Constrictive pericarditis caused by Cutibacterium (Propionibacterium) acnes: A case report and review of literature

Troels Bek Jensena,⁎, Makhmud Abu El Kheyrb, Rajesh Moheycc

a Department of Anesthesia, Hospital Unit Vest, Herning, Denmark
b Department of Cardiology, Hospital Unit Vest, Herning, Denmark
c Department of Medicine; section of Infectious Diseases, Hospital Unit Vest, Herning, Denmark

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A B S T R A C T

Constrictive and effusive-constrictive pericarditis are rare cardiac disorders. Only rarely are the conditions caused by purulent infection, and even more infrequently by anaerobe bacteria. We describe a case of constrictive – and effusive-constrictive pericarditis due to Cutibacterium (formerly Propionibacterium) acnes in a 75-year old, immunocompetent and previously healthy patient without any predisposition. The patient was successfully treated with subtotal pericardiectomy and beta-lactam antibacterials. C. acnes was the only infectious agent recovered from samples of cultured pericardial tissue.

C. acnes is a microaerophilic, Gram-positive anaerobic bacillus that is a part of the normal flora. In symptomatic patients, however, positive samples should be considered as clinically relevant and not dismissed as contamination. Due to the low virulence, the capability of adherence and biofilm formation of C. acnes, diagnosing C. acnes constrictive pericarditis may be difficult. In the context of compatible symptoms, the incubation time of clinical samples should be prolonged or supplemented by polymerase chain reaction techniques. Parenteral beta-lactam antibacterials are considered the drugs of choice.

We describe a rare case of constrictive pericarditis caused by Cutibacterium acnes (C. acnes), formerly Propionibacterium acnes (P. acnes) [5], in an immunocompetent patient without predisposition to C. acnes infection.

C. acnes has a low virulence, is a skin colonizer, and when isolated from clinical samples, it is often considered a contaminant [6]. We imply that these two factors result in the underestimation of its clinical significance and hence delay in diagnosis and appropriate treatment. In this case report we describe the clinical symptoms, characteristics, major findings and treatments of C. acnes associated pericarditis, and review the clinical literature on previously reported cases.

Case

A 75-year old man with hypertension, but otherwise healthy, was referred to our Cardiology department for a tentative diagnosis of congestive heart failure. Symptoms included fatigue, progressive dyspnea, position-dependent chest pain and pitting edema of the lower extremities. The symptoms had developed over a two-month period with worsening of symptoms seven days prior to admission. On admission his blood pressure was 136/65 mmHg, heart rate 90/min and a core temperature of 37.8 ° Celsius. Electrocardiography showed low voltage in the extremity leads, but no signs of arrhythmia or ischemia. Chest radiograph revealed ectasia cordis and left sided pleural effusion. Blood chemistry showed C-reactive protein 51 mg/L with a normal white blood cell count. Transthoracic echocardiography revealed concentric pericardial effusion measuring 16 mm, elevated central venous
pressure, normal chamber dimensions and wall thickness, no valve disease and normal left ventricular systolic and diastolic function (Fig. 1A).

The patient was tentatively diagnosed with viral pericarditis and parapneumonic effusion and received oral amoxicillin/clavulanic acid, furosemide and ibuprofen as an outpatient. However the patient’s condition deteriorated over the following months. Throughout the clinical course, the predominant symptoms remained: asthenia, intermittent chest pain and symptoms of heart failure with dyspnea and pitting edema of the lower limbs.

Diagnostic approach for evaluation of pericarditis included testing for tuberculosis as well as other infectious causes and rheumatic and autoimmune diseases.

Intensified diuretic therapy and pleurocentesis resulted in only transient alleviation of the symptoms. The patient showed signs of progressive heart failure with increasing dyspnea, excessive edema of the lower extremities and he developed drug resistant atrial fibrillation. Repeat echocardiography showed thickening of the pericardium at four millimeters, pericardial effusion, and signs of the heart being incased in a non-pliable pericardium [7]. Computed tomography (CT) scan revealed thickening of the pericardium, pericardial – and pleural effusions, but no other abnormalities (Fig. 1B, C). Invasive evaluation with simultaneous right – and left-heart catheterization showed an equalization of the end-diastolic pressures at 18 mmHg and pressure tracings showed the classic “Dip-plateau” or “Square-root” filling pattern. Both measurements are distinctive hallmarks of constrictive pericarditis [1,7].

Subtotal pericardiectomy through a median sternotomy was performed. Both the parietal and visceral pericardium showed significant thickening and fibrosis, and the visceral pericardium adhered completely to the myocardium. Postoperatively, the patient recovered rapidly with relief of symptoms. Bilateral cardiac catheterization revealed normalization of end-diastolic pressures and a marked improvement in cardiac output and cardiac index.

