Cardiac Rupture due to Metastases from 
a Carcinoma of the Antrum

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Although neither cardiac rupture nor metastatic tumor to the heart is rare, their combination is exceedingly uncommon. This is a report of such an instance. This case also presents a third unusual feature, that of metastasis of “cancer to cancer.”

Case Report

A 70-year-old White Russian Jewish man began to experience pain in the region of the right upper molar teeth late in March 1957. The first right upper molar tooth was removed shortly thereafter. The pain persisted, however, and the wound failed to heal properly. There was progressive swelling of the right upper jaw, as well as a foul-smelling sanguineous oozing from the site of extraction. Biopsy of the area revealed undifferentiated anaplastic carcinoma. He entered the Beth Israel Hospital on May 10, 1957.

The patient had had an episode of amebic hepatitis in 1939 and an acute myocardial infarction in October 1954.

Physical examination on admission revealed swelling of the right side of the face, a necrotic area in the right upper alveolus, and a firm right submandibular node of moderate size. The blood pressure was 120/70. Roentgenograms of the skull and paramosal sinuses (fig. 1) showed the right antral cavity almost totally obscured by an irregular soft-tissue mass extending into the adjacent nasal cavity. There was some destruction of the medial and lateral walls of the antrum as well as of the floor of the orbit. Chest and cervical spine, examined by x-ray, were within normal limits. An electrocardiogram revealed evidence of old anterolateral infarction (fig. 2, left). The hemoglobin level was 12.2 Gm. per cent, the hematocrit value was 37 per cent, and the white-cell count was 12,500 per ml. A urinalysis and blood nonprotein nitrogen determination were within normal limits. In preparation for a course of supervoltage x-ray therapy the right premolar and molar teeth were extracted, and an antral-oral fistula was created to facilitate drainage of the maxillary sinus.

Radiation therapy, in the amount of 6,000 r was administered on an outpatient basis during the succeeding 8 weeks, and initially gave considerable symptomatic relief. On July 16, however, the patient appeared chronically ill. He complained of pain and swelling of the right side of his face and of tiring easily. He had lost 25 pounds in 2 months. Three weeks later he was rehospitalized. The rectal temperature was 102 F. The right nasal cavity was almost obliterated by a friable, oozing, pink-grey mass. The right upper alveolus was necrotic and covered by a foul-smelling grey-green membrane. The heart and lungs were negative except for a grade II systolic murmur at the base. The abdomen was unremarkable. There was no peripheral edema. The hemoglobin level had fallen to 8.7 Gm. per cent, the white-cell count was 29,600 with 65 per cent neutrophils, and there was occult blood in the stool. Roentgenograms of the paramosal sinuses showed further destruction of the antral walls and floor of the right orbit. Three units of packed red blood cells were administered. The patient was discharged 2 days later, on August 11, feeling much improved and with a hemoglobin of 11.8 Gm. per cent.

Inability to retain solid food and increasing pain necessitated rehospitalization 2 days later. The hemoglobin level was unchanged, the white-cell count had risen to 34,400, with 91 per cent neutrophils, and the urine was unremarkable.

On the afternoon of August 14 the patient vomited and suffered acute vascular collapse. There was no pain. An electrocardiogram revealed sinus tachycardia and nonspecific S-T and T changes (fig. 2, right). The hemoglobin level was essentially the same. An infusion of levterenol was begun. Three hours later the neck veins appeared distended. The heart was enlarged to the left and right, and the heart sounds were more distant. The liver was felt 3 cm. below the right costal margin. The lungs remained clear. A repeat electrocardiogram was unchanged. A portable chest x-ray (fig. 3) showed cardionegaly and increased bronchovascular markings. Rapid digitalization was begun. The patient’s condition deter-
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Fig. 1. Roentgenogram of skull and paranasal sinuses showing right antrum occupied by soft-tissue mass, with invasion of adjacent nasal cavity.


diagram again failed to reveal significant changes, a white count was 84,000, and a serum glutamic oxaloacetic transaminase level was 537 units.

