Forward Angiography in the Identification of Vegetations in Tricuspid Endocarditis

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A patient with staphylococcal endocarditis of unknown valvular location and resistant to antibiotic therapy was studied in order to localize the site of infection prior to cardiac surgery. The injection of contrast material into the right atrium visualized tricuspid vegetations which were confirmed at surgery. In such situations, forward angiographic studies constitute a safe, simple, and potentially diagnostic procedure which avoids the hazards of advancing a catheter across an infected valve.

The presence of fever and of positive blood cultures in a patient known to be a heroin user strongly suggests a diagnosis of infective endocarditis. Under these circumstances the infection is usually engraffed upon a valve which was previously normal in structure, often located in the right cardiac chambers. Aside from the manifestations of sepsis, there may be few, if any, signs or symptoms, since hemodynamic abnormalities are often minimal or nonexistent. It may, therefore, be impossible to pinpoint the affected valve by the usual clinical, radiologic, and noninvasive maneuvers. This becomes a major concern when standard antibiotic therapy fails to cure the infection and surgical intervention is contemplated. The following case report describes our experience in such a situation, in which tricuspid vegetations were visualized by the safe and simple technique of forward angiographic studies, allowing for surgical extirpation of the infected valve and bacteriologic cure.

Case Report

A 27-year-old black man who was an occasional heroin user was admitted to Los Angeles County General Hospital in April of 1975 with cough, fever, chills, and chest pain. Four blood cultures were positive for Staphylococcus aureus, and the patient was treated with intravenous administration of methicillin (2 gm every four hours). He initially became afebrile on this regimen, but x-ray films revealed pulmonary infiltrates believed to represent septic emboli. Shortly thereafter, the patient developed methicillin-induced nephritis with eosinophilia. The therapy with methicillin was discontinued, and intravenous administration of vancomycin (500 mg every eight hours) was begun. His fever abated, and the patient became asymptomatic.

On May 16, 1975, the patient was transferred to Rancho Los Amigos Hospital for further therapy. On that day, his temperature returned to 39.4°C (103°F), and blood cultures positive for S. aureus were again obtained. The organism was sensitive to cephalothin, chloramphenicol, erythromycin, gentamicin, vancomycin, streptomycin, tetracycline, and methicillin. The patient was then placed on a regimen of intravenous therapy with cephalothin (2 gm every six hours). The dosage was increased to 10 gm per day on May 22, 1975. On May 23, therapy with chloramphenicol (2 gm daily) was added. The fever continued with this combination, and therapy with vancomycin was reinstituted on May 27, 1975. This produced an urticarial reaction at the site of injection, and administration of the drug was discontinued.

The patient was transferred to St. Vincent Medical Center for consideration for cardiac surgery. On admission, he was having shaking chills with a temperature of 40.6°C (105°F). Findings from his physical examination were entirely normal, with the exception of a grade 2/6 early systolic decrescendo murmur heard loudest at the lower left sternal edge. The murmur did not show a clear-cut change with inspiration, the jugular venous pulsations were normal, and the liver was not palpable. The results of the cardiac examination were otherwise unremarkable. The electrocardiogram was entirely normal, except for generalized nonspecific changes in the ST segment and T wave. A chest x-ray film showed a normal cardiac silhouette with a patchy lower lobe infiltrate. All of six blood cultures were again positive.

The patient was placed on an intravenous regimen of cephalothin (2 gm every three hours) and gentamicin (100 mg every eight hours). Despite one week of therapy, a toxic course continued, with daily spiking temperatures, chills, and positive blood cultures. A decision was made at this point to proceed with surgical intervention.

In an attempt to localize the site of the putative intracardiac infection, the patient was taken to the cardiac catheterization laboratory on June 3, 1975. A No. 7 Gensini catheter was introduced into the right femoral vein by Seldinger's technique and was advanced to the level of the junction of the right atrium and inferior vena cava. Sixty milliliters of meglumine diatrizoate (Renografin) were then injected into the right atrium at a pressure of 500 psi in the right anterior oblique position. The contrast material was followed through all four cardiac chambers. No further studies were done, and the catheterization was terminated.

Although not seen directly on the screen, the developed angiographic film revealed the presence of two pea-sized masses (Fig 1) attached to the atrial aspect of the tricuspid valve, entering the right ventricle in diastole with the leaflet and returning to the right atrium in systole. All four cardiac chambers were well seen, and no additional abnormalities were noted.

On June 4, 1975, the patient underwent tricuspid valvectomy. Two discrete vegetations measuring approximately 1 x 3 x 5 mm were found attached to the anterior and septal tricuspid leaflets. These produced abundant growth of S. aureus on culture, and no other vegetations were present. After surgery, the patient was placed on a regimen of intravenously administered nafcillin (1 gm every four hours), since studies of minimal inhibitory and minimal bactericidal concentrations of this drug against the infecting organism in vitro performed at the University of California at Los Angeles Medical Center revealed that S. aureus was sensitive to it. The patient became afebrile on the tenth postoperative day and has remained so for two weeks of additional follow-up. Multiple subsequent blood cultures have remained sterile, and the patient was returned to Rancho Los Amigos Hospital to complete a six-week course of intravenous antibiotic therapy. Signs of obvious tricuspid regurgitation with slight
cardiac enlargement followed surgery and were controlled with fluid restriction and diuretic therapy. Consideration will be given to tricuspid valve replacement at a later date.

