SARCOMA OF THE BREAST

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Primary sarcoma of the breast is a rare condition and the number of published cases few. For this reason the prognosis following surgical treatment of these tumors and their biological reaction to radium and x-rays are still but imperfectly known. It seems worth while, therefore, to record even a short series of cases despite the fact that many of the older records are incomplete and the preservation of the tissues is often poor.

Malignant connective-tissue tumors of the breast may arise in preexisting fibro-adenomas or may spring from any portion of the pectoralis major fascia whose trabeculations constitute the supporting septal framework of the breast. The fat, nerve, and underlying muscle tissue may also give rise to sarcomatous neoplasms, though each contributing tissue in its turn usually presents several types of cell constituents. Tumors formerly described as small-cell sarcomas of obscure origin are now usually regarded as small-cell undifferentiated carcinomas, lymphosarcomas, and myelomas. In addition to those tumors whose origin can be traced with fair certainty to a single type of preexisting connective tissue, there is a small group of mixed tumors composed of several distinct types of adult tissue suggesting a teratomatous origin except that all the components are mesodermal derivatives. A still more unusual type contains derivatives of two germ layers.

Mammary sarcoma is of infrequent occurrence as compared to the reported malignant epithelial breast tumors. According to the standard texts, sarcoma constitutes from 0.5 to 9.0 per cent of malignant breast lesions. The higher figure is Poulsen's (17), but he has failed to exclude the cystosarcomas. At St. Luke's Hospital the records for a period of thirty-five years showed 15 primary breast sarcomas and 1873 primary breast carcinomas, a proportion of 1 to 125, or an incidence for sarcoma of 0.8 per cent. Figures based on hospital series, however, do not represent a fair sample of the population and are therefore not to be accepted without reservation. The correct proportion is probably not far from 1 to 100.
Of the 15 sarcomas recorded in the files of St. Luke's Hospital, which form the basis of this report, all occurred in females. The patients ranged in age from twenty-eight to seventy-three, the average being fifty-three years. The right breast was involved in 7 cases, the left in 8. Twelve of the tumors were of the simple type, 3 were of the mixed type.

**Spindle-cell Fibrosarcoma**

Of the 12 simple sarcomas, 5 presented rather uniform characteristics grossly and microscopically and were considered spindle-cell fibrosarcomas. Four of these were well encapsulated either by connective tissue or compressed breast tissue. In two instances a history of tumor preceding active growth,

![Image](image.png)

**Fig. 1. Case I: Spindle-cell Fibrosarcoma: Area Showing Interlacing Bundles of Elongated Spindle Cells. × 190**

for eight and twenty years, pointed to a preexisting fibro-adenoma. Microscopically the tumors were composed of compact, interlacing and parallel bundles of spindle cells separated by varying amounts of fibrous connective tissue and richly supplied by blood vessels. Nuclear hyperchromatism and mitoses were constant. Each tumor, however, showed minor differences in cellularity, number of mitoses, vascularity, and amount of intercellular substance. Glandular elements were entirely lacking, and none of the lesions could be classified with the so-called adenosarcomas. Clinically the development of the tumor was usually slow, and medical advice was not sought until rapid growth was apparent.

**Case I:** A. G., a white, married housewife of twenty-eight years, first noticed a small lump in the right breast eight months prior to admission. This grew slowly for four months
and was removed at another hospital. During the ensuing four months the patient had suffered from occasional pain in the back and shoulders. Two weeks prior to admission a small mass appeared in the incisional scar and another medial to it. The right breast and axillary nodes were removed on Feb. 22, 1926. Two non-encapsulated soft, gray, hemorrhagic tumors were found, each measuring 0.3 × 2.5 cm.

Fig. 1 shows a characteristic area of one of the tumors. Large interlacing bundles of elongated and plump spindle cells with nuclear hyperchromatism and numerous mitoses, and a moderate amount of intercellular substance are visible, and the tumor is well vascularized. With Masson's trichrome the fibers of the intercellular structures assume a blue color, thus proving their connective-tissue origin, while the nuclei take a reddish-purple stain. The glandular elements are entirely replaced by the invading tumor. The axillary nodes showed no tumor infiltration.

The patient is alive and well ten years after operation.

