

Original Article

Early operative outcome of pericardiectomy for symptomatic chronic tuberculous constrictive pericarditis

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Abstract

Background: Pericardiectomy procedure is commonly indicated for constrictive pericarditis (CP). One of the most important clue to diagnosis of CP is the signs and symptoms of right-sided heart failure that are not completely explained by presence of pulmonary disease or left-ventricular failure. The aim of this study was to assess clinical data presentation and early operative outcomes of pericardiectomy performed for symptomatic chronic constrictive pericarditis who had failed maximal medical therapy.

Methodology: A retrospective analysis was carried out of consecutive constrictive pericarditis adult age patients who underwent pericardiectomy procedure from 2002 to 2012. The patients who had intraoperative diagnosis of other than constrictive pericarditis were excluded from further analysis. A total 51 patients were selected for this study. The preoperative assessment, intraoperative findings and postoperative course and outcome such as hospital stay, prolonge ICU stay, post-operative CPV etc. were evaluated.

Results: 43 males and 8 females were include in the study among them 41% gave history of previous (TB) and 35% were pediatric patients (teens, as shown less than 19 years). 8 patients had effusive type pericarditis. The preoperative findings revealed dyspnea 54%, Chest Pain 45% and persistent cough 31%. Furthermore, 43% patients had ascites and 41% with pleural effusion. The mean preoperative central venous pressure (CVP) was 20.5 respectively. The post-operative outcome was short hospital stay, the post-operative patients CVP was estimated 13.5 and the mean drop of CVP due to pericardiectomy was estimated 7 respectively.

Conclusion: The conclusive findings of our study revealed that among the patients of symptomatic chronic tuberculous CP, the timely pericardiectomy attempt can effectively improve the hemodynamics of the patient. The early pericardiectomy can also reduce the morbidity and mortality rate of these patients.

Keywords

Early Operative, Pericardiectomy, constrictive pericarditis, symptomatic chronic tuberculous



Introduction

Among tuberculosis (TB), one of the forms of this disease is extra pulmonary chronic tuberculosis. Tuberculous pericarditis (TBP) is considered as one of the most severe forms of extra pulmonary tuberculosis, causing death or disability in a substantial proportion of affected people. (CP) is diagnosed among these patients and it is not a common disease but it is often diagnosed in TB endemic areas^{1&2}. The mortality was ranged about 17% to 60% among TBP patients reported that 26% of patients with presumed pericardial TB died within six months of diagnosis, despite anti-tuberculosis therapy^{3&4}. TBP is an important complication of infection with *Mycobacterium tuberculosis* can progress rapidly to constriction. Constrictive calcific pericarditis is relatively uncommon and still a real clinical entity due to the emergence of drug-resistant strains of TB in association with acquired immunodeficiency syndrome^{5&6}.

CP can be suspected based on history and clinical examination but it is confirmed by imaging techniques like echocardiography and cardiac catheterization, which is considered mandatory to confirm the diagnosis⁷. The clue of diagnosis is the signs and symptoms of right-sided heart failure that is not confirmatory sign⁸. On auscultation at the left sternal border a high-pitched early diastolic pericardial knock after the second heart sound can be heard, it increases in intensity during inspiration⁹. This corresponds to the sudden and abrupt cessation in early ventricular filling caused by non-compliant pericardium^{10&11}. The timely recognition of CP therefore permits the clinician to pick out the most appropriate therapy. Its prevalence changes with the incidence and treatment of TB^{12&13}. The TBP is

clinically classified into three stages which include acute, subacute and chronic stages¹⁴.

Once symptoms are present and imaging confirms chronic constriction then usually surgery is the only effective therapy¹⁵. Surgical pericardectomy is a complicated procedure with high morbidity and mortality reported in the literature. According to literature complications may include excessive bleeding, atrial and ventricular arrhythmias, and ventricular wall ruptures¹⁶. Surgical management so far is the only effective treatment and can completely cure this disorder, but its mortality ranges from 5-15% due to the surgical complications¹⁷. Early mortality is high and in some research 30-days perioperative mortality reported was 6.1% respectively^{18&19}. Patient mortality is strongly linked to the preoperative condition and stability of the patient. Some of the causes of death are progressive heart failure, infections leading ultimately to sepsis, renal failure, prolonged ventilation for respiratory failure, and fatal arrhythmias²⁰.

