RIGHT-SIDED GRAM-NEGATIVE ENDOCARDITIS AFTER INTRAVENOUS ABUSE OF NON-ILLICIT DRUG

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INFECTIVE ENDOCARDITIS involving the right side of the heart is increasing in frequency, probably as a result of the widespread use of intravenous illicit drugs.[1] Two thirds of the cases of right-sided endocarditis studied at the Mayo Clinic were acute with prominent pulmonary manifestations.[2] Blood cultures were usually positive and *Staphylococcus aureus* was isolated in half of the cases. A case report of right-sided endocarditis involving both the tricuspid and the pulmonic valves with the unusual feature of being precipitated by abuse of non-illicit drugs and resulting from infection with gram-negative bacilli and having the clinical features of tricuspid stenosis and regurgitation is presented.

Case Report

A 30-year-old male nurse, nonsmoker, presented with a history of recurrent attacks of bronchitis for the past 18 months. During these episodes the patient used to treat himself with intravenous ampules of calcium with vitamin C.

Two weeks prior to admission, the patient described paroxysmal attacks of fever associated with chills, shortness of breath, and cough with hemoptysis and cyanosis; each episode lasted for about 30 minutes. On one occasion, he had massive hemoptysis that required a transfusion of two units of packed red blood cells. Past history revealed benign intracranial hypertension which had been treated with dexamethasone, and the last ten days prior to referral, the patient was treated with intravenous cefazolin (1 g every 6 hours).

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On clinical examination, the patient was ill-looking, clubbed, pale, and febrile with a temperature of 39.4 °C. The heart rate was 105 beats per minute, and his jugular venous pressure was elevated to the ear lobe. Left parasternal heave was noted. The first and second heart sounds were loud with an ejection systolic murmur of grade III at the left sternal border and a diastolic rumble at the tricuspid area. Both murmurs increased with inspiration. Hepatomegaly was noted but splenomegaly, skin rashes, or neurological findings were not present.

Initial investigation revealed anemia with hemoglobin, 9.7 g/L; hematocrit, 30.1; and white cell count, 14.3×10^3 with 71% segmented neutrophil and 9% band. The platelet count was normal, and the sedimentation rate was elevated (99 mm/h). The prothrombin time was prolonged to 19.5 s while the control was 15 s. Liver function tests revealed a mildly increased total bilirubin of 29 mmol/L (NR 2-17 mmol/L) with direct of 12 mmol/L. Total protein was 74 g/L; albumin, 36 g/L; liver enzymes were normal; hepatitis surface antigen was negative; blood cultures repeatedly were negative; and urine analysis was normal.

The electrocardiogram showed incomplete right bundle branch block with right-axis deviation. Two-dimensional echocardiography revealed markedly dilated right ventricle and right atrium. A homogeneous echogenic mass was seen attached to the tricuspid valve, measuring 2×3 cm in size (Figure 1). In addition, there was a 5×5 mm mobile echogenic mass attached to the pulmonic valve. Doppler study revealed a diastolic gradient of 10 mm Hg across the tricuspid valve, a tricuspid regurgitation of grade III to IV, and a pulmonary regurgitation of grade II. The chest x-ray revealed clear lung fields with dilated right ventricle.

Ventilation/perfusion lung scan revealed multi-

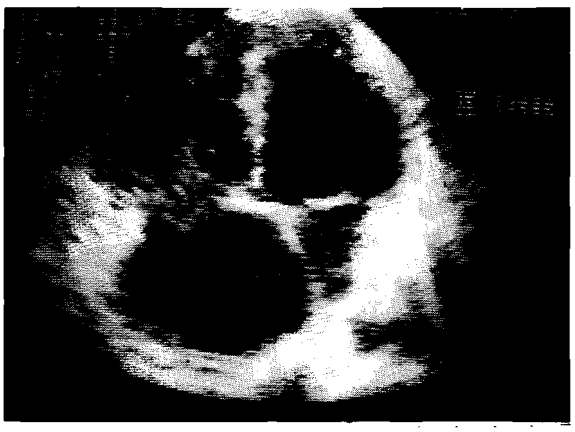

Figure 1. Four-chamber view showing markedly dilated right atrium with large vegetation involving the tricuspid valve.

Figure 2. Right atrial angiogram in anterior posterior position showing the jet of blood going through the tricuspid valve and filling the right ventricle.

ple pulmonary emboli with poor ventilation. Abdominal ultrasound revealed hepatosplenomegaly. Cardiac catheterization confirmed a high right atrial pressure with tricuspid stenosis and a filling defect was noted in the right ventricle (Figures 2 and 3).

Despite treatment with intravenous penicillin (3 million units every 4 hours) and gentamicin (100 mg every 8 hours) for two weeks, the patient continued to have fever. Repeated blood cultures were all negative.