CASE II: M. F., an unmarried white woman of fifty years, had first noticed an oval tumor in her right breast one year prior to admission. This enlarged until it involved almost the entire breast. A simple mastectomy was performed Nov. 21, 1922, and an encapsulated tumor measuring 5 × 4 × 3 cm. was found in the lower half of the breast. On section it was pinkish-white to grayish and lobulated. A few scattered hemorrhagic areas were present.

Microscopically the tumor is composed of parallel and interlacing elongated, slender spindle cells separated by a rather large amount of fibrous connective tissue (Fig. 2). Mitoses are present but not numerous. The tumor is fairly well vascularized. The appearance is that of a rather slowly growing neoplasm.

The patient was well and symptomless two months after operation, but evaded further follow-up.

CASE III: K. M., a white married woman of seventy-three years, first discovered a painless lump in the upper outer quadrant of the right breast eight years before admission. This grew slowly until five months prior to hospitalization, when the overlying skin became
red and painful. The tumor formed a bulky mass in the upper outer quadrant of the breast, measuring $10 \times 9$ cm. It was fairly well encapsulated. The overlying skin was adherent and ulcerated, the nipple displaced downwards. A radical mastectomy was performed on June 3, 1927. On section the tumor had a smooth grayish-white surface with occasional hemorrhagic and necrotic areas at the periphery. An occasional small lobulated area was filled with mucus.

Microscopically the sections show irregularity in the contour and arrangement of the cells. The elongated spindle cell is for the most part supplanted by numerous plump connective-tissue cells having rounded or clubbed ends. These are distributed radially about the numerous blood vessels in a peritheliomatous arrangement (Fig. 3). Some are separated by edematous connective tissue. Other apparently fused forms have produced giant nuclei. The blood vessel in the section here reproduced (Fig. 3) is seen to be invaded by tumor cells. The axillary nodes were not involved.

CASE IV: A. B., a fifty-three-year-old white woman, had had a painless lump in her left breast for twenty years. Eight months prior to admission this began to enlarge and become indurated and painful. A radical mastectomy was performed Aug. 4, 1915, and two discrete tumors were found in the breast. One measured $8 \times 5 \times 4$ cm., was encapsulated, and contained numerous calcified areas. Microscopically it was a benign fibro-adenoma. Beneath the nipple was a larger encapsulated tumor, $12 \times 10 \times 8$ cm., having a sarcomatous appearance on section.

Microscopically this tumor is seen to be a more uniform and differentiated type of fibrosarcoma (Fig. 4). The elongated spindle cells are separated by a moderate amount of fibrous connective tissue and show little variation in size and shape. Mitoses are rare.

The patient was last seen one month after operation and was symptomless at that time.

CASE V: P. H., a white woman of thirty-six years, discovered a painless lump in the upper quadrant of the right breast following a bruise. This grew slowly until three months prior to admission, when it assumed rapid growth, involving almost the entire breast. The
**FIG. 4.** CASE IV: SPINDLE-CELL FIBROSARCOMA: WELL DIFFERENTIATED AREA OF TUMOR SHOWING LONG, THIN TYPE OF SPINDLE CELLS WITH NARROW NUCLEI. × 150

**FIG. 5.** CASE V: SPINDLE-CELL FIBROSARCOMA: AREA SHOWING PREDOMINANCE OF SHORT SPINDLE CELLS INTERMINGLING WITH LESS DIFFERENTIATED FORMS. × 150
breast was removed on June 22, 1913. It weighed 5.5 kilos and was practically filled by two large encapsulated masses. The appearance on section was homogeneous.

Microscopic sections show spindle cells predominating (Fig. 5), but many have become rounded and of irregular contour. A radial arrangement about the numerous blood vessels is present throughout. Mitoses are fairly numerous.

The patient was discharged ten days after operation in apparent good health and was subsequently lost to follow-up.

**Fibromyxosarcoma**

Two cases were classified as fibromyxosarcoma. These show wide variations in the amounts of myxomatous and fibrous tissue in their structure. It is difficult to determine whether one represents a more advanced stage of two essentially similar tumor processes or whether the myxomatous change is to be explained by some nutritional disturbance of the cells or intercellular substance, resulting in degeneration.

