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ADVANCED

CASE REPORT: CLINICAL CASE

A Complicated Case of Transient Constrictive Pericarditis Secondary to Rivaroxaban-Associated Hemopericardium

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ABSTRACT

A 72-year-old man on rivaroxaban developed effusive constrictive pericarditis secondary to hemopericardium. His condition improved with anti-inflammatory therapy supporting a diagnosis of transient constrictive pericarditis. On follow-up, residual constriction developed requiring surgical pericardiectomy. Although many cases with transient constrictive pericarditis resolve with medical management, some may progress and require pericardiectomy. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2020;2:1947–50) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

A 72-year-old man first presented in November 2013 to an outside hospital with complaints of fatigue and chest discomfort. He was diagnosed with new-onset atrial fibrillation. He underwent successful cardioversion and was discharged on rivaroxaban. He presented 5 days later to the same outside hospital with complaints of orthopnea and exertional dyspnea. He was found to have a large circumferential pericardial effusion and underwent pericardiocentesis with drainage of 300 ml of hemorrhagic fluid. He subsequently presented in December 2013 to our pericardial center in a wheelchair with complaints of a 30-lb weight gain and exertional dyspnea. His physical examination was notable for bilateral pitting edema, markedly elevated jugular venous pressure to the angle of the jaw, and a pericardial knock. He was admitted with a clinical diagnosis of New York Heart Association (NYHA) functional class III heart failure and concern for constrictive pericarditis (CP) for further management.

LEARNING OBJECTIVES

- ECP may present after treatment of hemopericardium due to rivaroxaban.
- ECP may sometimes be the initial presentation of TCP.
- Many cases of constriction may resolve on anti-inflammatory therapy. In some cases recurrence may occur, which necessitates surgical pericardiectomy.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Case Reports* author instructions page.

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ABBREVIATIONS AND ACRONYMS

CP = constrictive pericarditis

DHE = delayed hyper-enhancement

ECP = effusive constrictive pericarditis

MRI = magnetic resonance imaging

NYHA = New York Heart Association

PWD = pulsed-wave Doppler

TCP = transient constrictive pericarditis

PAST MEDICAL HISTORY

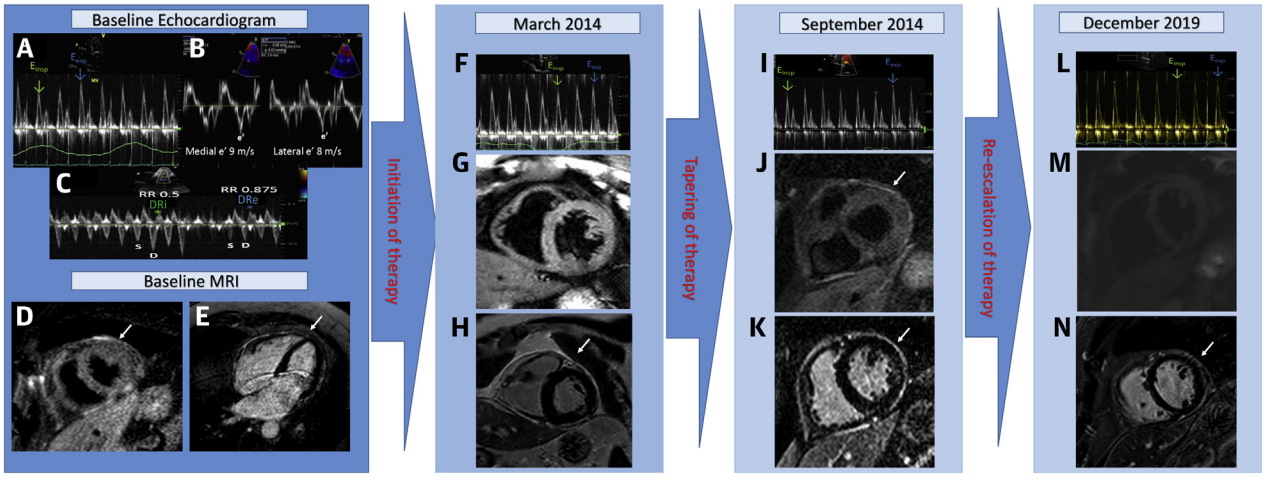
His past medical history was significant for hypertension and hyperlipidemia. He was a non-smoker. He had no family or personal history of autoimmune diseases.

