JACC: CASE REPORTS VOL. 1, NO. 1, 2019

CASE REPORT

INTERMEDIATE

CLINICAL CASE

A Case of Delayed Hemorrhagic Effusive-Constrictive Pericarditis After Left Atrial Appendage Occlusion Device Placement

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ABSTRACT

This report describes a case of pericardial effusion and tamponade that appeared several weeks after WATCHMAN device (Boston Scientific, Natick, Massachusetts) placement for left atrial appendage occlusion. The report also discusses the likely etiology and clinical management of this uncommon condition. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2019;1:27–31) © 2019 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/).

The WATCHMAN device (Boston Scientific, Natick, Massachusetts) is an increasingly popular, Food and Drug Administration–approved device for left atrial appendage (LAA) occlusion in patients with nonvalvular atrial fibrillation who seek an alternative to oral anticoagulation (1). Its safety and efficacy have been demonstrated in 2 major randomized control trials: PREVAIL (Prospective Randomized Evaluation of the WATCHMAN Left Atrial Appendage Closure Device in Patients with Atrial Fibrillation Versus long-term Warfarin Therapy) and PROTECT AF (Percutaneous Closure of the Left Atrial Appendage versus Warfarin Therapy for Prevention of Stroke in Patients with Atrial Fibrillation) (2,3). The rate of pericardial effusion post-WATCHMAN implantation in these trials was approximately 2% to 5% (2,3). Most of these were acute hemorrhagic pericardial effusions that manifested within 7 days of implant as a result of macroperforation. The etiology, prevalence, and clinical consequences of delayed pericardial effusions after WATCHMAN placement are not well described. In this report, we describe a case of pericardial effusion and tamponade that appeared several weeks after WATCHMAN placement. We also depict the likely etiology and clinical management of this uncommon condition.

LEARNING OBJECTIVES

- Delayed pericardial effusion several weeks after implantation is a rare complication that implanting physicians should be aware of. Follow-up TEE should include evaluation of the pericardial space so that this complication is not missed.
- Late pericardial effusion is likely caused by microperforation during implantation that results in a subclinical hemopericardium. This sets off a vicious cycle of inflammation and increased bleeding in the setting of anticoagulation, which ultimately results in cardiac tamponade.
- Delayed, hemorrhagic effusive-constrictive pericarditis can be managed with pericardiocentesis and anti-inflammatory agents, without the need for cardiac surgery.

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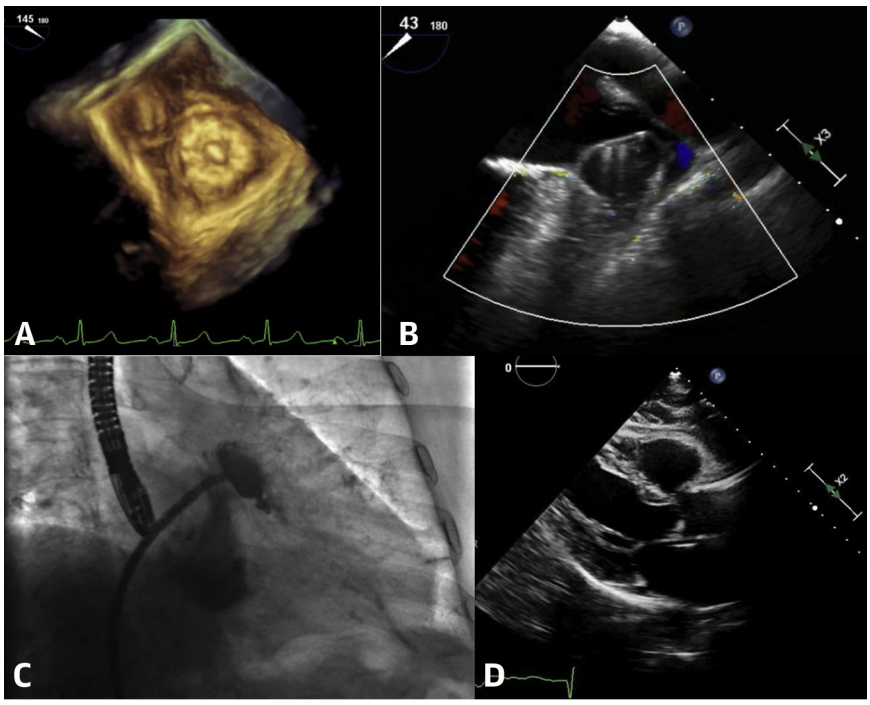
Manuscript received March 25, 2019; revised manuscript received April 26, 2019, accepted April 26, 2019.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2019.04.003

