Exacerbation of severe constrictive pericarditis after prior inadequate pericardiectomy

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Abstract
Pericardiectomy is commonly used to treat constrictive pericarditis (CP); however, persistent calcification can complicate recovery. An 82-year-old man presented with CP following an inadequate pericardiectomy at another hospital two years earlier. He was referred to our hospital with a diagnosis of recurrent CP. Pre-operative computed tomography revealed that the pericardium was not calcified on the anterior of the heart, while the inferior, posterior and lateral surfaces exhibited calcification. Notably, calcification along the inferior portion of the heart formed a calcium envelope structure. Pericardiectomy via re-sternotomy without cardiopulmonary bypass was performed. While dissecting the calcium envelope, a paste-like substance was exuded. Cardiac function improved after pericardiectomy, although the postoperative recovery from heart failure was prolonged. Calcified pericardium should be removed to the extent possible to enhance the efficacy of pericardiectomy, which contributes to improved early surgical results and prevents CP recurrence.

Keywords: constrictive pericarditis, recurrent pericarditis, pericardiectomy

Case report
An 82-year-old man with CP underwent pericardiectomy at another hospital to resect only the anterior portion of the calcified pericardium, which did not satisfactorily resolve the condition. Two years after the operation, the patient again experienced heart failure, and he was referred to our hospital with a diagnosis of recurrent CP.

Computed tomography before the previous operation had shown a single layer of calcified pericardium enveloping the entire surface of the heart (Fig. 1A, B). Computed tomography before the operation described herein revealed that the pericardium was not calcified on the anterior of the heart, while the inferior, posterior and lateral surfaces exhibited calcification. Notably, calcification along the inferior portion of the heart formed a calcium envelope structure (Fig. 2A, B). Echocardiography revealed that the wall motion was globally reduced and that the ejection fraction was 43%. Pre-operative coronary angiography indicated no significant coronary artery stenosis. The causes of heart failure were believed to be diastolic dysfunction due to calcified pericardium and compression by the inferior calcified mass.

The patient was diagnosed with exacerbated CP. The right femoral artery and vein were exposed, and although cardiopulmonary bypass (CPB) was kept on standby, re-sternotomy for pericardiectomy was performed without CPB being required. The pericardiectomy was started at the anterior surface of the right ventricle. Although it was difficult to locate the border between the calcified tissue and the heart, we identified the edge of the calcium plate at the lower anterior margin of the right ventricle. The calcified pericardium was gently removed from the heart using an electric knife and ultrasonic scalpel (Fig. 3). While cutting into the calcified mass enveloping the inferior portion of the heart, a paste-like substance was exuded. The calcified pericardium and the inferior mass were removed completely. Cardiac contraction improved as resection of the pericardium progressed. The cardiac index increased from 1.2 l/min/m² at the time of anaesthesia induction to 3.2 l/min/m² after the pericardiectomy. Total pericardiectomy was also completed without CPB being required.

The pathological diagnosis was recurrent idiopathic CP, while the paste-like substance inside the calcium envelope was determined to be haematoma. We found no evidence of infection. The postoperative course was uneventful, although the duration of recovery from heart failure was prolonged.

Discussion
CP is a type of pericardial disease whose causes could be idiopathic
or due to tuberculosis, prior cardiac surgery, post-mediastinal radiation therapy, connective tissue disease, infection, uraemia and sarcoidosis. Fibrotic and calcified pericardium restricts diastolic function, thereby reducing cardiac output. The surgical result of CP is unfavourable, with an early mortality rate of 6–7.6%. Furthermore, the commonly observed postoperative low-output syndrome is aggravated because of degeneration of the myocardium due to poor cardiac function after inadequate pericardiectomy.
Since the standard treatment of CP is pericardiectomy, fibrotic and calcified pericardium should be removed to the extent of enhancing the efficacy of treatment. Furthermore, calcified pericardium effectively grows into the cardiac surface, thereby increasing the risk of heart injury when attempting to remove the pericardium.

The complications of pericardiectomy are as follows: bleeding due to myocardial injury, coronary artery injury and phrenic nerve injury, therefore, when conducting a pericardiectomy, an ultrasonic scalpel should be used due to its safety and compatibility with minor tissue damage. Total pericardiectomy is defined as radical phrenic-to-phrenic excision of the pericardium, from the great arteries superiorly to the diaphragmatic surface inferiorly, and in case of fibrotic and calcified pericardium, total pericardiectomy is advisable to prevent future exacerbation. Although good surgical outcome of left anterolateral thoracotomy for recurrent CP has been reported in a previous study, total pericardiectomy using this approach is difficult and the article does not mention total pericardiectomy.

Recurrence or exacerbation of CP following previous partial pericardiectomy is common. Interestingly, a previous report described a case involving re-pericardiectomy 43 years after a previous pericardiectomy had been performed. The authors of that report indicated that the cause of CP recurrence was the inadequate removal of calcified pericardium. Therefore, inadequate pericardiectomy renders the early surgical results unfavourable and increases the risk of recurrent CP.

The patient in our case had undergone prior pericardiectomy to treat only anterior calcified pericardium. However, during postoperative follow up, heart failure occurred due to the recurrence of CP two years later. Furthermore, the calcified pericardium had changed over time; however, a haematoma was found to have developed prior to the second operation, which contributed to the development of the atypical calcification. As a result, the enveloped haematoma occupied the space between the heart and the diaphragm. We conclude that the calcified tissue not only perturbed diastolic function, but also physically compressed the heart.

Conclusion
It is important to remove as much fibrotic and calcified pericardium as possible since effective pericardiectomy contributes to improved early surgical results and prevents the recurrence of CP. Inadequate pericardiectomy can result in an unfavourable postoperative course and prognosis; therefore, total pericardiectomy should be performed for CP.

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References