

Original Research Article

A Study of Clinical Profile and Management of Patients with Chronic Constrictive Pericarditis - Our Experience

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Abstract

Introduction: The constrictive Pericarditis is a disabling condition but has a good prognosis if surgery is undertaken in time. Pericarditis can be seen as an effusive disease or progressive cardiac constriction. Patients have number of symptoms due to wide variety of causes. Good results for both effusive and constrictive Pericarditis have been reported by centers using different surgical approaches namely the anteriolateral thoracotomy and median sternotomy.

Materials and methods: Data was obtained from review of 25 patients operated for constrictive Pericarditis for a period of 3 years clinical profile.

Results: The patient's age ranged from 18 months to 45 years. Male to female ratio is 2:1. The presentation in the majority of cases is fairly typical with exertional dyspnoea Class III or IV ascites, hepatomegaly, raised JVP, pedal edema and pleural effusion and pericardial effusion. Study spectrum consists of constrictive Pericarditis in 17 (68%) cases, constrictive Pericarditis associated with pericardial effusions in 8 (32%) cases. Constrictive Pericarditis associated with pleural effusions in 5 cases. Pyogenic Pericarditis was present in two cases of which in one case right sided empyema was present. SLE present in 2 cases. Exertional dyspnoea was present in 96%, abdominal distension in 68%, peripheral edema in 32%, general cachexia in 30% orthopnoea in 7% of cases. Signs consist of muscle wasting and cachexia in 70% increased JVP 96%. Hepatomegaly in 92%, distant heart sounds in 88%, Kussmaul's sign 96%, peripheral edema 32%, pericardial knock 56%, pulsus paradoxus 24% cases.

Conclusions: Pericarditis is a curable disease if diagnosed and treated in the early stages. If Pericardectomy is done early it reverts the hemodynamic alterations due to constrictive Pericarditis and also establishes the diagnosis of specific disease like tuberculosis by histopathology.

Key words

Progressive cardiac constriction, Pericardectomy, Hemodynamic alterations.

Introduction

Medical writings on the pericardium began with the description of the normal pericardium by Hippocrates. Greeks noted the characteristics of the heart in certain battle field heroes, describing it as "hairy". Galen recognized the protective function of the pericardium. In the early 17th century Rondefet described pericardium and pleuritis. Chronic constrictive pericarditis is rare disease that develops because of a chronic inflammatory process that causes fibrosis and thickening of the pericardium and leads to a loss of elasticity that limits diastolic ventricular filling. Pericardectomy has been established as the only treatment that improves cardiac dynamics [1].

The More common etiological factor is tuberculosis in our country. In most of the cases, the diagnosis of constrictive Pericarditis can be made clinically with fair certainty [2]. However, at times even an invasive investigation like cardiac catheterization may fail to distinguish from restrictive cardiomyopathy and an operation may be the only way to ascertain the cause [3]. Knowledge of the natural history of surgically untreated patients with the chronic constrictive pericarditis is incomplete. The interval between an etiologic occurrence and the onset of clinical evidence of constriction varies between a few months and many years. But, the factor determining the rate of progression of the disease and its symptomatology are known. In the present study, we analyze results in patients operated for chronic constrictive pericarditis.

Materials and methods

We conducted a retrospective study of all patients in our center undergoing pericardectomy for chronic constrictive

pericarditis from November 2012 to October 2015. We included patients with clinical, echocardiographic, and hemodynamic signs of pericardial constriction in whom the diagnosis was confirmed by pathologic analysis of resection tissue. In patients with idiopathic pericardial constriction, we discounted other systemic diseases such as collagenopathies and uremia. Atrial fibrillation commonly occurs at some stage and results in a sudden deterioration in circulatory status.

The patient's age ranged from 18 months to 45 years. The presentation in the majority of cases is fairly typical with exertional dyspnoea class III or IV, ascitis, hepatomegaly, raised JVP, pedal edema and pleural effusion and pericardial effusion.

Indications for Operations

- The diagnosis of chronic constrictive Pericarditis in general an indication for operation.
- Because of the unfortunate results in patients whose chronic constrictive pericarditis is the result of previous irradiation therapy, operation is advisable in such patients only when symptoms are advanced.
- Cardiopulmonary bypass is used when other associated conditions where present like ASDs and rheumatic mitral stenosis.

Median sternotomy was done in 7 cases; left anteriolateral thoracotomy was done in 18 cases.

Technique of Operation

The approach may be through a left antero-lateral throacotomy or a median sternotomy.

