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Solitary Myeloma with Massive Extracellular Crystalline Structures
— A Case Report —

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We describe a case of solitary myeloma showing cystic change filled with massive crystalline structures in a 54-year-old woman. A bone X-ray showed a solitary cystic osteolytic lesion in the right iliac bone. Serum and urine protein electrophoresis showed no demonstrable M-protein, and bone-marrow aspirates did not show any myeloma cells. Histologic examination of the tumor revealed aggregation of plasma cells with massive extracellular infiltration of the rhomboid-shaped crystalline structures. In immunoperoxidase staining, both these crystalline structures and the cytoplasms of the myeloma cells demonstrated a positive reaction for lambda light chain. By electron microscope, the large extracellular crystalline structures were observed, and we found unique rhomboid or rectangular-shaped crystalline structures in the cytoplasms of the myeloma cells.

Key Words : *Solitary myeloma, Extracellular crystalline structures, Immunoperoxidase staining, Electron microscopy*

INTRODUCTION

Solitary myeloma is a single plasma cell tumor of the bone. The commonly occurring sites are the spine, pelvis, and femora(Woodruff et al., 1979). The median age at the time of diagnosis is 11 years less than that of multiple myeloma. The survival period from the time of diagnosis is much longer than that of the usual multiple myeloma. The diagnosis of solitary myeloma is established, when a solitary lytic lesion is found in X-ray, by either needle or surgical biopsy that reveal aggregation of plasma cells, or by random bone-marrow aspirates from the other sites, which reveal less than 5 percent of plasma cells(Bergsagle, 1990).

Recently, we experienced a case of solitary myeloma in the right iliac bone, satisfying the above diagnostic criteria, along with massive extracellular crystalline structures. Many cases of the intracytoplasmic crystalline structures in various diseases have been reported, especially plasma cell disorders such as multiple myeloma(Feremans et al., 1978), and lymphoid cell malignancies such as chronic lymphocytic leukemia(Clark et al., 1973). In addition, Kalderon et al.(1977)reported a case of the extracellualar crystalline materials in the bone marrow of a patient with multiple myeloma, but no report of solitary my-

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eloma showing large cyst filled with extracellular crystalline structures has been found. The characteristics of these crystalline structures have been demonstrated by cytochemical staining, immunoh-istochemical staining, and ultrastructural studies(Kalderon et al., 1977 ; Pinkus and Said, 1977 ; Feremans et al., 1978 ; Raman and Van Slyck, 1983). We had an opportunity to examine solitary myeloma with extracellular crystalline structures and to demonstrate the characteristics by immunohistochemistry and electron microscopy.

CASE PRESENTATION

A 51-year-old woman had been admitted to hospital due to a palpable mass on the right buttock. A solitary osteolytic lesion on the right iliac bone also had been detected by plain X-ray. At that time, bone-marrow aspiration revealed no evidence of plasmacytosis. Serum and urine protein electrophoresis including immunoelectrophoresis showed no evidence of M-protein. This case was thought to be cystic fibrous dysplasia preoperatively. Surgical removal of the cystic mass of the right iliac bone was performed, and the mass was diagnosed as an inflammatory pseudotumor by light microscopic examination. The patient was then discharged without radiation therapy.

After 2 1/2 years since the first admission, she was readmitted to hospital, because of tenderness on the previous operation site. At the time of readmission, the physical examination didn't reveal any abnormal findings except for tenderness on the old operation scar at the inferior medial aspect of the right buttock. A plain pelvic AP view of the

