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Constrictive Pericarditis induced by Human Herpes Virus Infection: A Case Report

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Abstract

Constrictive pericarditis represents a severe diastolic heart failure secondary to an inelastic and poorly compliant pericardium mediated by inflammation and fibrosis. It shows relative regional and temporal differences with respect to the etiologies. Regardless, a significant proportion of patients remain idiopathic on account of the limitation of testing and imaging in practice. Here we first identified human herpesvirus as the cause in a 37-year-old male diagnosed with Constrictive pericarditis utilizing next-generation sequencing. The patient underwent a complete radical pericardiectomy eventually and demonstrated a satisfactory outcome in a 3-month follow-up. Our work first highlighted the human herpesvirus infection associated with the development of constrictive pericarditis.

Keywords: Constrictive pericarditis; Virus; Tuberculosis; Next-generation sequencing, Cardiac computed tomography.

Abbreviation: CP: Constrictive Pericarditis; NGS: Next-Generation Sequencing.

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Introduction

Constrictive Pericarditis (CP) results from pericardial inflammation and fibrosis, impeding diastolic cardiac filling and eventually leading to severe diastolic failure [1,2]. The accurate incidence was not well established but estimated to be relatively rare, less than no more than 1 per 100000 people per year [3]. There was a regional heterogeneity regarding etiologies worldwide. Tuberculosis was the predominant cause of CP in developing countries, while prior cardiac surgery was most frequent in North America and Europe [4]. Additionally, other potential causes encompassed asbestosis, trauma, malignancy, rheumatologic disease, and infection. A vast array of organisms has been demonstrated to be responsible for the development of CP such as human immunodeficiency virus, cytomegalovirus, adenoviruses, enteroviruses, and influenzas. Despite the advance in diagnostic technique in terms of immunohistochemistry, pericardioscopy, and polymerase chain reaction testing, there were a significant proportion of patients remains idiopathic [5]. Herein, we reported a CP patient associated with human herpesvirus 1 and 6B as determined by Next-Generation Sequencing (NGS).

Case presentation

A 37-year-old man was admitted to our hospital due to a six-month history of progressive exertional dyspnea and chest distress. He was previously diagnosed with a dual infection of hepatitis B and C and without tuberculosis one year ago. On physical examination, a distention of jugular vein, a palpated hepatomegaly, and an auscultatory pericardial knock were identified. Cardiac computed tomography confirmed the CP as a consequence of a circumferential calcification of both the parietal and visceral layer pericardium (Figure 1A-C). Transthoracic echocardiogram demonstrated the posterior motion of the ventricle septum at the early-diastolic period in inspiration, a distention of inferior vena cava with inspiratory collapse over 50%, and distinctly thickened pericardium (Figure 1D), reconfirming the diagnosis. Abdominal ultrasound revealed liver cirrhosis with multiple gallstones.

A radical pericardiectomy without cardiopulmonary bypass establishment via median sternotomy was performed, showing a massive bean dreg-like substance wrapped between the parietal and visceral layer pericardium. The calcific pericardium was removed as much as possible, inevitably leaving plaque-like epicardial calcification (Figure 2A). Care was taken not to injure the coronary vessels or the phrenic nerves. Pathology indicated significant collagen hyperplasia, severe calcification, as well as aggregation of a few neutrophils and lymphocytes (Figure 2B). What's more, human herpesvirus 1 and 6B rather than mycobacterium tuberculosis were detected as causes of NGS. The patient received diuretics and antiviral treatment postoperatively and was discharged 2 weeks after surgery with significantly relieved symptoms. The postoperative one-month and three-month follow-ups showed a satisfactory improvement in the New York Heart Association functional class, with 63% of left ventricle ejection fraction.

Discussion

The human herpesvirus identified as the cause of CP has been rarely reported. This report described that a male with severe calcific CP confirmed by NGS underwent a meticulous radical pericardiectomy and showed a satisfactory outcome during follow-up.