INVESTIGATIONS, MANAGEMENT, AND FOLLOW-UP

His cardiac magnetic resonance imaging (MRI) showed residual trace pericardial effusion, thick pericardium (4 mm), pericardial edema, prominent diastolic septal bounce, respirophasic septal shift, and pericardial enhancement on delayed gadolinium imaging, suggestive of acute pericardial inflammation (**Figures 1B1 to 1C1**, Video 1). Review of the outside hospital records showed that the pericardial fluid analysis was negative for neoplastic cells and infectious disease work-up, and that he had elevated right atrial pressures even after draining the hemopericardium (most likely secondary to rivaroxaban use). These findings were suggestive of effusive inflammatory constriction. He was treated with furosemide 80 mg intravenous daily and started on triple anti-inflammatory therapy with colchicine 0.6 mg twice-a-day, prednisone 50 mg once-a-day, and aspirin 650 mg once-a-day. His chest pain and shortness of breath improved (from NYHA functional class III to NYHA functional class I to II) and he was discharged 1 week later. On follow-up after 4 months (March 2014), a repeat cardiac MRI showed a decrease in pericardial thickness (4 to 3 mm), edema, inflammation, and the associated constrictive physiology (**Figures 1B2 to 1C2**). The colchicine dose was reduced to 0.6 mg once-a-day, and prednisone was tapered very slowly every 2 weeks as per European Society of Cardiology guidelines (1). His condition continued to improve and prednisone was stopped July 2014 (total 7 months of therapy).

RECURRENT TRANSIENT CONSTRICTION. He returned 2 months later (September 2014) with generalized malaise. A cardiac MRI showed a significant increase in pericardial thickening (3 to 5 mm), edema, inflammation, and respirophasic septal shift consistent with returning inflammatory constriction. He was restarted on prednisone 5 mg once-a-day, in addition to colchicine 0.6 mg twice-a-day and aspirin 650 mg once-a-day (**Figures 1B3 to 1C3**). On follow-up, constrictive physiology improved on imaging, and prednisone was again stopped in April 2015. All anti-inflammatory medications were stopped in April 2018.

FIGURE 1 Multimodality Imaging-Guided Therapy for Recurrent Pericarditis



Baseline echocardiogram using pulsed-wave Doppler (PWD) demonstrating significant **(A)** respiratory variation of peak E-wave velocity (26%), **(B)** annulus reversus, and **(C)** increased hepatic vein diastolic flow reversal with expiration. Baseline magnetic resonance imaging showing pericardial edema on short-axis view on T2 short tau recovery sequence **(D, arrow)** and pericardial inflammation on delayed hyper-enhancement sequence **(E, arrow)**. Follow-up imaging after initiation of anti-inflammatory therapy demonstrating **(F)** improvement of respiratory variation of peak E-wave velocity (13%) on PWD, **(G)** resolution of pericardial edema on T2 STIR sequence and persistent pericardial delayed hyperenhancement **(H, arrow)**. Once tapering of medication began, subsequent worsening of **(I)** respiratory variation of peak E-wave velocity (20%), reoccurrence of pericardial edema on T2 STIR **(J, arrow)** and inflammation on delayed hyperenhancement (DHE) sequences **(K, arrow)**. With re-escalation of therapy there was, once again, improvement of the mitral inflow pattern (15%) **(L)**, resolution of pericardial edema on both T2 STIR **(M)** and inflammation on DHE **(N, arrow)** sequences.

