larly the case in primary lymphosarcoma and in reticulum-cell sarcoma of the spleen, in which splenomegaly may be the only abnormal finding. In congestive splenomegaly due to various causes such as cirrhosis of the liver corroborative evidence in favour of the diagnosis is often provided.

Summary

A simple technique for splenic puncture is described. Patterns of the splenogram in 43 patients with different blood diseases are given and the diagnostic value of the procedure is discussed. In the diagnosis of certain atypical or cryptic types of leukaemia splenic puncture may be very useful. It is particularly valuable in the diagnosis of myeloid metaplasia of the spleen and in certain neoplastic processes which involve that organ.

REFERENCES

- Benhamou, E. (1933). *Exploration fonctionnelle de la Rate*. Masson, Paris.
 Block, M., and Jacobson, L. O. (1950). *J. Amer. med. Ass.*, **142**, 641.
 Dameshek, W. (1951). *Blood*, **6**, 372.
 Ferrara, A., and Storti, E. (1946). *La Malattia del Sangue*. Soc. Editrice Libreria, Milano.
 Gosio, R. (1944). *La Mlza Malarica*. Chap. 10. Ediz. Italiane, Rome.
 Graham, S., and Blacklock, J. W. S. (1927). *Arch. Dis. Childh.*, **2**, 267.
 Heilmeyer, L. (1942). "Blutkrankheiten" in *Handbuch der inneren Medizin*, edited by G. v. Bergmann and R. Stachelin, 3rd ed., vol. 2. Springer, Berlin.
 Hess, J. H. (1930). *Ann. intern. Med.*, **4**, 467.
 Jordan, H. E. (1942). *Physiol. Rev.*, **22**, 375.
 Manson-Bahr, P. (1925). *Lancet*, **2**, 70.
 Moeschlin, S. (1947). *Die Milzpunktion. Technik, klinisch-diagnostische und hämatologische Ergebnisse*. Schwabe, Basle.
 Morrison, M., Samwick, A., Rubinstein, J., Morrison, H., and Loewe, L., (1951). *J. Amer. med. Ass.*, **146**, 1575.
 Nagy, G. von (1924). *Klin. Wschr.*, **3**, 274.
 Nicolle, Ch. (1909). Quoted by Moeschlin (1947).
 Rosenthal, M. C. (1950). *Bull. New Engl. med. Cent.*, **12**, 154.
 Schiller, W. (1943). *Amer. J. Path.*, **19**, 809.
 Tempka, T., and Kubicek, M. (1938). *Fol. haemat.*, **Lpz.**, **60**, 18.
 Weil, P. E. (1949). *L'Hématologie Clinique et Laboratoire*. Masson, Paris.
 — et al. (1936). *La Ponction de la Rate*. Masson, Paris.
 Wintrobe, M. M. (1951). *Clinical Hematology*. Lea and Febiger, Philadelphia.

SARCOMA OF THE SPLEEN

BY

PETER STORY, M.D.

Demonstrator of Pathology, St. Bartholomew's Hospital

AND

W. E. GIBB, D.M., F.R.C.P.

Assistant Physician, St. Bartholomew's Hospital

[WITH SPECIAL PLATE]

The rarity of tumours originating in the spleen may be partly responsible for the variety described, as any one observer will see only a few. Several classifications have been suggested. Ewing (1940) considered that most malignant growths of the spleen fall into groups described by Weichselbaum (1881)—namely, spindle-cell sarcoma, endothelial sarcoma, and lymphosarcoma. Smith and Rusk (1923) attempted to classify by tissue of origin and suggested that tumours may be derived from capsule and trabeculae, lymphoid tissue, or vascular and sinus endothelium. This principle was extended by Bostick (1945), who believed the histogenesis to be vascular, lymphoid, reticulo-endothelial, from embryonic inclusions, fibrous tissue, smooth muscle (arranged in order of frequency as found in the literature), and nervous tissue. No tumour originating in the last tissue has yet been described.

A case of primary malignant tumour of the spleen in an elderly woman is described.

Case Report

A woman aged 74 was admitted to hospital on March 25, 1949, on account of loss of weight. For 25 years she had been subject to burning epigastric pains after meals and flatulence; these spells of dyspepsia lasted for two to three weeks and recurred at intervals of three to six months. During the past few weeks she had lost about 2 st. (12.7 kg.) in weight and there was anorexia. Two weeks before admission there had also been attacks of pain, worse on breathing, in the left shoulder and under the left costal margin. The bowels had become constipated.

On admission the patient was pale and wasted. There was no lymphadenopathy. The abdomen was distended, and in the left hypochondrium was felt a swelling which was of firm consistence, had an irregular outline, and descended four fingerbreadths below the costal margin on respiration. The liver was palpable, its lower edge being smooth and extending to two fingerbreadths below the right costal margin. In view of the history of dyspepsia the swelling was thought most likely to be a carcinoma of the stomach.