Surgical treatment includes drainage of pericardial fluid in effusive pericarditis and removal of thickened pericardium from the surface of the heart and the great vessels including the aorta, pulmonary artery and the vena cava²¹. Pericardectomy is defined as the removal of a portion or all of the pericardium, this procedure is commonly indicated for constrictive pericarditis²². Other names used for this procedure are pericardial stripping or pericardial decortication (removal of thick cortex)²³. The benefit of pericardectomy is usually immediate with hemodynamic improvement and symptomatic improvement^{24&25}.

Pericardiectomy can be a long and often technically complex procedure. Usually this procedure is done without the help of a cardiopulmonary bypass (CPB) machine but in emergency situations e.g. uncontrolled bleeding, CPB machine may be needed²⁶. The two standard approaches used for this surgery are via anterolateral thoracotomy and via a median sternotomy²⁷. Despite the effectiveness of surgical therapy for the treatment of CP, there are disparate opinions about the role of corticosteroids in the treatment of TBP, the timing of the operation, the surgical approach, the degree of decortication, and the need for cardiopulmonary bypass surgery^{28&29}. The aim of this study was to assess the clinical presentation and early operative outcomes of pericardiectomy performed for symptomatic chronic constrictive pericarditis who had failed maximal medical therapy.

Methodology

A retrospective analysis was carried out of all pericardial surgeries. We reviewed the medical records of all the patients after approval from the Institutional Review Board. The patients diagnosed with CP, who underwent pericardiectomy surgery were selected among all the records between the year 2000 to 2012 at Rehman Medical Institute Peshawar, Pakistan. The patients who had an intraoperative diagnosis of other than CP were excluded from further analysis.

We retrieved data regarding their preoperative assessment, intraoperative findings and postoperative course and outcome. Data extraction forms were used to collect data. The history of previously diagnosed TB and history of anti-tuberculous treatment was especially observed. Findings from the clinical exam were documented initially from their admission,

surgery history and stay duration. Data include the history of dyspnea, chest pain, fever, cough, palpitation, swelling in legs (edema), raised (JVP) and hepatomegaly. All preoperative laboratory findings were recorded for further review.

All patients were evaluated preoperatively by an infectious disease team (microbiologist) whose expertise included TB treatment. Patients were asked if they have had previously diagnosed tuberculosis and/or if they have had treatment for it.

Firstly, all preoperative Echos were reviewed to confirm the diagnosis of CP. The criteria used by our department to confirm CP diagnosis were based on the following hemodynamic hallmarks – increased interdependence of both right and left ventricles and dissociation of thoracic and cardiac pressures. We also looked at septal motion, mitral inflow pulse-wave doppler, medial and lateral tissue, doppler of the mitral annulus, filling and flow assessment using doppler of inferior vena cava and the hepatic veins was done. Echocardiographers also looked at the septal bounce or septal shudder which helps to identify the differences in right and left ventricle early diastolic pressures. The restrictive filling pattern which is identified by E/A ratio greater than 0.8 was measured by Doppler assessment of mitral inflow. Also the inferior cava size and its respiratory changes were assessed as it provides a non-invasive estimation of right atrial (RA) pressures. Presence of (IVC) dilatation and expiratory diastolic flow reversal was taken as a very specific sign of CP. Furthermore, all preoperative echocardiograms were evaluated for the presence of pericardial effusion and cardiac function. Abdominal ultrasound reports were checked for the presence of

abdominal ascites. Preoperative chest X-ray was routinely done for all patients and we recorded the presence of pleural effusion on it.

All patients were operated with median sternotomy. Important points regarding the surgical technique used for these patients are as follows. In non-effusive pericarditis the parietal and visceral pericardium are fused and were separated together from the heart. In effusive CP the visceral pericardium is thickened and stripped off the surface of the heart. First it was dissected along the pulmonary artery to release the right ventricular outflow. A dissection plane was initiated by separating the thickened pericardium from the fat covering the cardiac surface. Using a combination of blunt and sharp dissection the plane was then extended. Scissors are used with tips up and scalpel was used in difficult areas also to continue with dissection. Fat helps in identifying the surface of the heart and is constantly kept under vision while dissecting, then the right and the left ventricle were released. Paid special attention to important areas i.e. SVC and IVC, usually a thick ring forms around these vessels that constrict and decreases inflow to the heart. These fibrous rings were completely dissected, pleural effusion and ascites if the present were drained simultaneously to decrease the risk of perioperative respiratory compromise. Drain the ascites by making an opening in the diaphragm, tissue biopsies of the resected pericardium were sent for histopathology. All of them showed multiple epithelioid granulomas surrounded by lymphocytes and giant cells indicating chronic granulomatous pericarditis.

