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CASE REPORT

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Mycobacterium phocaicum detection in a child with a dysfunctional bioprosthetic valve

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Abstract

Nontuberculous mycobacteria have been identified as the cause of bioprosthetic valve dysfunction in adults. In 2006 Mycobacterium phocaicum has been isolated by means of rpoB gene sequencing and has since been identified as the cause of bacteremia in pediatric hematology-oncology patients. We observed growth of Mycobacterium phocaicumon the bioprosthesis of a child suffering from infective endocarditis after cardiac surgery.

Keywords: *bioprosthetic valve endocarditis, mycobacterium phocaicum, pediatric valve endocarditis*

Introduction

Endocarditis in children is often associated with pre-existing heart disease, and prosthetic valve endocarditis accounts for about 8% of these cases [1]. The most common causal pathogens are *Staphylococcus aureus* and *Streptococcus viridans*, but recently also nontuberculous mycobacteria have been found on dysfunctional bioprosthetic material in adult and pediatric patients. Persistence of mycobacteria on the bioprostheses as well as infection by contaminated aerosols from heater cooler devices during cardiac surgery have been reported [2-4]. Since detection of infection by blood culture needs specific media and possibly prolonged incubation time, bacteremia is seldom reported. But specific staining and 16s rRNA gene polymerase chain reaction may verify the infection on the removed prostheses.

Case report

We are reporting on an 11-year-old boy who suffered from infective endocarditis at least partly caused by *Mycobacterium phocaicum.* His past medical history included Tetralogy of Fallot correctionby means of a transanular patch in his newborn period and placement of a right ventricle to pulmonary artery (RV-PA) bioprosthetic conduitat the age of 9 years. 26 months laterat the age of 11 he was referred to our pediatric cardiac surgical unit for exchange of his RV-PA conduit. An infective endocarditis had been suspected and confirmed by a positive blood culture with *Streptococcus oralis*. He had suffered from recurrent fever for about 7 weeks, and leucocytes, C-reactive protein (CRP) and procalcitonin (PCT) had been elevated. He was on antibiotic therapy with amoxicillin/clavulanate and afebrile on admission. The leucocyte count was 10.3x109 /L with 80% neutrophils, CRP was in the normal range with 0.1mg/dl.Echocardiography showed a combined stenosis and insufficiency within the conduit, which had been inserted two years before, and a progressiveright ventricular dilatation could be observed too. A computer tomographyrevealed an enlargement of the left pulmonary arteryand a thickening of the main and left pulmonary arterialwall as a sign of inflammation. Therefore, dilatation of the stenosis and implantation of a valved stent by cardiac catheterization was not feasible.As a consequence, the conduit was replaced by a homograft on cardiopulmonary bypass. Upon surgical exploration an aneurysm was found distal to the conduit valve and after incision the valvular cusps appeared completely destroyed. But no thrombus, vegetation or ulceration could be detected. The bioprosthesiswas excised in all. Besides temporary pacing due to bradycardia and nausea the postoperative course was uneventful. The antibiotic therapy was continued and the patient could be discharged to the referring hospital one week after surgery. The microscopy revealed local infiltration