**Case VI:** E. R., a fifty-two-year-old white woman, had a slight pain in the left breast one month prior to admission, which called her attention to a small tumor. This grew slowly until she entered the hospital for surgical treatment. At operation a round, firm tumor, 4 × 3 cm., was removed. A fibromatous cyst had been excised from the same breast four years earlier.

Microscopic sections show colorless to faintly bluish areas of myxomatous tissue interspersed with an essentially sarcomatous structure of spindle-cell type (Fig. 6). The cells show wide morphological variations. Mitoses are infrequent. Blood vessels are numerous and many leukocytes infiltrate the tumor.
The patient was discharged two weeks after operation and further follow-up was impossible.

Case VII: N. F., a white woman of forty-nine years, noticed two years prior to admission that her left breast was becoming larger. At the same time there was a purulent discharge from the nipple. These symptoms continued for one year and a partial mastectomy was then performed at another hospital. Almost immediately after this the breast began to enlarge and an ulceration appeared in the scar. On admission to St. Luke's Hospital a radical mastectomy was performed and an unencapsulated tumor, 7 × 5 cm., was found beneath the old scar, infiltrating the underlying pectoral muscle. Gross section showed a soft, grayish surface with large mucoid areas.

Microscopic sections show enormous quantities of jelly-like myxomatous tissue in which are embedded irregular, swollen, spindle and stellate cells having abundant acidophilic cytoplasm (Fig. 7). Within the cytoplasm of some of the cells are clumps of apparently phagocytosed polynuclear leukocytes. The tumor cell nuclei are enlarged, irregular, and hyperchromatic. Sections of the axillary nodes showed infiltration with tumor.

The patient was discharged five weeks after the operation with a large, fungating, recurrent mass in the operative wound, and a cough with bloody sputum.

This tumor shows none of the characteristics of the giant intracanalicular myxomas of the breast, or so-called cystosarcoma phylloides of Johannes Müller, which are composed of large polypoid and finger-like dendritic collections of myxomatous tissue growing into cyst-like spaces. Their rate of growth is slower than that of the sarcomata and they usually offer a good prognosis following operative removal.
FIG. 8. CASE VIII: NEUROGENIC SARCOMA: DUCT TISSUE INCLOSED IN INVADING TUMOR. × 120

FIG. 9. CASE VIII: NEUROGENIC SARCOMA: AREA BENEATH SKIN SURFACE SHOWING COMPACT ARRANGEMENT OF ELONGATED TUMOR CELLS. × 120
NEUROGENIC SARCOMA

The following case is the only one which we have diagnosed as neurogenic in origin and although no nerve filaments were demonstrable entering the growth, the microscopic structure appears to warrant the diagnosis.

CASE VIII: E. N., a white woman of sixty-one, presented herself at the hospital with a hard, round tumor, 4 cm. in diameter, in her right breast. Information as to its duration was not obtainable. A radical mastectomy was performed.

Microscopic section (Fig. 8) shows interlacing bundles of slender spindle cells, which in some areas are quite widely separated by collagenous fibers. The nuclei show some palisading. A few small ducts invaded by inflammatory cells are surrounded by strands of tumor tissue. Fig. 9 shows an area beneath the skin surface having a similar but more compact arrangement of the cells.

Stained with Masson's trichrome, the fibers take a vermillion red in contradistinction to the usual blue of the supporting collagenous fibers. The cells differ markedly in shape and pattern, as well as in staining capacity, from those of the spindle-cell fibrosarcoma and point to an origin from the sheath of Schwann.

The patient was discharged in good health nine days after operation and was lost to follow-up.

Tumors of this type occurring primarily within the breast are rare, only a few having been reported in the literature. Their frequency elsewhere in the body, however, where they arise either from cutaneous or deep nerve trunk sheaths, is well known and there is no reason why they should not occasionally be seen in the breast.
Polymorphous-cell Fibrosarcoma

Two cases showed no predominance of any fixed connective-tissue cell type and have therefore been designated as polymorphous-cell fibrosarcoma. The amount of fibrous stroma in these was small. In a third case there was a slight preponderance of spindle cells.