Left Antero-lateral Thoractomy approach [3]

The patient is positioned supine with a pillow beneath the left scapula. The patient's left hand is secured beneath the left buttocks with the hand hanging over the well padded left side of the table. A curving left antero-lateral skin incision is made beneath the breast anteriorly and more laterally over the fifth inter space. The incision is carried through pectoralis major muscle anteriorly and the 5th inter costal space is opened. The inter space incision is carried well. The anteriorly and usually the internal mammary vessels are ligated and divided and the 5th costal cartilage divided from the sternum.

The rib spreader is inserted and the inter space incision laterally and posteriorly extended with scissors as the spreader is gradually opened. The left phrenic nerve is dissected away from pericardium, as much fat and soft tissue is left with the nerve as is possible to minimize damage to it. The pericardium is incised through an area of minimal calcification, if possible posterolaterally over what is presumed to be left ventricle.

When a space is entered, the initial longitudinal incision is carried anteriorly and posteriorly from its superior and inferior extremities. The anterior pericardial flap is dissected as far as the right atrio ventricular groove beneath the elevated thymus and prepericardial fat and respected. The posterior flap is dissected for posteriorly and excised. The dissection must be carried superiorly on to the pulmonary trunk, since failure to relieve pericardial bands across the pulmonary trunk can result in post-operative gradients and severe right ventricular hypertension. The peel of pericardium left inferiorly is dissected off the diaphragm except in the area of the central fibrous tendon from which it cannot be removed.

The fibrous plaques adherent to the epicardium are now dissected off through entire area of resection. If the epicardium is thin and relatively normal, it need not be disturbed. If it is thickened, it must be removed either in its

entirely or in a sufficient number of areas to allow more normal diastole filling of two ventricles. Failure to do this will severely compromise the result of operation. If no pericardial space is found, the entire longitudinal incision and its anterior and posterior extensions are made only through the fibrous pericardium.

Then the incision is deepened in an area that seems to be over myocardium rather than over the inter ventricular or atrio ventricular groove. Slowly and carefully, the posterior flap is dissected off the left ventricular myocardium. When the dissection in this plane is not possible, such as in an area of calcification or dense scarring, islands of calcification and scar may be attached to the myocardium, but separated from other areas. The dissection moves to anterior pericardial flap whenever progress ceases posteriorly and vice versa.

Particular care is exercised when the dissection passes across the atrio ventricular groove and on to the atria. It is important to be certain that all constrictions in the atrio ventricular groove are removed since they can result in gradients between atrium and ventricle.

The anterior and posterior pericardial flaps are left long until the dissection is completed, so they may be used temporarily to control any hemorrhage from the myocardium that occurs during the dissection. When the dissection has been completed, these pericardial flaps as well as diaphragmatic portion of the pericardium are excised. A polyvinyl catheter is brought out from the left atrium via the appendage or left pulmonary veins when never possible to assist in post-operative care.

Two left pleural drainage tubes are placed, the tip of one being placed posteriorly and inferiorly and that of other anteriorly and superiorly. The inter space incision is closed with heavy pericostal and perichondrial absorbable sutures and the muscle layers are closed with continuous Dacron. The skin is closed with a continuous subcuticular suture.

Median Sternotomy Approach [4, 5]

The median sternotomy approach may be used without cardiopulmonary bypass or with it. In either event, the sternum is split in the usual manner. The pericardium is opened vertically and anteriorly. Often it is necessary to use knife for this procedure and particular care is taken when the plane between the thickened pericardium and the myocardium is reached. The pericardial flaps are now dissected laterally superiorly and inferiorly as already described. To the right, the dissection passes across the atrioventricular groove and proceeds across the anterior and lateral walls of the right atrium. The cleavage plane there, is readily found. In this portion of thickened pericardium can be left in situ.

In the former instance, pericardial flap is excised about 2 cm anterior to the right phrenic nerve. To the left, the dissection proceeds across the front of ventricles and the over the lateral left ventricular wall.

This pericardial flap is excised 1 cm in front of the left phrenic nerve. The dissection continues posterior to the phrenic nerve, but in the plane between myocardium and epicardium until the entire left ventricle is freed. It is usually then possible to remove the thickened, often calcified outer pericardial layer. Since there is usually cleavage plane between this and the overlying thickened pleura containing the phrenic nerve. The same is usually true of the thickened pericardial tissue inferiorly overlying the diaphragm.

When CPB is used, it may be convenient to use the femoral vessels for both venous and arterial cannulation. Then after CPB has been established, the thickened pericardium can be opened and the dissection accomplished.

Results

It is a retrospective study of patients undergoing pericardiectomy for chronic constrictive pericarditis. Median sternotomy was done in 7

patients and left anteriolateral thoracotomy was done in 18 patients. Age Range of patients were in 18 months to 45 years. Age group most common in study was 11-30 years and males were more as per **Table - 1**. External Dyspnoea is most common symptom observed and Increased JVP was most common sign as per **Table - 2**.

Table - 1: Demographic details.