FIGURE 1 Initial WATCHMAN Positioning in the LAA



(A) A 3-dimensional transesophageal echocardiography image of WATCHMAN device (Boston Scientific, Natick, Massachusetts) in place in the left atrial appendage (LAA) was obtained intraoperatively. No peridevice leak was seen by **(B)** Doppler on transesophageal echocardiography or **(C)** angiography. **(D)** Bright pericardium on post-operative day 1.

HISTORY OF PRESENTATION

An 87-year-old female patient with a history of atrial fibrillation and a CHA_2DS_2-VASc (congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, prior stroke of transient ischemic attack or thromboembolism, vascular disease, age 65 to 74 years, and sex category [female]) score of 4 was referred for placement of an LAA occlusion device. On examination, she was normotensive, with an irregularly irregular pulse of 87 beats/min, without any jugular venous distention or peripheral edema.

PAST MEDICAL HISTORY

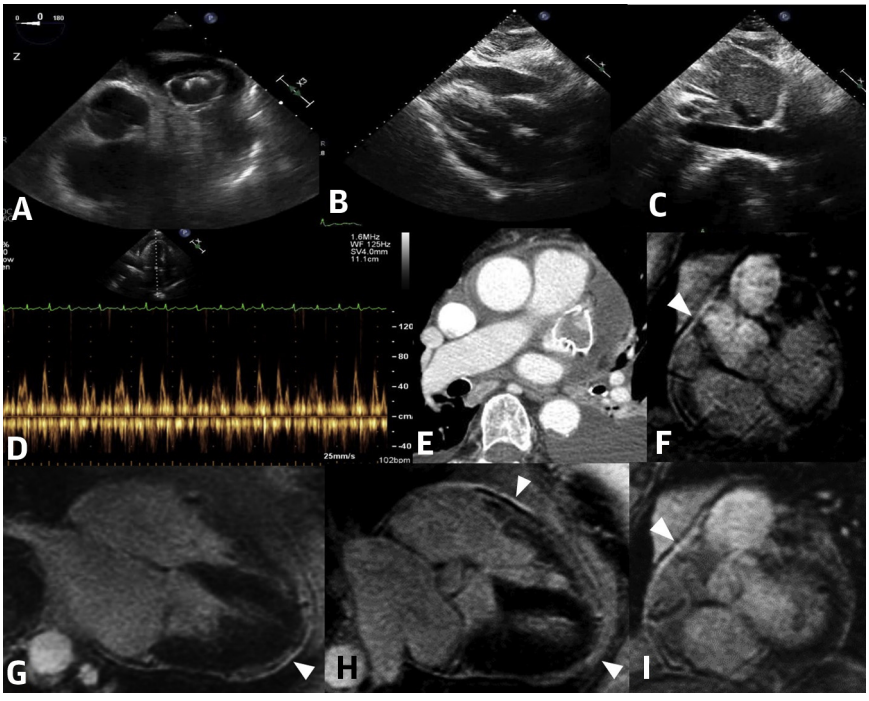
She had a history of esophageal ulcers and frequent falls, which resulted in an intracranial hemorrhage, so she was deemed high risk for significant bleeding with long-term oral anticoagulation.

INITIAL MANAGEMENT: PLACEMENT OF WATCHMAN DEVICE

The LAA was measured as an average diameter of 26 mm on transesophageal echocardiogram (TEE). Therefore, a #30 WATCHMAN device was placed. After deployment, the "PASS" criteria were met: the position of the device at the LAA os was confirmed, and the tug test revealed that the device was anchored with 20% compression without any peridevice leaks. The device was released, and the patient recovered well without any immediate complications (Figures 1A to 1C).

