SOLITARY MYELOMA (PLASMACYTOMA) OF THE FEMUR: REPORT OF ONE CASE

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INTRODUCTION

The occurrence of the multiple primary tumor of bone known as multiple myelomata is not exceedingly rare. Geschickter and Copeland (5) reviewed 425 cases recorded in the English and continental literature previous to 1928. One of their conclusions, based upon this study, was that the multiplicity of the tumor is one of its cardinal points. The occurrence of this disease in a solitary focus, however, is of sufficient interest to justify the report of an additional case.

Solitary myeloma was first recognized by Ewald in 1897 (1). He described a case in which the disease was limited to the clavicle, although a complete autopsy report is not given. Subsequent to his report there have been nine other cases described in the literature (Table I). In seven of these cases the patient was alive at the time the report was made and for that reason complete confirmation of the solitary nature of the lesion could not be made.

The present report concerns a solitary myeloma of the femur mistaken for a metastatic malignant tumor in a sixty-year-old man.

REPORT OF CASE

History: LACGH 166-502. J. H. W., a white male of sixty years, entered the Los Angeles County General Hospital on July 19, 1931, complaining of a dull, aching pain in the region of the left hip. Eighteen months previously, in January 1930, he had noticed a dull, aching pain in the region of the left hip, which radiated down the inner side of the thigh to the region of the knee. This distress was continuously present until some time in June 1930, when he was awakened by a series of cramps in the left thigh. This was followed by extreme local pain and loss of function of the left leg. A pathological fracture of the femur at the level of the lesser trochanter was found (Fig. 1). The radiographic appearance of the lesion was that of a purely osteolytic lesion confined to the region of the fracture.

A walking caliper splint was applied, and the patient permitted to be ambulatory. The caliper was removed in November 1930. The radio-
graphic examination at that time showed good callus formation with expansion of the shaft and marked trabeculation (Fig. 2). During the subsequent eight months the patient was able to walk with the aid of crutches and could bear some weight on the affected left leg. He was free from pain when the limb was at rest. In June 1931 he suffered a second pathological fracture (Fig. 3). The limb was immobilized, but the pain associated with the fracture persisted even with the limb at rest.

The past personal history and family history were essentially negative as regards the local condition, except for a cellulitis of the left leg about twenty-five years previously and a history of a prostatectomy six years before. The pathologist reported the specimen as being a benign adenoma of the prostate.

Physical Examination: The essential physical findings were confined to the local pathology in the femur. The left femur was shortened three inches, and the left thigh was three and one-half inches less in diameter than the right thigh. The left foot was inverted and showed marked limitation of motion. The Wassermann reaction on the blood serum was negative on two occasions. The urine, on July 14, 1931, and September 2, 1931, was negative for Bence-Jones protein. The blood count showed 4,400,000 red blood cells and 90 per cent hemoglobin (Sahli). The white blood cells numbered 5000 with 55 per cent polymorphonuclears. No
<table>
<thead>
<tr>
<th>Reference</th>
<th>Age</th>
<th>Sex</th>
<th>Site of Lesion</th>
<th>Histological Type</th>
<th>Radiographic Pathological Type</th>
<th>Pathological Pathological Type</th>
<th>Autopsy</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Ewald (1) 1897</td>
<td>62</td>
<td>Male</td>
<td>Right clavicle</td>
<td>Plasmacytoma</td>
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<td>No</td>
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<td>Morax (2) 1910</td>
<td>?</td>
<td>?</td>
<td>Right orbit</td>
<td>Myelocytoma</td>
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<td>No</td>
<td>No</td>
<td>No reported</td>
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<td>Female</td>
<td>Right maxilla</td>
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<td>Yes</td>
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<td>Bernard Shaw (4) 1923</td>
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<td>Male</td>
<td>Right humerus</td>
<td>Myelocytoma</td>
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<td>Finat (6) 1929</td>
<td>15</td>
<td>Male</td>
<td>Frontal</td>
<td>Myelocytoma</td>
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<td>Rogers (7) 1930</td>
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<td>Male</td>
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<td>No</td>
<td>No anemia</td>
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<td>Geschickter (8) 1930</td>
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<td>Male</td>
<td>Femur</td>
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<td>No anemia</td>
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<td>32</td>
<td>Male</td>
<td>4th dorsal vertebra</td>
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<td>No</td>
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<td>Male</td>
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<td>Plasmacytoma</td>
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<td>?</td>
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<td>Plasmacytoma</td>
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<td>Harding and Kimball (1932)</td>
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immature cells were observed. Radiographic examination of the entire skeleton showed the lesion to be limited to the left femur (Fig. 3). At the level of the lesser trochanter was an irregular area of decreased density, with some widening of the shaft adjacent to it. There was a slight amount of calcification, although the lesion in general was osteolytic. The medullary canal showed more extensive involvement than the cortex. In addition there was a fracture at the site of the lesion.

**Course:** The patient was placed in extension and later in a plaster cast, but the distress persisted. Owing to the continual agony and the inability to find other foci of malignant disease, disarticulation of the leg at the hip-

![Fig. 3. RadioCopy of Solitary Myeloma (Plasmacytoma) of the Femur joint was advised. This was accomplished on Sept. 3, 1931. Surgical shock ensued. The patient failed to rally, and death occurred on the following day.

