

Surgical Treatment of Chronic Constrictive Pericarditis Using an Ultrasonic Scalpel

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A 61-year-old male had complained of cough and dyspnea on effort, with right pleural effusion. Computed tomography demonstrated a calcific pericardium surrounding the entire heart, with thickening of 10 mm. Cardiac catheterization showed no coronary disease, but a dip-and-plateau of the pressure curve of both ventricles. We diagnosed congestive heart failure due to chronic constrictive pericarditis, and performed a subtotal pericardiectomy, using an Ultrasonic Scalpel through a median sternotomy combined with anterior left thoracotomy at the level of the fifth rib, without cardiopulmonary bypass (CPB). After the subtotal pericardiectomy, his postoperative recovery was uneventful and his functional status improved. We consider that our surgical technique is a useful method for treatment of chronic constrictive pericarditis, and advocate the use of the Ultrasonic Scalpel for a safe and easy pericardiectomy. (Ann Thorac Cardiovasc Surg 2005; 11: 204–7)

Key words: constrictive pericarditis, ultrasonic scalpel, surgical treatment

Introduction

Constrictive pericarditis develops when a progressive fibrotic change in the pericardium compresses the myocardium, causing the impairment of ventricular diastolic filling. Pericardiectomy is an established treatment of constrictive pericarditis and is effective not only for improving the patient's hemodynamics, but also for producing clinical improvement. However, controversy still exists regarding the best surgical techniques for pericardiectomy, such as the surgical approach, degree of pericardial resection, and whether cardiopulmonary bypass (CPB) is necessary during the operation. We report herein a case of subtotal pericardiectomy using an Ultrasonic Scalpel through a median sternotomy combined with anterior left thoracotomy at the level of the fifth rib,

without CPB, for the treatment of chronic constrictive pericarditis and evaluate the usefulness of the Ultrasonic Scalpel.

Case Report

A 61-year-old male who had complained of cough and dyspnea on effort, with right pleural effusion, for four months was admitted to our hospital. He had a past history of rheumatic fever 41 years earlier and bone resection for tuberculosis infection of the sternum and left clavicle 40 years earlier. Furthermore, he had been diagnosed with bradycardia with a complete atrioventricular (A-V) block 12 years previously and underwent pacemaker implantation, and at that time he was also noted to have constrictive pericarditis. However, surgical treatment was not conducted and he received medication of digitalis and diuretics. The congestive symptoms were progressive and he was readmitted due to unresponsiveness to the medication. Chest radiography demonstrated a calcific pericardium shadow with pleural fluid on the right side (Fig. 1). Computed tomography demonstrated a calcific pericardium surrounding the entire heart, with thick-

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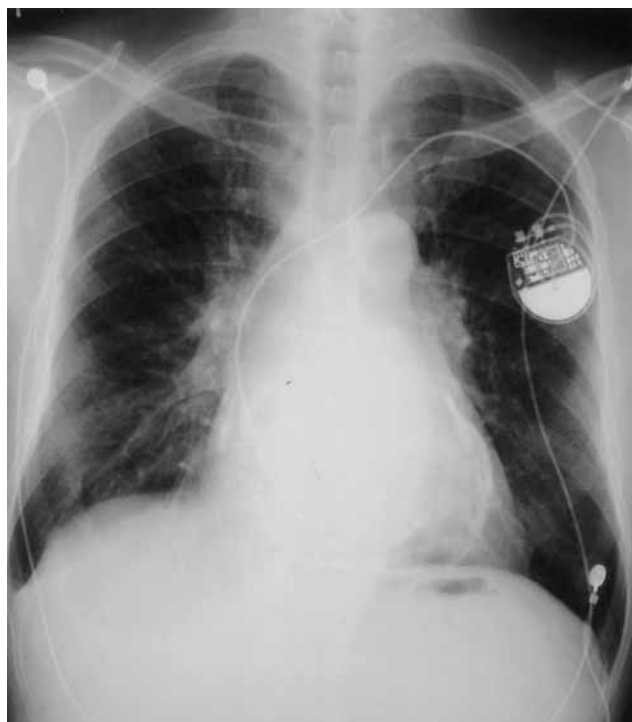


Fig. 1. Chest radiography demonstrated a calcific pericardium shadow with pleural fluid on the right side.

ening of 10 mm, and pleural effusion on the right side (Fig. 2). Cardiac catheterization showed no coronary disease, but a dip-and-plateau of the pressure curve of both ventricles. Echocardiography showed the dilatation of inferior vena cava, pulmonary hypertension, and splenomegaly. We diagnosed congestive heart failure due to chronic constrictive pericarditis and performed a subtotal pericardiectomy through a median sternotomy combined with anterior left thoracotomy at the level of the fifth rib, without CPB. Macroscopically, the calcific pericardium was found to be markedly thickened and hard, and was strongly adherent to the myocardium, especially along the inferior surface of the right ventricle, but it was removed easily with no myocardial injury and no bleeding, using an Ultrasonic Scalpel (Fig. 3). Between the left and right phrenic nerves, the anterior, inferior, and lateral pericardium were resected as much as possible using the Ultrasonic Scalpel, including the apical region (Fig. 4). Histological examination showed calcifying fibrous thickening of the pericardium, and chronic constrictive pericarditis was diagnosed. Although cardiac catheterization was not performed immediately after the operation, his clinical findings improved gradually, while the right pleural effusion persisted. Echocardiography

