PRIMARY LIPOSARCOMA OF BONE *

Report of a Case

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Primary liposarcoma of bone is sufficiently rare to justify the reporting of isolated instances of this disease. The existence of liposarcoma of bone was noted by Ewing [1] at the London Cancer Congress of 1928. One of the authors [2] reported in detail 3 cases from this hospital, 2 of which had formed the basis for Ewing's tentative recognition of the disease, the other case having appeared after the Congress report.

The tentative recognition of these tumors as liposarcomas was criticized by W. G. Barnard.[3] He states that "case 2 appears to be a polymorphous-cell sarcoma in which some of the cells have taken up fat." The authors do not recognize the term "polymorphous-cell sarcoma" as other than purely descriptive since it implies nothing as to histogenesis, fundamental nature and presumptive clinical course. It has long been our effort to avoid such terms whenever possible. Barnard's criticism suggests a lack of familiarity with the alveolar lipogenic tumors of soft tissue. Fender [4] reported a liposarcoma with certain alveolar tendencies although he makes no claim for its origin in bone but believes that it arose at least in close proximity to the fibula. An additional case was reported by L. Barnard [5] and two others by Rehbock and Hauser.[6]

We have, therefore, 1 case of questionable bone origin and 6 where the origin in bone seems reasonably well established. The present case appears to be the 7th. The report of this last tumor has been deliberately delayed until the lapse of five years from first admission to the hospital in order that any peculiarities in the clinical course might be observed. It will be remembered that the original cases from this hospital ran clinical courses that seemed to place them in a special category apart from the usual sarcomas of bone.

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Report of Case

Clinical History: M.Q., male, aged 49 years, applied to the Memorial Hospital on March 28, 1933. His family and past history were irrelevant. He dated his present illness to a fall, sustained on Nov. 23, 1932. He stated that while carrying a load of 100 pounds he had slipped. He was admitted to another hospital where radiographs disclosed a fracture of the lower portion of the shaft of the left femur. The patient was treated for this fracture and on Jan. 7, 1933 was discharged with a supporting splint.

Although intermediate films are not available for study it would appear that healing was imperfect. Pain persisted and shortly before entering the Memorial Hospital the patient sustained a second fracture while lying in bed. Films taken the day following admission revealed a pathological fracture through the lower third of the left femur with extensive displacement. The bone tissue in the region of the fracture had a "rotten wood" appearance. There was a large soft tissue mass surrounding the site of fracture and at the periphery of the mass evidence of calcification. The differential diagnosis lay between a primary medullary tumor of bone, *i.e.*, plasma cell myeloma, and a metastatic carcinoma. No evidence of metastases appeared in films of the lungs. No other primary site of tumor was demonstrated.

It was decided to amputate the extremity. This may seem an unusual decision in view of the tentative diagnosis of myeloma but experience has shown that the bulky myeloma, through which fracture has occurred, does not do well with roentgen therapy. The tissue is usually reduced to a hemorrhagic cellular mass, often mainly blood clot, and the reaction essential to regression of tumor under X-ray proceeds very poorly under such circumstances. The fracture persists and isolated myelomatous areas remain throughout the hemorrhagic residue.

Amputation at a level 14 cm. below the uppermost point of the great trochanter was done on April 3, 1938. This level was well above the area of change demonstrated by radiographs. Convalescence was rapid and uneventful and within 3 months the patient was using an artificial limb.

Nine months after the amputation an enlargement of the stump was noted. The tissue was aspirated and a diagnosis of recurrent tumor was made. The stump recurrence was irradiated through three portals, anteriorly, posteriorly and laterally, giving 2000 r,

in 500 r doses through each portal. Reddening and superficial desquamation resulted and the recurrent mass showed considerable regression. It became fluctuant and some 300 cc. of bloody fluid were aspirated. The lung fields remained clear and no bone destruction could be demonstrated in the femoral stump. In February of 1934 tissue destruction was noted on the lateral aspect of the stump and persistent disease was palpable in the deeper tissues so additional radiation was given to two fields, anterior and posterior, totalling 1500 r per portal in 500 r doses. A biopsy in June 1934 showed no evidence of residual disease. By July 1934 the combination of heavy radiation and careless stump hygiene had resulted in considerable necrosis both anteriorly and posteriorly over the stump. The bone began to protrude and the infection spread. It was thought moreover that deep disease was present. Further radiation was impossible and a trial of Coley toxin was suggested. Toxin was given for 1 month, from Oct. 8, 1934 to Nov. 17, 1934, and from Nov. 30, 1934 to Dec. 22, 1934. This treatment was resumed in January and continued throughout the month. Constitutional reaction was moderate.

