90% of patients. These abnormalities were confirmed in 5 patients who underwent chest CT scans. The mean time to diagnosis was 5.3 ± 1 months. The most common aetiology was tuberculosis (55%), followed by idiopathic (35%) and neoplastic (10%) forms. All patients received symptomatic treatment, with only one undergoing pericardectomy. Intrahospital mortality was 5%. Conclusion: CCP is a rare but treatable cause of heart failure, primarily associated with tuberculosis in our setting. Improving management and prognosis requires wider access to specialist investigations and surgery. This study highlights once again that tuberculosis remains a major public health issue with high morbidity and mortality in low-income countries.

Keywords

Constrictive Pericarditis, Tuberculosis, Right Heart Failure, Echocardiography, Pericardectomy

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1. Introduction

Chronic constrictive pericarditis (CCP) is a rare but potentially reversible disease of the pericardium. It is characterized by fibrosis and thickening of the pericardial layer, and sometimes calcification, which leads to impaired diastolic filling of the heart chambers [1, 2]. This process can lead to heart failure, which is usually predominantly right-sided. This can make diagnosis difficult because the symptoms may not be very specific.

CCP is poorly understood epidemiologically and is probably underestimated, particularly in low-resource countries. CCP is a rare clinical entity, accounting for 0.5-2% of all heart diseases [3, 4]. Around 9% of patients with acute pericarditis develop constrictive physiology [5]. While the main causes in developed countries are post-surgical, post-radiation or idiopathic, tuberculosis is the primary cause in developing countries, particularly in sub-Saharan Africa [5-7]. HIV infection may also aggravate the condition by promoting the spread of pericardial infections, particularly those caused by Mycobacterium tuberculosis [8, 9].

Diagnosis is based on a combination of clinical (right heart failure, Pick's syndrome and signs of systemic congestion) and paraclinical data. Transthoracic Doppler echocardiography is the examination of choice, enabling visualization of pericardial thickening, atrial cavity dilatation and signs of ventricular interdependence. Cross-sectional imaging (thoracic CT or cardiac MRI) improves diagnostic sensitivity and helps to better characterize the underlying etiology [10, 11].

Treatment is primarily etiological when a cause is identified. For persistent or advanced symptomatic forms, pericardectomy is the gold-standard curative treatment, although it is still associated with significant morbidity and mortality, particularly in cases of late diagnosis or extensive involvement [12-14].

This study aims to describe the epidemiological, clinical, diagnostic and therapeutic characteristics of cases of chronic constrictive pericarditis observed in a hospital setting in sub-Saharan Africa, with a focus on the challenges faced in countries with limited resources.

2. Material and Methods

2.1. Type and Setting of Study

This was a multicenter retrospective study conducted between 1st January 2012 and 31 January 2024. It was carried out in the cardiology departments of three university hospitals (UH) in Togo: Campus UH, Sylvanus Olympio UH, and Kara UH. These UH hospitals are the national referral hospitals in Togo, with two located in the capital, Lomé, in the south, and one located in the north.

2.2. Study Population

All patients who were diagnosed with chronic constrictive pericarditis based on clinical, echocardiographic and/or computed tomography (CT) criteria, in accordance with current recommendations [15, 16], were included.

The inclusion criteria included:

1) clinical signs compatible with predominant right heart failure (e.g. exertional dyspnoea, hepatomegaly, ascites, oedema of the lower limbs, turgid jugular veins and hepatojugular reflux);
2) suggestive ultrasound abnormalities (pericardial thickening, ventricular interdependence, a paradoxical septum, dilatation of the vena cava without inspiratory collapse, exaggerated respiratory variations on mitral and hepatic Doppler, or 'septal bounce'/rapid diastolic movement of the septum).
3) signs on chest X-ray (pericardial calcifications);
4) and/or CT signs (pericardial thickening of more than 2 mm and/or calcifications).

All the diagnostic tool were available in the three hospital. MRI scan and cardiac catheterization are not available in both hospital.

Patients with acute pericarditis that had not progressed or whose data were incomplete were excluded.