**Report of Pathology**

(a) **Gross Surgical Specimen:** The specimen consists of the left leg disarticulated at the hip joint. There is no irregularity in the contour of the skin that would indicate a tumor growth along the shaft of the femur, but on palpation a small mass is felt near the upper end of the bone. There is abnormal mobility of the head and neck of the femur, indicating a fracture, apparently well up in the proximal third of the shaft. After removing the skin and subcutaneous tissues down to the deeper layer of muscles, the mobility of the head of the femur increases and there is visible irregularity in the line of the bone just below the trochanters. As
the muscles are stripped away from the bone, those lying on the postero-medial surface show a distinctly lighter color than those elsewhere and are more easily torn, as if infiltrated by tumor tissue. After all the muscles have been removed the shaft of the femur is seen to present a point of discontinuity, the intervening space being occupied by rather firm, tumor-like tissue which mushrooms out from the shaft forming an irregular ring 7 cm. in diameter and 4.5 cm. in vertical width (Fig. 4). This ring is not entirely symmetrical, due to pressure on some of the segments by the tendons. The tumor has produced marked bone destruction, with little or no evidence of osteogenesis. The periosteum over the tumor is largely destroyed.

When the femur and tumor are split longitudinally, there is revealed a rounded tumor mass occupying the medullary cavity (Fig. 5), which has produced destruction of the cortex and is continuous with the tumor seen on external examination. It would appear that this began as an intra-medullary tumor and grew by expansion, destroying the bone and then producing a collar-like mass of tumor tissue about the shaft, with subsequent invasion of the muscles.

(b) Microscopic Pathology: The sections, stained with hematoxylin-eosin, show a tumor having but little fibrous stroma, packed with cells of fairly uniform size and appearance. The cells have an abundance of clear acidophilic staining cytoplasm, with rather small, dark staining nuclei having prominent chromatin bodies (Fig. 6). In locations where these cells are more loosely arranged they are round, but when they are closely packed they are polygonal in shape. Occasionally a cell of similar character but of much larger size is seen. Mitotic figures are not numerous.
FIG. 6. PHOTOMICROGRAPH SHOWING CELLULAR STRUCTURE
Note apparent lack of intercellular substance. Hematoxylin-eosin (oil immersion)

FIG. 7. INVASION OF ADJACENT MUSCLE BY THE PLASMA CELLS
Hematoxylin-eosin. Low power
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Several of the sections include muscle fibers, and the cells are seen infiltrating between these. This accounts for the light color of the muscles on the posteromedial surface (Fig. 7). The sections stained by Perdrau’s method show a rich reticulum throughout the tumor. It is distributed in large, coarse bundles from which many fine strands arise. In areas these fibers surround each individual cell (Fig. 8).

(c) Autopsy Findings: Autopsy was performed two hours after death. The report was as follows: The body is that of an exceedingly well developed and well nourished white male. External examination shows a recent surgical wound over the left ligament of Poupart, which is closed in layers in the usual surgical manner. The left lower extremity has been disarticulated at the hip-joint.

Careful examination of the calvarium and base of the skull, sternum and ribs, pelvic bones, right femur and tibia, and all of the vertebrae shows no foci of neoplastic tissue. The viscera show no gross pathological changes of note except for a moderately contracted kidney with multiple small retention cysts throughout the cortex. No enlarged lymph nodes are found in any region of the body. The microscopic examination of the tissue confirms the gross impression.
DISCUSSION

According to Geschickter and Copeland (5), the following six features are characteristic of myelomata:

1. Multiple involvement of the skeletal trunk.
2. Pathological fracture of a rib.
3. Bence-Jones bodies in the urine.
4. Backache with signs of an early paraplegia.
5. An unexplained anemia.
6. Chronic nephritis with nitrogen retention and low blood pressure.

The case here reported exhibited none of these features. The histologic appearance of the tumor, however, is typical of plasma-cell myeloma.

In eight of the nine cases previously described there has been a statement of the type of cell predominating in the growth. Six of these were of the plasma-cell type. All of the cases occurring in the bones of the extremities showed this type of cell. The solitary myelomata occurred at an earlier age than is characteristic for the disease occurring in multiple foci. The average age in the ten cases of solitary myeloma is about forty years, while the average age of patients exhibiting multiple involvement is approximately fifty-five years. The occurrence of Bence-Jones protein in the urine is said to have been observed in about 65 per cent of the cases of the tumor. It is of interest that in only one of the five cases of solitary myeloma in which this substance was searched for was it found. The characteristic anemia of the disease is not found in those cases with a solitary focus. This fact is in agreement with the impression that the anemia may be due to the widespread destruction of the bone-marrow accompanying multiple involvement. In every case in which the growth occurred in the appendicular skeleton there has been a pathological fracture. The mechanism of callus and calcification occurring at the site of pathological fracture following immobilization has not been explained satisfactorily.

SUMMARY

1. A case of solitary plasma-cell myeloma of the femur is reported.
2. The nine cases of solitary myeloma occurring in the literature are reviewed.
3. Complete radiographic and post-mortem examinations were made in the case reported.

Literature