The patient was taken for surgery and the operative findings showed a deformed tricuspid valve with a mass involving both surfaces of the anterior leaflet and extending down to the right ventricular cavity. The mass was reddish to yellowish in color with a fragile segment on the surface. Frozen section revealed inflammatory cells. A size 33 Hancock type II valve was used to replace the tricuspid valve.

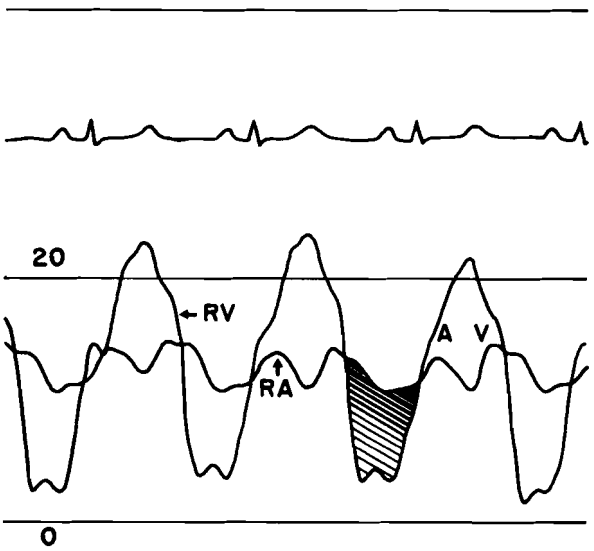

Figure 3. Diastolic pressure gradient noted across the tricuspid valve; RV = right ventricle; RA = right atrium; A = atrial contraction; V = venous filling of the atria by great veins.

The histopathology of the valve showed granulated tissue formation with infiltrate by both acute and chronic inflammatory cells. Phagocytosed particles in macrophages, suggestive of gram-positive bacteria, were seen in gram stain. Culture of the tricuspid valve tissue revealed a mixed growth of *Streptococcus sanguis* (sensitive to ampicillin), *Acinobacter lwoffi,* and *Bacteroides oralis* (both sensitive to cefoxitin).

After the culture and sensitivity of the valve tissues were available, the treatment was modified to intravenous ampicillin (2 gm every 4 hours) and cefoxitin (2 gm every 8 hours) for 4 weeks with good response. The patient became afebrile and was discharged home. A 5-month follow-up revealed no further complications and the patient returned back to work.

Discussion

Involvement of the right side of the heart occurs in about 5% to 10% of the patients with infective endocarditis and affects the tricuspid valve more commonly than the pulmonic valve.[3] The prevalence of right-sided endocarditis, however, has increased significantly in recent years, especially

among intravenous drug addicts.[4]

Pulmonary manifestation as in our case is the predominant clinical feature of tricuspid valve endocarditis.[3,5] Pneumonia or septic pulmonary emboli resulting from dislodgement of fragments of the right-sided cardiac vegetation are present in 60% to 100% of patients with tricuspid valve endocarditis.[4] Thus, cough, sputum production, hemoptysis production, hemoptysis, pleuritic chest pain, and dyspnea are the most common presenting symptoms.

Cardiac manifestations are less prominent in tricuspid valve endocarditis. However, tricuspid regurgitation is present in the majority of patients and is characterized by a short ejection murmur that is best heard over the left sternal border; the murmur increases with inspiration.[3,6] Rarely, tricuspid stenosis can be due to vegetation as in our case.[7] Our patient had a pressure gradient across the tricuspid valve noted by Doppler study and confirmed at cardiac catheterization by simultaneous pressure recordings from the right atrium and the right ventricle.

Recently, Verdejo et al[8] reviewed 46 cases of staphylococcus endocarditis diagnosed with strict criteria in non-drug addict patients and 25 episodes in drug addict patients. Eighty-four percent of the addicts had endocarditis of the tricuspid and the pulmonary valve while only 13% of non-addicts had right heart involvement. The right-sided endocarditis in the non-addict was always due to intracardiac catheters. Fifty-four percent of the endocarditis episodes in the non-addict were fatal.

Gram-negative endocarditis has increased in frequency due to intravenous drug abuse, and nosocomial infections are recognized as the causative agent in 10% of cases.[9] Endocarditis due to *Acinobacter* and *Bacteroides* have been described in the past.[10,11] Failure of medical therapy occurs when organisms are inaccessible to body defense mechanisms and to antibiotics (abscess, large vegetation, the pericardial space). Failure of antibiotic treatment also occurs when the infection is due to highly virulent organisms such as gram negative or fungi. Our patient had failure to medical therapy despite treatment with antibiotics.

Infective endocarditis in intravenous drug abusers poses surgical problems as well. There is more reluctance to insert a prosthetic valve in these patients because most of them continue to abuse drugs who then become at risk of prosthetic valve endocarditis.

In conclusion, right-sided endocarditis is a major risk in drug abuse, and the disease may also result from abuse of non-illicit drugs (such as in our case despite being used by a nursing staff). Careful attention to skin sterilization during any intravenous procedure should be observed and intravenous lines should be evaluated before they become infected.

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