The following day, the patient's exam remained unchanged except she reported substernal chest pain that was worse when lying down and improved with sitting up. A transthoracic echocardiogram (TTE) revealed a bright pericardium but did not demonstrate pericardial effusion (Figure 1D). She was discharged on 0.6 mg colchicine twice a day for

FIGURE 2 Echocardiographic Evidence of Delayed Effusive-Constrictive Pericarditis



(A) A 6-week follow-up transesophageal echocardiography with a short-axis view demonstrating a moderate pericardial effusion surrounding a WATCHMAN device (Boston Scientific, Natick, Massachusetts) in the left atrial appendage. **(B)** Transthoracic echocardiography on post-operative day 55 demonstrating a large pericardial effusion with right ventricular collapse in diastole. **(D)** After pericardial effusion drainage, a persistent large, noncollapsing inferior vena cava and 45% mitral inflow velocity variation with respiration remained. **(E)** Post-drainage, computed tomography angiography illustrated the WATCHMAN device within the lumen of the left atrial appendage. **(F to I)** Late gadolinium enhancement **(arrowheads)** seen in the pericardium on cardiac magnetic resonance.

suspected post-procedural pericarditis and continued warfarin. The chest pain persisted 1 week later, and TTE again revealed a bright pericardium without pericardial effusion. She was continued on colchicine. On 4-week follow-up, she reported a gradual resolution of chest pain. No TTE was performed given her clinical improvement, and colchicine was discontinued.

FOLLOW-UP

Her routine 6-week TEE revealed a moderate pericardial effusion without evidence of tamponade (Figure 2A). Three days later, she presented with significant dyspnea and tachycardia. A TTE revealed a large pericardial effusion with findings suggestive of cardiac tamponade (Figure 2B). During urgent pericardiocentesis, 500 ml sanguineous fluid was drained, and a pericardial drain was left in place. Pericardial fluid analysis revealed 1,201,000/mm^3 red blood cells, 6,452/mm^3 nucleated cells, pH 7.6, and negative Gram stain, suggestive of a concomitant inflammatory and hemorrhagic process. Serum sedimentation rate and C-reactive protein were found to be elevated at 49 mm/h and 2.7 mg/dl, respectively. Computed tomographic angiography showed no obvious macroperforation of the device. The post-pericardiocentesis TTE revealed constrictive physiology (Figures 2C to 2E).

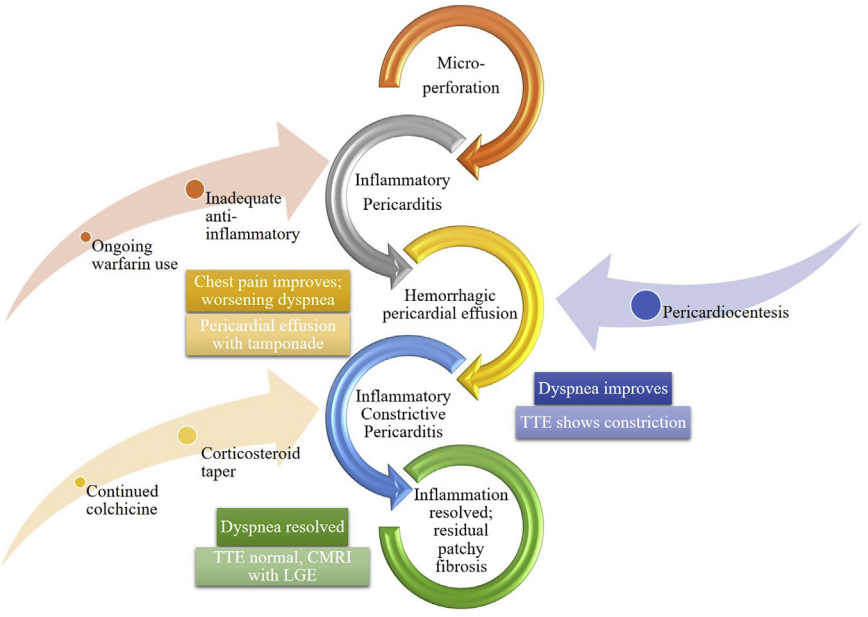
DIFFERENTIAL DIAGNOSIS

The suspected cause of the delayed effusion was microperforation leading to inflammatory effusive-constrictive pericarditis with delayed secondary bleeding. She was not started on nonsteroidal anti-inflammatory drugs because of the hemorrhagic effusion and her history of esophageal ulcer.