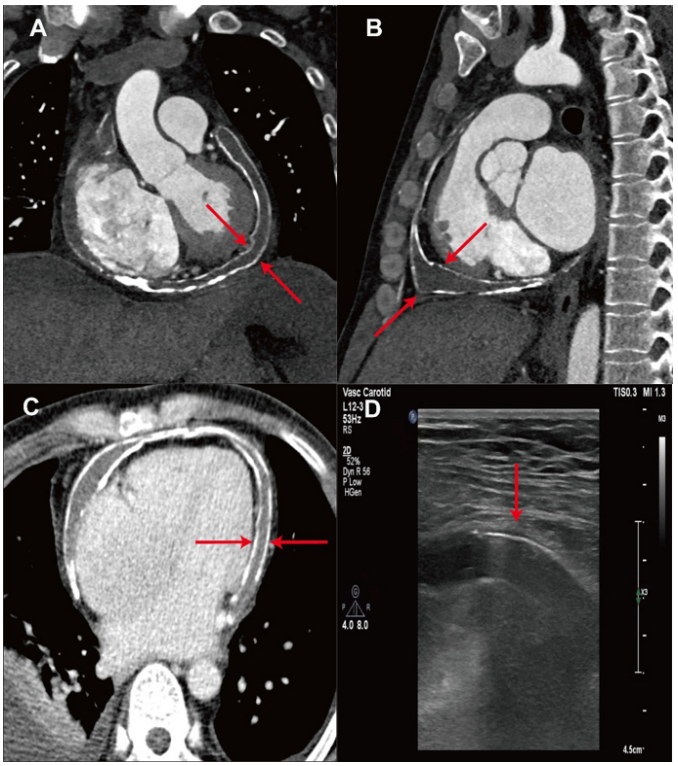

Figure 1: Thickened and circumferential calcification of both the parietal and visceral layer pericardium were observed at coronary **(A),** sagittal **(B),** and transverse plane **(C)** on cardiac computed tomography. The distinctly thickened pericardium was confirmed by transthoracic echocardiogram **(D)**.

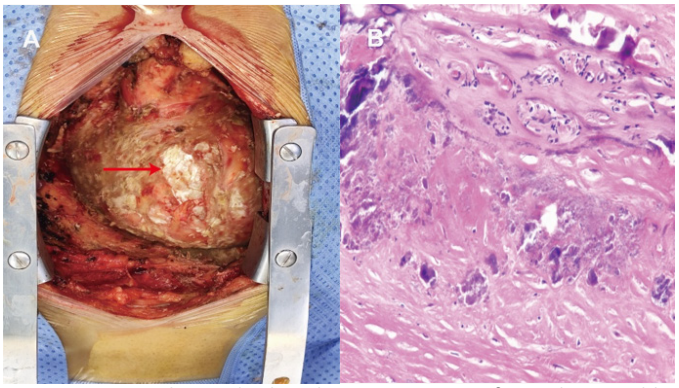

Figure 2: A complete radical cardioectomy was performed, inevitably leaving plaque-like epicardial calcification **(A)**. Pathology of the pericardium sample showed aggregation of a few neutrophils and lymphocytes, collagen hyperplasia, and severe calcification **(B)**.

The CP that represented a spectrum of diastolic heart failure was relatively rare worldwide. It showed quite temporal and regional differences with respect to the etiologies. Specifically, there was a great etiology transition in the developed countries in the 20th century, predominantly due to the widespread of cardiac surgery [6]. It was reported that 0.2-0.4% of patients undergoing cardiac surgery would result in CP after a postoperative mean of 2 years [7]. Of CP patients at the Mayo Clinic during the period of 1936-1982, there was only 2% resulting from the prior cardical [8]. However, the incidence rose to 34% between 1996 and 2006 [9]. In contrast, tuberculosis was the most common cause in developing regions such as Africa and Asia. For instance, the inci-

dence of CP attributed to tuberculosis in India was 61% during the period of 1954-1985 and 93% during the period of 1985-2004, respectively [9]. A recent systematic review including 30 studies and over 11000 patients showed that tuberculosis remains the most frequent cause in Asia and Africa while previous cardiac surgery has become the predominant cause in North America and Europe [4]. Regardless, a part of CP patients remained idiopathic. Nakanishi *et al.* described a CP patient associated with severe acute respiratory syndrome coronavirus 2 vaccination [10]. Griessel *et al.* first verified the *Nocardia asiatica* infection responsible for the development of CP in a man concurrent with human immunodeficiency virus infection [11]. To the best of our knowledge, we reported the first case confirming the human herpesvirus infection as the primary cause of CP with the utilization of NGS of the pericardium sample. Additionally, the CP could be classified into transient, effusive-constrictive, and calcific types. After sternotomy, the patient presented a severely calcific CP in view. The calcific CP was reported to account for approximately 25%-30% of all CP patients more prevalently radiation-induced and idiopathic [12-14], which was different from that induced by human herpesvirus in our case.

The surgical pericardiectomy is the only curable intervention for CP patients. Due to the severe pericardium calcification and myocardial adherence, a meticulous pericardiectomy with or without additional procedures such as the sacrifice of the phrenic nerve, cardiopulmonary bypass establishment, ultrasonic decalcification, and careful wedge excision of calcific plaques, is required. Anterior pericardiectomy was demonstrated to be inherent with the residual calcific pericardium, a higher risk of recurrent CP, thereby resulting in repeat pericardiectomy with 7% of 30-day mortality [15]. Given this, we performed a complete radical pericardiectomy with the aim to remove the calcific pericardium as much as possible. Postoperatively, the patient's symptoms were significantly relieved and treated with antivirus therapy. During the 3-month follow-up, the patient showed a satisfactory outcome in terms of improvement in New York Heart Association functional class and left ventricle ejection fraction.

Therefore, the human herpesvirus infection was first demonstrated to be capable of potentially triggering pericardial inflammation and fibrosis, thereby leading to CP. A complete radical pericardiectomy to remove the pericardium as much as possible was effective in such patients.

Declarations

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Conflict of interest: There is no conflict of interest to declare.

Ethics Statement: This study was approved by the Guangdong Provincial People's Hospital ethics committee. Informed consent was obtained from this patient.

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