



Chronic Constrictive Pericarditis in a low-income-setting: Challenges and Outcome of Surgery

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Abstract

Background: In a low-income setting like ours, chronic constrictive pericarditis is not uncommon. Affected patients present late for surgical management owing to poverty and ignorance. These two factors adversely affect the outcome of surgery.

Objective: To review 45 cases of chronic constrictive pericarditis done in our center with a view to determining the challenges and outcome of surgery.

Patients and Methods: This is a retrospective study spanning 10 years, 2011 to 2020. Data comprising of biodata, morphologic and histologic types including challenges and outcome of surgery were obtained from our hospital Record Department. Data were analyzed using SPSS version 22(Chicago) and results presented using bar chart, tables and pie chart.

Results: There were 45 patients. Of this number, there were 33 males (73.3%) and 12 females (27.7%). Age ranges affected were from 11-20 to 61-70 years. Morphologic types were totally calcific chronic constrictive pericarditis (4.4%), effusive chronic constrictive pericarditis (40%) and isolated chronic constrictive pericarditis (55.6%). Histologically, tuberculosis (60.0%) was most common, followed by idiopathic (33.3%). 2 patients were treated using cardiopulmonary bypass while the remainder had off-pump pericardiectomy, ranging from partial, total and radical. The outcome was poor in 30%, because they were not able to progress beyond NYHA class III despite inotropic support and repeated paracentesis abdominis.

Conclusion: Chronic constrictive pericarditis especially when it presents late is a major cause of morbidity and mortality in the young population. Poorly equipped ICU and lack of highly trained personnels also affect adversely those who present for treatment.

Keywords: constrictive, pericardiectomy, NYHA, inotrope, paracentesis

Introduction

Constrictive is a chronic inflammatory process involving both fibrous and serous layers of the pericardium. It leads to pericardial thickening and compression of the ventricles with resultant impairment in diastolic filling and cardiac function.¹ The aetiology is variable ranging from infections to

idiopathic, affecting young, middle and elderly people. Symptoms are mainly that of heart failure ranging from New York Heart Association (NYHA) 3 to 4. Surgical treatment is able to improve the functional class in the majority of late survivors.² Low-income economies are those with Gross National Income (GNI) per capita, calculated using the World Bank Atlas method, of \$1,045 or less in 2014. Middle-income economies are those with a GNI per capita, calculated using the World Bank Atlas method, of more than \$1,045 but less than \$4,125.³ Nigeria is the most populous black nation in Africa and indeed world over with an absolute value of about 200 million people. There are high

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levels of unemployment, high-poverty prevalence, moderate level of inequality, low level of certification of the working-age population, and therefore, weak capital developments and near-complete loss of tertiary graduates (brain drain syndrome).^{4,5}

Materials and Methods

Within a period of 10 years, 45 patients were managed and included unplanned and isolated (planned) pericardiectomy. This was a retrospective study and data were obtained from record department and cardiothoracic surgery unit operative register. Data obtained were demography (age, sex), aetiology, preoperative evaluation methodology and outcome, intra-operative challenges and postoperative outcomes as well as follow up strategies. The results were analyzed using SPSS version 22(Chicago). Data were presented using Computer based bar chart, tables and pie chart

Results

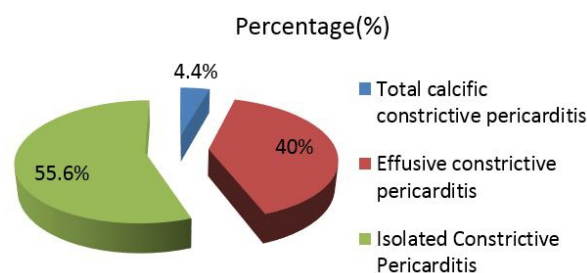
There were 33(73.3%) males and 12(27.7%) females with a male to female ratio of 2.8:1.