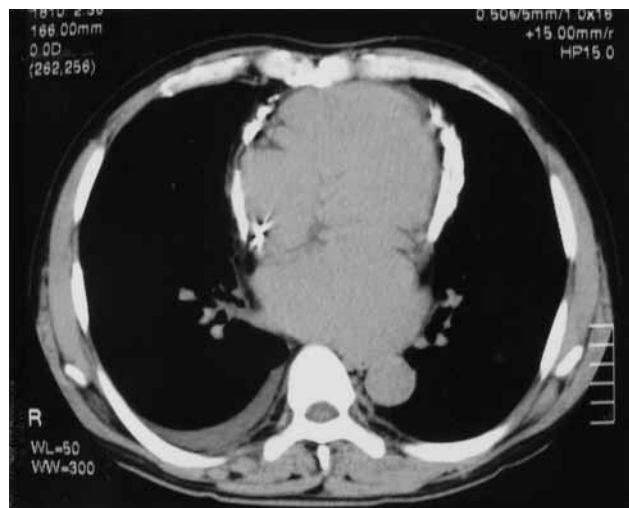


Fig. 2. Preoperative computed tomography demonstrated a calcific pericardium surrounding the heart, with thickening of 10 mm.

showed that the pressure of the right ventricle decreased from 41.0 mmHg to 27.5 mmHg, the pulmonary hypertension disappeared, and the maximum diameter of the inferior vena cava decreased from 26.2 mm to 23.7 mm. Laboratory findings demonstrated that the total serum bilirubin level gradually decreased from 1.5 mg/dl to 0.6 mg/dl. The postoperative recovery was uneventful and he was discharged on the 23rd postoperative day.

Discussion

Chronic constrictive pericarditis develops when a progressive fibrotic, thickened, adherent inflammatory change occurs in response to various insults to the pericardium, impairing diastolic heart filling. The causes of chronic constrictive pericarditis include tuberculosis, radiotherapy, collagen diseases, mesothelioma, and previous cardiac surgery.¹⁾ In the present case, the suspected etiology was tuberculous pericarditis, which had developed 40 years earlier, causing constriction in both ventricles due to the rigid and thin calcified pericardial shell, although no evidence of tuberculous infection was revealed by histological examination of the pericardiectomy specimen, excluding the past history of bone resection for tuberculosis infection of the sternum and left clavicle. Among the cases of chronic constrictive pericarditis lacking specific features and labeled as idiopathic, many could be related to prior tuberculosis that was unrecognized because of the absence of viable tubercle bacilli in the latter stage, after



Fig. 3. Intraoperative view showed the dissection of thickened pericardium using a Ultrasonic Scalpel (right side: cranial).

complete absorption of the pericardial effusion.²⁾

In general, it has been well reported that pericardiectomy results in improved functional status for long-term survivors in patients with constrictive pericarditis.³⁾ In particular, regarding the time of the operation, it has been reported that pericardiectomy should be performed early, before the inflammatory process infiltrates the myocardium and causes cardiomyopathy, particularly in tuberculosis pericarditis.^{1,3)} In our case, we suspected that the adherent thin pericardium was difficult to remove because of the chronic constrictive pericarditis over a long term. Therefore, in consideration of the benefit of dissection of pericardium, we used a dissection hook type Harmonick Scalpel (Ethicon Endo-Surgery Inc., Cincinnati, OH) at level 2 and then properly used the quick touch method that Higami et al.⁴⁾ proposed. This scalpel is a surgical device, which can coagulate and cut vessels or tissues, used for harvesting the internal thoracic artery⁴⁾ and radial artery.⁵⁾ The ultrasonically activated scalpel denatures tissue protein into a sticky coagulum that seals blood vessels and bleeding tissues. The scalpel's mechanisms for cutting are the longitudinal vibration of the blade tip at 55,500 times/sec over an expanse of 5 to 10 μm , and



Fig. 4. Postoperative computed tomography demonstrated the anterior, inferior, and lateral pericardium resected as much as possible between the left and right phrenic nerves, including the apical region.

cavitation fragmentation that disrupts low-density tissues such as fat and parenchyma, and causes tissue planes to separate ahead of the blade tip.^{6,7)} We also consider that the hook-shaped blade of the Ultrasonic Scalpel has the functional advantage of avoiding hyperthermic damage to the myocardium or coronary vessels avoiding myocardial muscular stimulation, producing minimal smoke, and hemostasis, in comparison with regular electrocautery.⁶⁻⁸⁾ Dissection of tight adhesions in the pericardiectomy was performed safely and easily, without hemodynamic deterioration, bleeding, myocardial injury or arrhythmia, throughout the operation in our case. Furthermore, we chose a median sternotomy combined with anterior left thoracotomy at the level of the fifth rib. We consider that the advantage of this approach method is the provision of excellent views for the subtotal pericardiectomy nearby the left phrenic nerve, including the apical region in particular, without retracting the heart or performing CPB.

In conclusion, we present a patient with good postoperative results who underwent subtotal pericardiectomy with an Ultrasonic Scalpel through a median sternotomy combined with an anterior left thoracotomy at the level of the fifth rib, without CPB. We consider that our surgical technique is a useful method for treatment of chronic constrictive pericarditis, and we advocate the use of the Ultrasonic Scalpel for a safe and easy pericardiectomy.

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