Age Group (Years)	No. of Patients	%
0-10	3	12
11-20	8	32
21-30	8	32
31-40	4	16
41-50	2	8
Gender		
Male	17	68%
Female	8	32%

Table - 2: Symptoms and Signs associated.

Symptoms	No. of Cases	%
External Dyspnoea	24	96%
Fever	18	72%
Abdominal Distension	17	68%
Peripheral Edema	08	32%
Chest Pain	07	28%
Weakness	08	32%
Orthopnoea	02	8%
Signs		
Muscle Wasting and Cachexia	-	70%
Increased JVP	24	96%
Hepatomegaly	22	88%
Distant Heart Sounds	24	92%
Kussamul's Sign	24	96%
Ascitis		75%
Peripheral Edema	8	32%
Pericardial Knock	14	56%
Pulsus Paradoxus	6	24%

Tuberculosis is more seen in the study in which non smokers are more observed, most of them are vaccinated.

Investigations carried out in the study were as per **Table – 3**. Incidence of etiology, Smoking, BCG status in study was as per **Table – 4**.

Table - 3: Investigations carried out in the study.

X - Ray Chest	No. of Cases
Pericardial Calcification	10
Pleural Effusion	05
Empyema	01
Cardiomegaly	20
Straightening Of The Lt Heart Border	05
Right Atrial Ventricular Enlargement	05
Left Atrial Enlargement	10
Echo Cardiogram	
Thickened Pericardium	24
Pericardial Effusions	10
Pericardial Calcification	10
Pleural Effusion	05

Table - 4: Incidence of etiology, Smoking, BCG status in study.

Etiological incidence	No. of Cases	%
Tuberculosis	14	56%
Chronic Non Specific	07	28%
Bacterial / Pyogenic	02	08%
SLE	02	08%
Incidence related to smoking		
Smokers	8	32%
Non Smokers	17	68%
Incidence related to BCG status		
Vaccinated	18	72%
Non Vaccinated	7	28%
Incidence related to Mantoux		
Positive	12	48%
Negative	13	52%

Intra-Operative morbidity

Bleeding	2
Arrhythmias	1
Delayed recovery	1
On Ventilation	3

Early Hospital Deaths occurred in 4 (16%) due to Low output state, Renal failure, R. V. Dysfunction and Pulmonary Edema

Time related survival:

1 Year	-	90%
5 Year	-	75%
10 Year	-	65%
20 Year	-	55%

About 75% of deaths, in the hospital after operation are in acute or subacute cardiac failure. Post-operative hemorrhage and respiratory failure are other modes of early death. Most cardiac deaths later after pericardiectomy are in Chronic heart failure.

Incremental risk factors for death

The pre-operative functional status of the patient is a powerful risk factor for death in early phase after operation. Thus early risk approaches zero in patients NYHA class III. 46% with NYHA class IV. Ascites and peripheral edema associated with class IV have also been identified as risk factors in the early phase after operation. The pre-operative NYHA functional class is also a risk factor for death later after operation. Correspondingly and very high right ventricular end diastolic pressure, pre-operatively has been a risk factor. Previous radiation therapy over the chest is an important risk factor for unfavorable results.

Hemodynamic Results

Virtually all patients with a good result have normal resting hemodynamic after adequate surgical treatment for chronic constrictive Pericarditis. During exercise 10 to 20 of patients may show mild elevation of pulmonary artery pressure or failure to increase cardiac output. When considerable amounts of thickened pericardium are left over the ventricles, the hemodynamic improvement is less complete.

Discussion

The constrictive Pericarditis is a fairly common disease representing 4 out of 300 cardiac cases per year. It affects young and middle aged

persons equally. Males are more frequently affected than females. In this study, the age ranged from 18 months to 45 years with mean of 31 years. Once pericardial effusion was diagnosed, the patients were kept on antituberculous chemotherapy for 6 to 8 weeks before excision of the pericardium was undertaken in suspected cases of tuberculosis and continued for 6 to 9 months post-operatively.

Advantage of anteriolateral thoracotomy is a simpler approach, there is less blood loss and better healing with minimal scar. There is direct access to the left ventricle, making it easier to go into the right plane. The left ventricle can be freed behind the left phrenic nerve also. Transverse division of sternum can be made if greater access is required to free the right ventricle [6, 7].

Advantages of median sternotomy is quick and simple approach. Direct access to the great vessels to go on bypass if necessary. RA, RV, svc & IVC can be completely freed side and total pericardiectomy is possible. By using cpg, associated cardiac conditions can be treated like closure of ASDs, open mitral valvotomy and valve replacements [8].

Patients were prepared pre-operatively with low salt diet, diuretics, aspiration of the ascitic and pleural fluid. Vitamin K was given as a routine. Pulmonary tuberculosis was present in 14 cases, received Anti-Tuberculosis treatment for 6 to 8 weeks period before surgery.