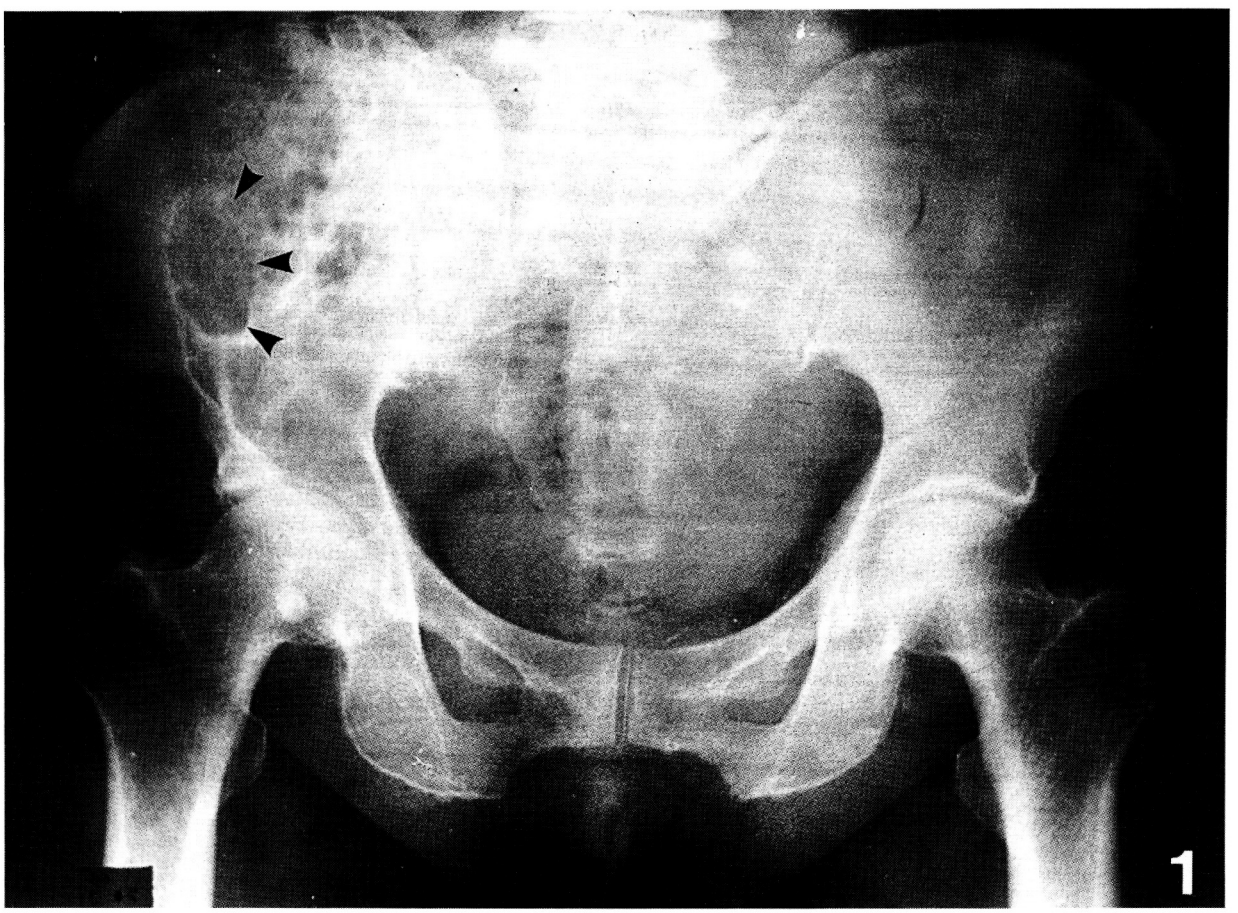

Fig. 1. Pelvic AP X-ray reveals a well-defined solitary cystic osteolytic lesion on the right ilium (arrowheads).