2.3. Data Collected

The following variables were collected from the medical records:

1) Socio-demographic data: age, sex, medical history (e.g. cardiac surgery, tuberculosis, cancer, radiotherapy).
2) Clinical data: symptoms, physical signs and duration of evolution.
3) Paraclinical data: results of chest X-ray, echocardiography and chest CT scan.
4) Therapeutic management: medical treatment and possible pericardectomy.
5) Outcome: clinical improvement and in-hospital mortality.

Idiopathic CCP was diagnosed when no apparent etiology was identified. Tuberculous CCP was defined as Koch bacilli being isolated from a pericardial specimen, or caseous granulomas being identified in a biopsy specimen. Purulent CCP was diagnosed when the pericardial fluid was macroscopically purulent or had a high polymorphonuclear cell count (>90%). Postsurgical CCP was diagnosed when CCP developed after open-heart surgery. Radiotherapy-induced CCP was defined as the development of CCP after therapeutic chest radiation, after excluding other causes of CCP. Pericardial calcification was defined as the presence of calcification on a chest X-ray, echocardiography, or chest CT scan. Left ventricular systolic function was considered abnormal if the estimated left ventricular ejection fraction was below 50%.

Right ventricular function was considered abnormal if the tricuspid annular plane systolic excursion was below 16 mm. The amount of pericardial effusion (PE) was categorized as mild (less than 10 mm of echo-free space in the anterior and posterior pericardial spaces), moderate (10-20 mm), or severe (>20 mm).

2.4. Statistical Analysis

The data were entered into a Microsoft Excel spreadsheet and then checked for completeness and cleaned. The data were analyzed using IBM Statistical Product and Service Solutions (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Quantitative variables were expressed as the mean ± standard deviation. Categorical variables were expressed as percentages.

2.5. Ethical Considerations

Ethical approval for the study was obtained from the Health Ethics Committee of the Faculty of Health Sciences, University of Lom é The study was conducted in accordance with the International Conference on Harmonization of Good Clinical Practice guidelines and the Declaration of Helsinki.

3. Results

3.1. Epidemiological Aspects

A total of 21 cases of CCP were diagnosed and managed over a 12-year period. The mean patient age was 46.5 ± 19.1 years, ranging from 16 to 90 years. The patients were predominantly male, with a sex ratio of 1.5 (12 men and 8 women).

The main cardiovascular risk factors were arterial hypertension (14.3%), smoking (14.3%), and diabetes (4.7%). The most common co-morbidity was HIV (33.3%). Eight patients (38.1%) had a history of pulmonary tuberculosis, and 7 (33.3%) had previously been treated for acute pericarditis, 3 of which were of tuberculosis origin.

3.2. Diagnostic Aspects

All patients were symptomatic on clinical examination. The main reason for consultation was dyspnoea, with 62% of cases classified as NYHA stage III. Other symptoms pedal oedema (76.2%), hepatalgia (33.3%), orthopnoea (23.8%), and chest pain (33.3%). On physical examination, signs of right heart failure were evident in 18 patients (85.7%). Pick's syndrome was present in 66.7% of cases, and pericardial vibrancy was present in four patients (19%). Table 1 summarizes the clinical characteristics of the patients and for some others studies.

Chest X-rays showed pericardial calcifications in 14 patients (66.7%), cardiomegaly in 28.6%, and pleural effusion in 38.1%. Electrocardiograms showed non-specific repolarisation disorders in 66.7% of cases and microvoltage in 28.6% of cases. Supraventricular rhythm disorders were observed in three patients (14.3%): two cases of atrial fibrillation and one case of atrial tachycardia.

Echocardiography revealed pericardial thickening in all patients, calcification in 90.5% of cases, biatrial dilatation in 47.6% and right ventricular dysfunction in 23.8%. Associated pericardial effusion was noted in 38.1% of patients (Table 2). Chest computed tomography, performed on 5 patients, revealed a thickened pericardium in all cases and calcifications in 3 cases. Three patients underwent histopathological analysis: 2 cases of tuberculosis and 1 case of breast carcinoma. No patient underwent cardiac MRI or catheterization. The mean time to diagnosis was 5.3 ± 1 months.

Tuberculosis was the most common etiology, identified in 11 cases (52.4%). The cause was considered idiopathic in seven cases (33.3%), neoplastic in two cases (9.5%), and purulent in one case (4.8%).