Case IX: A. T., a fifty-nine-year-old white woman, had a circumscribed tumor, \(3 \times 1.5\) cm., removed from her left breast. No record of its duration was obtainable. Two months following removal there was a recurrence in the operative scar. This continued to grow for two months, and a radical mastectomy was then performed. The patient succumbed with multiple metastases in the left lung and pleura six months after the original operation.

Microscopic section (Fig. 10) shows closely packed spindle, round, and polyhedral cells with little intercellular substance. Many very large tumor cells with various forms of degenerative nuclear changes are present. Mitoses are numerous. The tumor is richly supplied with blood vessels.

Case X: H. M., a thirty-five-year-old white woman, noticed a lump in her left breast seven months prior to admission. It was slightly painful on palpation. Growth was slow, and on admission the tumor measured about 7 cm. in diameter. The overlying skin was red and tender. Radical operation was refused and a biopsy was performed. The patient left the hospital after operation and no follow-up was possible.

Microscopic section shows loosely arranged large, plump, spindle, polyhedral and round cells separated by a considerable amount of swollen connective-tissue fibers (Fig. 11). Some leukocytic infiltration is present. The tumor is well vascularized and shows very large tumor cells with prominent irregular nuclei.

Case XI: E. M., a fifty-nine-year-old white woman, entered the hospital with a tumor in the left breast, of unknown duration. A radical mastectomy was performed. The entire
outer quadrant of the breast, measuring $30 \times 23 \times 10.5$ cm., was filled with unencapsulated, soft, friable tumor with a necrotic center. The surface of the pectoralis major was invaded by tumor. The patient was discharged sixteen days after the operation and could not be followed.

Microscopic sections show a predominance of spindle cells, with large numbers of round, polyhedral and giant forms (Fig. 12). There is considerable leukocytic infiltration of the edematous connective-tissue stroma.

Histologically these three tumors appear to be of a rapidly infiltrating type, though in only one case was it possible to substantiate this clinically.

![Figure 12: Case XI: Typical Area Showing Predominance of Spindle Cells with Morphologic Variations. × 150](image)

**Rhabdomyosarcoma**

The following case, a rhabdomyosarcoma, presents all the histologic features of this type of tumor seen elsewhere in the body, yet only one previous example has been recorded in the literature as occurring primarily in the breast. Billroth (2) reported this case in a girl of sixteen years who had a slow-growing mass in her left breast for nine months. One month before she was admitted to the hospital, growth became rapid and on admission the tumor had reached the size of a child's head. An unencapsulated tumor surrounded by a layer of healthy appearing breast tissue was removed only to be followed by a local recurrence in the scar four months later. The axillary nodes were not involved. Microscopic sections of the tumor showed groups of elongated muscle cells with distinct cross-striation, numerous large granular myoblasts as well as fat cells, occasional gland acini and supporting structures. Following discharge from the hospital nothing further was heard of the patient.
FIG. 13. CASE XII: RHABDOMYOSARCOMA: PRIMARY TUMOR WITH LARGE NUMBER OF MYOBLASTS AND OCCASIONAL ELONGATED MUSCLE FIBERS. × 120

FIG. 14. CASE XII: RHABDOMYOSARCOMA: SECTION OF NODULE IN LIVER SHOWING ELONGATED MUSCLE FIBERS WITH DISTINCT LONGITUDINAL STRIATIONS, AS WELL AS ROUND, SPINDLE, AND POLYHEDRAL CELLS SIMILAR TO THOSE IN ORIGINAL TUMOR. × 165
We were more fortunate than Billroth, having the opportunity not only to examine the sections of the original tumor in our case, but to study the lesions post-mortem as well.

**Case XII:** A. W., a colored woman, thirty-eight years old, discovered a lump in her left breast, some 2 cm. in diameter, two years prior to admission. This apparently disappeared and was forgotten until ten months later, when it reappeared and grew rapidly until within two months it measured some 7 cm. in diameter. It was removed at another hospital, but seven months later a recurrence lateral to the scar was observed. This also grew rapidly, attaining the size of the former tumor and extending to the axilla in two and a half months. It was extirpated and three weeks later the patient was seized with severe generalized abdominal cramps, followed within a week by vomiting and signs of incomplete intestinal obstruction. On admission to St. Luke's Hospital she was moribund and only palliative measures were deemed advisable. Death occurred two weeks later.