Radiological examination showed the left dome of the diaphragm to be raised and almost immobile, and that the fundus of the stomach did not fill with barium. The radiologist concluded that there was a tumour arising in the fundus or that the cardia was displaced to the right by an extrinsic lesion. A test meal showed the presence of free acid and the stools contained no occult blood. Haemoglobin was 62% Haldane (8.6 g.%), red blood cells 4,700,000 per c.mm., and white cells 8,800 per c.mm., the differential count being normal.

The patient rapidly lost flesh and ran an irregular fever to 101° F. (38.3° C.); there was no vomiting. The tumour quickly enlarged and the absence of definite gastric symptoms and of occult blood from the stools made the diagnosis of gastric neoplasm now seem improbable; the features were not those of a renal swelling and the tumour was thought to be the spleen. Ascites developed and large quantities of blood-stained fluid were removed by paracentesis on three occasions. This fluid contained 2,000 leucocytes per c.mm., mainly neutrophils, but no malignant cells were found. The patient died on June 6, about 10 weeks after admission.

Without further evidence of the nature of the disease process it was clinically impossible to explain satisfactorily the rapid increase in size of what appeared to be the spleen. Primary and secondary neoplasms of the spleen are rare (Krumbhaar, 1927), yet this organ is commonly affected in disorders of the cell element of the reticulo-endothelial system (Bodley Scott and Robb-Smith, 1936) and a reticulo-sarcoma in the region of the spleen, causing infiltration of the surrounding tissues and peritoneal involvement, seemed a possible explanation. A reticulosarcoma usually gives rise to a generalized lymphadenopathy, but the absence of enlarged superficial lymph nodes is in keeping with one of the less-differentiated forms which may arise in the viscera or as a local tumour involving deep glands. The true nature of the condition was found after death.

Pathological Findings

Necropsy performed 36 hours after death showed the body of a thin elderly woman with a prominent abdomen and oedema of both legs. The left pleural cavity contained 600 ml. of dark-brown turbid fluid, and the left dome of the diaphragm and adjacent lung were heavily infiltrated with tumour tissue. One round metastasis (0.7 cm. diameter) was seen in the middle lobe of the right lung. The right dome of the diaphragm appeared normal. About 1,500 ml. of dark-brown turbid fluid was present in the peritoneal cavity. Dense adhesions were found in the left hypochondrium, which contained a mass consisting of spleen, a large amount of soft friable tissue around the stomach, and the left lobe of the liver, all being adherent to the adjacent diaphragm. The liver, of normal size and slightly congested, showed

a number of white neoplastic areas in which small haemorrhages could be seen. The spleen weighed 1,550 g. and showed alternating areas of haemorrhage and necrosis except for a thin layer around the edge and a larger area at the

FIG. A.—Spleen showing large haemorrhagic and necrotic tumour in centre, and normal splenic tissue at edge and lower pole.

lower pole which looked like normal splenic tissue (Fig. A). At the upper extremity of the spleen no normal tissue could be seen, suggesting that a rupture may have occurred at that point. The splenic blood vessels and portal vein were normal. Aortic lymph nodes were slightly enlarged, but there was no evidence of neoplastic involvement. A metastatic deposit was present in the marrow near the

neck of the right femur and also in a lower thoracic vertebra; no growths were found in the other bones examined. In a complete examination all other findings were normal.

The cytological characters of the growth are best seen in the lung metastasis, and accordingly these are described first. Outstanding features are its extreme vascularity, numerous areas showing extravasation of blood, and, in places, necrosis. The tumour cells are pleomorphic, predominantly rounded, with a moderate amount of slightly opaque cytoplasm, and nuclei are irregular in shape and hyperchromatic. Many cells are in mitosis and some contain two or three nuclei (Special Plate, Fig. 1). A few small collections of elongated cells with hyperchromatic spindle-shaped nuclei are seen; they resemble fibrosarcoma cells (Fig. 2). Smaller blood spaces are lined by obvious tumour cells, and many erythrocytes are scattered about among these cells; larger vessels are lined by flattened endothelium. Around a few blood vessels the tumour shows a peritheliomatous arrangement which is rather a characteristic feature evident in the lung and primary splenic tumour, but best seen in the hepatic metastases (Fig. 3). At the edge of the tumour mass cells have invaded the alveoli in a tuft-like manner, in some places leaving a small cleft between the alveolar wall and papillary ingrowth of tumour cells. Around the necrotic tissue are polymorph infiltration and phagocytes bearing altered blood pigment.

On microscopical examination of the spleen most of the tissue is seen to consist of extravasated blood or amorphous necrotic material, but there are a few small areas where congested splenic tissue and surviving tumour are evident. The tumour is like the pulmonary metastasis, but, owing to more extensive necrotic changes, detailed histology is not well preserved. There is much granulation tissue in relation to areas of haemorrhage and necrosis.