Table 1. *Clinical characteristics of patients.*

Clinical characteristics	Our study Togo n = 20	Yangni-Angate [20] Ivory Cost (2016) n = 120	Taamallah [14] Tunisie (2021) n = 21	Nootan [23] India (2025) n = 19
Mean age (years)	45.6 ±19.1	28.8 ±10.4	40.46 ±16.74	26.57 ±11.9
Sex, male n (%)	12 (60)	72 (60)	20 (80)	14 (73.68)
Medical history				
Tuberculosis n (%)	8 (40)	119 (99.2)	11 (44)	84.21)
Acute pericarditis n (%)	7 (35)	-	-	-
Brest cancer n (%)	2 (10)	-	-	-
Clinical findings				
Dyspnoea n (%)			21 (84)	
NYHA II n (%)		63 (52.5)		3 (15.8)

Clinical characteristics	Our study Togo n = 20	Yangni-Angate [20] Ivory Cost (2016) n = 120	Taamallah [14] Tunisie (2021) n = 21	Nootan [23] India (2025) n = 19
NYHA III n (%)	13 (65)	54 (45)		10 (52.6)
NYHA IV n (%)	7 (35)	3 (2.5)		6 (31.6)
Chest pain n (%)	6 (30)	68 (57)	6 (24)	4 (21.1)
Ascites n (%)		56 (46.6)	10 (40)	16 (84.2)
Hepatomegaly n (%)	20 (100)	120 (100)	19 (76)	
Pedal edema n (%)	16 (78)	56 (46.6)	16 (64)	13 (31.6)
Hepato-jugular reflux n (%)	20 (100)	120 (100)	14 (56)	
Paradoxical pulse n (%)	7 (35)	-		
Pericardial vibrancy n (%)	4 (20)	-	2 (8)	

Table 2. *Echocardiography findings.*

Findings	Number	Percentage
Atrial dilatation	10	50
Septal bounce	9	45
Respiratory variation in flow	18	90
Pericardial thickening	20	100
Pericardial effusion	8	40
Mild	5	25
Moderate	3	15
Calcification	19	95
Right ventricular systolic dysfunction	5	25
Left ventricular systolic dysfunction	1	5

3.3. Therapeutic Aspects

All patients received diuretic treatment. Four patients (19%) also received anti-tuberculosis treatment. Only one patient underwent subtotal pericardectomy, resulting in clear functional improvement. The average hospital stay was 11.3 ± 7.07 days (range 3-19 days). Intra-hospital mortality was 4.8%.

4. Discussion

Chronic constrictive pericarditis (CCP) is a rare but potentially curable form of heart failure if diagnosed early. It is estimated to account for between 0.5 and 2% of all heart diseases [3]. A bicentre study by Taamallah et al. [14] in Tunisia identified 25 cases of CCP over 21 years. Fateh et al. [17] recorded 21 cases over 11 years in Pakistan. In our series, we recorded 21 cases over 12 years, which testifies to the low incidence of this condition, probably due to missed or late diagnoses.

The age of patients with CP varies according to the studies. The mean age of 46.5 years, with a male predominance (sex ratio of 1.5), is comparable to that reported in African and Asian studies, in which CCP occurs more frequently in young patients, particularly in association with infectious etiologies such as tuberculosis [1, 2]. The high prevalence of comorbidities such as HIV (30%) supports this hypothesis in a context of immunodeficiency that favors tuberculosis dissemination. In Western countries the average age of discovery of CCP is in the fifth and sixth decades [18, 19]. This difference could be explained by the difference in etiologies between countries.

Clinically, the symptoms were dominated by signs of right heart failure, most notably exertional dyspnea (100%), hepatomegaly (100%), and pedal edema (76.2%) comparable to study of Yangni-Angate [20]. While these data are consistent with classic descriptions of CCP, they also highlight the lack of specificity of the symptoms, which often results in delayed diagnosis. In our series, the mean time to diagnosis was 5.3 ± 1 months, which is relatively short compared to other studies where delays of several months or even years have been reported.

