why induction of anesthesia is associated with the onset or exacerbation of this problem. These include the effect of anesthesia on pulmonary mechanics, the supine body position, and the elimination of glottic regulation of airflow by endotracheal intubation.1 Suggested management interventions include awake fiberoptic intubation,1 placement of the endotracheal tube as near to the carina as possible,1 maintenance of spontaneous ventilation as long as possible,1 changes in patient position,1 avoidance of general anesthesia,4 availability of cardiopulmonary bypass,2 preoperative radiation therapy,5 corticosteroids,6 and positive end-expiratory pressure.3 Most of these would not have been of any benefit to our patient, although a left-sided endobronchial tube was considered. The cystic nature of our patient’s mass presented another option, transcarinal decompensation. The diagnostic use of a transbronchoscopic needle aspiration of a mediastinal cyst was reported by Barzo and Gyulai7 in 1975. Schwartz et al8 reported the therapeutic use of transbronchial needle aspiration for a bronchogenic cyst in 1986. We believe this is the first report of the intraoperative therapeutic use of the same technique. The patient whose case is reported herein, despite minimal symptoms preoperatively, exhibited ventilatory difficulty with a large alveolar-arterial gradient immediately after induction of anesthesia and endotracheal intubation. This could only have been expected to worsen after turning to the left lateral position and performance of a right thoracotomy. Endoscopic deflation of the cyst allowed for more effective ventilation and made the subsequent anesthetic management easier and safer. We do not suggest that this technique should take the place of surgical resection.

REFERENCES
3 Tonnesen AS, Davis FG. Superior vena caval and bronchial obstruction during anesthesia. Anesthesiology 1976; 45:91-2

Candida Right Ventricular Mural Endocarditis Complicating Indwelling Right Atrial Catheter*

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Candida Right Ventricular Mural Endocarditis is a common problem in immunocompromised patients. A leukemic patient had Candida right ventricular mural endocarditis complicating an indwelling right atrial catheter. To our knowledge, this is the first reported case of Candida right ventricular mural vegetation visualized by two-dimensional echocardiography. (Chest 1990; 97:1492-93)

Fungal mural endocarditis is rare, but it often occurs in immunocompromised patients.1-3 Causative organisms include Aspergillus, Candida, and Mucor species.1-3 In this report, we describe a leukemic patient who had right ventricular mural endocarditis developed as a complication of an indwelling right atrial catheter. Candida krusei was identified as the causative organism. The diagnosis was aided by the two-dimensional echocardiographic demonstration of the mural vegetation in the right ventricle. To our knowledge, the imaging of the right ventricular mural vegetation by two-dimensional echocardiography has not been described before.

CASE REPORT

A 20-year-old male patient was diagnosed as having acute myeloblastic leukemia in 1987. He was maintained in hematologic remission by chemotherapy until April 1988 when he developed the first hematologic relapse. An indwelling central venous (Hickman) catheter was inserted and the tip terminated in the right atrium. Reinduction with chemotherapeutic regimen consisting of amsacrine, thioguanine, and cytarabine (cytosine arabinoside) resulted in the second hematologic remission. He was then put on antibiotic prophylaxis with ofloxacin and co-trimoxazole. However, he shortly went into second relapse in August 1988 with the presence of 80 percent myeloblasts in the peripheral blood. Another chemotherapeutic regimen consisting of daunorubicin, cytarabine, etoposide (VP-16), and L-asparaginase was commenced. He developed neutropenia on day 14 with a nadir of neutrophil count of 400/ cu mm. He developed fever on day 21. Physical examination revealed no obvious source of infection. Chest roentgenogram revealed clear lung fields and two-dimensional echocardiogram revealed no abnormality. Cultures for bacteria and fungi were negative. He responded to ten days of intravenous cefazidime and netilmicin. He was discharged from the hospital, on a regimen of ofloxacin and co-trimoxazole.

He was readmitted two weeks later because of fever, persistent cough with purulent sputum, as well as pleuritic type of chest pain. Physical examination revealed a temperature of 38.5°C as well as coarse crepitations over the right lung base. Chest roentgenogram showed nodular densities in both lungs as well as cardiomegaly. He was empirically given intravenous cefoperazone and netilmicin but the fever persisted after five days. The neutrophil count was 3,800/ cu mm with 57 percent blasts. An echocardiogram revealed a dilated left ventricle with moderately impaired systolic contraction. Left ventricular end-diastolic and end-systolic contraction were 5.8 cm and 4.6 cm, respectively. In addition, a pedunculated vegetation in the right ventricle that was clearly separated from the normal-looking tricuspid and pulmonic valve was visualized (Fig 1). The intra-atrial catheter was removed.

Cultures of sputum, the catheter tip, and four sets of blood cultures all revealed moderate growth of C krusei. All microbiologic specimens for fungal culture were done on Sabouraud-dextrose agar. Amphotericin B (1 mg/kg/day) was given in addition. However, the fever and cough persisted. Despite the amphotericin B (total dose, 500 mg), the patient’s condition deteriorated and he died of generalized fungemia ten days later. Postmortem examination was refused.
vegetations could occur in any cardiac chamber and fungal myocardial abscesses were present in each patient. Walsh and Hutchins' described a 2½-month-old infant with Candida endocarditis involving the right atrium and tricuspid valve complicating prolonged central venous catheterization after gut surgery. An organized mycotic thrombus that surrounded the catheter and extended into the right atrium and tricuspid valve was found in postmortem examination. Mullen et al^1^ reported the case of a female patient with alcoholic liver disease and intravenous drug abuse with Aspergillus mural endocarditis involving the left ventricle who died despite systemic antifungal therapy and surgical resection of the vegetation. Herzog et al^2^ described a female adult with Candida mural endocarditis of the left ventricle complicating immunosuppressive therapy for systemic lupus erythematosus. She died despite systemic antifungal treatment. Thus, our patient was similar to those cases previously reported since he had acute myeloblastic leukemia and had received multiple cytotoxic drugs.

The pathogenesis of Candida mural endocarditis in our patient included (1) direct extension of underlying myocardial abscess or subendocardial focus onto the endocardium, and (2) extension of Candida vegetation from the infected central venous catheter since the same organism also grew from the catheter tip. The latter underscores the importance of strict aseptic technique in taking care of central venous catheter since these patients are often immunocompromised.

Of the previously reported cases of fungal mural endocarditis, two were antemortem diagnoses that were made possible by the use of two-dimensional echocardiography. In these two cases (one Aspergillus and one Candida), the vegetations were seen as echogenic pedunculated masses attached to the mural endocardium of the left ventricle. In our patient, the pedunculated vegetation was seen clearly attached to the right ventricular mural endocardium and moved freely in the right ventricular cavity during the cardiac cycle. The tricuspid and pulmonic valves were normal in appearance. To our knowledge, this is the first reported case of fungal right ventricular mural vegetation visualized by two-dimensional echocardiography. Therefore, two-dimensional echocardiography is also useful for the detection of infected mural vegetations. Finally, since the vegetation in our patient was not surgically resected or examined postmortem, the vegetation had not been proven unequivocally to be due to Candida.

**References**