Transesophageal Color Flow Doppler Features of Aorta to Right Ventricle Fistula

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A patient developed aortic-to-right ventricular fistula after aortic valve replacement surgery and infective endocarditis. The fistula was not detected by transthoracic twodimensional echocardiography and color flow Doppler. The transesophageal study, however, was instrumental in diagnosing this entity and prompting surgical resection of the fistula.

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Aorta to right ventricle fistula can result in setting of aortic dissection, sinus of Valsalva aneurysm rupture, with or without infective endocarditis. The aneurysm of the right aortic sinus usually ruptures in the right ventricle whereas the posterior or noncoronary sinus aneurysm usually ruptures through the atrial septal wall into the right atrium.

Transthoracic echocardiography with either contrast injection or color flow Doppler has been of value in diagnosing these entities. We present a patient with infective endocarditis who had aorta to right ventricle fistula diagnosed by transesophageal echocardiography with color flow Doppler. The transthoracic study initially failed to diagnose this. To the best of our knowledge, this is the first such case diagnosed by transesophageal echocardiography.

CASE REPORT

A 49-year-old man with a history of intravenous drug abuse was admitted to the hospital with fever, chills, and Staphylococcus aureus septicemia. Preoperative transthoracic and transesophageal echocardiography revealed vegetations on the aortic and tricuspid valves with severe valvular insufficiencies. He was treated with 4 weeks of intravenous antibiotic therapy but later underwent aortic and tricuspid valve replacement with St. Jude medical prosthetic valves because of congestive heart failure.

The postoperative course was complicated by fever, chills, and congestive heart failure. Serial blood cultures were negative. A week after surgery, a new-to-and-fro systolic-diastolic murmur was heard in the lower left sternal border. A transthoracic echocardiogram demonstrated moderate St. Jude aortic valve insufficiency. A transesophageal study performed to rule out St. Jude aortic valve vegetations or abscess revealed severe aortic insufficiency without vegetations. In addition, two color flow jets were observed directed from the aortic root toward the right ventricle and the right ventricular outflow tract (Fig 1), compatible with a fistula. Other indirect signs of left to right shunt such as fluttering of the tricuspid valve were not observed by M-mode study.

Aortography confirmed the presence of aorta to right ventricular fistula and severe paravalvular St. Jude aortic valve insufficiency. In view of persistent congestive heart failure, the patient underwent a second operation. At surgery, the entire annular area where the sewing ring of the valve prosthesis should have been seated was destroyed by infection. This resulted in an abnormal communication at the point where the valve was torn off at the annulus with the right ventricle. This required a pericardial patch repair of the fistula, reconstruction of the aortic annulus, and aortic valve replacement by another St. Jude valve. Postoperative St. Jude valve cultures revealed Candida albicans. Subsequently, the patient had a prolonged hospital course complicated by sepsis, pneumonitis, heart and renal failure and, ultimately, death. No autopsy was performed.

DISCUSSION

Sinus of Valsalva aneurysm forms because of intrinsic weakness at the union of the aorta with the heart. The aortic media may separate from the aortic annulus and retract upward. The structure that lies between becomes aneurysmal and may rupture. This process may be spontaneous or initiated by infection. Transthoracic echocardiography either with contrast injection and/or color flow Doppler has been shown to be of value in diagnosing aorta to right ventricular fistula. To the best of our knowledge, this is the first report in which fistula was detected by transesophageal color flow Doppler. As angiography carries inherent risk in these patients, transesophageal study is a reasonable option to consider in these patients.

In conclusion, aorta to right ventricular fistula can be diagnosed by transesophageal echocardiography with color flow Doppler. This test should be considered if clinical suspicion is high and the transthoracic study is not diagnostic.

REFERENCES

3. Terdjman M, Bourdarias JP, Farcot JC, Gueret P, Dubourg O,
Photodynamic Therapy as an Alternative Treatment for Surgery in a Patient with Lung Cancer Undergoing Bone Marrow Transplantation*

Tom Sutedja, M.D., F.C.C.P.; Bibi Kwa, M.D.; Harman van Kamp, M.D.; and Nico van Zandwijk, M.D., Ph.D., F.C.C.P.

We describe a patient who suffered from a bacterial pneumonia and had a left-sided infiltrate on his chest radiograph. He was found to be cytopenic and acute myeloid leukemia was diagnosed. A complete remission was achieved after chemotherapy, and the patient was scheduled to have autologous bone marrow transplantation. Bronchoscopy was performed because of persistent hemoptysis and a squamous cell carcinoma in the right upper lobe bronchus was found. This small tumor was successfully treated with photodynamic therapy preventing any delay in the treatment of his leukemia, which would have occurred if surgery had been the treatment of choice. The patient is still in complete remission after a follow-up period of 12 months.

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Photodynamic therapy (PDT) is laser illumination of malignant tissue containing photosensitizers such as Photofrin II (PII, Cyanamid Pearl River, NJ). Photodynamic therapy leads to selective damage because tumor stroma retains PII at a higher concentration than the normal surrounding tissue and because the light can be delivered directly to the tumor via fiberoptics. Previous reports indicate that PDT is especially effective in the treatment of "small" endobronchial tumors without a major loss of functioning lung tissue. We have performed PDT in a patient who was scheduled to have an autologous bone marrow transplantation (ABMT) for acute myelogenous leukemia (AML); a second primary non-small cell lung cancer (NSCLC) was found in this patient.

**Case Report**

A 47-year-old man was admitted to a hospital in the United States because of fever, hemoptysis, and dyspnea. The chest radiograph showed a left-sided infiltrate. He was found to be cytopenic and further analysis revealed the diagnosis of AML. He was treated with broad-spectrum antibiotics for bacterial pneumonia and a complete remission of the leukemia was achieved with combination chemotherapy (Ara-C Daunorubicin). He was subsequently transferred to the University Hospital Leiden-The Netherlands, for consolidation chemotherapy and ABMT. Although chest radiographs and computed tomographic (CT) scan of the chest were normal, bronchoscopy was performed because of a persistent hemoptysis. A circumscript intraluminal tumor, with a diameter of 1.5 cm, was seen on the trifurcation of the right upper lobe (Fig 1: left, during treatment; and right, 1 year after treatment). Biopsy specimens showed squamous cell carcinoma. Since surgical treatment of this T1N0M0 tumor would have delayed further chemotherapy and ABMT, PDT was considered as an alternative treatment. After obtaining informed consent, the patient received 2 mg/kg PII intravenously. Two days later, intraluminal illumination with laser light of 638-nm wavelength (argon-dye laser, Spectra Physics) was performed, using a laser fiber with a 2-cm cylindrical diffusing tip. The patient was advised to avoid sunlight exposure for a period of 4 weeks following PII injection to prevent skin photosensitivity. Consolidation chemotherapy and ABMT could be performed successfully after PDT without any delay within 3 months as scheduled. The follow-up period to date is 14 months and he has remained disease free with regard to both his leukemia and lung cancer.

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**Table:**

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<th><strong>ABMT</strong></th>
<th>autologous bone marrow transplantation</th>
<th><strong>AML</strong></th>
<th>acute myelogenous leukemia</th>
<th><strong>NSCLC</strong></th>
<th>non-small cell lung cancer</th>
<th><strong>PDT</strong></th>
<th>photodynamic therapy</th>
<th><strong>PII</strong></th>
<th>Photofrin II</th>
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**Figure 1.** Bronchoscopy during treatment (left) and 1 year after treatment (right).