Diffuse repolarisation disorders and microvoltage on the electrocardiogram are commonly reported in the literature, but are non-specific. Supraventricular arrhythmias were found in 10% of our patients, which is similar to the 16% reported by Lazaros et al. [21], but lower than the 36% reported by Kumawat et al. [22]. This difference depends mainly on the stage of the disease. At advanced stages, persistently high right atrial pressure may be responsible for atrial arrhythmias [15].

Despite its low sensitivity, chest radiography revealed

pericardial calcifications in 66.7% of cases. Echocardiography confirmed pericardial thickening in all cases, with a high prevalence of calcification (90.5%), atrial enlargement (47.6%), and associated effusion (38.1%). In the study of Yangni-Angate [20], echocardiography shown thick pericardial layers (100% of cases) with calcifications and was specific in diagnosing CCP in 80 cases (66%). These signs suggest constriction and confirm the central role of ultrasound in diagnostic orientation [8]. Although not widely used in our study (n = 5), chest CT confirmed pericardial thickening in all cases and calcifications in 60% of cases. The absence of MRI scans and cardiac catheterization in our patients reflects the limited access to these specialized examinations in our setting.

The finding of tuberculosis in 52.4% of patients confirms its predominance in sub-Saharan Africa and in others developing countries [23], in contrast to Western countries where cardiac surgery, radiotherapy and idiopathic causes predominate [10]. CCP post-cardiotomy is common in Western countries, it occurs after a few months to a few years after any cardiac surgery [24, 25]. Constrictive pericarditis post-radiation is also a common cause of pericardial constriction in Western countries. Pericardial constriction can occur 5 to 10 years after radiotherapy [26, 27]. None of our patients had a history of cardiac surgery or radiation therapy, probably due to the absence of cardiac surgery and the very recent introduction of radiotherapy in our country. Two cases of neoplastic CCP have been identified, both of which were related to breast carcinoma. This underlines the importance of investigating a malignant origin in cases of atypical progression.

Treatment remained primarily symptomatic. All patients received diuretics, and only four were treated with antituberculosis drugs. Pericardectomy was only performed on one patient (4.8%), probably due to the technical constraints and cost of the procedure. However, pericardectomy is the gold standard treatment for CCP, often yielding favorable functional results [11]. Our in-hospital mortality rate remains low at 4.8%, but could increase in the long term in the absence of pericardectomy. In the surgical series, the in hospital mortality rang from 6 to 12.5% and The most frequent cause of early death was a low cardiac output [14, 20, 23]. In the study of Taamallah [14], among the 22 patients who survived, 17 patients were follow-up from 14 months to 21 years (mean average follow up = 5.67 years). A regression of dyspnea was observed within 1.8 months in 82% of patients (n = 14). There was no death during the year after the pericardiectomy, but during follow-up, one patient (4%) died 2 years after pericardiectomy, the cause of death was worsening of a hepatic cirrhosis existing before pericardiectomy. At 20 years follow up, 50.9% of patients were still alive in the study made in Spain [24].

5. Study Limitations

Our study has several limitations: a small sample size; retrospective data; and an absence of long-term follow-up. Limited access to certain advanced diagnostic tests (e.g. MRI scans and catheterization) may have resulted in an underestimation of certain conditions or an incorrect etiological classification.

6. Conclusion

Chronic constrictive pericarditis is a rare but serious condition. It is diagnosed based on a number of clinical and imaging findings. In our context, tuberculosis is the most common cause, reflecting the epidemiological reality of countries with limited resources. Symptoms dominated by signs of right heart failure are often misleading, which explains the frequent delays in diagnosis. Although echocardiography is the basic screening tool, the use of advanced imaging tests such as CT and MRI scans, as well as cardiac catheterization, would be desirable in order to refine the diagnosis and guide management. Treatment focuses on providing symptomatic relief, but only pericardectomy offers a definitive cure. Clinicians need to be more aware of this potentially curable condition, and access to specialist investigations and surgery must be improved. This study highlights once again that tuberculosis remains a major public health issue with high morbidity and mortality in low-income countries.

