

METASTATIC TUMORS OF THE MYOCARDIUM *

A REVIEW OF SIXTEEN CASES

GORTON RITCHIE, M.D.

(From the Department of Pathology, University of Wisconsin, Madison, Wis.)

Metastatic tumors of the myocardium are relatively infrequent. In the autopsy series of the Wisconsin General Hospital, with slightly over 3,000 autopsies recorded at the time of writing, 16 cases had occurred.

Clinically, no sign of involvement of the heart muscle had been found even when extensive invasion had occurred. In every instance, any impairment of cardiac function noted during life was adequately explained by the non-neoplastic cardiac lesions present, such as coronary sclerosis, myocardial fibrosis or valvular lesions.

In 1935 Shelburne¹ reported a primary cardiac tumor diagnosed during life by reason of (1) a comparatively sudden onset of cardiac decompensation without known cause; (2) rapid accumulation of bloody pericardial fluid, which did not clot on standing; (3) lack of positive evidence of tuberculosis or syphilis, and (4) predominance of lymphocytes in the white cells of the pericardial fluid, eliminating the possibility of acute pericarditis. Heart block was also present. Such phenomena were absent in the present series.

Fishberg² recorded 3 cardiac tumors, diagnosed antemortem by the presence of auricular fibrillation in 2, and auricular flutter in the third. The only patient showing fibrillation in the present series (No. 30:194) had noticed an irregular heart beat "as long as she could remember"; little importance therefore can be attached to that phenomenon in this particular case.

Besides the myocardial metastases here reported, there were 23 cases with metastasis to the pericardium, representing 11 different types of primary tumors: carcinoma of the lung, 6 cases; lymphosarcoma, 5 cases; melanosarcoma, 3 cases; carcinoma of the stomach, 2 cases; and endothelioma, carcinoma of the renal pelvis, reticulo-endothelioma, carcinoma of the fundus uteri, car-

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TABLE I
Sixteen Cases of Metastatic Myocardial Neoplasia

Case No.	Type of tumor	Part of heart invaded	Route of invasion	Other lesions of heart	Other metastases
28:131 M., 66 yrs.	Rhabdomyosarcoma of kidney	Myocardium of right auricle	Blood-borne	Hypertrophy, fibrosis, slight coronary sclerosis	Adrenal, abdominal lymph nodes, liver, lung, ribs, vertebrae
30:50 F., 45 yrs.	Scirrhous carcinoma of breast	Subepicardial muscle of left ventricle	Blood-borne to epicardium, thence by lymphatics to myocardium	Atrophy, congestion and edema, hydropic degeneration, lipomatosis, slight fibrosis	Lymph nodes, liver, pleura, adrenal, uterus, pancreas, chest wall
30:103 M., 50 yrs.	Reticulo-endothelioma, primary in skin(?)	Atrioventricular groove; left ventricle; aortic valve	Blood-borne	Hypertrophy, diffuse fibrosis, lipomatosis, coronary sclerosis, edema	Lung, lymph nodes, pancreas, bladder, peritoneum, pelvic connective tissue, skin, voluntary muscle
30:104 F., 75 yrs.	Small spindle cell sarcoma of lung	Pericardium; muscle of left auricle	Direct extension	Coronary sclerosis, atrophy, fibrosis, dilatation	Bronchial nodes, by extension only
30:211 M., 29 yrs.	Melanosarcoma from mole on leg	All parts: all layers	Blood-borne	Diffuse fibrosis	Practically all organs except ureters
31:31 F., 49 yrs.	Carcinoma of bronchus, columnar-celled in some parts, squamous in others	Right ventricle (epicardium, muscle, and endocardium)	Blood-borne(?) to epicardium, thence by lymphatics to myocardium	Coronary sclerosis, edema, hypertrophy, perivascular fibrosis	Opposite lung, bronchial lymph nodes, liver, peritoneum, adrenals, uterus, ovary, mesentery
32:34 M., 57 yrs.	Reserve (or indifferent) cell carcinoma of lung	Right auricle (epicardium and myocardium)	Regional lymphatics (May have been direct extension)	Atrophy, in general; mitral stenosis; hypertrophy of right ventricle; congestion, edema, and round cell infiltration of muscle	Thyroid, pleura, ribs, kidney, lymph nodes
33:145 M., 31 yrs.	Adenocarcinoma of rectum	Right ventricle	Blood-borne to epicardium, thence by lymphatics to myocardium; tumor cells also in blood vessels of myocardium	Auricular thrombus	Pelvis, abdominal lymph nodes, lungs, parietal pleura, spleen, liver