**Fig. 15.** **Case XII: Rhabdomyosarcoma: Lung Alveoli Filled with Large Myoblasts, Ribbon-like and Smaller Irregularly Shaped Tumor Cells.** × 225

At autopsy an ulcerated mass 5 × 2.5 cm. was found in the left axilla lateral to the healed operative scar. Tumor nodules, from 0.7 to 3.5 cm. in diameter, and varying in color from grayish-red to white, studded the pleural surfaces of both lungs and infiltrated the tracheobronchial nodes. Similar nodules were scattered through the lung tissue. An area of bronchopneumonia was present in the upper lobe. In the right lobe of the liver were two tumor nodules, the larger measuring 7 cm. in diameter. A hard, pedunculated tumor, some 2 cm. in diameter, projected into the lumen of the stomach at its mid-portion near the greater curvature. Three centimeters from this was a smaller tumor with ulceration of the mucosal surface. Two similar nodules projected into the lumen of the jejunum and one large nodule 3 feet from the ileocecal valve had caused complete intussusception. The uterus contained multiple small fibromyomata, all of which proved to be benign. No lesions were found in the vertebral column.

A microscopic section of the original tumor was obtained and proved to be practically identical with the local recurrence found at autopsy. It shows large numbers of myoblasts having a granular cytoplasm and deep-staining nuclei both centrally and eccentrically placed (Fig. 13). Scattered about are occasional elongated ribbon-like fibers with distinct longi-
tudinal striations. Between these are small polyhedral spindle cells and still smaller round cells, as well as strands of connective tissue which show some leukocytic infiltration.

The nodule in the liver (Fig. 14) shows elongated muscle fibers with distinct longitudinal striations as well as round, spindle and polyhedral cells similar to those in the original tumor.

A portion of tumor tissue invading the lung alveoli (Fig. 15) is composed of large polyhedral and ribbon-like muscle cells. Another lung field, under high magnification (Fig. 16), shows a dilated capillary filled with large granular myoblasts. A still higher magnification of a lung field (Fig. 17) shows a muscle fiber in the center with distinct cross-striations.

Sections of the intestinal lesions revealed myosarcomatous tumors of essentially the same histological structure as those in the liver (Fig. 18). Some elongated fibers showed distinct striations.

The question may be asked whether this tumor may not possibly have arisen within the pectoralis major muscle and invaded the breast secondarily. That these neoplasms may arise within skeletal muscle anywhere within the body has been demonstrated by Wolbach (23), who in a rhabdomyoma arising within the erector spinae muscle over the dorsal vertebrae of a four-year-old girl, found normal adult skeletal muscle fibers intermingled with embryonal muscle fibers and tumor cells. He traced the development of myofibrils within the tumor cells to the paired centrioles found close to the nucleus and appearing throughout as dispersion granules, which upon division gave rise to fibrils and proliferated at the expense of the cell cytoplasm.

The most frequently reported sites of rhabdomyoma, however, are within the kidney and testicle, where no skeletal muscle exists. The origin of these tumors showing distinct striated muscle fibers is most satisfactorily explained
Fig. 17. Case XII: Rhabdomyoblastoma: Lung Metastasis Showing a Muscle Fiber with Distinct Cross-striations. × 720

Fig. 18. Case XII: Rhabdomyosarcoma: Area from Wall of Ileum Showing Elongated Muscle Fibers, Myoblasts, and Smaller Irregularly Shaped Cells. × 225
on the basis of a misplaced embryonal mesenchymal rest which, under the proper growth stimulus, proliferates into more or less mature muscle elements. The superficial position of the original breast tumor reported here makes this view tenable.

![Image of breast](image)

**FIG. 19. CASE XIII: CHONDROMYXOFIBROSARCOMA COMPLETELY INVOLVING RIGHT BREAST**

![Image of histology](image)

**FIG. 20. CASE XIII: CHONDROMYXOFIBROSARCOMA: ISLETS OF CARTILAGE IMBEDDED IN LOOSELY ARRANGED MYXOMATOUS STROMA. X 150**

**Mixed Tumors**

Two tumors are designated as mixed tumors of the mesodermal type since they contain a variety of well differentiated structures which can be traced to a single germ layer. A third tumor contained both proliferating ectodermal
and mesodermal derivatives. The first of these three neoplasms, a chondromyxofibrosarcoma, showed rather slight differentiation of its components.

