Intracavity Cardiac Melanoma Diagnosed by Endomyocardial Left Ventricular Biopsy*

Peter C. Hanley, M.D.; Clarence Shub, M.D.; James B. Seward, M.D.; and Lester E. Wold, M.D.

A patient was evaluated for a persistent pericardial effusion and on two-dimensional echocardiography was found to have an intracavity left ventricular mass. Twenty-two years earlier, a melanoma of the ethmoid sinus had been excised. An electrocardiogram revealed impressive T-wave abnormalities and pathologic Q waves, initially suggestive of "myocardial infarction." However, the coronary arteries were normal at angiography. At catheterization, the left ventricular mass was biopsied, using a transvenous catheter-directed technique, and proved to be a metastatic melanoma. This procedure obviated the need for diagnostic thoracotomy. We believe that this is a unique application of the use of catheter-directed biopsy to make a histologic diagnosis of a left ventricular neoplasm.

The ability to make direct, in vivo histopathologic diagnoses of myocardial diseases by transcatheter endomyocardial biopsy is an intriguing concept. In recent years, the indications for endomyocardial biopsy have expanded from the detection of cardiac transplant rejection to include a wide range of cardiac disorders, for example, myocarditis, amyloid, sarcoïdosis, and hemochromatosis. In the hands of experienced operators, myocardial biopsy techniques of either the right or the left ventricle have a very low complication rate.

Herein we describe a patient who had a left ventricular intracavitary mass diagnosed by two-dimensional echocardiography. After clinical and noninvasive evaluation, the mass was biopsied using a transcatheter biopsome technique; histopathologic diagnosis of metastatic malignant melanoma was confirmed. This information obviated the need for diagnostic thoracotomy. This is a unique application of the endomyocardial biopsy technique for the diagnosis of an intracavitary cardiac malignancy.

Case Report

A 56-year-old woman was transferred to the Mayo Clinic for evaluation of recurrent pericardial effusion. In 1960, 22 years before her current admission, an excisional biopsy specimen of a nasal polypoid lesion demonstrated a localized malignant melanoma. No other primary source of the melanoma was found. She had no further problems until 1963, 19 years before her current admission, when acute small bowel obstruction developed. At laparotomy, an obstructing melanoma was surgically resected. Fifteen months later, an obstruction recurred and a second obstructing melanoma was

*From the Division of Cardiovascular Diseases and Internal Medicine, and the Section of Surgical Pathology, Mayo Clinic and Mayo Foundation, Rochester, Minnesota.
Reprint requests: Dr. Hanley, Section of Publications, Mayo Clinic, Rochester, Minnesota 55901

**FIGURE 1.** Serial electrocardiograms. The tracing on 12/12/76 is normal. Note the development of T-wave abnormalities on 1/25/78, which by 2/5/81 have progressed to become deeply inverted (II, F, and V1-V6). The tracing on 8/31/82 shows the development of a "pseudoinfarction" pattern with localized Q waves and "current of injury" in Vc-V6.
surgically removed.

The patient remained in good health for the next 14 years, when, in 1978 (3½ years prior to admission), she experienced an episode of severe precordial pain associated with dyspnea, which resolved spontaneously over several hours. A subsequent electrocardiogram obtained in November, 1978 showed a T-wave abnormality in the inferiorateral leads which was considered to represent a recent myocardial infarction (Fig 1). A follow-up electrocardiogram in February, 1981, while the patient was asymptomatic, showed more diffuse T-wave abnormalities (Fig 1). The patient remained asymptomatic until eight months before the current admission, when she complained of left precordial discomfort and progressive effort fatigue and dyspnea. Three months before admission, an enlarged cardiac silhouette was first noted on a chest roentgenogram. An M-mode echocardiogram, performed at another institution, showed a moderately large pericardial effusion. Prednisone (60 mg/day) was prescribed, but the pericardial effusion persisted, as did her symptoms. Because of these cardiac abnormalities, the patient was referred to the Mayo Clinic for evaluation.

On physical examination, the patient showed features of exogenous hypercortisolism. She was afebrile. Her blood pressure was 114/72 mm Hg, pulse rate 120 beats/min, and respiration 18/min. The cardiac apex beat was forceful, diffuse, and slightly displaced laterally. A grade 1/6 systolic ejection murmur was heard at the left sternal border. There was no gallop, rub, or extra heart sound. Examination of the skin revealed no abnormal areas of pigmentation.

The admission electrocardiogram (August, 1982) showed ST-T elevation and significant Q waves, especially in the lateral precordial leads (Fig 1). An enlarged roentgenographic cardiac silhouette was consistent with pericardial effusion.

The hospital course was complicated by recurrent, nonsustained ventricular tachycardia, which was treated and controlled with quinidine. M-mode and two-dimensional echocardiograms were obtained to assess the pericardial effusion. In addition to a moderately large pericardial effusion, a heterogeneous echo-dense mass filling the apical one-half of the left ventricle was visualized (Fig 2). There was no apparent thinning of the underlying ventricular wall, and a ventricular aneurysm was not evident. Although a left ventricular thrombus was a diagnostic possibility, a cavitary tumor was considered more likely because of the patient's history of melanoma and lack of myocardial wall thinning. Under two-dimensional echoangiographic guidance, pericardiocentesis was performed, and 400 ml of serosanguineous fluid was obtained. The patient's dyspnea improved. Pericardial fluid analysis, including cytologic examination for malignant cells, was negative.

A contrast-enhanced computed tomographic (CT) scan of the chest confirmed the presence of an ill-defined left ventricular mass. There was no intrathoracic lymphadenopathy.