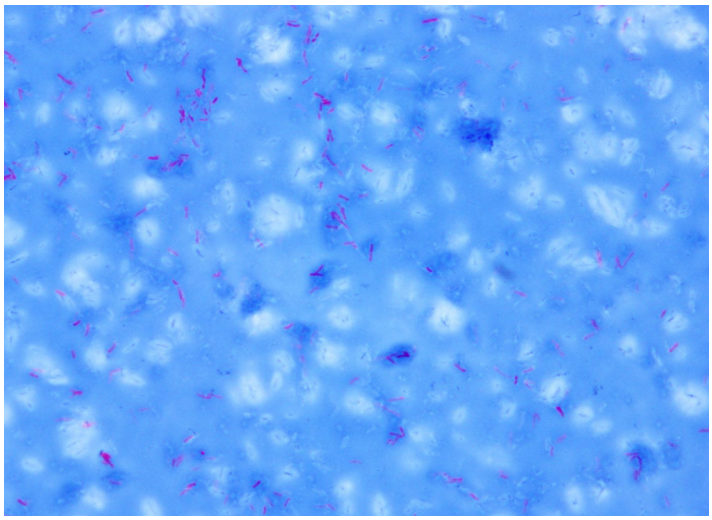

Figure 1. *Ziel-Neelson staining of culture medium showing acid-fast bacilli.*

by lymphocytes and neutrophil granulocytes on the removed valveas well as fibrinoid necrosis and vascularisation. Initially no causative organism could be detected.After about two weeks incubationof the valve (BHI bioMerieux) small rods were found by microscopy which were identified as mycobacteria by Ziehl-Neelson staining (Figure 1). RpoB gene sequencing was performed at the research centerBorstel/Hamburg/Germany and the result was *Mycobacterium phocaicum* susceptible to amikacin, linezolid, imipenem, cefoxitin, co-trimoxazole and clarithromycin, but resistant to ciprofloxacin and doxycycline. The referring hospital was informed by telephone call to perform blood cultures specific to mycobacteria to potentially detect any residual microbes. Blood cultures have been negative as well as clinical signs of infection during the ongoing observation period of two years now. The child has been treated with amoxicillin/clavulanate intravenously for 6 weeks after the operation and is stillon prophylactic oral phenoxybenzylpenicillin.

Discussion

A series of bioprostetic valve endocarditis caused by nontuberculous mycobacteria was reported in adults [2]. The infection caused paravalvular regurgitation, and accordingly valve replacement was necessary. Routine blood cultures were negative, as well as gram staining and conventional cultures of the prosthetic material. Only by Ziehl-Neelsen staining acid-fast bacilli could be detected and identified as mycobacteria by 16 S rRNA gene polymerase chain reaction. The source of infection, possibly bacterial survival and proliferation on the prosthetic material or postoperative entry is to be clarified. On the recommendation of the authors explanted bioprosthetic material should be examined carefully including Ziehl-Neelson staining especially in the case of early graft dysfunction. Native valve endocarditis caused by Mycobacteria has been reported very rarely in patients suffering from a severe underlying disease, like end stage chronic obstructive pulmonary disease (COPD), and mycobacteria could be isolated from the lung and blood cultures as well [5]. In another series of infectious endocarditis with negative blood cultures after bioprosthetic valve replacement in adults *Mycobacterium chelonea* could be identified as the causative microorganism [6]. Different treatment modalities were applied. One patient not receiving any specific antimicrobial treatment remained without relapse ofthe infection. Therefore it is obvious that surgical treatment plays an important role and might even be the sole treatment considering the estimated number of unreported cases. Mycobacteria are known to form a biofilm consisting of a polysaccharide- rich extracellular matrix with entrapped bacteria within it, making them resistant to antibiotics. As biofilms are formed predominantly on foreign materials, diagnosis of infection is essential to avoid reimplantation of another foreign body into an infected area [7]. Divergence in the 16S rRNA sequence of rapid growing mycobacteria was published in 2003. But complete 16S rRNAsequence homology may be shared among some mycobacterial species [8]. Nevertheless 3 novel rapid growing mycobacteria species were discriminated in 2006. Amongst others the polymorphic region of rpoB (nucleotides 2533 to 3255) was used to identify Mycobacterium bolletii, *Mycobacterium phocaicum* and *Mycobacterium aubagnense* [9]. So far only blood stream infections caused by *Mycobacterium phocaicum* have been described in pediatric [10] and adult hematology-oncology patients [11]. Therapy consisted of removal of catheters and antimicrobial therapy for several weeks. Patients eventually recovered and removal of the central line turned out to be the most effective treatment. Mycobacterium phocaicum has been found in water of therapy pools and in aerosols generated from indoor swimming pools and hot tubs [12]. Therefore, community-acquired infections as well as contamination of medical devices and nosocomial infections may arise.

To our knowledge this is the first observation of *Mycobacterium phocaicum* on an infected bioprosthesis in a child. Our patient had been tested positive for Streptococcus oralis by blood culture prior to admission and was treated accordingly. Because of his valve dysfunction an intervention was inevitable. Since there were signs of inflammation on the CT scan, surgery was the method of choice and microscopy revealed inflammation as well as the presence of *Mycobacterium phocaicum* in the culture medium containing the excised valve by Ziehl-Neelson staining. We received this result 6 weeks after surgery. Due to the patient`s good clinical condition without any evidence of recurrent infection and reports of *Mycobacterium phocaicum* susceptible to amoxicillin/clavulanate [11] in the literature we refrained from further antibiotic treatment besides prophylactic oral phenoxybenzyl penicillin. Inaddition the foreign body had been removed and there was no dysfunctional immune status in this child.

Conclusion

Mycobacteria may cause valve dysfunction in culture negative bioprosthetic valve endocarditis, however a positive blood culture consisting of a different pathogen does not rule out growth of mycobacteria on biologicalprosthetic material.

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