

# The Incidence of Splenic Metastasis of Carcinoma

HERBERT L. ABRAMS, M.D., *San Francisco*

## SUMMARY

*The incidence of metastases to the spleen observed at autopsy in a series of 1,000 consecutive cases of malignant neoplasms of epithelial origin was 9 per cent; in a group of 104 cases of malignant neoplasms of non-epithelial origin, the spleen was involved in 45 per cent. These data do not support the contention that metastasis to the spleen is rare, or that the spleen possesses anti-neoplastic properties.*

THE spleen has often been cited as an infrequent location of metastatic tumor deposits in man,<sup>9, 12, 15</sup> although some evidence has been presented to the contrary.<sup>11, 13, 16</sup> A large volume of experimental work has been performed in an effort to investigate the "anti-neoplastic" properties of the spleen.<sup>14</sup> It is the purpose of this paper to present additional evidence that the spleen should not be considered a rare site of metastasis.

## MATERIAL AND RESULTS

The incidence of metastases to all sites, as observed at autopsy in 1,000 consecutive cases of malignant neoplasms of epithelial origin at the Montefiore Hospital between 1943 and 1947, was recorded. Some of the results of this survey have already been reported.<sup>1, 2</sup> There was metastasis to the spleen in 90 of the 1,000 cases. Table 1 gives the incidence of carcinoma arising in different sites and the number and percentage of metastases to the spleen from each primary site. Metastases to and direct extension to the capsule of the spleen were excluded as carefully as possible.

During the same period at the same hospital autopsy was done in 104 cases of malignant neoplasm of non-epithelial origin. The incidence of splenic involvement in this group is shown in Table 2. The spleen was involved in 47 cases, most often in association with lymphosarcoma and Hodgkin's disease.

## DISCUSSION

Di Biasi<sup>5</sup> reported splenic metastases in 1.86 per cent of 9,761 cases of carcinoma, Gussembauer and Winiwarter<sup>8</sup> in 0.9 per cent of 1,445 cases, and Handley<sup>10</sup> in 0.2 per cent of 422 cases of carcinoma of the breast. Barron and Litman<sup>3</sup> noted splenic enlargement in seven of 1,000 cases of malignant neoplasm, but in only one of the seven was there metastasis of the tumor to the spleen. Ewing<sup>6</sup> considered

metastasis to the spleen a rarity. Guttman<sup>9</sup> discussed the common explanations for the "infrequency" of splenic metastases, such as the motility of the spleen, the absence of afferent lymphatic vessels, and the sharp angulation of the splenic artery as it leaves the celiac axis. In 1942, Herbut<sup>12</sup> noted metastases in the spleen in only 2.4 per cent of 640 cases of carcinoma. On the basis of these observations, it would seem that metastasis to the spleen were indeed rare.

Other investigators, however, have reported observations not in accord with the foregoing. Warren and Davis<sup>17</sup> in 1934 noted metastases to the spleen in 4 per cent of 1,140 cases of neoplastic disease. As this was not significantly different from the incidence of renal metastases in their series, they saw no reason to believe that splenic tissue possessed anti-neoplastic properties. Yokohata<sup>18</sup> reported a high incidence of metastases to the spleen in a small group of cases carefully studied. Koletsky<sup>13</sup> observed tumor cells in the spleen in 11 per cent of 100 cases of carcinoma of the lung; Grauer<sup>7</sup> in four of 34 cases (11 per cent) of carcinoma of the pancreas; and Saphir and Parker<sup>16</sup> in 10 of 43 cases (23 per cent) of carcinoma of the breast. More recently Harman and Da Corso<sup>11</sup> noted splenic metastases in 13

TABLE 1.—Incidence of Metastases to the Spleen in 1,000 Cases of Malignant Neoplasm of Epithelial Origin

Site of Carcinoma	Number of Cases	Metastases to Spleen	
		Number	Per Cent
Breast .....	167	28	17
Lung .....	160	15	9.5
Stomach .....	119	7	6
Colon .....	118	6	5
Rectum .....	87	5	6
Ovary .....	64	17	27
Kidney .....	34	2	6
Uterus .....	23	2	9
Prostate .....	19	1	.....
Bladder .....	19	1	.....
Cervix .....	13	1	.....
Nasopharynx .....	3	1	.....
Fallopian tube .....	2	2	.....
Primary site unknown....	26	2	.....
Others .....	146	0	.....
Total.....	1,000	90	

TABLE 2.—Incidence of Splenic Involvement in 104 Cases of Malignant Neoplasm of Non-Epithelial Origin

Neoplasm	Number of Cases	Involvement of Spleen	
		Number	Per Cent
Lymphosarcoma .....	22	18	71
Hodgkin's disease.....	21	15	82
Reticulum cell sarcoma.....	16	8	50
Melanosarcoma .....	7	3	.....
Kaposi's sarcoma.....	5	2	.....
Miscellaneous .....	33	1	.....
Total.....	104	47	

From the Laboratory Division of the Montefiore Hospital, New York City. Present address: Stanford University School of Medicine (Department of Radiology), San Francisco.