Surgical notes and all pericardial biopsy reports were reviewed. Patients were labeled as

TB with CP based on the histopathological report and microbiologist specialist report to confirm the diagnosis. The specimens or sample include the culture of Mycobacterium Tuberculosis from pericardial fluid or tissue, pericardial tuberculosis granuloma stained with acid-fast bacilli or pleural tuberculosis. We monitored the patient's central venous pressure (CVP) using a central lumen catheter in the right internal jugular vein. Hemodynamic data include blood pressure, oxygen saturation, heart rate and ECG recordings were also evaluated. The raw data was entered first on data extraction sheets and then transferred to Microsoft Excel. Further analysis and graphical representation was completed using Microsoft Excel and expressed in percentage (%).

Results

The perioperative data of the patient was presented in Table I, 41% gave a history of previous TB and who had received some duration of anti-tuberculosis treatment. Out of these 35% were pediatric patients (less than 19 years of age). Preoperative echocardiogram was reviewed for effusions and 12 patients were found to have effusive type pericarditis (Figure 1). Multiple preoperative and postoperative variables were studied while most common symptoms were dyspnea 54%, Chest Pain 45% and cough 31% (Table Ia). Abdominal ultrasound was done for patients with abdominal distention 43% of patients had radiologically confirmed ascites. All patients had a preoperative chest X-ray, 41% of patients had pleural effusion on chest X-ray (Table Ib). blood profile conducted preoperatively were analyzed, the most common lab abnormalities were high erythrocyte sedimentation rate (ESR), high bilirubin and high alkaline phosphatase (Table Ic).

Table I Preoperative data of patients

(a) Symptom/Sign	n	%
Dyspnea	28	27%
Chest Pain	23	23%
Fever	11	11%
Cough	16	16%
Palpitations	8	8%
Swelling in legs(edema)	12	12%
Hepatomegaly	4	4%
(b) Radiological findings on admission		
Ascites	22	22%
Pleural Effusion	21	21%
Pericardial effusion	12	12%
(c) Biochemical findings on admission		
High ALT	1	1%
High ESR (>15)	12	12%
Hyponatremia	4	4%
High Alkaline phosphatase	16	16%
High bilirubin	16	16%

The intensity of the cardiac effusion among TCP patients was presented in Fig I, 76% of patients were with not any cardiac effusion, the 16.0% patients were presented with mild cardiac effusion. Furthermore the 2% of patients were with severe and 6% were with moderate cardiac effusion respectively.

■ MILD ■ MODERATE ■ SEVERE ■ None

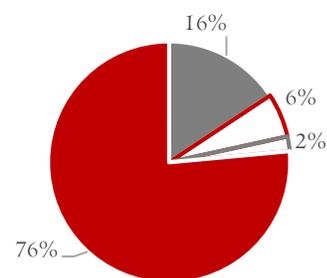


Figure I: The intensity of cardiac effusion among tuberculous constructive pericarditis patients

The post-operative outcome was evaluated in Table 2. The postoperative inpatient mortality rate was 6% and among the 7% of the inpatients the CVP was dropped. The 3 Patients remained in the ICU >48hr for postoperative recovery. The hospital stay of the patients was 5 to 14 days almost all patients had a drop in CVP, the preoperative CVP was 27 and post-operative CVP was measured 20.5 respectively.