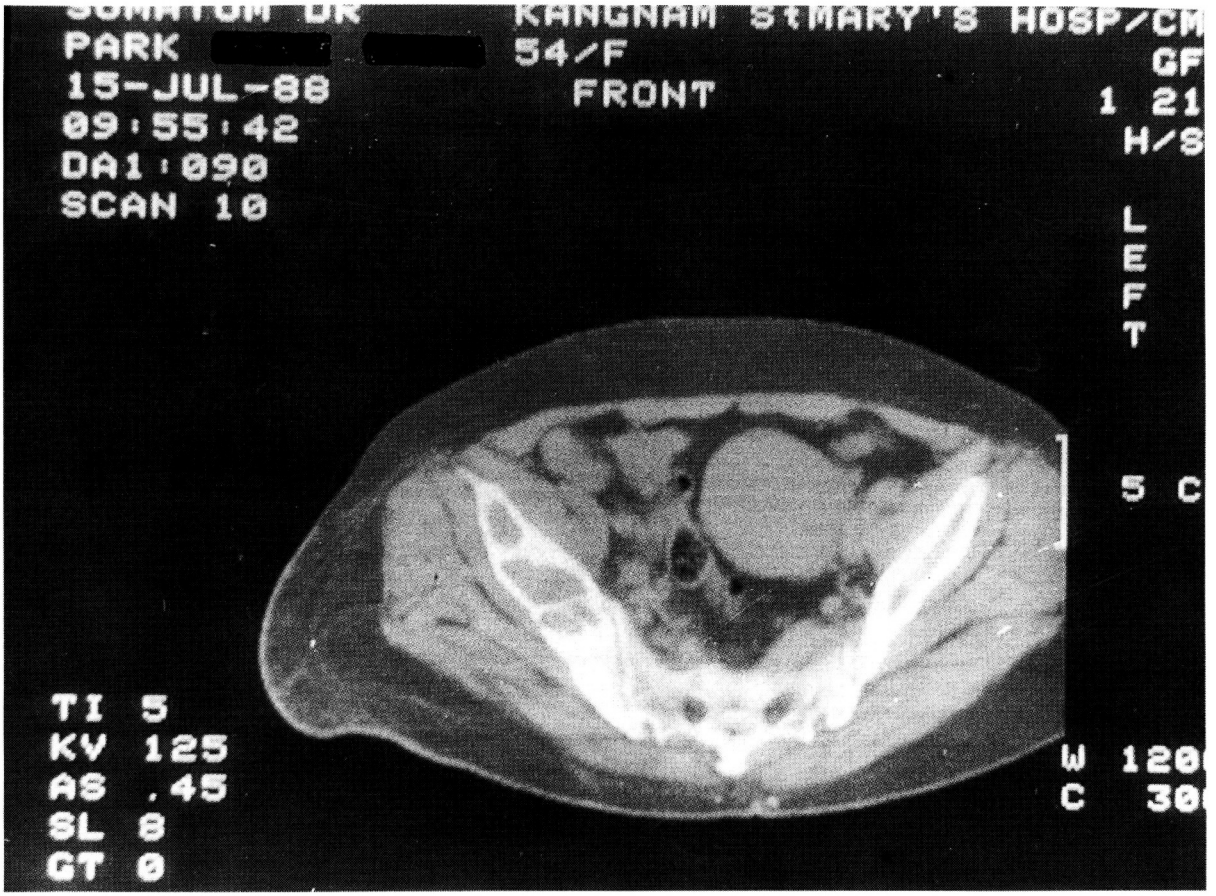

Fig. 2. Pelvis CT scan reveals various sized well-defined osteolytic lesions on the right ilium.

X-ray study showed a solitary cystic osteolytic lesion on the previous lesion site(Fig. 1) and a pelvic CT revealed a solitaty osteolytic lesion on the right ilium(Fig. 2). In the laboratory examination, the hemoglobin was 14.8 g/dl, hematocrit 44 %, total leukocyte count 7,300/ul, with a slight degree of eosinophilia(13 %), platelet count 392,000/㎕, serum protein 6.7 g/dl, calcium 9.5 mg/dl, phosphorous 5.4 mg/dl, and alkaline phosphatase 275 IU/l. Other routine laboratory data were within normal limits. Serum protein electrophoresis and immunoelectrophoresis showed unremarkable findings. A curettage of the cystic lesion demonstrated in the bone X-ray was performed.

Several fragmented tan brown and rubbery masses, up to 1.5㎝, were received by Pathology Department. They consisted of relatively mature plasma cells with massive extracellular infiltration of rhomboid or rectangular-shaped crystalline structures(Fig. 3). These plasma cells and crystalline structures showed a positive reaction in methyl green pyronine stain(Fig. 4) and a negative reaction in PAS stain. The monoclonal characteristics of these plasma cells and crystalline structures were demonstrated by immunoperoxidase staining. Monoclonal lambda light chain was present not only in the cytoplasm of these plasma cells, but also in the crystalline structures(Fig. 5). By electron microscopy, unique rhomboid- or rectangular-shaped crystalline structures were demonstrated in the cytoplasm of the plasma cells (Fig. 6), and the plasma cells revealed enlarged rough endoplasmic reticulum and multiple cystic structures in their cytoplasms. Histologic diagnosis was solitary myeloma with massive extracellular infiltration of the crystalline st-ructures.