On Feb. 1, 1935 the femoral stump was disarticulated. The healing was incomplete and Reverdin grafts were necessary. Four months later the patient developed cough, with yellowish white sputum, occasionally blood-tinged. Radiographs of the lung fields showed for the first time evidence of metastasis. The metastatic deposit consisted of a single, bulky, sharply outlined round mass in the hilar area on the left. The mass measured 9 cm. in diameter. The mass was treated by radiation, through three portals, 500 r daily until each portal had received 1500 r. Toxins were continued, each course being conducted in such fashion that a reaction would be obtained every few days for a period of a month, after which a rest period of 2 to 3 months would intervene, to be followed by a continuation of the toxins. This treatment has been continued to date.

Following either the radiation or the toxins, or both, the lung metastasis regressed. It measured 9 cm. in diameter on Aug. 28, 1935. By Jan. 23, 1936 it measured 5 cm. in diameter. Six months later the size had decreased somewhat more and there was a very noticeable decrease in the density. In January 1938 no definite mass could be made out but the region showed considerable fibrosis

not incompatible with roentgen pneumonitis. The general condition of the patient remains excellent. He has gained much weight and weighs more without his leg than he did on admission with the extremity present.

In other words, the entire clinical course of this tumor is unusual. Its natural history and response to treatment are not consistent with the usual medullary sarcoma of bone, nor can they be reconciled with a metastatic tumor. The apparent radiosensitivity coincides with previous observations on tumors of the liposarcoma group.

The peculiarity of the tumor became immediately evident from the gross examination. The tissue was soft, grayish yellow, lobulated, and revealed a coarsely fascicular structure, resembling a medullary fibrosarcoma of bone. The location, however, was distinctly unusual since such tumors tend strongly to occur at the extremities of the long bones. This tumor occupied the lower shaft, centering 11 cm. above the articular surface (Fig. 1). About 5 cm. of shaft were filled with rather sharply circumscribed tumor. A pathological fracture had occurred approximately in the center of the tumor-bearing area, the cortex was perforated and a sharply outlined, lobulated tumor had mushroomed out into the surrounding tissue, displacing muscles and an abundant deposit of extraperiosteal fat tissue. There were areas of bright yellow necrosis in the tumor. Extending up the shaft of the femur were irregular islands of glistening, opaque, grayish, mucoid-like tumor. A slight degree of callus production had occurred along the line of pathological fracture. There were foci of necrosis in the surrounding muscles. These were evidently the result of the trauma of fracture.

Microscopically the main tumor consists of interlacing spindle cells resembling those seen in medullary fibrosarcoma of bone (Fig. 2). They tend, however, to be a trifle more blunt in some areas than cells of the usual fibrosarcoma of bone. Their cytoplasm is more acidophilic and were the tumor one of soft tissues one would have strongly considered the possibility of muscle origin. The nuclei are largely centrally placed. The cells differ moderately in size and shape; mitoses are abundant and some few are atypical and multiple. Hyperchromatism of the large ovoid nuclei is marked.