Case No.	Type of tumor	Part of heart invaded	Routs of invasion	Other lesions of heart	Other metastases
34:125 M., 40 yrs.	Prickle cell carcinoma of esophagus	Myocardium of left ventricle	Blood-borne	Thrombus in cardiac vein, endocardial thrombus, congestion, edema, fibrosis	Bronchi and mediastinum (extension)
36:23 M., 55 yrs.	Mesothelioma of pleura	Scattered throughout myocardium	(1) Blood-borne to myocardium; (2) blood-borne to epicardium, with direct extension to myocardium	Slight hypertrophy, coronary sclerosis, mitral sclerosis and fibrosis, myocardial fibrosis	Lungs, brain, kidneys, lymph nodes, skin, peritoneum, adrenals, pancreas
36:69 F., 57 yrs.	Adenocarcinoma of fundus uteri	Left ventricle, epicardium and muscle (cells in blood vessels)	Blood-borne to epicardium; tumor cells in blood and lymph vessels in myocardium	Congestion, slight fibrosis, cloudy swelling and hydropic degeneration	Lung, lymph nodes, liver, spleen, pancreas, adrenals, kidneys, gall-bladder, peritoneum
36:291 M., 58 yrs.	Squamous cell carcinoma of lung	Left ventricle (epicardium and myocardium)	Blood-borne to epicardium, thence by lymphatics to muscle	Perivascular fibrosis	Bronchial and vertebral lymph nodes and adrenal; chest wall by extension
37:217 M., 69 yrs.	Myogenic sarcoma of bladder	Left ventricle, right auricle, all layers	Blood-borne	Sclerosis of aortic valve, coronary sclerosis, patchy fibrosis, endocardial thrombus	Esophagus, pleura, lungs, liver, spleen, pancreas, adrenals, ureters, colon, abdominal wall
38:111 M., 74 yrs.	Adenocarcinoma of pancreas	Left ventricle, muscle	Blood-borne	Coronary sclerosis, edema and patchy fibrosis	Gallbladder, mesentery, lungs
38:236 M., 45 yrs.	Lymphosarcoma (primary site undetermined)	(Autopsy done elsewhere; incomplete gross description)	Probably blood-borne to epicardium, with direct extension to muscle		Lung, diaphragm, intestine
39:41 M., 69 yrs.	Adenocarcinoma of pancreas	Right auricular appendage	Blood-borne	Auricular thrombus, hypertrophy, perivascular fibrosis	Lungs, lymph nodes, liver, peritoneum, adrenals, spine

cinoma of the thyroid, perithelial angiosarcoma of the pleura, and Hodgkin's endothelioma, each 1 case.

Table I summarizes the essential features of the 16 cases with myocardial metastases but certain items of special interest may be mentioned at greater length.

In case No. 30:194 a diagnosis of sarcoma of the lung was made. It was recognized that this resembled the tumor usually diagnosed as small cell or oat cell carcinoma, but the growth was massive and apparently metastasized only by direct extension. Further, a reticulum stain revealed reticular fibers in intimate contact with the tumor cells and forming processes which appeared to take their origin from the cells. On this basis the tumor was considered a sarcoma.

Case No. 34:125 illustrated a multiplicity of modes of spread, the bronchi and mediastinum being invaded by direct extension from the primary site in the esophagus, whereas the tumor cells in the myocardium very obviously came by way of the coronary arteries.

In case No. 32:34 there were two primary tumors: a carcinoma of the lung, the major malignancy which gave rise to the myocardial metastasis, and a carcinoma of the prostate which spread only by local extension to the seminal vesicles and bladder. The two tumors differed so widely in their histologic structure that there was no difficulty in determining the source of the metastases.

Case No. 39:41 presented a histologic picture of special interest. The wall of the right auricle was invaded by metastatic cells from a primary tumor in the body of the pancreas, and the right auricular appendage contained a decolorized thrombus. Within this thrombus was a cystic space of microscopic size, lined by cancer cells.