The patient who was discharged after surgi-

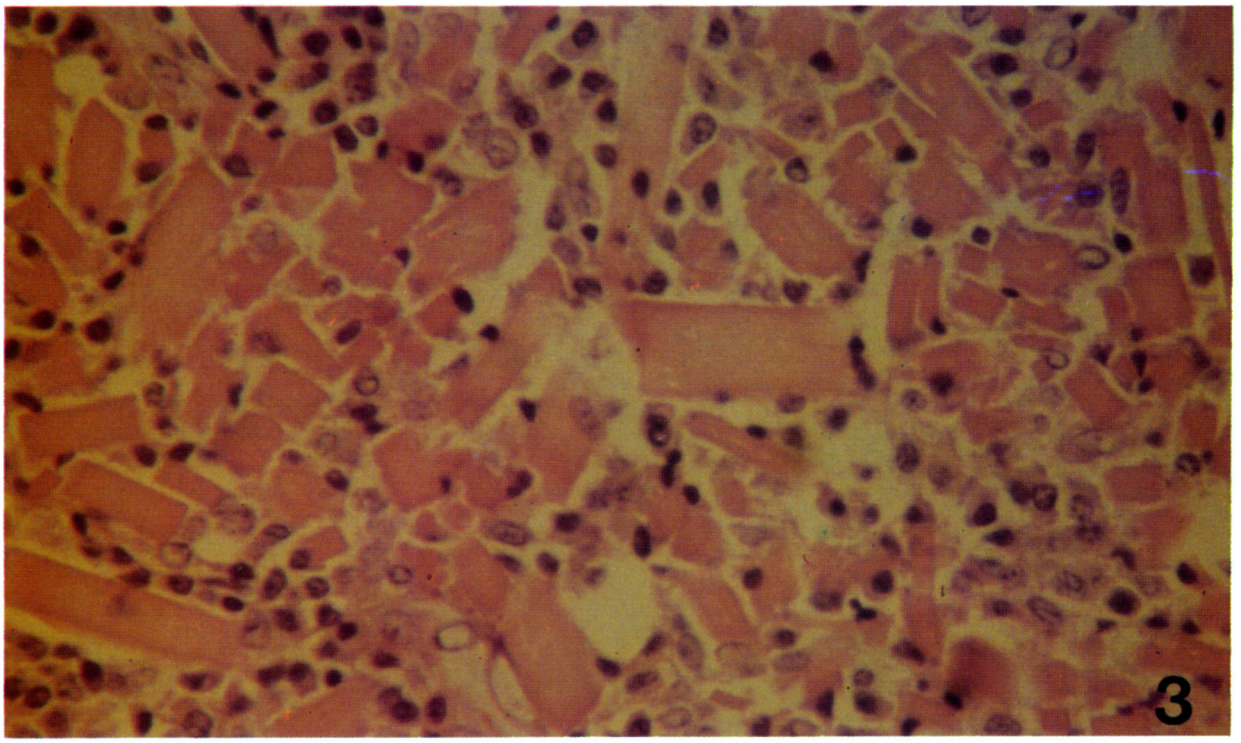

Fig. 3. Photomicrography shows aggregation of mature plasma cells and various sized rectangularshaped crystals(H&E, ×500).