DISCUSSION

In our patient, forward angiographic studies clearly identified the site of intracardiac infection to allow for planned surgical intervention. In patients with bacterial endocarditis resistant to eradication by antibiotic therapy and perhaps in those with fungal infection, cardiac surgery has been shown to be a useful and often necessary adjunct to therapy with drugs. When surgery is being considered, precise localization of the site of surgical attack is, of course, mandatory. This may be difficult when the infection is localized to a right-sided valve and particularly so when, as in our patient, infection is not yet accompanied by sufficient anatomic rearrangement to give rise to localizing signs.

In a recent report, Pazin and co-workers suggest resolving this dilemma by right cardiac catheterization accompanied by dye-dilution studies, intracardiac phonocardiograms, and right ventriculograms to detect subtle degrees of tricuspid regurgitation coupled with quantitative blood cultures on samples drawn from various intracardiac sites. Although their methods were successful in the two patients reported, the hazards of advancing a cardiac catheter across an infected valve are obvious, and Pazin et al. state that in both of their patients, vegetations appeared to have been dislodged.

Forward angiographic studies in our patient permitted precise visualization of tricuspid vegetations without traversing the infected valve and, therefore, without the risk of dislodgment and distal embolization. The technique is simple and safe, even in the presence of intracardiac infection. The chief risks would appear to be minimal and related to the possible complications attendant upon the introduction of contrast material into the circulation. The limitations of forward angiographic studies are difficult to define in the light of our single experience; however, one might certainly anticipate less diagnostic clarity or even a false-negative result if the patient has single or multiple small vegetations, rather than large lesions such as were demonstrated in the case under consideration.
presented. Moreover, patients with right-sided endocarditis may often have vegetations engrafted on more than one valve. It is not known what degree of success one might expect from attempts at delineating lesions on more distal valves by right atrial angiographic techniques. Such attempts would be especially difficult in the presence of low output states or with tricuspid regurgitation.

Despite the problems outlined herein, we would suggest that forward angiographic studies be added to other diagnostic procedures in situations analogous to that described, and that such studies should be considered prior to resorting to more potentially hazardous maneuvers.

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REFERENCES

Cytomegaloviral Infection Presenting as a Solitary Pulmonary Nodule*

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Cytomegaloviral infection presenting in an immunologically compromised host as a solitary pulmonary nodule has not previously been reported. A patient with a renal transplant and with no pulmonary symptoms was noted to have a single nodule on a chest roentgenogram. At autopsy, this proved to be secondary to cytomegaloviral infection. Differential diagnostic considerations in the immunosuppressed patient are discussed.

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The high incidence of infection with cytomegalovirus in patients who have received renal transplants has been reported by several observers. Frequently, infection with this virus occurs in conjunction with other opportunistic invaders, making radiographic analysis difficult. Initial reports stated that in those cases in which cytomegalovirus was the sole pathogen, the radiographic pattern consisted of small nodules scattered throughout the periphery of the lungs. However, more recently, Bragg and Janis have indicated that the pattern is commonly one of bilateral nodular infiltrates in the upper lobes of an asymptomatic patient who has received a transplant.

We have recently encountered cytomegaloviral infection presenting as a solitary nodule in the lower lobe of a patient with a renal transplant. The unusual presentation of this immunologically compromised host suggested the possibility of several other serious infections, such as aspergillosis, nocardiosis, or phycomycosis.

CASE REPORT

This 22-year-old man with progressive renal failure secondary to systemic lupus erythematosus underwent renal transplantation on July 24, 1974. The surgical procedure was uneventful, and the kidney functioned well in the immediate postoperative period. Medications after the transplantation consisted of 150 mg of prednisone and 150 mg of azathioprine per day. The dosage of azathioprine was subsequently reduced by half because of developing neutropenia. An initial postoperative bacteriologic survey revealed only a throat culture positive for Candida albicans, which was treated with a mouthwash containing nystatin (Mycostatin).

On the eighth day after renal transplantation (Aug 1, 1974), fever developed, and renal function deteriorated. Acute rejection of the transplanted kidney was confirmed by renal biopsy and was treated with high doses of steroids (up to 1 gm of prednisone per day), 500 mg of actinomycin intravenously and radiation therapy. Renal function continued to deteriorate, and the kidney was removed on Aug 7, 1974. Therapy with prednisone was tapered after surgery to 40 mg/day.

A chest roentgenogram (Fig 1A) on Aug 5, 1974 showed a homogeneous round density measuring 3.5 cm in diameter in the left lower lobe. The remaining lung was normal, and there was no associated pleural effusion or hilar adenopathy. The previous chest x-ray film of July 27, 1974 had been normal, except for cardiomegaly secondary to the patient's underlying renal disease. Tomographic studies (Fig 1B) confirmed a homogeneous well-circumscribed lesion without evidence of cavitation or air bronchograms. No other pulmonary lesions could be identified. The lesion persisted essentially unchanged over the next three weeks, and at no time could signs or symptoms referable to it be noted. Bronchial brushing of the nodule was performed on two separate occasions, but no pathogens were seen microscopically or were cultured.

The remainder of the hospital course was one of persistent deterioration in mental status, although the findings from extensive evaluation of the central nervous system were remarkable. The patient died during a seizure on the 42nd day after renal transplantation.