PATHOLOGY

At autopsy the right maxillary antrum was occupied by a necrotic, grey mass that extended through the antral wall into the right nasal cavity, and from there into the vestibule of the oral cavity. The pericardial sac was large and bulging, and contained 500 ml. of liquid blood. The heart weighed 380 Gm. A reddish, grey mass, measuring 3.5 by 3.0 by 0.6 cm., was present on the anterior aspect of the right ventricle, near the base. The center of the mass was necrotic, and communicated with the lumen of the right ventricle (fig. 4). Two similar masses were situated at the base of the left ventricle and on the posterior wall of the right atrium, but no perforations were noted in these areas. A 1.5 by 1.0 by 1.0 cm. mass protruded from the myocardium into the cavity of the right ventricle, beneath the chordae tendineae of the tricuspid valve. Yellow-red tumor nodules, 0.5 to 1.0 cm. in diameter, were also found in both lungs, the liver, and in the submucosa of the small in-

iorated during the night. The next morning he was semistuporous. The peripheral signs of right-heart failure had increased, and the heart sounds were barely audible. He complained of mild precordial pain. Shortly thereafter he became comatose and died. Just prior to death, an electrocar-
The peritoneal cavity contained 1,000 ml. of clear, amber fluid. The liver weighed 2240 Gm., and was congested. The single, firm right submandibular node was not examined.

On microscopic examination the antral mass was composed of bizarre cells, with very large and irregular nuclei and nucleoli. The chromatin pattern was reticulated. Numerous mitotic figures, some atypical, were noted. Giant tumor cells were also present. The cells had a spindle-shaped appearance and tended to be loosely arranged in sheets. The histological appearance was that of a highly anaplastic carcinoma. The metastatic nodules, including those in the heart, were made up of cells identical with those seen in the primary antral tumor (fig. 5). Within the clear-cell adenoma of the left kidney could be seen groups of metastatic tumor cells from the antrum (fig. 6).

**DISCUSSION**

Tumor metastases to the heart and pericardium are no longer considered rare entities. The incidence of cardiac spread in patients suffering from malignant disease, exclusive of lymphomas and leukemias, has ranged in more recent series to as high as 10.9 to 19.1 per cent.1-6 Series including leukemias and lymphomas have shown an even higher incidence.2-4 Although carcinomas of almost every organ system have been described as giving rise to cardiac metastases, those arising in the bronchus and the breast account for the bulk of recorded cases.1-8 Carcinoma of the antrum, on the other hand, rarely spreads to the heart. Only one other recorded instance was found.8

Despite the frequency of cardiac metastases, resultant rupture of the heart is exceedingly rare. A survey of the literature yielded only 3 documented cases. Krumblhaar and Crowel, in their 1925 review,9 mentioned a case of rupture of a heart invaded by melanotic sarcoma, but gave no details. Costa, in 1931,10 described left atrial rupture secondary to leukemic infiltration of the heart. More recently McNamara et al.11 recorded a similar instance associated with carcinoma of the duodenum.

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**Fig. 3 Top.** Portable chest roentgenogram showing moderate cardiomegaly and increased bronchovascular markings.

**Fig. 4 Bottom.** Tumor mass at the base of the right ventricle with arrow pointing to central perforation.

A similar yellow nodule in the cortex of the left kidney proved to be a clear-cell renal adenoma rather than a metastatic mass.
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Fig. 5. Top. Histologic section through anaplastic carcinoma of maxillary sinus. X 170. Bottom. Section through right ventricle showing tumor metastasis of cells identical to those in the antrum, adjacent to a segment of uninvolved myocardium.

The present case represents a fourth instance of rupture as a sequel to cardiac metastases.