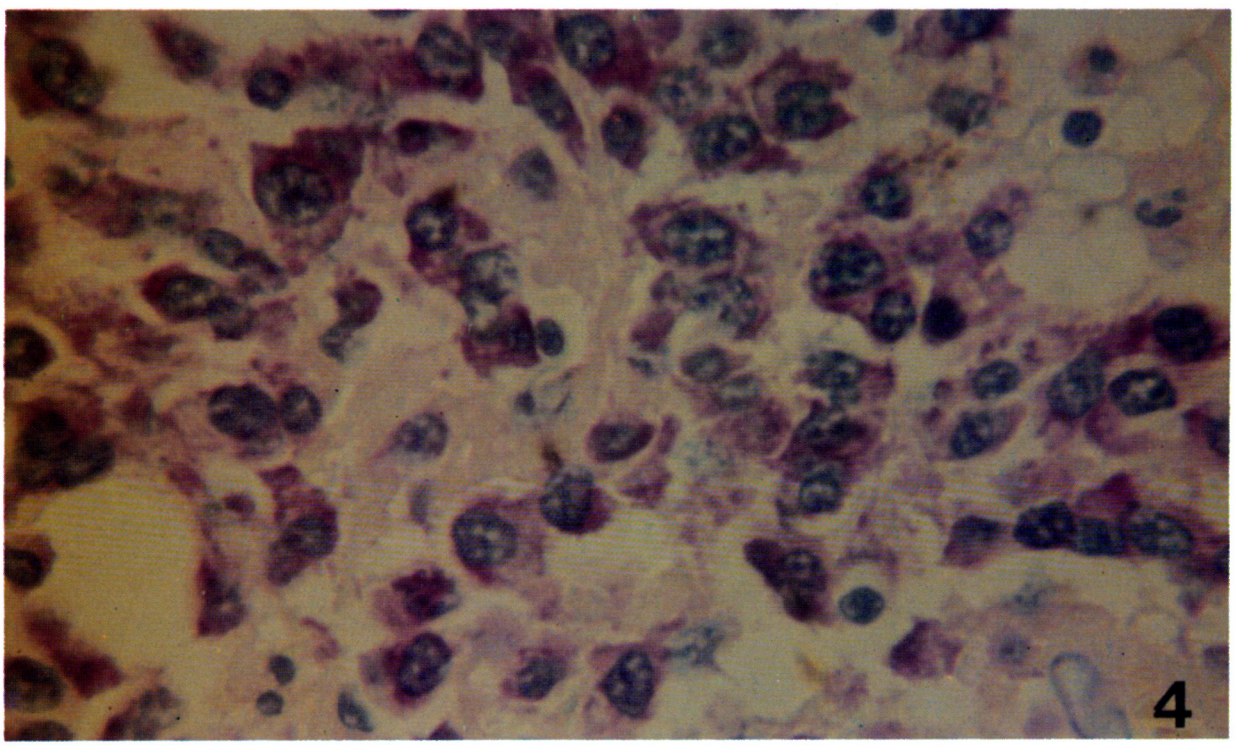

Fig. 4. Photomicrography shows pink-colored positive result in cytoplasm(methy green pyronin stain, 1,000).