Staining for fat droplets revealed none in the spindle cells making up the bulk of the tumor. Only in the irregular islands of tumor in the medullary portion of the shaft above the main mass is it possible to trace the histogenesis of the lesion. In these areas there is a low grade chronic inflammatory reaction in the marrow fat tissue, characterized by diffuse and nodular lymphocytic infiltration, the presence of scattered large adult fat cells surrounded by many smaller young fat cells (Figs. 3, 4) with numerous fine, foamy droplets which take fat stains. In the adult fat cells the nuclei occupy the usual peripheral position. In the small vacuolated foam cells the nuclei are either peripherally or more centrally placed; some are small, rounded and deeply staining; others are larger, occupying from one-third to one-half the diameter of the cell. Occasionally the nuclei reach large dimensions and contain single large nucleoli as large as the entire nucleus of some of the young vacuolated fat cells. In the midst of these rounded or polyhedral fat cells are found fusiform cells which contain hyperchromatic ovoid nuclei. Such cells are obviously neoplastic and yet the cytoplasm of the fusiform cells appears vacuolated, thus resembling that of the fat cells. As the cells become more atypical vacuolization is lost, the cytoplasm tends to be rather acidophilic and the cell can no longer be identified as arising from fat.

In our opinion the origin of this tumor is traceable to inflammatory changes in adult fat. The process is similar, for example, to the changes in fat which one occasionally sees in the kidney bed and which give rise to lesions that may be classed as true malignant tumors, or which when present in less obvious form may tax the effort of the pathologist to find a precise classification. We class the tumor here reported as a primary liposarcoma of bone. Adopting the proposed separation of liposarcomas into two types, adult liposarcoma and myxoliposarcoma of embryonal structure, as suggested by Ewing [7] for the liposarcomas of soft parts, the tumor would be classed as an adult liposarcoma. The several peculiarities which serve to separate this tumor from the usual spindle cell medullary sarcoma of bone have been sufficiently emphasized in the clinical discussion. Since evidence has gradually accumulated over a period of years, which may indicate a relation between trauma, especially when repeated, and the development of liposarcoma of the adult type, the question might be

raised as to whether or not this tumor could have *followed* a fracture. It must be answered in the negative, since, although the initial films were not interpreted as showing tumor and the accident seems bona fide, a reexamination of these films in the light of subsequent events shows that tumor was present at the time the first fracture occurred.

REFERENCES

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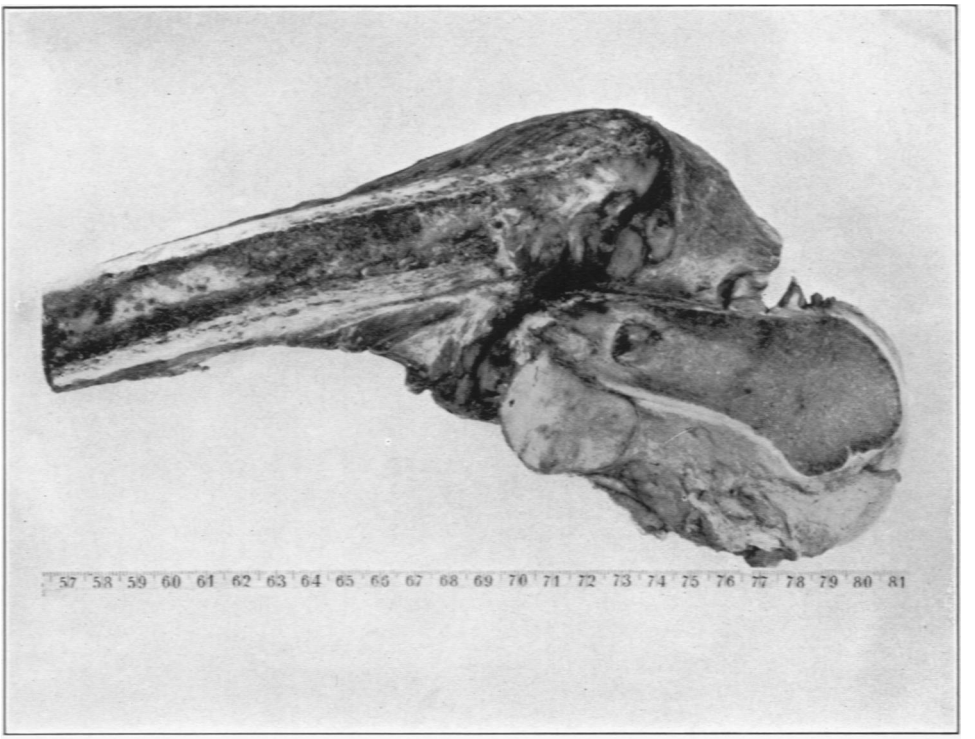
DESCRIPTION OF PLATES

PLATE 140

FIG. 1. Hemisection of lower femur showing pathological fracture through the main portion of the tumor, well above the articular surface.