Table2 Post-operative outcome of patients with tuberculous constructive pericarditis

Hospital stay(live patients)(\bar{x})	Minimum 5 days Maximum 14 days
Prolonged ICU stay >48hr(\bar{x})	3 patients Maximum 13 days
Postoperative mortality	6%.
Central Venous Pressure(CVP) measurements (mm of Hg)	
Maximum preoperative CVP	27
Preoperative CVP(\bar{x})	20.5
Postoperative CVP (\bar{x})	13.5
Drop in CVP with pericardectomy (\bar{x})	7%

Discussion

Pericardiectomy associated mortality is still very high despite advances in surgical and post-surgical techniques. However, postoperative mortality in our study was found low 6% respectively. Similar findings were noted by Zhu P 2015, the mortality and post-operative complications were approximately 5.4% and 23%, respectively³⁰. Furthermore, Vistarini N 2015, noted mortality of 7.9% in the case of pericardiectomy¹⁶. The patients underwent in pericardiectomy early on within 6 months after the symptoms & diagnosis which presented a lower risk of mortality. Preoperative clinical conditions and associated comorbidities are crucial in predicting the risk of mortality, and early operation seems to be the most appropriate choice. In our study the mortality rate is very low due to the early approach of pericardiectomy. In Pakistan Malik A in 2015 studied 50 patients in the time period of 5 years, similar to our study patients the Tuberculosis was the main cause of constrictive pericarditis. In comparison to our

study mortality associated with pericardiectomy was higher 10%³¹. In this study the mortality and morbidity were low output stat with or without right heart failure. In a study very low mortality was also noted by Kang (2014) which was 1.2%³². Gopaldas (2013) noted the hospital mortality in the United States of America (USA) was 7.5% among the CP³³. The variation in the mortality depends on the severity of the disease and the early diagnosis. Tokuda Y 2013, a total of 346 patients who underwent isolated pericardiectomy for constrictive pericarditis nationwide. Logistic regression analysis revealed that the predictive factors for composite operative mortality or major morbidity were preoperative chronic lung disease.

Surgery is the only definitive treatment. Effusive/ chronic relapsing patients present most commonly with recurring episodes of pain and less commonly with compressive effusions and constriction. Ghavidel (2012) also support our hypothesis that cardiac effusion increased the complications among

CP patients, in our study only 2% of patients were with severe cardiac effusion and the mortality was only 6% respectively³⁴. Effusive-constrictive pericarditis (ECP) is a clinical hemodynamic syndrome in which constriction of the heart by the visceral pericardium occurs in the presence of a compressive pericardial effusion. ECP is believed to be a rare manifestation of the pericardial disease that occurs as part of a continuum from effusive to constrictive pericarditis³⁵.

The early pericardectomy also improve the hemodynamics in our study the preoperative mean CVP was only 20.5 and post operatively it was improved and maintained at 13.5 in Table: 2 respectively. CVP was dropped only among the 7% of the patients. Chowdhury UK (2017) noted the preoperative CVP 12 which was further reduced post operatively 8 respectively³⁶. Furthermore constantly early and late results of pericardectomy of constrictive pericarditis patients were reported in many studies which were experience in similar to our study results. From our own it is evident that very few patients underwent a low cardiac output state after pericardectomy procedure^{37&38}. It has been proved that early pericardectomy improves the hemodynamics, cardiac output, ejection fraction, CVP post-operatively. In fact, our study confirmed that early pericardectomy contributed to reducing the mortality rate. This reflected the importance of earlier recognition of the disease and their surgical management^{39&40}.

The present study has certain limitations owing to the nature of the study no long-term follow-up data on survival could be obtained, and all outcomes were restricted to in-hospital outcomes. Second, the present study lacks the objective hemodynamic information such as

the cardiac output, ventricular end-diastolic pressure, and central venous pressure. We only used the CVP to evaluate the preoperative and post operatively function of the heart which reflects the incomplete status of the cardiac status.

Despite these limitations, the present study is so far, the outcome of pericardectomy for constrictive pericarditis in Peshawar Pakistan in the availability of limited modern surgical techniques. The recommendation of our study revealed that early pericardectomy among the CP patients can reduce the related complications and mortality rate. Further, the risk factors regarding pericardectomy can be evaluated by using modern statistical techniques.

Conclusion

In summary, surgical pericardectomy remains a procedure for the patients of symptomatic chronic tuberculosis although relatively high morbidity and mortality rates. Pericardectomy is a safe treatment option in those who failed medical therapy but with a timely diagnosis. The early surgical intervention of pericardectomy among these patients can effectively improve the hemodynamics and can contribute to improving the surgical outcome with reduced mortality rate.

Conflicts of Interest

None.

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