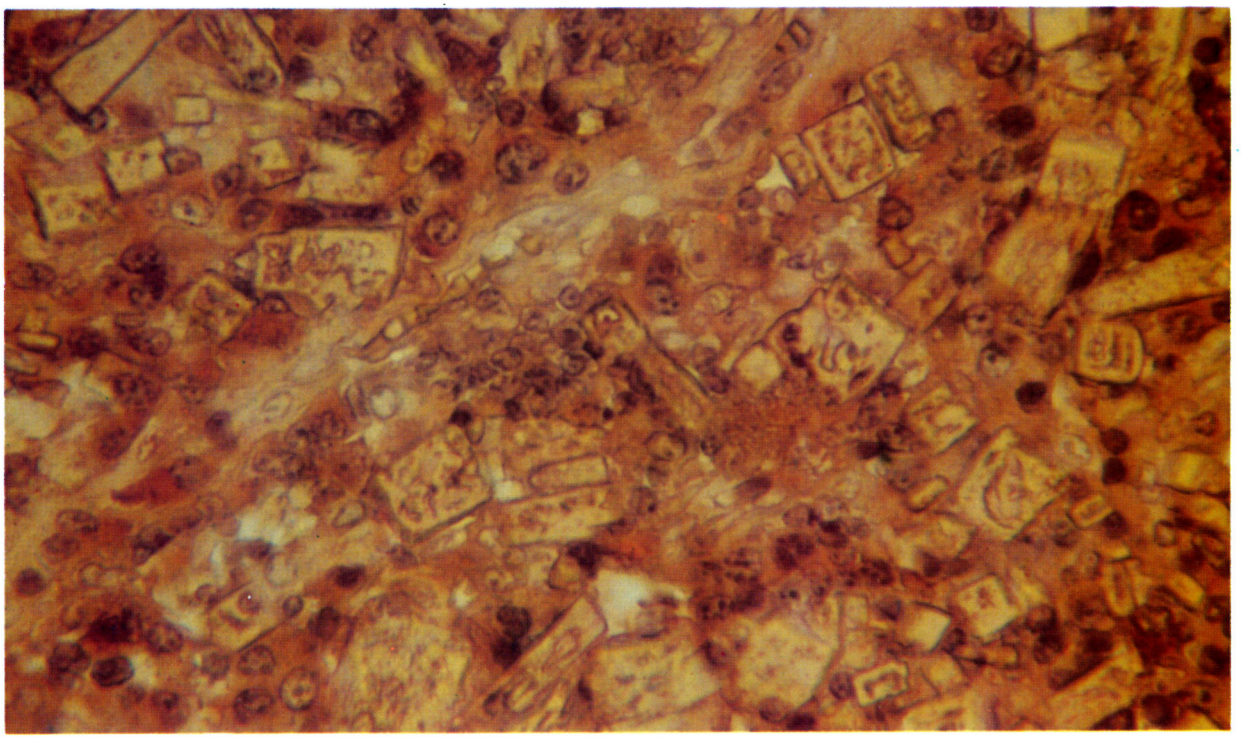

Fig. 5. Immunohistochemistry for lambda light chain reveals positive stainability both in the cytoplasm of the plasma cells and on the crystalline structures(PAP stain for lambda ligtht chain, x 1,000).

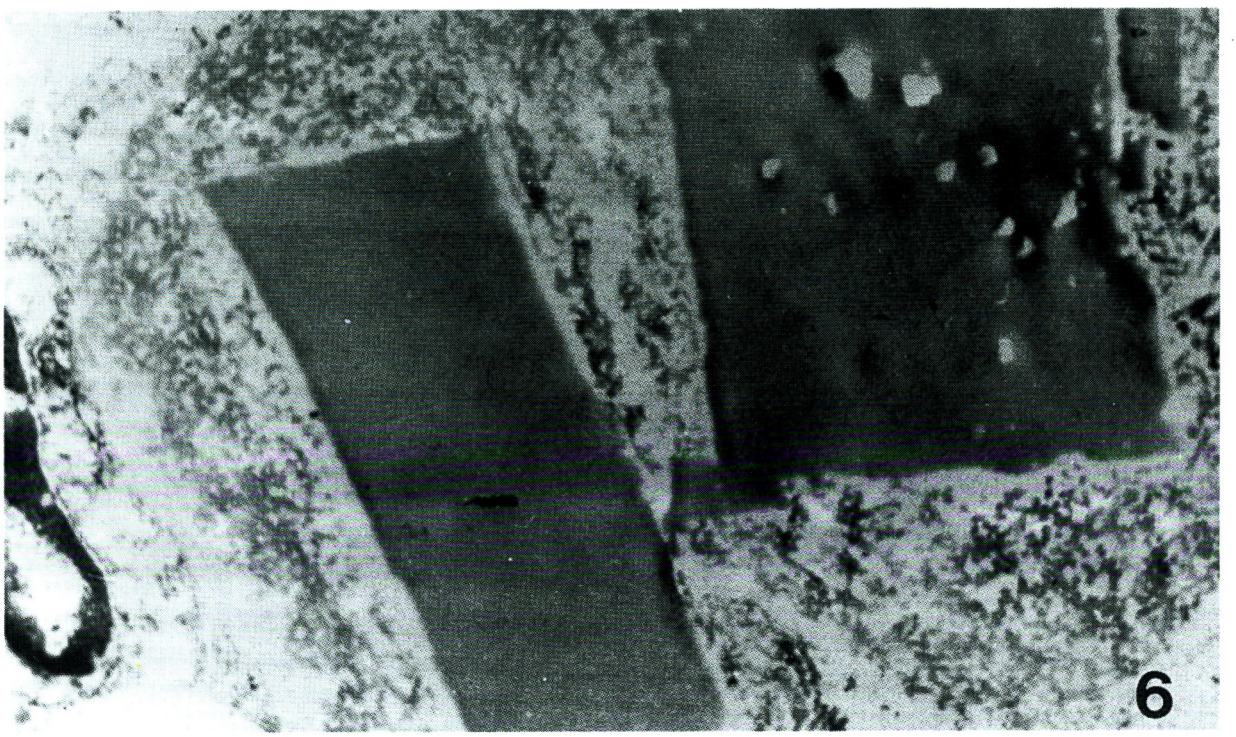

Fig. 6. Electron microscopy reveals unique rhomboid-or rectangular-shaped crystalline structures in the plasma cell cytoplasm(x 12,500).

cal removal of the tumor mass and received radiation therapy, has been doing well 14 months since the operation.