FIG. 2. Structure of the main tumor. Spindle and giant cell sarcoma.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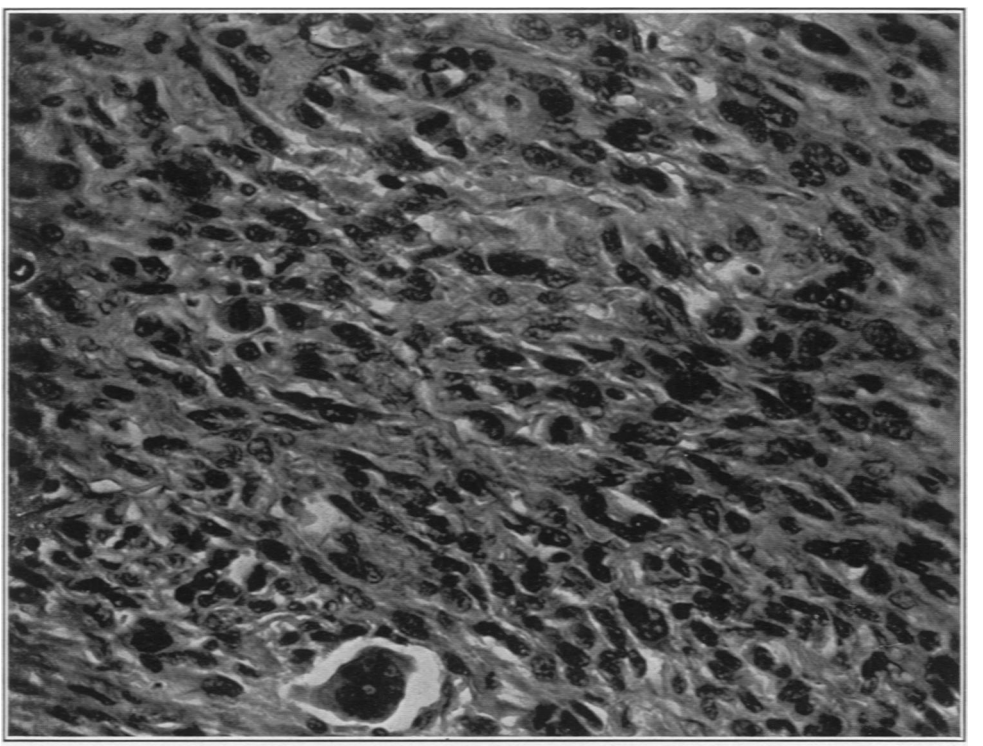