MANAGEMENT

She was given a 1-week taper of methylprednisolone in addition to continuing colchicine for a total of

FIGURE 3 Inflammatory Cascade



The series of events leading to delayed effusive-constrictive pericarditis post-WATCHMAN device (Boston Scientific, Natick, Massachusetts) placement. CMRI = cardiac magnetic resonance imaging; LGE = late gadolinium enhancement; TTE = transthoracic echocardiogram.

3 months. On follow-up, TTE 1 week later revealed elevated right atrial pressure, septal bounce, and thickened pericardium suggestive of constriction, although no effusion. One month later, repeat TTE showed normalized filling pressures, mild septal bounce, and a bright pericardium without pericardial effusion. A cardiac magnetic resonance image obtained after a full 3 months of colchicine therapy revealed pericardial thickness of 4 mm with patchy late gadolinium enhancement in the pericardium (**Figures 2F to 2I**).

DISCUSSION

We report delayed pericardial effusion and subsequent effusive constrictive pericarditis after WATCHMAN device placement. To the best of our knowledge, this is the first such reported case.

Acute pericardial effusion and tamponade secondary to macroperforation during WATCHMAN device expansion or tugging when testing for appropriate anchoring are known complications of this procedure. Although an oversized device can cause perforation, the #30 WATCHMAN (15% larger than the 26-mm LAA os) device used in this patient is within the sizing recommendations for fixation and stable positioning (4). The incidence of pericardial effusion in both the prospective EWOLUTION registry and the Boston Scientific manufacturer-compiled registry is close to 1%, significantly lower than the rates demonstrated in the original randomized controlled trials (5,6). Physicians who implant these devices should be aware of the very rare complication of delayed pericardial effusion several weeks after implantation. Follow-up 6-week TEE should include evaluation of the pericardial space so that this rare complication is not missed.

The pathophysiology of late pericardial effusion and subsequent constrictive-effusive pericarditis after WATCHMAN device placement is unclear. We hypothesize that the following sequence of events resulted in this clinical presentation (**Figure 3**): 1) given the delay in development of the pericardial effusion, a microperforation at the time of the implantation led to a subclinical hemopericardium; 2) blood in the pericardial space, which is a known trigger for pericardial inflammation (7), resulted in inflammatory pericarditis; 3) worsening inflammation in the setting of systemic anticoagulation caused pericardial effusion and tamponade; 4) persistent inflammation post-pericardiocentesis resulted in constrictive physiology; and 5) patchy fibrosis persisted after resolution of the inflammation, thus explaining the

cardiac magnetic resonance findings of pericardial delayed enhancement.

Management of microperforation-related inflammatory pericarditis with ongoing systemic anticoagulation is challenging. In this case, a 3-month course of colchicine alone was insufficient to control the inflammation; instead, we postulate that initial dual or triple anti-inflammatory therapy (with addition of nonsteroidal anti-inflammatory drugs and/or a taper of steroids) would have prevented subsequent pericardial effusion and constriction. The patient's history of esophageal ulcer dissuaded us from adding additional agents initially. The use of corticosteroids in post-procedural pericarditis remains controversial because of the fear of recurrent pericarditis and pericardial effusion (8,9). In this case, a short course of corticosteroids in addition to colchicine resulted in resolution of inflammation without the development of the dreaded steroid-related recurrent effusion. This case demonstrates that pericardiocentesis with aggressive management of inflammation is sufficient to reverse effusive-constrictive pericarditis without the need for cardiac surgery (10).

CONCLUSIONS

We report microperforation-related delayed hemorrhagic effusive-constrictive pericarditis after WATCHMAN device placement. Further evaluation is necessary to characterize the clinical presentation and management strategy of this rare complication.

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KEY WORDS atrial fibrillation, cardiac tamponade, effusive-constrictive pericarditis, left atrial appendage closure device, pericardial effusion