Abbreviations

CCP	Chronic Constrictive Pericarditis
CT	Computed Tomography
HIV	Human Immunodeficiency Virus
MRI	Magnetic Resonance Imaging
NYHA	New York Heart Association
PE	Pericardial Effusion
SPSS	Statistical Product and Service Solutions
UH	University Hospital

Author Contributions

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Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Ling LH, Oh JK, Schaff HV, Danielson GK, Mahoney DW, Seward JB, et al. Constrictive pericarditis in the modern era: evolving clinical spectrum and impact on outcome after pericardiectomy. Circulation. 1999; 100(13): 1380-6. https://doi.org/10.1161/01.cir.100.13.1380

[2] Welch TD, Oh JK. Constrictive pericarditis: old disease, new approaches. Curr Cardiol Rep. 2015; 17(4): 20. https://doi.org/10.1007/s11886-015-0576-x

[3] Schiavone WA. The changing etiology of constrictive pericarditis in a large referral center. Am J Cardiol 1986; 58(3) 373-5. https://doi.org/10.1016/0002-9149(86)90087-1

[4] Fernandes F, de Melo DTP, Ramires FJA, Dias RR, Tonini M, Fernandes VDS, et al. Importance of Clinical and Laboratory Findings in the Diagnosis and Surgical Prognosis of Patients with Constrictive Pericarditis. Arq Bras Cardiol. 2017; 109(5): 457-465. https://doi.org/10.5935/abc.20170147

[5] Mutyaba A, Balkaran S, Cloete R, du Plessis N, Badri M, Brink J, et al. Constrictive pericarditis requiring pericardiectomy at a tertiary hospital in South Africa: causes and perioperative outcomes in the HIV era. J Thorac Cardiovasc Surg. 2014; 148(6): 3058-65. https://doi.org/10.1016/j.jtcvs.2014.07.065

[6] Syed FF, Schaff HV, Oh JK. Constrictive pericarditis a curable diastolic heart failure. Nat Rev Cardiol. 2014; 11(9): 530-44. https://doi.org/10.1038/nrcardio.2014.100

[7] Naicker K, Ntsekhe M. Tuberculous pericardial disease: a focused update on diagnosis, therapy and prevention of complications. Cardiovasc Diagn Ther 2020; 10(2): 289-295. http://dx.doi.org/10.21037/cdt.2019.09.20

[8] Mayosi BM, Burgess LJ, Doubell AF. Tuberculous pericarditis. Circulation. 2005; 112(23): 3608-16. https://doi.org/10.1161/CIRCULATIONAHA.105.543066

[9] GBD 2019 Tuberculosis Collaborators. Global, regional, and national sex differences in the global burden of tuberculosis by HIV status, 1990-2019: results from the Global Burden of Disease Study 2019. Lancet Infect Dis 2022; 22: 222-41. https://doi.org/10.1016/S1473-3099(21)00449-7

[10] George TJ, Arnaoutakis GJ, Beaty CA, Kilic A, Baumgartner WA, Conte JV. Contemporary etiologies, risk factors, and outcomes after pericardiectomy. Ann Thorac Surg. 2012; 94(2): 445-51. https://doi.org/10.1016/j.athoracsur.2012.03.079

[11] Bertog SC, Thambidorai SK, Parakh K, Schoenhagen P, Ozduran V, Houghtaling PL, et al. Constrictive pericarditis: etiology and cause-specific survival after pericardiectomy. J Am Coll Cardiol. 2004; 43(8): 1445-52. https://doi.org/10.1016/j.jacc.2003.11.048

[12] Welch TD, Ling LH, Espinosa RE, Anavekar NS, Wiste HJ, Lahr BD et al. Echocardiographic Diagnosis of Constrictive Pericarditis. Mayo Clinic Criteria. Circulation: Cardiovascular Imaging 2014; 7(3): 526-534. https://doi.org/10.1161/CIRCIMAGING.113.001613

[13] Maisch B, Seferović PM, Ristić AD, Erbel R, Rienmuller R, Adler Y, et al. Guidelines on the diagnosis and management of pericardial diseases. Eur Heart J. 2004; 25(7): 587-610. https://doi.org/10.1016/j.ehj.2004.02.002

[14] Taamallah K, Ben Zaied N, Lahdhili H, Ben Omrane S, Denguir R, Chenik S. Constrictive pericarditis: 21 years' experience and review of literature. Pan Afr Med J 2021; 8: 38: 141. https://doi.org/10.11604/pamj.2021.38.141.22884