Case XIII: B. S., a white married woman of sixty-eight years, discovered a painless lump in her right breast four years prior to admission. This grew slowly for two and a half years, and then more rapidly until on admission it filled the entire breast (Fig. 19). A biopsy was performed and two pieces of grayish, firm tissue were removed, each measuring $0.4 \times 2 \times 0.8$ cm.

Microscopic study showed numerous small islets of fairly well formed, blue-staining, hyaline cartilage embedded in a myxomatous and spindle-cell stroma (Fig. 20). No bone was found. The nuclei of the spindle cells stained deeply, but mitoses were rare.

The patient was referred for x-ray therapy, but disappeared. Inquiry revealed that she died at home five months after leaving the hospital.
FIG. 23. Case XIV: Osteogenic Sarcoma: Area showing small spicules of osteoid tissue closely packed and surrounded by single layers of osteoblasts. × 120

FIG. 24. Case XIV: Osteogenic Sarcoma: Area showing parallel bundles of elongated spindle cells enveloping a few breast ducts. × 120
The next case, because of the complexity of the adult structures composing the tumor, has been designated as an osteochondrofibrosarcoma or osteogenic sarcoma.

Case XIV: C. M., a white female fifty-nine years of age, six weeks prior to admission observed a lump in her right breast, which grew rapidly. A simple mastectomy was performed and a portion of the breast, measuring $8 \times 6 \times 3.5$ cm., was removed. A hard, round tumor, $4 \times 3$ cm., was present beneath the nipple, unattached to the underlying muscle or fascia. Fig. 21 shows a cross-section of the breast and the prominent bony mass.

Fig. 22 shows an area of interlacing, compact, broad strands of elongated and plump spindle cells. The nuclei for the most part are deeply stained; mitoses are numerous. In another area (Fig. 23) closely packed spicules of osteoid tissue are seen surrounded by layers of osteoblasts in close proximity to bundles of slender, elongated spindle cells; elsewhere are seen a few breast ducts, enveloped by these spindle-cell bundles (Fig. 24). Fig. 25 shows a mosaic pattern of calcified bone spicules, some of which contain bone cells and have a lamellar structure. Between the spicules are numerous thin-walled blood vessels. Osteoblasts line the edges of some of the bone, and there are occasional osteoclasts. An area of hyaline cartilage undergoing resorption with the formation of spicules of osteoid tissue is illustrated in Fig. 26, while Fig. 27 shows elongated spicules of osteoid tissue some of which contain clear lacunar spaces. Closely packed osteoblasts surround the newly formed spicules. Marrow tissue was not present in any of the sections.

The patient at the present writing, two years after operation, shows no evidence of local recurrence or metastasis.

A case similar histologically to the one described above has recently been reported by Kurosu (12) in a white woman of eighty years. This he describes as an osteochondrofibroangiosarcoma. The patient died shortly after discharge from the hospital and no autopsy was performed. Kurosu also reviews the accepted cases of mixed tumors of the breast as well as those cases
FIG. 26. CASE XIV: OSTEOGENIC SARCOMA: AREA OF HYALINE CARTILAGE UNDERGOING RESORPTION WITH THE FORMATION OF SPICULES OF OSTEOID TISSUE. × 120

FIG. 27. CASE XIV: OSTEOGENIC SARCOMA: AREA OF ELONGATED SPICULES OF OSTEOID TISSUE, SOME OF WHICH CONTAIN CLEAR LACUNAR SPACES. × 120

Closely packed osteoblasts surround the newly formed spicules.
of von Hacker (9), Coen (3), Hueter and Karrenstein (10), and Kreibig (11) in which both malignant epithelial and connective-tissue elements were present. He prefers, as does Kreibig, not to classify these latter tumors as teratomas, as in no instance did they contain other teratomatous elements or muscle or glial tissue. No doubt some of them can be considered as collision tumors, in which one type of malignancy is invaded by another, or as combination forms in which two tumors derived from different germ layers arise fortuitously and proliferate in close proximity. Recent animal experiments with carcinogenic hydrocarbons in which two tumors have arisen, one epithelial and the other of connective-tissue origin, suggest the probability of such phenomena (5). R. Meyer (16) suggests an even narrower relationship for certain carcinosarcomata in which the boundaries of one type overlap the other, raising the question of whether both elements could not be derived from a single tissue.