Right and left cardiac catheterization revealed right-sided pressures that were mildly elevated (pulmonary artery pressure of 45/25 mm Hg) and a mean pulmonary wedge pressure of 21 mm Hg. Multiple right ventricular biopsy specimens, both fresh-frozen and stained with hemotoxylin and eosin, were interpreted as normal.

![Figure 2](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21373/)

**Figure 2.** A, Two-dimensional echocardiogram. Apical four-chamber view showing intracavitary, heterogeneous, echo-dense mass in the apex of left ventricle (arrow). B, Illustration showing tumor mass within left ventricle. LV = left ventricle, LA = left atrium, RA = right atrium, RV = right ventricle, vs = ventricular septum, T = tumor mass.

![Figure 3](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21373/)

**Figure 3.** Left ventriculogram (lateral view) showing large, irregular filling defect. Tumor fills more than half of left ventricular cavity. Arrow points to a lobulation of the tumor.

**Intracavitary Cardiac Melanoma (Hanley et al)**
The catheter was next placed into the left atrium using a transatrial-septal approach, and left atrial angiography was performed. The left ventriculogram demonstrated an irregular mass (filling the lower two-thirds) of the left ventricle (Fig 3). Selective coronary angiography excluded coronary artery disease. The patient and her family had been informed of the potential diagnostic alternatives, including transcatheter biopsy of the left ventricular mass. Because of the patient's history of recurrent melanoma and the likelihood that the mass represented an unresectable cardiac melanoma, it was decided to proceed with biopsy of the left-sided mass, in hopes of avoiding exploratory thoracotomy. A long, 7-F Muller's sheath was then positioned over the mitral valve orifice, utilizing the transseptal technique. A 7-F biopsite was advanced, under fluoroscopic guidance, into the left ventricular cavity, onto the mass. Five biopsy specimens were obtained without incident. Two specimens were sent for immediate frozen section and showed a malignant spindle cell process consistent with metastatic melanoma (Fig 4). Subsequent Fontana-Mason stain of this tissue for melanin was also positive. Surgical resection of the tumor did not appear feasible because of the extensive left ventricular involvement.

Following steroid withdrawal, there was no clinical or echocardiographic evidence for reaccumulation of pericardial fluid. The patient returned home to consider various chemotherapeutic options.

**DISCUSSION**

There are a number of unusual features of this case: the metastatic melanoma to the heart presenting as an intracavitary left ventricular mass 22 years after discovery of the initial tumor; electrocardiographic mimicry of transmural myocardial infarction, and most importantly, the unique use of transcatheter endomyocardial biopsy to obtain a diagnostic tissue specimen.

Cardiac involvement by malignant melanoma may take many forms. In any patient with melanoma without previously known cardiac disease, the development of one or more of the following is suggestive of cardiac metastasis: (1) acute pericarditis; (2) pericardial effusion or rapid increase in cardiac size on chest roentgenogram; (3) cardiac tamponade or constriction; (4) "ectopic tachycardia;" (5) atrial tachycardia; (6) second- or third-degree atrioventricular block; or (7) congestive heart failure. The finding of an intracavitary mass probably should be added to this list of diagnostic clues.

In a series of 70 patients reported by Glancy and Roberts, the longest reported interval between excision of a melanoma and death was 15 years. Our patient thus far has survived 22 years from the time of initial excision of a melanoma.

The episode of chest pain in our patient 3½ years before admission, along with the abnormal findings on the electrocardiogram (Fig 1) (interpreted as "myocardial infarction"), suggest that myocardial metastasis was present at that time.

Electrocardiographic patterns mimicking myocardial infarction, as evident in this case, have been reported to occur with cardiac metastases but are infrequent. Presumably, the pathologic Q waves (pseudoinfarction pattern), as well as the injury current (ST segment elevation), represent transmural myocardial involvement by tumor.

Two-dimensional echocardiography is the procedure of choice for the detection of intracardiac mass lesions. Echocardiographic features that suggest left ventricular tumor rather than thrombus include the heterogeneous density of the lesion and the absence of underlying ventricular wall thinning.

The technique of endomyocardial biopsy is fairly standardized, and others have suggested its use for the diagnosis of cardiac metastases. Left ventricular biopsy, however, is not widely practiced, primarily because of technical difficulties, low yield in unselected cases, and fear of systemic embolization of thrombus. There is also an unknown risk of tumor dislodgement and embolization. We suggest that, in selected patients with a large cavity cardiac tumor, the transcatheter biopsy technique may be considered...
an alternative method for obtaining tissue and obviate the need for exploratory surgery. Multiple specimens should be obtained to increase the diagnostic yield. Thoracotomy has obvious disadvantages, including pain, cost, risk of general anesthesia, and, in patients with metastatic tumor, little likelihood of therapeutic benefit.

REFERENCES
5 Young JM, Goldman IR. Tumor metastasis to the heart. Circulation 1954; 9:220-29
6 DeLoach JF, Haynes JW. Secondary tumors of heart and pericardium: review of the subject and report of one hundred thirty-seven cases. AMA Arch Intern Med 1953; 91:224-49
7 Waller BF, Gottdiener JS, Virmani R, Roberts WC. The "charcoal heart": melanoma to the cor. Chest 1980; 77:671-76
8 Rosenbaum FF, Johnston FD, Alzamora VV. Persistent displacement of the RS-T segment in a case of metastatic tumor of the heart. Am Heart J 1944; 27:667-75
9 Bisel HF, Wróblewski F, LaDue JS. Incidence and clinical manifestations of cardiac metastases. JAMA 1953; 153:712-15
14 Mason JW, Billingham ME. Myocardial biopsy. Prog Cardiol 1980; 9:113-46