TABLE 3.—Incidence of Metastatic Involvement of Various Visceral Organs, Observed at Autopsy in 1,000 Consecutive Cases of Carcinoma

Site of Metastases	Percentage of Cases With Metastases
Kidney .....	12.5
Pancreas .....	11.5
Ovary .....	11.0
Spleen .....	9.0
Uterus .....	6.0
Gallbladder .....	6.0
Bladder .....	3.5

per cent of 116 cases of carcinoma; and in a group of 30 cases selected because one or more visceral sites were involved, metastases to the spleen were present in 15.

Although the literature contains conflicting reports on the incidence of metastases to the spleen, in general the more recent reports suggest a higher incidence than the older ones.

Again with regard to the previously mentioned series of 1,000 cases at Montefiore Hospital, the incidence of metastases from neoplasms of epithelial origin to a number of organs is listed in Table 3. There was a higher incidence of metastases to the spleen than to the uterus, the gallbladder or the bladder, and only a slightly higher incidence of metastases to the kidney, to the pancreas or to the ovary than to the spleen. De Long and Coman,<sup>4</sup> in recent experimental work with tumor implants, noted no difference in the incidence of neoplastic growth in the spleen as compared with that in the adrenal glands or the kidneys. Hence, if metastasis to the spleen is considered a rarity, then it is logical to look upon metastases to these other organs as rare also.

The data on incidence of splenic involvement by malignant tumors of non-epithelial origin (Table 2) do not represent the actual incidence of metastases in these cases, since in some instances the tumors may have been primary in the spleen. The high percentage of cases in which there was splenic involvement supplies additional evidence, however, that the spleen is by no means infertile soil for tumor growth, either primary or secondary.

Probably the incidence of metastases to the spleen would be found to be even higher if exhaustive histo-

pathologic studies of splenic tissue were performed in all cases of carcinoma. Furthermore, if the incidence of metastasis per volume of splenic tissue is compared with the incidence for equivalent volumes of lung or liver, splenic metastasis is just as common on a volume for volume basis as is hepatic or pulmonary metastasis. To speak of the spleen as a "rare site" of metastasis is no longer justified.

#### REFERENCES

1. Abrams, H. L.: Skeletal metastases in carcinoma, *Radiology*, 55:534-538, Oct. 1950.
2. Abrams, H. L., Spiro, R., and Goldstein, N.: Metastases in carcinoma: Analysis of 1,000 autopsied cases, *Cancer*, 3:74-85, Jan. 1950.
3. Barron, M., and Litman, A. B.: Importance of hepatomegaly and splenomegaly in differential diagnosis, *Arch. Int. Med.*, 50:240-256, Aug. 1932.
4. De Long, R. P., and Coman, D. R.: Studies on metastasis: The effect of anatomical location on the growth of tumor implants, *Abst. Scientif. Prog. Am. Assn. for Cancer Research*, *Cancer Research*, 10:212, April 1950.
5. Di Biasi, W.: Virchow's *Arch. f. Path. Anat.*, 261:885-918, 1926, cited by Guttman.<sup>9</sup>
6. Ewing, J.: *Neoplastic Diseases*, W. B. Saunders Co., Philadelphia and London, 1928 (p. 87).
7. Grauer, F. W.: Pancreatic carcinoma: A review of 34 autopsies, *Arch. Int. Med.*, 63:884-898, May 1939.
8. Gussembauer and Winiwarter: Cited by Krumbhaar.<sup>18</sup>
9. Guttman, P. H.: Carcinoma to the spleen: Metastases, *Cal. and West. Med.*, 52:156-158, April 1940.
10. Handley, W. S.: Cited by Krumbhaar.<sup>18</sup>
11. Harman, J. W., and Da Corso, P.: Spread of carcinoma to the spleen, *Arch. Path.*, 45:179-186, Feb. 1948.
12. Herbut, P. A., and Gabriel, F. R.: Secondary cancer of the spleen, *Arch. Path.*, 33:917-921, June 1942.
13. Koletsky, S.: Primary carcinoma of the lung: A clinical and pathologic study of one hundred cases, *Arch. Int. Med.*, 62:636-651, Oct. 1938.
14. Krumbhaar, E. B.: Functions of the spleen, *Phys. Rev.*, 6:160-200, Jan. 1926.
15. Krumbhaar, E. B.: The incidence and nature of splenic neoplasms, with a report on forty recent cases, *Ann. Clin. Med.*, 5:833-860, March 1927.
16. Saphir, O., and Parker, M. L.: Metastasis of primary carcinoma of the breast, with special reference to spleen, adrenal glands, ovaries, *Arch. Surg.*, 42:1003-1018, June 1941.
17. Warren, S., and Davis, A. H.: Studies on tumor metastasis: V. The metastases of carcinoma to the spleen, *Am. J. Cancer*, 21:517-533, July 1934.
18. Yokohata, T.: Cited by Guttman.<sup>9</sup>