Native Valve Bacterial Endocarditis Due to Staphylococcus Epidermidis

A Community Acquired Infection Following an Acute Course

C. Rudniki, M.D., I. Elian, M.D.,* M. Katz, M.D.,
H. Salman, M.D., and I. Zahavi, M.D.

SUMMARY

Staphylococcus epidermidis (SE) is the leading pathogen of prosthetic valve endocarditis. At the same time it is a very rare cause of native valve endocarditis and it follows a clinical course and outcome similar to Streptococcal viridans endocarditis. We report here the case of a 41-year-old man with a community acquired SE endocarditis of a native aortic valve. Despite early surgical intervention, the case followed an acute and fatal course.

Additional Indexing Words:
Bacterial endocarditis Staphylococcus epidermidis Native valve endocarditis

Staphylococcus epidermidis (SE), or coagulase negative staphylococcus, is being recognized increasingly as a pathogen. These organisms are the most frequent cause of positive blood cultures in the hospital and they are common causes of infections around prosthetic devices and in immunosuppressed patients. Staphylococcus epidermidis is now recognized as the most common cause of prosthetic valve endocarditis. Conversely, it is rarely a cause of native valve endocarditis. The subacute course of these two forms of endocarditis are differentiated by the high mortality rate of prosthetic valve endocarditis, the fact that the native valve endocarditis is a community acquired infection that resembles the subacute bacterial endocarditis caused by Streptococcus viridans in its susceptibility to antibiotics, and the prognosis. We recently treated a patient with a community acquired endocarditis of a native aortic valve caused by SE. The clinical course was fulminant with the development of perivalvular and myocardial absces-
ses and congestive heart failure. The patient died, despite appropriate antibiotic therapy and early surgical intervention.

**CASE REPORT**

A 41-year-old man was admitted because of fever and chills that started 6 days before admission. There were no other symptoms and a therapeutic trial with oral amoxycillin was ineffective. Thirty years ago, he underwent cardiac surgery for a patent ductus arteriosus. After the operation the patient remained under medical control for about 20 years because of a persistent faint systolic murmur that was interpreted as a very mild pulmonic stenosis. There was no history of recent travel, use of illicit drugs, homosexual activities or any surgical procedure.

On physical examination at admission he was found to be without dyspnea, pallor or cyanosis. The temperature was 40°C and the arterial blood pressure was 105/70; the pulse rate was 90/min and regular, with a normally shaped carotid pulse. Conjunctival petechiae and cotton wool exudates were seen by ophthalmological examination. The neck was supple without jugular vein distension. The lungs were clear. On heart auscultation the first and second sounds were normal and a 3/6 holosystolic murmur was heard along the left sternal border (LSB).

The liver and spleen were not palpable. The peripheral pulses were normal and the neurological examination was unremarkable. On laboratory examination: the ESR was 90 mm in the first hour, hemoglobin 12.5 g/dl, WBC 14,700/mm³. The differential count revealed: 6% stabs; 78% polymorphonuclears, 14% lymphocytes and 2% monocytes. The platelet count was 180,000/mm³. Urea, creatinine, glucose, electrolytes, SGOT, SGPT, alkaline phosphatase, LDH and serum proteins were within the normal limits. The urine was normal.

The ECG showed normal sinus rhythm, 100 per minute with inverted T waves in leads I and aVL. A chest x ray was normal. An echocardiogram on admission showed a mildly enlarged left ventricle (5.3 cm) and an echogenic mass in the ventricular aspect of the right aortic coronary cusp of the valve compatible with the diagnosis of vegetation.

Three blood cultures were obtained at 30 min intervals and a further culture was obtained 6 hours later before an empiric treatment with penicillin G 24 million U, oxacillin 12 g and gentamycin 240 mg per day was started. All the cultures were taken from different veins and sent for aerobic and anaerobic bacteria cultures. The next day, the growth of gram-positive bacteria was reported in all the blood cultures. Later in the day, the bac-
bacteria were identified as SE, resistant to penicillin and sensitive to oxacillin and gentamycin. Accordingly, the penicillin therapy was discontinued.

During the next 2 days the temperature dropped to 38°C. On the 4th day the murmur located in the LSB became louder and a systolic thrill was palpable over the entire precordial area. A perforation of the ventricular septum causing a ventricular septal defect (VSD) was suspected and confirmed by an Echo-Doppler examination, which revealed a small VSD in the uppermost part of the interventricular septum.

At this time the patient felt well without clinical and radiological signs of cardiac failure. A serum bactericidal titer was 1/16. Because the temperature increased to 39°C, oxacillin was replaced by vancomycin 2 g/day and riphampicin 1,200 mg/day was added.

On the 8th day the patient developed severe dyspnea and a diastolic murmur compatible with aortic regurgitation was heard concomitantly with radiographic evidence of pulmonary edema. Due to these clinical developments, the patient was sent for emergency surgery. The aortic valve was found to be destroyed with the leaflets covered with vegetations. The same vegetations were seen covering the septal area of the right ventricular endocardium. A VSD was closed with a dacron patch and the aortic valve was replaced by a prosthetic Sorin 25 valve.

