Endocarditis caused by Staphylococcus aureus: A Rare Case of Aortic Valve Perforation

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Abstract
We report a case of acute endocarditis with aortic valve destruction caused by Methicillin-resistant Staphylococcus aureus in a 60 year old woman in healthy valve after dental extraction without bacterial prophylaxis. S. aureus is an aggressive pathogen and bacteremia with this organism can infect healthy heart valves. Neurological complications of infective endocarditis, particularly embolic events, tend to be higher with this organism. S. aureus typically causes acute endocarditis and progresses to death within weeks if left untreated.

Methicillin-resistant Staphylococcus aureus (MRSA) is a gram-positive bacterium that is genetically different from other strains of Staphylococcus aureus. MRSA is any strain of S. aureus that has developed multiple drug resistance to betalactam antibiotics. During the hospitalization there was also the sudden appearance of hemolytic anemia and thrombocytopenia, fever and neurological dysfunction. The patient received intensive treatment with antibiotics (gentamicin and daptomycin). Given the slow and ineffective clinical response, it has undergone the success of aortic valve replacement.

IE: Infective Endocarditis; SA-NVIE: Staphylococcus Aureus Native Valve Infective Endocarditis; HF: Heart Failure; MRSA: Methicillin Resistant Staphylococcus Aureus; NVE: Native Valve Endocarditis, PVE: Prosthetic Valve Endocarditis

Introduction
Infective endocarditis (IE) is defined as an infection of the endocardial surface of the heart, which may include one or more heart valves, the mural endocardium, or a septal defect. Its intracardiac effects include severe valvular insufficiency, which may lead to intractable congestive heart failure and myocardial abscesses. If left untreated, IE is almost inevitably fatal [1].

Staphylococcus aureus is the leading cause of infectious endocarditis and its mortality has remained high despite better diagnostic and therapeutic procedures over time.

S. aureus endocarditis is an aggressive, often fatal, infection. The results of the current study suggest that valve replacement will improve the outcome of infection [2]. Staphylococcus aureus native valve infective endocarditis (SA-NVIE) is not completely understood. S. aureus is an important and common cause of IE. The outcome of SA-NVIE is worse than that of non-SA-NVIE. Several clinical parameters are independently associated with mortality for patients with SA-NVIE [3].

Case Presentation
At 60 years with a history of hypertension presented in hospital with fever not sensitive to penicillins and dyspnoea.

On physical examination her vital organs were: BP 115/80, T 38°C and its O2 saturation was 97% on oxygen (2l/ min). Her respiratory examination revealed mild
Crackles in the lower pulmonary area. The rest of the exam was irrelevant. Her blood counts were WBC 11.84 × 99 / L, hemoglobin 11.5 g / L (MCV 86 fL) and platelets 228 × 109 / L. The electrolytes included sodium 135 mmol / L, potassium 4.4 mmol / L. Other investigations showed creatinine 1.2 mM / L and d-dimer 1024 (normal < 250 ng / mL). His ECG was normal sinus rhythm with ischemic characteristics.

A dose of gentamicin (1mg/ kg e.v three times a day) and daptomycin (6mg/ kg e.v one a day) for seven days. She was received and did not respond well despite the resolution of the fever. A transthoracic echocardiogram performed at the entrance revealed vegetation (4.6 ×10 mm) on the aortic semilunar (right cusp). Her cardiac work-up together with the DUKE criteria suggested endocarditis on a native aortic valve. Hemoglobin levels started to drop (upto 7.7 g / L) and after 2 whole blood pockets almost completely normalized in four days (hemoglobin after transfusion: 9.8 g / L); also suggesting the high pathogenic aggressiveness. There was also a decline in iron. During the anemia the hemodynamic conditions were established. For this reason therapy with diuretics and titrated therapy with ace-inhibitors and beta-blockers has been undertaken. Effective overall treatment for normalization of hemodynamic parameters.

Serious blood cultures were made that isolated the Staphylococcus aureus resistant to penicillins. A computerized tomography to the brain was performed that showed microembolization (two millimeters of hyperdense areas in the frontal and parietal right and another in the right cerebellar hemisphere).

On the seventh day, considering the lack of clinical response, a transesophageal echocardiogram was performed which demonstrated the growth of the vegetation up to a length of 16.6 mm and width 6.5 mm (Figure 1) and showed a perforation of one of the semilunar aortic (Figure 2).

For these reasons, a surgical replacement with mechanical prosthesis has been indicated. She was submitted to replacing the valvular with biopics mechanical prosthesis (Sorin Biocarbon n 23) (Figure 3). The patient recovered completely after surgery and was safely discharged home on the thirtieth day.
Discussion
The literature related to three aspects of dental bacteremia has been reviewed in regard to post-procedure bleeding and bacteremia, intensity of bacteremia, and cumulative exposure to bacteremia from “everyday” events. Significant bacteremia can occur in the absence of clinically discernible bleeding. The cumulative exposure to bacteremia is significantly greater from everyday procedures when compared to dental operative procedures. It is far more likely that such everyday procedures are the cause of bacterial endocarditis because the cumulative exposure is often hundreds, thousands, or even millions of times greater than that occurring following surgical procedures such as extraction of teeth. The value of antibiotic prophylaxis prior to dental treatment is questioned [4]. The committee concluded that only an extremely small number of cases of IE might be prevented by antibiotic prophylaxis for dental procedures even if such prophylactic therapy were 100 percent effective. Infective endocarditis (IE) prophylaxis for dental procedures should be recommended only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from IE [5]. Antibiotic prophylaxis should be considered for patients at higher risk of IE:
1. Patients with any prosthetic valve, including a transcatheter valve, or those in which none prosthetic material was used for the heart valve repair
2. Patients with a previous episode of IE
3. Patients with CHD [6]

Staphylococcus aureus is a major cause of bacteremia and endocarditis. S. aureus bacteremia is associated with serious complications, including endocarditis, in 30-40% of cases. Staphylococcus aureus carries a very high risk of mortality and often requires a timely replacement of the valve. The reasons are the manifestations of heart failure, the resistance to antibiotics, large vegetation (> 10 mm) and valvular complications.