Gross examination of the pericardium showed severe fibrosis and thickening, approximately nine millimeters. Microscopic examination

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**Fig. 1.** A: Initial echocardiogram, subcostal view; Pericardial effusion due to effusive pericarditis. B, C: Early CT-scan, axial and coronal views; Severe pericardial effusion, slight thickening of the pericardium. D: Preoperative CT-scan, axial view; Minimal pericardial effusion with gross thickening of the pericardium.
showed chronic inflammation and intense pericardial fibrosis. Tissue samples from both the parietal and visceral pericardium were cultured; *C. acnes* was recovered from two samples. No other infectious agents were recovered. Polymerase chain reaction (PCR) for *Mycobacterium tuberculosis* was negative. Antimicrobial susceptibility testing revealed that it was susceptible to penicillin.

The patient was treated with intravenous penicillin G for four weeks, followed by 12 weeks with oral amoxicillin/clavulanic acid. Six months after surgery the patient remained free of infection, showing continued improvement in overall cardiac function, and a complete remission of both pericardial — and pleural effusions as well as atrial fibrillation.

**Discussion**

*C. acnes* is a slow-growing microaerophilic, Gram-positive anaerobic bacillus that is a part of the normal flora of the oral cavity, large intestine, conjunctiva and skin in humans [6]. Prolonged aerobic and anaerobic culture for up to two weeks may be required to isolate the organism from clinical samples [6,8,9]. Most laboratories routinely incubate blood cultures for five days, which may be insufficient for the growth of *C. acnes*. When isolated from clinical samples it is often considered as a contaminant. An increasing number of studies have described *C. acnes* as the cause of serious infections such as endocarditis, prostatic joint infection, endophthalmitis, osteomyelitis and central nervous system infections. Due to the low virulence, the capability of adherence and biofilm formation of *C. acnes*, these infections, like constrictive pericarditis, are often associated with minimal clinical signs of infection at initial presentation and a diagnostic delay [8–12].

Like other cases described in the literature [4,13,14], our patient’s acute effusive pericarditis developed into effusive-constrictive pericarditis, and, subsequently, into constrictive pericarditis requiring pericardiectomy (Fig. 1A–D).

Our case highlights the potential severity of *C. acnes* constrictive pericarditis, but also the difficulty in isolating *Catheter bacterium* spp.

We conducted a search for similar cases described in PubMed and Medline databases. Two case reports described *C. acnes* as the cause of constrictive — or effusive-constrictive pericarditis in six patients [15,16]; five were in men and one in a woman. The clinical course of all patients were characterized by minimal signs of infection at initial presentation and a long diagnostic delay, mean 30 weeks, compared to 17 weeks for our case. The predominant symptoms were asthma, chest pain, palpitations, and symptoms of heart failure. A combination of culture results, echocardiograms, magnetic resonance imaging and cardiac catheterization was used to ascertain the diagnosis. *C. acnes* was penicillin-sensitive in all patients. All patients needed a combination of surgery and prolonged treatment with antibiotics to alleviate symptoms. Three patients experienced relapses requiring further medical treatment including anti-inflammatory drugs, and corticosteroids.

The etiology of constrictive and effusive-constrictive pericarditis is identical. The most common causes of both conditions are: idiopathic and viral infections followed by postsurgical, posttrauma, tuberculous and miscellaneous [3,17]. Only three to six percent of cases are thought to be caused by purulent pericarditis and only a small number of these due to anaerobe bacteria [2–4]. However, a recent study in which samples from 138 patients with infectious pericarditis, 20 of whom had constrictive pericarditis, were examined using prolonged aerobic and anaerobic culture for up to two weeks, revealed *C. acnes* as the etiologic agent in 49 patients. The study included a high volume of cardio-vascular surgeries, prostatic valve implantations, dental procedures and a high prevalence of immunocompromised patients [13]. *C. acnes* as the causative agent of constrictive and effusive-constrictive pericarditis is probably underestimated.

Untreated, the mortality of bacterial pericarditis approaches 100% [4]. Our patient was treated successfully with subtotal pericardiectomy and beta-lactam antimicrobials. He remained free of relapse after 6 months. Long-term survival for constrictive pericarditis patients with infectious or idiopathic disease is favorable (88%), compared to postsurgical (66%), or postradiation disease (27%) [2,3].

The current expert opinion suggests parental penicillin G for initial management of serious *C. acnes* infections, until the antibacterial therapy can be guided by antimicrobial susceptibility [18]. This is substantiated by a study of 304 isolates of *C. acnes* from invasive infections in Europe that found 100% susceptibility to penicillin and vancomycin [19].