Table 1: showing the distributions of the age ranges

S/No	Age ranges (years)	Number	Percentages (%)
1	11-20	2	2.2
2	21-30	15	33.3
3	31-40	12	26.7
4	41-50	5	11.1
5	51-60	6	13.3
6	61-70	5	11.1
Total		45	100

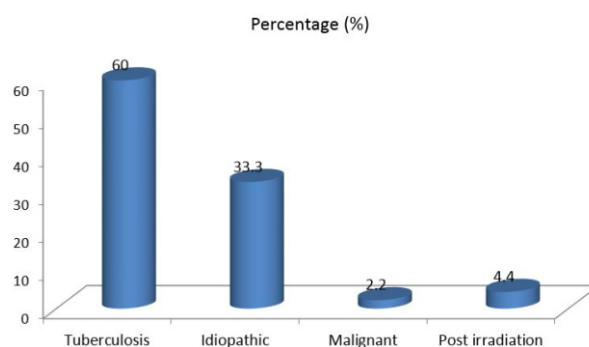
Table 1: showing the distributions of the age ranges. The age range of 21 -30 was the highest while the least was the 11-20.

Figure 1: showing the distributions of the morphologic variant of the disease



Isolated chronic constrictive pericarditis was the highest while that of total calcified constrictive pericarditis was the lowest.

Figure 2: Showing the distributions of histologic/aetiological forms of chronic constrictive pericarditis.



The commonest cause in our series was tuberculosis followed by idiopathic.

Preoperative Evaluations Strategies

Table 2: Showing the preoperative evaluation strategies

S/No	Parameters	No of patients	Percentages (%)
1	SOBE/NYHA 11-IV	40	13.0
2	Elevated JVP	45	14.6
3	Ascites	45	14.6
4	Pleural effusion	35	11.4
5	Hepatomegaly	45	14.6
6	Low QRS complexes	45	14.6
7	Atrial fibrillation	30	9.7
8	Pulsus- Paradoxus	20	6.5
9	Calcification	3	1.0
Total		308	100

Table 2: showing the preoperative evaluation strategies, both clinical and laboratory employed during patient work up for surgery. All the patients evaluated had varying degree of ascites, hepatomegaly, elevated jugular venous pressure and low QRS complexes in transthoracic echocardiogram.

Preoperative Echocardiography

Table 3: showing the distribution of significant echocardiographic findings

S/No	Parameters	No of Patients	Percentages (%)
1	Chronic calcified CP	3	2.5
2	Isolated CCP	25	21.2
3	Chronic Effusive CP	18	15.3
4	LVEF (%)	45 (30-65)	38.1
5	Dilated IVC	10	8.5
6	Pulm systolic HTN > 60mmHg	10	8.5
7	MVR (rheumatic)	1	0.9
8	VSD (subaortic - 8mm)	1	0.9
Total		118	100

Most of the patients had low ejection fraction. 2 patients had additional pathologies: ventricular septal defect (VSD) and mitral valve incompetence (MVI) respectively.

Other preoperative evaluation strategies

1. Anti-streptococcal antibody (ASO) titer → negative
2. Full blood count (total & differential) + erythrocyte sedimentation rate → normal
3. Serum electrolyte, urea & creatinine → normal
4. Retroviral screening → nonreactive in the evaluated patients
5. Hepatitis B and C surface antigens (HBsAg & HCsAg) → negative in the patients evaluated
6. Fasting blood sugar (FBS) → 5 patients had adult onset diabetes mellitus but were controlled preoperatively. Glucose, insulin and potassium (GIK) regime was however used both intra- and

immediate postoperatively.

Intra-operative challenges

1. Jehovah witness patient status → 1
2. Additional pathology → 2
3. Long duration of symptoms → 9
4. Co-morbid diseases (DM) → 5
5. Calcification of pericardium → 2
6. Use of cardiopulmonary bypass → 2

The above listed factors affected were the intraoperative challenges encountered. One Jehovah witness patient had chronic constrictive pericarditis plus ventricular septal defect (VSD). He was aged 12. He had radical pericardiectomy and intracardiac repair of the VSD. The tissue dissection resulted in coagulopathy. Intraoperative cell saver technique was used. Permission sought from the parents to group, crossmatch and transfuse him blood proved abortive. He died on the operating table (DOT). This same coagulopathy happened in another patient with chronic constrictive pericarditis with mitral valve incompetence. Other challenges were as listed above.