An antemortem diagnosis of tumor invasion of the heart was not made. In the light of the patient's known coronary heart disease, including at least 1 acute myocardial infarction, it seemed entirely probable that the terminal episode was due to another infarct. Pulmonary embolism and dissecting aneurysm were also briefly considered. The possibility of neoplastic infiltration of the heart was not even entertained. This difficulty in antemortem diagnosis is in conformity with the general experience. Doane and Pressman in 1942 were able to find only 20 documented cases in which such a diagnosis had been made. Brick and Greenfield contributed 2 more cases in 1947. Since that time several other cases have been reported, but the total number remains small. The infrequency with which a clinical diagnosis of this condition is made stems, of course, from the failure of cardiac tumors to produce specific signs and symptoms. They are either silent, as is usually the case, or they may present any of the whole gamut of cardiovascular symptoms including congestive failure, arrhythmias, atrioventricular block, chest pain, vena caval obstruction, or cardiac tamponade. Roentgenograms and electrocardiograms have usually been of little specific diagnostic significance, as in the present case. The major point in antemortem diagnosis
must therefore continue to be a high index of suspicion in patients with known malignant disease who develop new, increased, or intractable symptoms of cardiac disease.\(^1\)\(^,\)\(^12\)\(^-\)\(^13\)

Rarely, such a clinical evaluation may be of more than strictly academic interest, as illustrated by reports of reversal, by x-ray therapy, of atrioventricular block secondary to leukemic infiltration of the interventricular septum.\(^14\)\(^-\)\(^15\)

An additional point of interest in this case is the occurrence of a metastasis from the antral carcinoma into a clear-cell adenoma of the left kidney. Metastasis of "cancer to cancer" is a rare phenomenon. Rabson et al.\(^16\) were able to verify only 19 such instances up to 1954. The case here reported represents the second instance of such metastasis in the recent autopsy material at the Beth Israel Hospital. A previous case also involved the spread to a renal-cell carcinoma (hypernephroma), but from a primary carcinoma of the bronchus. It is of interest that carcinomas of the kidney have been the seat of the metastatic lesions in two thirds of Rabson's cases, as well as in both those presented here.

**Summary**

The case is described of a 70-year-old white man with a primary anaplastic carcinoma of the right maxillary antrum, and with widespread visceral dissemination, including metastases to the heart. Myocardial rupture was noted to have occurred through one of the metastatic lesions. To the best of our knowledge this is the fourth instance of rupture as a sequel to tumorous infiltration of the heart.

Among the metastases were one or more to a clear-cell adenoma of the left kidney. This instance of metastasis of "cancer to cancer" is the second case of this rare condition in the recent autopsy material of the Beth Israel Hospital.

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At the Los Angeles County Hospital, the charts of 954 patients with known cardiovascular syphilis were analyzed to determine trends in incidence, diagnosis, treatment, and prognosis during the years 1945 to 1954. In that period, the incidence of cardiovascular syphilis decreased approximately 47 per cent. Twenty-six and eight tenths per cent of the patients were found to have syphilitic aortitis; 49.5 per cent, syphilitic aortic insufficiency; 9.3 per cent, syphilitic aortic insufficiency associated with syphilitic aortic aneurysm; 14.0 per cent, syphilitic aortic aneurysm. The most common complication was congestive failure. Less frequent complications were hypertension and angina pectoris. The latter 2 developments definitely made the prognosis less favorable. Blood serologic reactions for syphilis were positive or repeatedly doubtful in 82 per cent of all patients studied. Radiologic findings were normal in only 8.8 per cent of 633 patients examined. Normal electrocardiograms were obtained in less than 4 per cent of patients examined. No electrocardiographic pattern pathognomonic of cardiovascular syphilis was noted. In the abnormal electrocardiographic records, the changes were diagnostic of either atrioventricular conduction defect, intraventricular conduction defect, or left ventricular hypertrophy. Penicillin was confirmed as the drug of choice for the treatment of cardiovascular syphilis. Progression of cardiovascular lesions was halted and untoward reactions were less frequent than were reactions following adequate treatment with bismuth or arsenic compounds. Prognosis as to long-term survival was best in the younger age groups because penicillin therapy was available to them. Nevertheless, at least 85 per cent of the patients in this study died from the sequelae of syphilitic cardiovascular lesions in the first 5 years after cardiovascular syphilis was diagnosed. The average age at the time of death for all patients was 62.5 years. The principal cause of death was congestive heart failure. However, among the patients with aortic aneurysm, rupture of the aneurysm was the main cause of death and in the patients in whom hypertension developed in conjunction with syphilitic aortic aneurysm, death was generally the result of a dissecting aneurysm developing at the site of the syphilitic aneurysm.

WENDKOS
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