In December 2019, he presented with a 2-week history of 25-lb weight gain and exertional dyspnea. He was diagnosed with NYHA functional class III heart failure. Cardiac MRI findings showed evidence of constrictive pericarditis (**Figures 1B4 to 1C4**). He underwent surgical radical pericardiectomy for symptomatic heart failure and his symptoms resolved. Pathological examination of the pericardium showed organized fibrinous pericarditis without granulomas. On follow-up until March 2020, he continues to remain asymptomatic.

DISCUSSION

This case was initially diagnosed as effusive constrictive pericarditis (ECP) secondary to an inflammatory reaction induced by an episode of hemopericardium due to rivaroxaban. ECP has been previously described as a clinical condition where constrictive physiology persists after treatment of pericardial effusion (2). However, improvement on initiation of anti-inflammatory therapy supported a diagnosis of transient constrictive pericarditis (TCP), which is described as a reversible form of constriction with spontaneous recovery on medical treatment, without progression to irreversible fibrosis and calcification (1). Our case was unique in the recurrent nature of the TCP findings, and the patient eventually experienced decompensated heart failure needing surgical pericardiectomy. Our case also shows that the inflammation can be treated with improvement of NYHA functional class; however, residual constriction can persist, and in some cases progress.

TCP was first described in a case series of 16 patients who were initially diagnosed with ECP but the objective finding of constrictive physiology resolved with anti-inflammatory therapy over a mean duration of 2.7 months (3). However, no patient in this case series had recurrent constriction. The study suggests that TCP may be an advanced stage in the spectrum of ECP, and that many cases may resolve on medical therapy. Another case series by Haley et al. (4) reported spontaneous resolution of constriction in TCP in 22 patients over a mean duration of 8.3 weeks.

The underlying pathophysiology of constriction is a transient loss of pericardial elasticity caused by inflammation, edema, and fibrin deposition (3,4). The clinical findings represent impaired diastolic ventricular filling, including an elevated jugular venous pressure with a steep "y" descent, increased inspiratory venous pressure (Kussmaul's sign), and exaggerated respiratory variation in systolic blood pressure (pulsus paradoxus) (4). Common known etiologies are post-viral, post-cardiac injury, radiation-induced, and infectious (5). Our case had a unique presentation with TCP secondary to an inflammatory response triggered by a hemopericardium. Current guidelines support the role of multimodality imaging to help establish diagnosis (1,6). The characteristic echocardiographic findings of constriction include prominent diastolic septal bounce, plethoric and noncollapsible inferior vena cava, and respirophasic variation of mitral and tricuspid inflows. Tissue Doppler imaging of the mitral annulus may show a characteristic reduction of the lateral early diastolic velocity relative to the septal velocity (e'), a phenomenon known as annulus reversus. There is also an increase in diastolic transmitral flow velocity (E), leading to abnormally normal to increased E/e', a phenomenon known as annulus paradoxus (1). Cardiac MRI can demonstrate abnormal physiology and anatomy: pericardial thickness (>3 mm); pericardial edema; and pericardial inflammation on delayed gadolinium hyperenhancement, with or without fat-suppression, consistent with TCP (1).

TCP may resolve spontaneously resolve or require anti-inflammatory therapy. Severe cases warrant a triple therapy with colchicine, nonsteroidal anti-inflammatory drugs, and corticosteroids (7). Refractory cases may treated with biological agents, such as anakinra, but there is limited evidence (8). Our case was unique because the patient had decompensated heart failure with worsening of underlying constrictive physiology and inflammation, needing surgical pericardiectomy.

CONCLUSIONS

TCP is a reversible form of inflammatory constrictive pericarditis, which may present after an episode of ECP (3). Early recognition and treatment with anti-inflammatory agents may prevent chronic constriction and need of surgical pericardiectomy.

AUTHOR RELATIONSHIP WITH INDUSTRY

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS cardiac magnetic resonance imaging, effusive constrictive pericarditis, hemopericardium, pericarditis, recurrence, transient constrictive pericarditis

APPENDIX For supplemental videos, please see the online version of this paper.