The liver is congested and contains metastatic deposits showing a thin layer of tumour cells at the edge of necrotic areas. Within the necrotic zone a few tumour cells have survived immediately surrounding blood vessels (Fig. 4). The neoplastic cells resemble those seen in lung and spleen. Histological findings in other organs were normal.

Post-mortem Diagnosis.—Vascular pleomorphic sarcoma of spleen with metastases in liver, lungs, femur, and vertebra; emphysema, ascites, and pleural effusion.

Discussion

As we pointed out above, Bostick (1945) has described a comprehensive classification of splenic tumours based on histogenesis. Accepting this basis of classification, Wright (1949) has drawn attention to a small group of primary splenic angiomatous tumours which are "characterized by

well-defined vascular channels, by areas of sarcomatous aspect histologically, and usually by metastases." He has reviewed six similar cases reported in the literature, including one described by Wright (1928), who first recognized this group. Wright (1949) describes another similar tumour of his own and discusses fully its origin and classification, suggesting the name haemangiosarcoma. Important features of his case are a marked tendency to form blood vessels and areas of sarcomatous aspect in contrast to the more commonly described haemangio-endothelioma, which may show vascular spaces, but in addition usually develops sheets and masses of cells characteristic of endothelioma. Wright (1949) presents a convincing case for recognition of this division of malignant angiomatous tumours of the spleen, but, as he says, "one might question whether such a distinction can or should be made in a group of tumours in which the classic characteristics are ill defined."

The tendency to produce vascular channels is not so well marked in our case, and we are impressed by Willis's (1948) warning against labelling growths as angiomatous mainly because they are extremely vascular. Nevertheless, in that it shows great vascularity, has tissue of sarcomatous appearance, and has metastases, we believe that this is a malignant splenic tumour of vascular origin closely resembling Wright's (1949) haemangiosarcoma.

Wright (1949) has drawn attention to changes in red cells resembling pernicious anaemia in his case and five other cases of splenic cancer from the literature, these blood changes bearing no relation to the tumour histology. In our patient, however, the anaemia was hypochromic.

Summary

A primary splenic tumour is described which is characterized by formation of vascular channels, areas of sarcomatous appearance, and metastases.

We are indebted to Dr. G. S. Sanson for the photomicrographs and to Mr. J. W. Miller for technical assistance.

REFERENCES

- Bostick, W. L. (1945). *Amer. J. Path.*, 21, 1143.
- Ewing, J. (1940). *Neoplastic Diseases*, 4th ed. Saunders, Philadelphia.
- Krumbhaar, E. B. (1927). *Ann. clin. Med.*, 5, 833.
- Scott, R. Bodley, and Robb-Smith, A. H. T. (1936). *St. Bart's Hosp. Rep.*, 69, 143.
- Smith, C. E., and Rusk, G. Y. (1923). *Arch. Surg., Chicago*, 7, 371.
- Weichselbaum, A. (1881). *Virchows Arch.*, 85, 554.
- Willis, R. A. (1948). *Pathology of Tumours*. Butterworth, London.
- Wright, A. W. (1928). *Amer. J. Path.*, 4, 507.
- Wright, M. (1949). *Arch. Path.*, 47, 180.

In America accidental falls from windows are said to account for about 500 deaths a year (*Statistical Bulletin*, February, 1952). Death-claim records of 181 Metropolitan Life Insurance Company industrial policy holders who died in such accidents in the years 1947-50 throw some light on the circumstances under which these accidents occur. About four-fifths happened in the home. Most of the fatal injuries outside the home were sustained in the course of gainful employment—by window-cleaners, porters, and so on. A few victims were delirious patients in hospitals. More accidents happen in the home during the summer months, and children are especially prone to injuries caused in this way in the warm weather: 11 out of 16 children under 15 died between June and August, according to the insurance records studied, and 10 of them were 3 years old or younger. But by far the largest number of deaths in falls from windows are among adults. In this particular study nine-tenths of the victims were 15 or over, and most of them over 45. The range of causes is wide. Twelve of these victims were cleaning windows; some temporarily lost their balance, others were killed when window-sills or frames collapsed. Apart from accidents happening whilst repairing windows, hanging curtains, and so on, several people fell to their death whilst leaning too far out of windows. Two died whilst sleepwalking, and about a quarter probably fell during attacks of dizziness. A much higher death rate occurred among men than women.

F. HAWKING: ONCHOCERCIASIS TREATED WITH HETRAZAN

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

PETER STORY AND W. E. GIBB: SARCOMA OF SPLEEN

FIG. 1.—Lung metastasis: many blood spaces, pleomorphic cells, and nuclei; occasional multinucleate and few mitotic cells. (H. and E. $\times 200$.)

FIG. 2.—Lung metastasis: predominance of long spindle-shaped cells. (H. and E. $\times 500$.)

FIG. 3.—Liver metastasis: compact layer of tumour cells round blood vessel. (H. and E. $\times 120$.)

FIG. 4.—Liver metastasis: necrotic zone with thin layer of tumour cells; islands of living cells round blood vessels. (H. and E. $\times 50$.)