After the intervention, the temperature dropped to normal levels and the oxacillin was resumed because of increased serum creatinine levels. The postoperative period was uneventful and the patient came back to the medical ward on the 10th postoperative day. He continued to be afebrile without cardiac murmurs until the 22nd postoperative day when he suddenly became tachypneic, tachycardic and on heart auscultation a continuous murmur along the LSB was heard. An Echo-Doppler examination revealed a shunt from the aorta to the right ventricle that was confirmed by cardiac catheterization. The patient died later in the same day.

At autopsy, the sutures of the patch were found to be open, creating a shunt between the aorta and the right ventricle. Around the aortic valve organized necrotic tissue was seen. Tissue cultures were obtained from the prosthetic aortic valve, the perivalvular area, right ventricle and septal endocardium. All the cultures were sterile.

**Discussion**

Although it was often dismissed in the past as a contaminant in cultures, SE must now be evaluated as a potential pathogen. This evaluation has paralleled the advances in medical technology; in particular the
expanded use of temporary and permanent indwelling foreign devices and aggressive therapy with immunosuppressive and cytotoxic agents.\textsuperscript{4}–\textsuperscript{11} Certainly, these organisms have emerged as prominent nosocomial pathogens.\textsuperscript{1}–\textsuperscript{3} Staphylococcus epidermidis has become the leading cause of prosthetic valve endocarditis.\textsuperscript{3,13}–\textsuperscript{14} The mortality rate is very high despite its indolent course, appropriate antibiotic therapy and aggressive surgical approach.\textsuperscript{15} In contrast, SE rarely causes native valve endocarditis, with a relative frequency of less than 5\% of all cases.\textsuperscript{16}–\textsuperscript{20} The symptoms tend to be more insidious, the course more prolonged, and consistent with SE. Because it is usually a community acquired infection, the SE strains are mostly susceptible to $\beta$-lactam antibiotics\textsuperscript{21}–\textsuperscript{23}; this includes the cases of prosthetic valve endocarditis that develop one or more years after surgery.\textsuperscript{4,24}

In two prior reviews in which SE has been reported to cause endocarditis of native heart valve, the majority of the cases had either rheumatic or congenital underlying heart lesions.\textsuperscript{18,22} Interestingly, even mitral valve prolapse (MVP) was not documented in these reports. In 1975 Lachman et al\textsuperscript{25} reported the first 6 cases of SE causing endocarditis in patients with MVP; recently Baddour et al\textsuperscript{26} reviewed the literature of this association. The indolent course of SE native valve endocarditis is well documented: in 7 of 10 patients in the series of Keys and Hewitt\textsuperscript{18} and 10 of 15 in the series of Geraci et al\textsuperscript{21} the symptoms were present at least 1 month before diagnosis. At the same time, in most of the patients even with previous heart disease, a predisposing factor for infective endocarditis was rarely found.\textsuperscript{17,21} Furthermore, the indolent course of most cases of SE endocarditis may delay a correct diagnosis, particularly in patients without congenital or rheumatic heart disease.

The current case is of interest because of the acute course of the disease and the rapid evolution to severe heart failure. The acute aortic insufficiency was caused by the involvement of the aortic valve, and an invasive abscess around the valve caused necrosis of the interventricular septum with the development of the VSD.\textsuperscript{27}–\textsuperscript{30} These were the pathogenic factors of the severe hemodynamic decompensation and indications for emergency surgical intervention.\textsuperscript{31}–\textsuperscript{33}

In general, the outcome of SE endocarditis is unpredictable. Despite the low "virulence" of this organism, the number of deaths in treated cases may remain high.\textsuperscript{26} Even with an appropriate antibiotic regimen, the clinical course may be prolonged with relapses following withdrawal of the drugs and the development of intractable heart failure and death.\textsuperscript{34} The high virulence of the SE in our case was demonstrated by the multiple complications of the disease, despite a potent antibiotic regimen and the peak
serum bactericidal titer of 1/16. Recent reports showed that routine susceptibility testing of SE may falsely label some strains of this organism as susceptible to commonly used antibiotics. When no rapid clinical improvement occur, the immediate change of the prescribed antibiotic regimen or addition of another antibiotic is the recommended approach. This is particularly important because in vitro studies cannot form an objective basis for therapy selection in SE endocarditis. Host factors like age, underlying diseases and severity of the endocarditis at the time of diagnosis will influence the outcome.

Finally, a role of emergency surgery in infective endocarditis cannot be overemphasized in cases in which the chemotherapy fails or potential lethal complications emerge (e.g. severe heart failure, VSD).

REFERENCES

15. Karchmer AW: Staphylococcal endocarditis. Laboratory and clinical basis for antibiotic
therapy. Am J Med 78 (suppl 6B): 116, 1985


29. Arnett EN, Robert WC: Valve ring abscess in active infective endocarditis. Frequency, location, and clues to clinical diagnosis from the study of 95 necropsy patients. Circulation 54: 140, 1976


34. Weinstein L: Modern infective endocarditis. JAMA 233: 260, 1975