We consider *C. acnes* to be an important and underestimated cause of constrictive pericarditis and effusive-constrictive syndrome.

This case demonstrates that invasive infection can occur even in an immunocompetent patient without predisposing factors. Diagnosis may be difficult, but in the context of compatible symptoms, the incubation time of clinical samples should be prolonged or supplemented by polymerase chain reaction techniques. In symptomatic patients, positive samples should be considered as clinically relevant and not dismissed as contamination.

Parenteral beta-lactam antimicrobials are considered the drugs of choice. However, the optimal duration of antibacterial therapy is unknown and should be individualized depending on the clinical circumstances.

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**Conflicts of interest**

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**References**

[1] Sengupta PP, Epley MF, Khandheria BK. Constrictive pericarditis. Circ J 2008;10:1555–62.
[2] Ling LH, Oh JK, Schaff HV, Danielson GK, Mahoney DW, Seward JB, et al. Constrictive pericarditis in the modern era: evolving clinical spectrum and impact on outcome after pericardiectomy. Circulation 1999;100:1380–6.
[3] Bertog SC, Thambidorai SK, Parakh K, Schoenhagen P, Ozdurnan P, Houghailing PL, et al. Constrictive pericarditis: etiology and cause-specific survival after pericardiectomy. J Am Coll Cardiol 2004;43:1445–52.
[4] Pankauweit S, Ristic AD, Seferovic PM, Maisch B. Diagnosis and management of bacterial pericarditis. Am J Cardiovasc Drugs 2005;5:103–12.
[5] Scholz CFP, Kilian M. The natural history of cutaneous propionibacterium, and reclassification of selected species within the genus Propionibacterium to the proposed novel genus Acidopropionibacterium gen nov. Catheter bacterium gen. nov. And Pseudopropionibacterium gen. nov. Int J Syst Evol Microbiol 2016;66:4422–32.

[6] Park HJ, Na S, Park SY, Moon SM, Cho O, Park K, et al. Clinical significance of propionibacterium acnes recovered from blood cultures: analysis of 524 episodes. J Clin Microbiol 2011;49:1598–601.

[7] Hancock EW. Differential diagnosis of restrictive cardiomyopathy and constrictive pericarditis. Heart 2001;86:343–9.

[8] Clayton JJ, Baig W, Reynolds GW, Sandoe JA. Endocarditis caused by Propionibacterium species: a report of three cases and a review of clinical features and diagnostic difficulties. J Clin Microbiol 2006;55:981–7.

[9] Brueggemann H. Insights in the pathogenic potential of Propionibacterium acnes from its complete genome. Semin Cutan Med Surg 2005;24:67–72.

[10] Gunhard H, Hany A, Turina M, Wust J. Propionibacterium acnes as a cause of aggressive aortic valve endocarditis and importance of tissue grading: case report and review. J Clin Microbiol 1994;32:3043–5.

[11] Chu RM, Tummala RP, Hall WA. Focal intraocular infections due to Propionibacterium acnes: report of three cases. Neurosurgery 2001;49:717–20.

[12] Vafidis G. Propionibacterium acnes endophthalmitis. Br J Ophthalmol 1991;75:706.

[13] Mookadam F, Moustafa SE, Sun Y, Wilson FC, Mohammed SS, Park S, et al. Infectious Pericarditis: an experience spanning a decade. Acta Cardiol 2009;64:297–302.

[14] Hancock EW. A clearer view of effusive-constrictive pericarditis. N Engl J Med 2004;350:435–7.
[15] Mesado D, Sarriá C, Bustamante J, Rodríguez JE, Domínguez I, Olivera MJ. Constrictive infectious pericarditis caused by Propionibacterium acnes. Rev Esp Cardiol 2013;66:403–15.

[16] Iseki H, Kayaba Y, Tamura T, Uzawa H, Suko Y, Miyamoto K. Localized pericarditis with calcifications mimicking a pericardial tumor. Intern Med 1999;39:355–8.

[17] Sagristá-Sauleda J, Angel J, Sánchez A, Permanyer-Miralda G, Soler-Soler J. Effusive-constrictive pericarditis. N Engl J Med 2004;350:469–75.

[18] Kanafani ZA, Sexton DJ, Baron EL. Invasive Cutibacterium (formerly Propionibacterium) infections. 2017 http://www.uptodate.com/contents/invasive-propionibacterium-infections.

[19] Oprica C, Nord CE. European surveillance study on the antibiotic susceptibility of Propionibacterium acnes. Clin Microbiol Infect 2005;11:204–13.