Case No. 36:23 introduced a controversial question, as many authorities doubt the existence of true mesothelioma of the pleura. The diagnosis in this case was made on the following gross and microscopic pathological considerations: the presence of a massive pleural growth which appeared, in the light of careful gross and microscopic scrutiny, to be invading the lung from the pleural surface; the lack of any other site which could be regarded as primary, even after diligent search; and the bizarre morphology of the cells, which in some fields formed sheets suggesting a cov-

ering tissue and in others were spindle-shaped, resembling cells derived from connective tissue. Undoubtedly many pathologists would call this tumor a carcinoma of the lung and it is impossible to prove that this was not a pulmonary tumor. It was felt, however, that the preponderance of evidence favored the conclusion drawn.

DISCUSSION

An analysis of this series reveals the great variety in type and origin of the primary lesions; in 16 cases, 13 different types of primary tumors are represented. There were 3 examples of carcinoma of the lung and 2 of carcinoma of the pancreas but these were the only types to be repeated. This is in agreement with Yater,³ who found in his exhaustive review of the literature that metastasis to the heart had occurred from neoplasms of all the main organs.

On further examination it appears that 7 of these 16 primary tumors were located in or about the chest. This observation could logically be anticipated, since such tumors are usually in fairly close proximity to the heart. It indicates a possibility of regional lymphatic dissemination which should be borne in mind when the clinical course suggests cardiac metastasis.

The degree of general spread of the tumors in this series is of interest. In 10 of the 16 cases the distribution of metastases could be considered as generalized. On the other hand, in one case (No. 34:125), a carcinoma of the esophagus, the myocardium was the site of the only remote metastasis, the bronchi and mediastinum being invaded by direct extension. Such an occurrence is infrequent. Burke,⁴ for instance, found in his series of 14 cases that the heart was never the sole site of metastasis. Yater³ made no specific observation on this point.

Three routes of invasion, as outlined by both Yater³ and Burke,⁴ are recognized; namely, the blood stream, the lymphatics and direct extension, lymphatic invasion being from the mediastinal lymph nodes against the lymph stream. In the present group, all three modes have occurred. A combination of routes was present in several cases, involving the transport of malignant cells through the blood stream to the epicardium and progression thence into the muscle through the lymphatics or by direct extension. In certain cases in which extensive invasion had occurred,

it was impossible to determine with certainty the route of metastasis by examination of microscopic sections. For example, in case No. 30:50 the epicardial nodule was so diffuse that it was impossible to ascertain by the microscopic appearance whether the tumor cells were blood-borne or carried through the lymphatics. A review of the gross description, however, revealed that there was an isolated epicardial nodule near the apex of the left ventricle. This fact, added to the presence of metastases in such remote organs as the uterus and adrenal, led to the conclusion that this was a blood-stream invasion of the epicardium.

Again, in a few cases malignant cells were seen in both the blood vessels and lymphatics of the myocardium. Whether the cells in the two vascular systems had been transported independently, or whether this invasion represented the rupture of tumor cells into vessels within the myocardium, could not be determined with certainty.

The modes of growth within the muscle, as distinct from the routes of metastasis, were those characteristic of the various types of tumors and took three general forms: (1) invasion through the channels, such as the lymphatics and blood vessels; (2) infiltrative invasion with varying degrees of myocardial destruction; and (3) massive growth (microscopically speaking), with displacement and complete destruction of muscle fibers.

No primary tumors of the heart were found in the autopsy series from this laboratory.

Consideration of the ages of the patients reveals nothing of particular interest, as in general they correspond to the age groups in which these types of tumors are apt to be found.

Twelve out of the 16 patients were males. This appears to represent a great predominance in the male sex, but such a conclusion is modified when one considers that in 857 cases of malignancy in the autopsy series studied there were 594 males and 263 females, a proportion not far from that found in the series of myocardial metastases.

SUMMARY

Sixteen cases of metastatic tumors of the myocardium are reported, with a tabulation of certain features and a brief discussion. Thirteen different types of primary tumors were repre-

sented, and there was considerable variation as to route of metastasis and mode of growth within the muscle. In no case had a clinical diagnosis of cardiac invasion been made.

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