



## *Propionibacterium acnes* Infection of a Mitral Annuloplasty Ring

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### Abstract

*Propionibacterium acnes* (*P.acnes*) is a Gram-positive bacillus which is part of the normal human skin flora. As such, this organism is typically considered a contaminant when grown in blood cultures. However, *P.acnes* is increasingly being recognized as a rare cause of infective endocarditis. This case describes *P.acnes* infection of a mitral valve annuloplasty ring and highlights the emerging role of this organism as a cause of culture-negative endocarditis, particularly in the setting of intracardiac devices or prostheses.

### Introduction

*P.acnes* is a ubiquitous aerotolerant, anaerobic, Gram-positive bacillus that can be cultured from human skin, conjunctiva, oropharynx, intestine, and the genitourinary tract. On the skin surface, it typically resides in hair follicles and sebaceous glands, where it hydrolyzes fatty acids and releases proteases which activate pro-inflammatory pathways [1-3]. Aside from its usual association with acne vulgaris, it is typically considered a non-pathogenic bacterium with low virulence. However, this seemingly benign organism has increasingly shown potential to be invasive, particularly in the setting of implanted devices such as prosthetic joints, cerebral shunts, breast implants, intraocular lenses, and endovascular devices [4,5]. Although rare, endocarditis secondary to *P.acnes* is associated with a high risk of complications including abscess formation and valve dehiscence [6,7]. Here, we describe a case of mitral valve annuloplasty ring endocarditis caused by *P.acnes* which highlights the diagnostic challenges this organism raises.

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### Case Presentation

A 67-year-old male with a history of chronic atrial fibrillation underwent a successful mitral valve repair for severe mitral regurgitation. He was maintained on aspirin and warfarin post-operatively. Approximately one year post-operatively, he presented with large bilateral cerebellar strokes in the setting of a therapeutic INR. On transesophageal echocardiogram (TEE), multiple small mobile well-circumscribed and multi-lobulated vegetations (largest measuring 0.6 x 0.9 cm), were seen attached to the mitral annuloplasty ring (Figure 1A and B). The patient had no fever or other signs or symptoms of infective endocarditis. Labs revealed a WBC of 9.5 B/L, ESR of 18 mm/hr and CRP of 0.3 mg/dL. Four sets of blood cultures obtained with BD BACTEC bottles (BD Medical Technology, Sparks, MD) remained negative after incubation for five days, and no antibiotics were given. He was suspected to have developed a cardioembolic stroke from a non-infectious thrombus despite normal hypercoagulable labs and full therapeutic anticoagulation with warfarin. His anticoagulation was switched to apixaban due to suspected warfarin therapeutic failure. A TEE was performed six months later to re-evaluate the vegetations. This follow-up TEE revealed a larger 1.6 cm x 1.1 cm x 1.0 cm vegetation attached to the mitral annuloplasty ring and basal portion of the posterior mitral valve leaflet (Figure 2A-C). Given the growing vegetation, the patient was readmitted to the hospital. Again, the patient was afebrile and labs revealed a WBC of 8.0 B/L, ESR of 31 mm/hr, and CRP of 0.72 mg/dL, and three sets of blood cultures remained negative after incubation for 14 days. The progressive size and characteristics of the vegetation was suggestive of infective endocarditis despite the negative infectious evaluation. Therefore, the patient was recommended to have surgical removal of the mitral annular ring with histopathologic examination of the vegetation. During surgery, the vegetation was found to be purulent, and anaerobic culture of the surgical specimen grew *P.acnes* after on the sixth day of incubation. He was treated with six weeks of IV Penicillin G and had a successful recovery.



**Figure 1:** Trans-esophageal echocardiogram following stroke.

(A) 2-chamber view of the mitral valve in systole with vegetations attached to the mitral annuloplasty ring.

(B) 3D TEE image of the mitral valve in diastole with multiple small vegetations attached to the mitral annuloplasty ring.

## Discussion

*P.acnes* is an uncommon cause of endocarditis, with as few as 70 cases formally recognized from a recent literature review [8]. Given its delayed growth from cultures, misdiagnosis as a contaminant, and lack of clinical symptoms, the true incidence of *P.acnes* endocarditis is likely underreported. The ability of this bacterium to produce a biofilm makes it a suitable pathogen for implanted devices [9]. *In vitro* studies have demonstrated the ability of this organism to adhere and form biofilms on a variety of materials including glass, steel, and silicone [5]. Confocal laser microscopy of infected prosthetic hips have also confirmed the presence of these biofilms *in vivo* [10]. Of the limited cases of *P.acnes* endocarditis available, prosthetic valves are involved in ~80%, with the aortic valve most frequently targeted. A recent case series of 24 patients with *P.acnes* endocarditis reported 96% involvement of prosthetic valves and annuloplasty rings, suggesting possible higher predilection for intracardiac devices than previously thought [11]. Cardiac implantable electrical devices (CIEDs) have been implicated as well with subsequent extraction demonstrating infected thrombus surrounding the leads [12,13]. The few cases involving native valves are usually associated with prior valvular pathology such as rheumatic heart disease or valvular stenosis [14].

There are several factors which complicate the diagnosis of *P.acnes* endocarditis. Firstly, patients do not exhibit typical symptoms such as fever and often do not fulfill the Duke's criteria for infective endocarditis. On average, this insidious infection manifests approximately 4-5 years after valve replacement, when clinicians are less likely to suspect a post-operative infection [15]. Furthermore, inflammatory markers such as C-reactive protein may not be elevated to levels typically seen with infective endocarditis. However, despite this deceptive lack of the classical symptoms, mortality from *P.acnes* endocarditis ranges from 20-40% [16]. In addition to its predilection for forming intracardiac abscesses, multiple reports of valve dehiscence and systemic embolization have been described [11,17,18]. Thus, antibiotics alone are usually insufficient; with 81% of cases requiring surgical intervention [8]. The microbiological characteristics of *P.acnes* also serve as a diagnostic barrier. Many hospital laboratories hold blood cultures for five days, whereas the growth of *P.acnes* can sometimes take up to 2 weeks to become detectable. Given this extreme delay of growth in addition to subtle symptoms, this entity may often be confused with culture negative endocarditis. Although *P.acnes* is not considered a "true" culture negative endocarditis, up to 40-50% of blood cultures can remain persistently negative despite prolonged incubation. Furthermore, even if this organism is detected in blood culture, it has been demonstrated that up to 75% of *P.acnes*



**Figure 2:** Follow-up trans-esophageal echocardiogram.

(A-B) 2-chamber view of the mitral valve in systole (A) and diastole (B) with a large vegetation attached to the annuloplasty ring and posterior mitral valve leaflet.

(C) 3D TEE image of the mitral valve in systole with a large vegetation attached to the mitral annuloplasty ring.

cultures are regarded as a skin contaminant [16].

## Conclusion

*P.acnes* is a part of normal adult skin flora and is increasingly being demonstrated as a cause of invasive infections, particularly of implanted devices. Several factors contribute to the delayed diagnosis and the initiation of appropriate therapy: the lack of classical symptoms of infective endocarditis, prolonged incubation period for blood culture, and the tendency to consider this organism as a contaminant when it is grown in culture. Thus, if clinically concerned for *P.acnes* endocarditis, it is recommended to incubate blood cultures for a minimum of two weeks and not dismiss positive cultures as contaminant.

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