The number of patients suffering from Chronic Constrictive Pericarditis was 25, out of which 8 cases are female. Youngest patient was 18 months old. The incidence was found to be maximum in the age group 10-30 years, i.e. 64%. The percentage of smokers was 32 and the patients with BCG scars were 72 percent. In this study almost all the patients presented with fatigue and breathlessness on.

This study of 25 patients shows that the most common etiology of Pericarditis is tuberculosis

i.e. 14 — 56% where as at Centers like UAB series of 27 patients and surgical experience GLH from of 52 patients, it is idiopathic.

Nearly all our patients presented with breathlessness on exertion i.e. 24 (96%) of 1-3 months duration where as in UAB series only 15 of the 27 patients i.e. 55.5% presented with breathlessness on exertion, 7 of the 24 patients complained of chest pain of 1-3 months duration i.e. 28% (**Table – 5**).

Table - 5: Comparative study on Tuberculous Etiology.

Study	Patients	Tuberculous Etiology
UAB series [2]	27	1
GLH Series [9]	52	2
Study at Osmania General Hospital	25	14

The distribution in UAB series is similar to that of McCaughan and colleagues at the Mayo's clinic [10]. From our study it appears that pulsus paradoxus is not a frequent sign in constrictive Pericarditis. Also breathlessness on exertion, raised JVP, hepatomegaly are the most frequent symptoms and signs seen in more than 90% of the patients. Low voltage waves on ECG, thickened pericardium on echo-cardiogram and elevated serum bilirubin are the frequent laboratory signs of constrictive Pericarditis.

Two approaches have been used in our patients and the most common being the AL Thoracotomy. In all the patients Left ventricle was liberated first and none of them developed pulmonary Oedema per operatively or post operatively. Only one patient went into a low cardiac output and required inotropic support. In UAB and GLH series operative mortality was 2-16% and 1-9% respectively whereas operative mortality in our series is 16%. There were 12 patients whose Mantoux test was positive. There were three patients who were subjected to anti tuberculosis treatment without HPE evidence

who later proved to be cases of non-specific Pericarditis and their anti-tuberculosis regime was then discontinued. This suggests the importance of pericardial biopsy before treating the patients with anti tuberculosis drugs. There were three patients who were subjected to anti-tuberculosis treatment for tuberculosis pericardial effusion in spite of which they developed constrictive signs and ultimately required Pericardectomy (**Table – 6**).

Table - 6: Comparative study on Symptoms and Echo findings.

Symptoms	Our Study	UAB Series [2]
Breathlessness on exertion	96%	56%
Chest pain	28%	Not Mentioned
Fever	72%	Not Mentioned
Edema Legs	32%	65%
Abdominal distension	68%	78%
Hepatomegaly	88%	Not Mentioned
Pulsus paradoxus	24%	36%
Kussamul's sign	96%	Not Reported
Pericardial knock	56%	Not Reported
Raised JVP = 15 Cm	96%	Not Mentioned
X- ray chest, calcified	28%	40%
ECG low voltage	72%	40%
Mantoux test	48%	Not Reported
Echo Findings		
Thickened Pericardium	90%	Not Reported
IVC Dilation	46%	Not Reported
Septal Bounce	36%	Not Reported
<i>Effusive Constrictive Pericaditis</i>	32%	Not Reported

Fatal bleeding caused by a tear in the right atrium or the venacava during surgery performed through left anteriolateral thoracotomy has been reported [6, 7] but in our study we did not encounter any such problems. The debate over

the extent of Pericardectomy is more controversial. Normalisation of cardiac hemodynamics has been reported after a radical Pericardectomy [7] as well as after de-cortication of the anterior surface from the AV groove on the right to the left phrenic nerve on the diaphragmatic surface [11]. Clifford and colleagues [12] suggested that delayed improvement and persistence of symptoms of pericardial constriction are most commonly the results of incomplete de-cortication. However, outcome is related not only to the extent of surgery but also to the myocardial involvement like myocardial fibrosis and atrophy [13, 14]. In the study of university of Gottingen Robert Koch Germany of 71 patients who underwent only Pericardectomy, CPB was used in only one case. But in our study no patient required a cardiopulmonary bypass [15].

Conclusion

Pericarditis is a curable disease if diagnosed and treated in the early stages. If Pericardectomy is done early it reverts the hemodynamic alterations due to constrictive Pericarditis and also establishes the diagnosis of specific disease like tuberculosis by histopathology. It avoids unnecessary treatment of non tuberculosis patients with anti-tuberculosis drugs and their side effects. Last but not the least early Pericardectomy reduces the overall cost of the treatment.

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