Operative technique

Table 4: Showing the distribution of operative techniques

S/No	Technique (Pericardiectomy)	Percentages (%)	No of patients
1	Partial	71.1	32
2	Total	17.8	8
3	Radical	6.7	3
4	Radical + VSD (ICR)	2.2	1
5	Radical + MVR	2.2	1
Total		100	45

Table 4: showing the distribution of operative techniques. 3 operative techniques were used. 32(71.1%) patients had partial pericardiectomy. 8(17.8%) patients and 3(6.7%) had total and radical pericardiectomy respectively. 2 patients with additional pathology had radical pericardiectomy. Total pericardiectomy is decortications of the

pericardium from phrenic to phrenic horizontally and from the great vessels to the diaphragm vertically. Radical pericardiectomy involves total pericardiectomy in addition to decortications posterior to the phrenic nerves, pulmonary veins and region of coronary sinus. Partial pericardiectomy is any form of decortications other than the two described.

Table 5: Showing the perioperative challenges and overall outcome of patients treated by surgery

S/No	Challenges	No of patients	Procedure	Remarks	Outcome
1	Jehovah witness status	1(2.2%)	RP+ VSD(ICR)	Coagulopathy	DOT
2	Prolonged duration of symptoms	1(2.2%)	RP + MVI(MVR)	Coagulopathy	DOT
3	Calcified CCP + severely constricted pericarditis	2(4.4%) + 9(19.8%)	PP → minimal decortication	Persistent ascites	No improvement in NYHA status
4	Prolonged duration of symptoms + severe constriction	1(2.2%)	PP with perforation of RA	coagulopathy	DOT
5	Mild & moderate constriction	32(71.1%)	TP	Uneventful postop	Excellent

Table 5: showing the perioperative challenges and overall outcome of patients treated by surgery. About 30% had poor outcome while 70% had excellent outcome. Precisely 7% had intraoperative death (DOT). Of the remaining 21%, there was 10% in-hospital deaths and 15% outside hospital deaths. Of this 15%, 5% were deaths within 30 days postoperative while 10% were deaths after 30 days postoperative period.

Keys: RP = radical pericardiectomy, PP = partial pericardiectomy, TP = total pericardiectomy. DOT = death on table, RA = right atrium.

Discussion

Constrictive pericarditis is a reduction or a quasi-absence of heart distension because of a chronic inflammatory, thickened, and compressive pericardium.⁶ Landmarks by cardiovascular surgeons all over the world, notably in the developed world are remarkable.^{6,7} Notably among them were Vieussens who in 1679 and 1715 coined the term constrictive pericarditis after observing some cases of pericardial adhesions. This was

confirmed in 1728, 1749, 1819 and 1842 by Morgagni, Senac, Laennec and Cheveers respectively. Subsequently clinical features were clarified on the basis of anatomical features. Eponyms related to such discoveries rested upon people like Wikes, Kausssmaul and Pick in 1870, 1873 and 1870 respectively. The first successful pericardiectomy is credited to surgeons working independently or jointly in Germany, France and USA in the names of Rehn-Sauerbruck cum Schmieden-Fisher, Hallopeau and Churchill-Beck respectively.⁸

The pericardium functions to anchor and stabilize the heart. In addition, it protects the heart from trauma, infection, inflammation and excessive dilatation.^{7,8} In case of constrictive pericarditis, restricted diastolic heart distensibility does exist and may provoke a right and a left ventricular preload decrease with a reduction of stroke volume and cardiac output.^{7,8} In low-income setting, late clinical presentation of patients with massive pericardial thickness and calcifications inducing myocardial atrophy, fibrosis, and severe systolic dysfunction that significantly affect the results after pericardiectomy are common occurrence. This was evident in our study for it turned out to be one of the challenges we encountered which adversely affected our come. See table 5.