DISCUSSION

Solitary myeloma of the bone has been regarded as a disorder related to multiple myeloma, because solitary myeloma of the bone in many patient, evolves into multiple myeloma sooner or later. Even though many investigatiors have regarded solitary myeloma of the bone as an unusual presentation of multiple myeloma, it has to be distinguished from multiple myeloma. Because the long survival rate of some patients with solitary myeloma implies that some of these lesions are indeed solitary. If adequate excision could be performe , these tumors will be curative. So, clearly distingishing it from multiple myeloma is needed for prospective prognosis and to establish therapeutic plan (Woodruff et al., 1979 ; Bergsagel, 1990). This case is suggestive of a true solitary lesion, because any evidence of dissemination or distant metastasis was not detected during the 1 1/2 years from the time the lesion was initially detected. In the case of multiple myeloma, the presence of M-protein in either the serum or urine is the most common feature of the disease, although M-protein is not revealed in rare cases of multiple myeloma, so-called nonsecretory myeloma(Kyle, 1975). The presence of cytoplasmic monoclonal immunoglobulins was demonstrated by immunofluorescent studies or immunoperoxidase studies (Pinkus and Said, 1977). As in our case and many previously reported cases of nonsecretory multiple myeloma, plasma cells are most commonly able to synthesize immunoglobulins but not excrete them to the peripheral blood(Cabo et al., 1985 ; Rubio-Felix et al., 1987)

The crystalline structures in the cytoplasms of plasma cells and lymphoid cells in various diseases, such as multiple myeloma(Jennette et al., 1981), chronic lymphocytic leukemia (Clark et al., 1973), and primary gastric plasmacytoma(Ferrer-Roca, 1982), have been previously reported in various forms. In many of these cases, immunofluorescent or immunoperoxidase studies of intracytoplasmic crystals have revealed that the composition of these crystalline structures is made up of monoclonal immunoglobulins. On the other hand, Raman et al.(1983) observed an unusual pattern of intracytoplasmic crystalline structures which showed no activity in immunofluorescent studies and a strong positivity in acid phosphatase staining, so they suggested that the intracytoplasmic crystalline structures were of lysosomal origin. Because both the crystalline structures in the extracellular spaces and cytoplasms of the plasma cells in our case showed positive reaction for lambda light chain in immunoperoxidase staining, we regarded the extracellular crystalline structures to be associated with the same kind of monoclonal immunoglobulins, defined as lambda light chain, as those presented in the cytoplasms of the myeloma cells. The PAS-negative staining of the crystalline structures suggests that these immunoglobulins lack their carbohydrate chain(Feremans et al., 1978). Kalderon et al. (1977) observed the crystalline structures having an unique subunit structure in intra- and extra-cellular spaces in the case of multiple myeloma with crystalcry-oglobulinemia by electron microscopy. We also observed extracellular crystalline structures and unique crystalline structures in the cytoplasm of the plasma cells having enlarged rough endoplasmic reticulum on electron microscopic examination.

The nature of the defect leading to the intracytoplasmic accumulation of immunoglobulin crystals remains hypothetical. It may be attributed to a lack of balance between immunoglobulin synthesis and secretion. In such a case, synthesis is increased but secretion does not follow at the same rate, or delay in secretion occur(Feremans et al., 19 78 ; Levine and Bernstein, 1985). From the results of our studies, we suggest that immunoglobulin excretion from the plasma cell is maintained without any defect, but some disturbances of excretion from the tumor mass, influence the forming of an extracellular crystalline structure, which might be the cause of cystic change of the bone.

The clinical significance of the crystalline

structures in the case of multiple myeloma, as supposed by Levine and Bernstein(1985), is that the finding of the crystalline structures should be added to the criteria(Kyle and Greip, 1980) for omission of chemotherapy, because patients with intracytoplasmic crystalline structures may present with a prolonged nonprogressive clinical course. In this respect of a true solitary lesion, this case has good prospects for a long survival.

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