

Contemporary Techniques of Pericardiectomy for Pericardial Disease



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KEYWORDS

- Pericardiectomy • Constrictive pericarditis • Diastolic heart failure

KEY POINTS

- Pericardiectomy is a potentially curative treatment for constrictive pericarditis.
- Adequate pericardial resection is crucial to prevent recurrent or persistent hemodynamic compromise and symptoms owing to residual constrictive physiology.
- The etiology of constrictive pericarditis has an important impact on survival after pericardiectomy and can be associated with additional cardiac disease.
- Survival remains low in those with radiation-induced constrictive pericarditis, predominantly owing to concomitant radiation-induced cardiac pathology.

INTRODUCTION

Constrictive pericarditis is a condition in which the pericardium is fibrotic and stiffened, presumably owing to a prior inflammatory process. The diseased pericardium limits diastolic filling of the heart, producing characteristic signs and symptoms of right-sided heart failure. There are several etiologies of constrictive pericarditis that are observed in varying frequencies in different patient populations. In the United States and other developed nations, the cause of constrictive pericarditis is most commonly thought to be idiopathic in nature, likely secondary to prior viral infection. However, documented preceding inflammatory pericarditis is the exception rather than the rule.¹ The next leading causes are iatrogenic, including mediastinal radiation and, more commonly, previous cardiac surgery. In developing countries, infectious processes are the most common cause, with tuberculous pericarditis being the leading etiology.²

Patients may present with signs and symptoms indistinguishable from other cardiac conditions, including those of right-sided heart failure (peripheral edema, ascites, venous congestion, hepatomegaly, or jugular venous pressure elevation) or left-sided heart failure (dyspnea or pleural effusion). One should consider constrictive pericarditis in patients with right-sided heart failure with preserved left ventricular ejection fraction in the absence of tricuspid regurgitation and patients with pericardial calcification on imaging.^{1,3} The differential diagnosis also includes restrictive cardiomyopathy, tricuspid valve disease, and chronic liver disease with ascites.

Differentiating constrictive pericarditis is essential because of availability of treatment modalities. Antiinflammatory medications can resolve acute, transient disease, but the take-home point is that symptomatic patients with chronic constriction can only be cured with an operation.⁴ Constrictive pericarditis can be classified as transient, effusive-constrictive (where features of constriction and

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cardiac tamponade coexist), radiation induced, tuberculous, or calcific.

Echocardiography and adjunct modalities such as cardiac MRI, computed tomography, and, in some patients, cardiac catheterization, can clarify the diagnosis in most cases. Constrictive physiology can present with septal shift with respiratory variation, transmitral velocity anomalies (increased mitral annular e' velocities), and hepatic vein flow variations with respiration.²

INDICATIONS

Pericardiectomy is performed most often for patients with chronic constriction, but surgical removal of the pericardium is also useful in patients with relapsing pericarditis refractory to antiinflammatory therapy.⁴ Rarely, patients may present signs and symptoms of acute inflammation accompanying evidence of constrictive physiology, and an initial trial of antiinflammatory medical therapy may be appropriate.⁵ However, it is important not to delay definitive intervention in patients with chronic constriction, because early surgical intervention may be associated with better outcomes.⁶

CONTRAINDICATIONS

Contraindications to pericardiectomy in patients with chronic constrictive pericarditis are similar to those of other major cardiac operations. The patient needs to be able to tolerate general anesthesia and a cardiac operation with potential need for cardiopulmonary bypass (CPB). Specific contraindications might include hepatic dysfunction with cirrhosis and ascites, uncontrolled infection or sepsis, and other systemic diseases limiting life expectancy. If the anticipated risks of an operation outweigh the potential benefits, patients with mild symptoms can be treated medically and observed for symptomatic progression.

Most patients with chronic constrictive pericarditis experience hemodynamic improvement after pericardiectomy, but the degree of recovery and improvement in physical activities depends on the extent and etiology of disease and comorbid conditions. Procedural risk is increased in patients with end-stage constrictive pericarditis pathophysiology, with manifestations such as a resting cardiac index of 1.2 L/m²/min or less with signs of cachexia, cardiogenic cirrhosis with subsequent hypoalbuminemia, and protein-losing enteropathy. Patients with mixed constrictive-restrictive disease commonly owing to radiation-induced myocardial damage also have increased

risk in the perioperative period, relatively poor long-term survival, and may have persistent symptoms after pericardiectomy.^{7,8}

SURGICAL APPROACH

General

Diagnostic studies to establish the diagnosis of constriction are covered in other articles in this series, but it should be emphasized that findings on clinical examination coupled with detailed Doppler echocardiographic assessment are sufficient to establish the diagnosis of constriction in most patients.⁹ Additional imaging to assess pericardial thickness may be useful, but pericardial thickness is normal in 12% to 18% of patients with hemodynamically significant constriction.^{10,11}

General preoperative planning for pericardiectomy is similar to other major cardiac procedures, with special attention to associated tricuspid valve regurgitation and adequacy of hepatic function, including vitamin K-dependent coagulation factors. Optimizing preoperative volume status with diuresis may be beneficial in some patients, but often diuretics are ineffective until constriction is relieved and pericardiectomy should not be delayed in patients with advanced heart failure.

Some surgical teams advocate minimal paralysis during anesthesia with use of short-acting muscle blockade agents to facilitate identification of phrenic nerves by stimulation during and after dissection. Inflammatory adhesions may obscure the phrenic nerves and low energy electrocautery settings and adjunct nerve stimulation may be useful in identifying the phrenic nerve to avoid nerve injury. Intraoperative transesophageal echocardiography should be used in all cases of pericardiectomy for chronic constriction to assess cardiac size and function during and after removal of the pericardium^{12,13} and, as discussed elsewhere in this article, to examine atrioventricular valve function after release of pericardial constraint.

Incision

A median sternotomy is used for most patients undergoing pericardiectomy for constrictive pericarditis. This approach gives wide access to the pericardium and simplifies cannulation if CPB is necessary for dissection, control of bleeding, or performing other cardiac procedures, such as addressing atrioventricular valve regurgitation.^{14,15}

In contrast with other operations where cardiac repair often results in lessening of tricuspid valve regurgitation, pericardiectomy and release of constriction may lead to right ventricular and tricuspid annular dilatation with worsening of

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