The last of the present series, a carcinosarcoma, contained both proliferating epithelial and connective-tissue cells.

Case XV: A. D., a white female of seventy-two years, was admitted with a firm tumor on the superficial portion of the left breast. The overlying skin was not adherent. The duration was not known. A radical mastectomy and axillary gland dissection were performed and a hard fibrous encapsulated tumor $4 \times 4 \times 6$ cm. removed.

Microscopically the tumor is a duct carcinoma with extensive areas of closely packed large polyhedral cells (Fig. 28), many of which have distinct intercellular bridges. In other areas strands of squamous cells lie between large spindle cells with large oval nuclei and fairly abundant cytoplasm (Fig. 29). Sections taken from other portions of the tumor
show the connective-tissue elements predominating (Fig. 30), though in many areas they merge almost imperceptibly with epithelial cells. Stained with Von Gieson's stain the spindle cells are reddish and often show fine red fibrils extending from their extremities.
Both the Van Gieson and Bielschowsky stains show fine fibrils between the spindle cells but none between the large, flat epithelial cells.

The classification of this tumor presents considerable difficulty. The large polyhedral cells appear to be derived from the lining of the ducts and invade in the manner of an undifferentiated large-cell carcinoma. The spindle-shaped cells, which show marked proliferative changes and merge closely with the epithelial cells, may represent no more than a marked hyperplasia resulting from stimulation of the adjacent cells, similar to the response shown by connective tissue to certain chemical irritants or infections. On the other hand, such a hyperplasia as is present in this tumor has not been seen in some 2000 sets of slides in the St. Luke's Hospital collection from carcinomata of the male and female breasts. The presumption is that the large-cell connective-tissue areas represent a true malignant growth of connective tissue.

The patient succumbed five days following operation from symptoms of cardiac failure and no autopsy was performed. The axillary nodes showed no metastatic lesions that might throw further light on the biological behavior of the tumor. On a purely morphological basis, however, it may be classified as a carcinosarcoma.

**Conclusions**

1. Fifteen primary sarcomas of the breast have been collected from the files of St. Luke’s Hospital over a period of thirty-five years, constituting 0.80 per cent of the malignant breast tumors seen during this time.

2. Twelve of these were classified as simple, being derived from a single type of connective tissue; 3 were of the mixed type. Of the former, 5, grouped as spindle-cell fibrosarcoma, showed the greatest differentiation and most uniform histologic characteristics. At least 2 of these arose in fibro-adenomas and showed slow growth until malignant change became evident. One of the 5 patients is known to be alive and well ten years after removal of the tumor.

3. Two tumors classified as fibromyxosarcomas showed marked differences in the amount of myxomatous tissue. The patient in which production was abundant ran a rapidly downhill course with a local recurrence and axillary node involvement, together with clinical evidence of pulmonary metastases. The other patient could not be traced.

4. The 3 examples of polymorphous fibrosarcoma showed little differentiation histologically and appeared to be rapidly infiltrating tumors. One patient died from lung metastases six months after the removal of a small tumor.

5. In one patient the histological picture was that of a neurogenic sarcoma, but the Hospital records gave no further information as to the clinical course.

6. A rhabdomyosarcoma is the second recorded as occurring primarily in the breast. The course was rapid, the patient succumbing with multiple metastases in the lungs, intestine, liver, and lymph nodes. No bone metastases were found.

7. Of the 3 patients with complex tumors, one with a chondromyxofibrosarcoma died within six months after a biopsy of the breast. The patient with an osteochondrofibrosarcoma is alive and symptomless two years after a simple mastectomy. In a third case, diagnosed as carcinosarcoma on a purely morphological basis, death occurred five days after operation, of cardiac failure.
Though a number of the patients of the earlier years could not be followed, the conclusion is obvious that these sarcomas are in general malignant, but that this property varies greatly with the different morphological types described.

Bibliography