[15] Adler Y, Charron P, Imazio M, Badano L, Barón-Esquivias G, Bogaert J, et al. 2015 ESC Guidelines for the diagnosis and management of pericardial diseases: The Task Force for the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology (ESC) Endorsed by: The European Association for CardioThoracic Surgery (EACTS). Eur Heart J 2015; 36(42): 2921-2964. https://doi.org/10.1093/eurheartj/ehv318

[16] Chiabrando JG, Bonaventura A, Vecchié A, Wohlford GF, Mauro AG, Jordan JH, et al. Management of Acute and Recurrent Pericarditis JACC State-of-the-Art Review. J Am Coll Cardiol 2020; 75(1): 76-92. https://doi.org/10.1016/j.jacc.2019.11.021

[17] Tipoo Sultan FA, Tariq MU. Clinical features, management and outcome of patients with constrictive pericarditis - Experience from a third world country. J Saudi Heart Assoc 2018; 30(1): 9-13. https://doi.org/10.1016/j.jsha.2017.04.008

[18] Busch C, Penov K, Amorim PA, Garbade J, Davierwala P, Schuler GC et al. Risk factors for mortality after pericardiectomy for chronic constrictive pericarditis in a large single-centre cohort. European journal of cardio-thoracic surgery: official journal of the European Association for Cardio-thoracic Surgery. 2015; 48(6): e110-6. https://doi.org/10.1093/ejcts/ezv322

[19] Kang SH, Song JM, Kim M, Choo SJ, Chung CH, Kang DH et al. Prognostic predictors in pericardiectomy for chronic constrictive pericarditis. The Journal of thoracic and cardiovascular surgery. 2014; 147(2): 598-605. https://doi.org/10.1016/j.jtcvs.2013.01.022

[20] Yangni-Angate KH, Tanauh Y, Meneas C, Diby F, Adoubi A, Manga D. Surgical experience on chronic constrictive pericarditis in African setting: review of 35 years' experience in Cote d'Ivoire. Cardiovasc Diagn Ther 2016; 6(Suppl 1): S13-S19. http://doi.org/10.21037/cdt.2016.09.06

[21] Lazaros G, Lazarou E, Tsioufis P, Soulaidopoulos S, Valatsou A, Karmpalioti M, et al Incidence and Prevalence of Cardiac Arrhythmias in Pericardial Syndromes. Rev Cardiovasc Med 2022; 23(10): 347. https://doi.org/10.31083/j.rcm2310347

[22] Kumawat M, Lahiri TK, Agarwal D. Constrictive pericarditis: retrospective study of 109 patients. Asian Cardiovasc Thorac Ann 2018; 26(5): 347-352. https://doi.org/10.1177/0218492318771490

[23] Hadiya NV, Kumar M, Gupta A, Tyagi AS, Prashad R. Clinical and echocardiography outcomes following pericardiectomy in chronic constrictive pericarditis. J Pract Cardiovasc Sci 2025; 11: 43-9. https://doi.org/10.4103/jpcs.jpcs_56_24

[24] Porta-Sanchez 1, Sagrista-Sauleda J, Ferreira-Gonzalez I, Torrents-Fernandez A, Roca-Luque I, Garcıa-Doradob D. Constrictive Pericarditis: Etiologic Spectrum, Patterns of Clinical Presentation, Prognostic Factors, and Long-term Follow-up. Rev Esp Cardiol. 2015; 68(12): 1092-1100. https://doi.org/10.1016/j.rec.2014.12.018

[25] Gillombardo CB, Hoit BD. Constrictive pericarditis in the new millennium. Journal of Cardiology 2024; 83: 219-227. https://doi.org/10.1016/j.jjcc.2023.09.003

[26] El Khorb N, El Ouali L, Lahlou I, Ouaha L, Akoudad H. La pericardite chronique constrictive. MorJCardiol. 2012; 7: 16-20.

[27] Toyofuku M, Okimoto T, Tadehara F, Sumii K, Imazu M, Yamakido M et al. Cardiac Disease Late After Chest Radiotherapy for Hodgkin's Disease. Jpn Circ J. 1999 Oct; 63(10): 803-5. https://doi.org/10.1253/jcj.63.803