From Yadav's study,⁹ approximately 9% of patients with acute pericarditis will contract a pericardial constriction. In low-income settings, the frequency of acute pericarditis varies widely with geographical location ranging from 2 to 11.3% among patients admitted in a hospital for cardiovascular diseases;⁵⁻⁷ it affects mostly young male population with an average age between 26 and 42 years old and tuberculosis as the most frequent etiology from 33 to 69.5% in sub-Saharan Africa.¹⁰⁻¹² These findings agrees with our own study in that the age ranges mostly affected in our study were 21-30(33.3%) followed by 31-40%(26.7%). Tuberculosis was also the commonest cause in our documentation. See table 1 and figure 2 respectively.

Diagnosis of CCP is made by both clinical evaluation and investigative modalities as outlined in table 2. Due to late presentations in low-income settings, clinical features are usually classical as corroborated by the works of Ali et al¹³ and Yangani

Angate et al¹⁴

Once diagnosis of chronic constrictive pericarditis is made, treatment is surgical because surgery remains the only efficient and comprehensive treatment option.⁸ Pericardiectomy is frequently performed via a median sternotomy approach or a left anterolateral thoracotomy approach; it may be partial, total or radical. In our review, there were triad of partial, total and radical pericardiectomy for 32(71.1%), 8(17.8%) and 5(11.1%) patients respectively. See table 4.

The resection of the pericardium extending from the right to the left phrenic nerves anteriorly and from the great vessels superiorly and to the diaphragmatic surface and the inferior vena cava inferiorly is referred to as total pericardiectomy. Radical pericardiectomy is total pericardiectomy in addition to pericardiectomy at the base of the heart including freeing the great vessels, i.e. ascending aorta, main pulmonary artery, superior vena cava and inferior vena cava of fibrous tissues. The other type which involves variable ranges of removing the thickened pericardium other than the aforementioned two types is regarded as partial pericardiectomy.

Our outcome is as shown in table 5. About 30% had poor outcome while 70% had excellent outcome. Precisely 7% had intraoperative death (DOT). Of the remaining 21%, there were 10% in-hospital deaths and 15% outside hospital deaths. Of this 15%, 5% were deaths with 30 days postoperative while 10% were deaths after 30 days postoperative. In our review, two patients (n=2, 4.4%) had additional pathologies that necessitated utilization of cardiopulmonary bypass. The duo ended in DOT. Unlike other studies done in African continent, cardiopulmonary bypass has not been used in all cases and excellent early surgical outcomes were reported.¹⁵ The outcome in our review was similar to those found in other African countries like Cote 'Ivoire, Ghana, South Africa, Ethiopia, Gabon and Morocco.¹⁶⁻²¹

Conclusion

Our review has shown that chronic constrictive pericarditis is successfully treatable by pericardiectomy. However, late presentation with associated poor NYHA class, prolonged cardiac cachexia, and additional pathologies necessitating utilization of cardiopulmonary bypass resulted in

significant poor postoperative outcome. There was also the deployment of 3 types of pericardiectomy like partial, total and radical in our patient management. It is hoped that with continued advocacy and improvement in socioeconomic status of low-income settings like ours, early presentation and improved perioperative management will result in greater favourable outcome.

Declarations

Conflict of interest: There is no conflict of interest whatsoever

Ethical clearance: this is an audit of patients managed and ethical clearance does not apply

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***What are known:**

1. Chronic constrictive pericarditis is relatively common in low-income-setting
2. Surgery is the common mode of treatment

***What are new:**

1. Patients with CCP plus additional pathology requiring on-pump surgery can be managed concomitantly.
2. Patient of Jehovah witness status with CCP and additional pathology requiring on-pump surgery can be managed concomitantly.

Author Contributions:

Nwafor IA → conceptualization, design, data analysis and interpretation and writing the manuscript.

Nwafor MN → Data collection, analysis and interpretation.

Eze AC → Data collection

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