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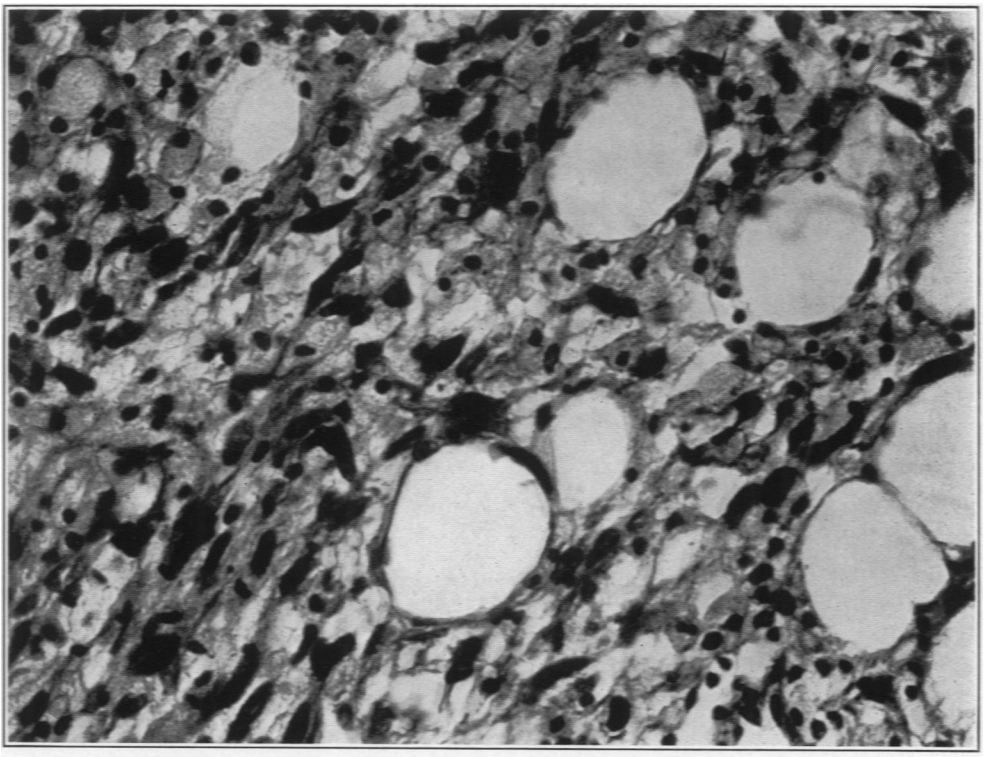
PLATE 141

FIG. 3. Adult fat cells and small vacuolated fat cells at the periphery of the main tumor. Origin of tumor cells from small young fat cells.

FIG. 4. A similar area apart from the main tumor. Fusiform vacuolated cells arising from fat.



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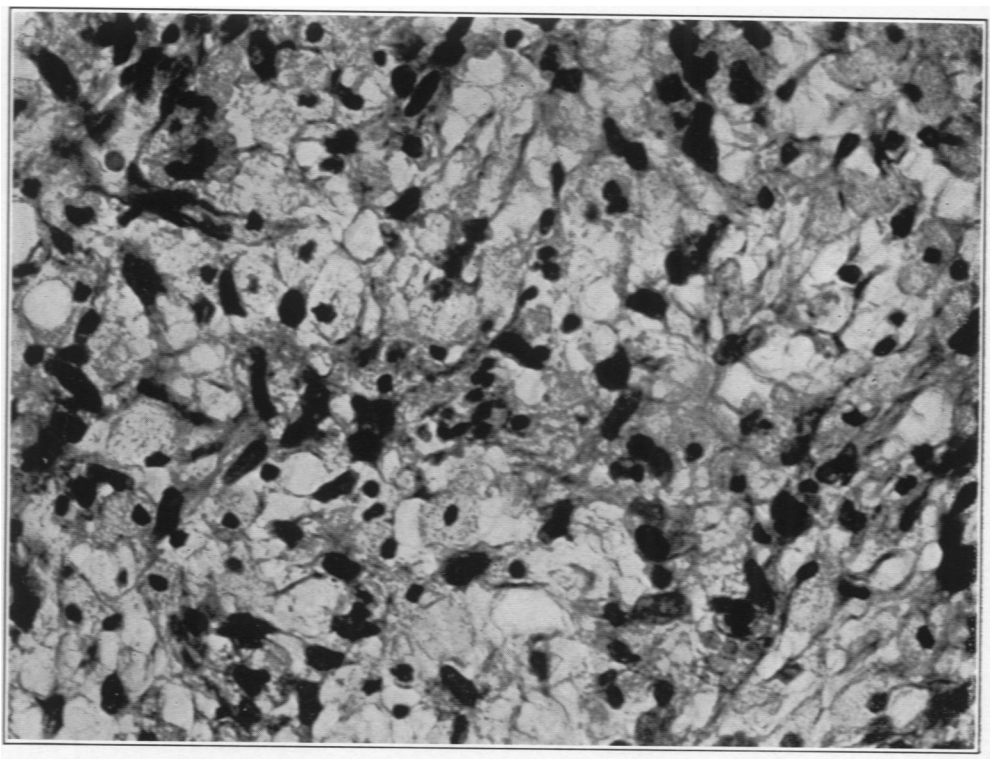

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