Heart failure (HF) is the most frequent complication of IE and the most common indication for surgery in IE. HF is more often present when IE affects the aortic rather than the mitral valve. Uncontrolled infection is one of the most feared complications of IE and is the second most frequent cause for surgery. Among these, the size and the mobility of the vegetations are the most potent independent predictors of a new embolic event. Patients with vegetations > 10 mm in length at higher risk of embolism.

In literature are described cases of thrombotic thrombocytopenic purpura associated with Staphylococcus aureus endocarditis on base the bacteremia secondary to infection. The mechanism of intravascular hemolysis due to endocarditis with its turbulent flow is not described obviously in medical literature. Rapid acceleration, fragmentation and collision of high-velocity blood across of vegetation are associated with a high shear stress that leads to hemolysis. Hypoferremia and anemia have developed in patients with staph infection for the release of toxins. Hypoferremia preceded the development of anemia. If under the conditions of infection the tissues have a high requirement for iron, questions of great interest are why they should need more iron, and what function this element performs in the inflammatory reaction. Treatment of the infection and intensification of the plasma exchange regimen resulted in a sustained remission [7].

What is the treatment of bacteraemia and infective endocarditis on a native valve from MRSA?
Bacteremia and infectious endocarditis from MRSA are pathologies serious diseases associated with considerable morbidity, and mortality due to endocarditis from MRSA amounts to 30% [8]. Evaluation for surgical intervention is recommended valve replacement in the presence of large vegetation (> 10 mm in diameter), occurrence of ≥1 embolic event during the first 2 weeks of therapy, insufficiency severe valvular, perforation or valvular dehiscence, insufficiency decompensated heart, perivalvular or myocardial abscess, heart block de novo or fever or persistent bacteraemia [9]. The therapeutic options for bacteremia and endocarditis caused by S. aureus, in particular S. aureus meticillin-resistant (MRSA), are limited. Vancomycin, the standard therapy for blood infections attributable to MRSA, has been associated with non-optimal outcomes. New agents are needed for the treatment of bacteremia and S. aureus endocarditis. Daptomycin 6 mg / kg / dose iv 1 / day is an alternative to vancomycin for the treatment of bacteremia and endocarditis from MRSA in adults. Daptomycin is a cyclic lipopeptide antibiotic that is rapidly bactericidal in vitro compared to most clinically relevant gram-positive bacteria, including S. aureus.

We evaluated the efficacy and safety of daptomycin compared to standard therapy for S. aureus bacteremia and endocarditis [10]. Patients with S. aureus endocarditis not showing prompt response to antibiotic treatment must be considered for early operation. Similarly, timely operative intervention for patients with annular abscess will be essential in decreasing late valve
infections and perivalvular leaks. Controversy exists regarding which valve type is best for patients with native (NVE) or prosthetic valve endocarditis (PVE). Historically, it has been suggested that bioprosthetic valves may be less susceptible to early recurrent endocarditis than mechanical valves, but that they may be more susceptible to late endocarditis due to infection of the tissue leaflets. Recent reviews have substantiated linearized PVE rates of less than 1.0% per patient-year for bioprosthetic and mechanical valves. Operative mortality and complication-free survival were also similar with mechanical and bioprosthetic valves. Mechanical valves are most suitable for younger patients with native valve endocarditis [11]. Symptomatic neurological complications occur in 15-30% of patients with IE and are mainly the consequence of embolism from vegetations. S. aureus IE is more frequently associated with neurological complications compared with IE caused by other bacteria. Vegetation length and mobility also correlate with embolic tendency. TEE is preferred to TTE in adults with bacteremia from MRSA for its superiority in the detection of vegetations and in the identification of complications such as intracardiac abscesses and valve perforations. The transesophageal (TEE) approach offers high quality images with excellent structural resolution. The risk factors associated with hospital mortality were embolism, a vegetation size of more than 10 mm and infection with Staphylococcus aureus [12]. A precise echocardiographic visualization of the vegetations helps to stratify the patients in a high risk subgroup, perhaps justifying an early prophylactic surgery. Transesophageal echocardiography can play an important role in assessing the clinical outcome of these patients [13].

Reasons to consider early surgery in the active phase (i.e., while the patient is still receiving antibiotic treatment) are to avoid progressive HF and irreversible structural damage caused by severe infection and to prevent systemic embolism. Rapid diagnosis, effective treatment, and prompt recognition of complications are essential to good patient outcome. TEE should be considered part of the early evaluation of patients. In some cases of IE, antibiotics alone are insufficient to eradicate the infection. Surgery has been indicated when fever and positive blood cultures persist for several days (7-10 days) despite an appropriate antibiotic regimen and when extracardiac abscesses (splenic, vertebral, cerebral or renal) and other causes of fever have been excluded. However, the best timing for surgery in this difficult situation is unclear [14]. A successful IE management requires a combined doctor and surgical approach. Clinical variability and complexity in infective endocarditis, however, impose that guidelines are used to support and not supplant the decisions directed by the physician in the management of individual patients.

Consent
The authors declare that informed written consent was obtained from the patient for the publication of this manuscript and the accompanying figures.

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References
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