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CASE REPORT

A Case of Multiple Myeloma with Auer Rod-Like Inclusions in Plasma Cells

Qibin Luo, Qingfeng Ma, Sai Zhang

Department of Clinical Laboratory, Feicheng People's Hospital, Feicheng, Shandong Province, China

SUMMARY

Background: **Auer rods are considered to be a distinctive feature of acute myeloid leukemia, presenting in the cytoplasm of leukocytes in a purplish-red rod-like, wood-bundles-like, and spindle-like morphology. In this paper, we report a rare presence of wood-bundles-like Auer rods in the plasma cells of patient with multiple myeloma (MM).**
Methods: **Retrospective analysis of the clinical presentation and laboratory diagnosis of patients with multiple myeloma containing Auer rod-like inclusions in plasma cells were reviewed in this study.**
Results**: In 2014, 15% of plasma cells were shown in the patient's bone marrow smear, and the diagnosis of multiple myeloma was considered. The cytosol of plasma cells was medium-sized, the nucleus was deviated, the chromatin was aggregated in clumps, and Auer rod-like inclusions arranged in woody bundles were seen in the cytoplasm. In 2017, the patient's condition relapsed, and an abnormal increase of κ-type free light chains was found in the urine, and the urine Bence-Jones protein was positive. In 2021, the patient's condition aggravated to the point of death.**
Conclusions: **In this uncommon case, the source and mechanism of Auer rod-like inclusions production should be paid more attention to provide rational suggestions for clinical diagnosis.**
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Correspondence:
Sai Zhang
Department of Clinical Laboratory
Feicheng People's Hospital
Feicheng, Shandong Province 271600
China
Email: 19853613162@163.com

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KEYWORDS

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INTRODUCTION

Auer rods are usually present in myeloid tumor cells as individual rods or bundles of firewood. They are most commonly seen in acute myeloid leukemia (AML) and myelodysplastic syndromes (MDS) [1], especially in M3 acute leukemia. They are important markers for the diagnosis of AML. However, Auer rod-like inclusions have also been reported in chronic lymphocytic leukemia [2], prolymphocytic leukemia [3], and early T-cell precursor acute lymphoblastic leukemia [4]. Although few cases were reported, the occurrence of this phenomenon is worth studying. Herein, we report a case of plasma cells of firewood-bundled Auer rods present in an MM patient.

CASE REPORT

A 70-year-old woman presented in March 2014 with paroxysmal left chest pain for half a year, aggravated and accompanied by left shoulder pain for one month. Physical examination showed that superficial lymph nodes were not visibly enlarged, thorax was symmetrical without deformity, and no abnormal mass was palpated. There was pressure pain on the left side of the chest and the left shoulder. Bilateral thoracic respiratory movements were symmetrical. The abdomen was soft, with no pressure or rebound pain, and no abnormal mass was found. The liver and spleen were not palpable under the ribs. Chest CT showed left upper chest-posterior rib bone destruction and high possibility of metastatic tumor. ECT was performed and the results showed that left 1 - 3 anterior ribs and 4th and 7th posterior ribs were metabolically active, and metastatic lesions to be ranked. Combining the symptoms and examinations, the preliminary diagnosis of left side rib tumor and high possibility of metastatic tumor was considered, and multiple myeloma cannot be excluded. Laboratory examination showed WBC, 5.29 x 10^9/L; hemoglobin, 106 g/L; platelet, 321 x 10^9/L; urea nitrogen, 7.48 mmol/L; creatinine, 99 μmol/L; ferritin, 287.59 ng/mL; IgA, 1.6 g/L; IgG, 8.9 g/L; IgM, 0.7 g/L.

Bone marrow cytology demonstrated that hyperplasia was active and plasma cells accounted for 15% of the total, with the consideration of multiple myeloma. Cell morphology examination showed medium-sized cytosol, nuclear bias, chromatin aggregates in clumps, cytoplasmic perinuclear staining areas, and dozens of densely arranged Auer rod-like inclusions in the cytoplasm (Figure 1).

Thus, the treatment of VAD regimen (vincristine, Adriamycin, dexamethasone) chemotherapy was given, along with the body's immunity regulation, acid-suppressing and stomach-protecting supportive therapy. Zoledronic acid was applied to inhibit the bone destruction caused by bone metastasis. Bone marrow aspiration smear was evaluated after 2 cycles of chemotherapy, and no myeloma cells were found. The remission was remarkable without myelosuppression. Bone marrow aspiration smear was then evaluated after 4 cycles of chemotherapy, and no myeloma cells were detected. The patient has reached complete remission after chemotherapy, and the regulation of the body's immunotherapy was continued.

The bone marrow aspiration smear in March 2016 showed that no myeloma cells were detected. Whole body magnetic resonance synthetic imaging (PET-like) combined with ECT scan in June 2016 showed the reduction of the L3 and L5 vertebral lesions and the metastasis in mediastinal lymph nodes, which demonstrated the improved treatment effects compared with before. Then localized palliative radiotherapy was given due to the lumbar vertebral body destruction at 3 - 5. The radiotherapy target area was the lumbar vertebrae 3 - 5, 300 cGy/dose, 5 times per week, and DT amount of 3,000 cGy/10 times.

MRI images of the whole spinal cord in May 2017 were consistent with an improved presentation of multiple myeloma. The result of ECT scan in October 2017 demonstrated that limited radio-concentrated shadows were seen in the right and left ribs, T6, T8, L4-L5, and sacrum, with an increased number of foci compared to the previous one. No myeloma cells were detected in the bone marrow aspiration smear examination. Serum immunofixation electrophoresis showed that no abnormal monoclonal band was found in all lanes. Urinalysis showed that abnormal monoclonal bands were found in the κ light chain and κ free light chain lanes. Besides, the urine Bence-Jones protein was positive, and the type was κ free light chain type. The diagnosis of multiple myeloma relapse after chemotherapy was made. Systemic chemotherapy (vincristine, Adriamycin, dexamethasone) was started and zoledronic acid was applied to prevent and control the adverse bone events. The disease relapsed several times and was treated with chemotherapy using a bortezomib and dexamethasone regimen.

Bone marrow aspiration smear in April 2021 showed that myeloma cells accounted for 47% of the total, the morphology was the same as the initial diagnosis, and multiple densely arranged Auer-like inclusions were seen in the cytoplasm. The patient's disease progressed and worsened, leading to sudden cardiac arrest, ineffective resuscitation, and clinical death.

DISCUSSION

The Auer rod-like inclusions reported in this case were seen in the plasma cells of a patient with κ light-chain MM and showed a wood-bundle morphology. Dietmar Enko et al. [5] reported a case of κ light-chain MM in which plasma cells contained several Auer rod-like inclusions. Mary T. Sylvia et al. [6] found Auer rod-like inclusions in the plasma cells of a patient with IgG-κ MM. Sarra Fekih Salem et al. [7] found Auer rod-like inclusions of different shapes, such as rod, rectangular, and spindle-shaped in plasma cells of patients with IgA-κ type MM. Reviewing and summarizing these cases, we found that Auer rod-like inclusions were predominantly present in the plasma cells of myeloma patients with IgA-κ, IgG-κ, or κ light-chain types, especially in patients with IgG-κ MM.

Observed from the cytochemical staining point of view, Auer rods stained strongly positive for POX, and the cytochemical staining results confirmed that it was formed by lysosomal fusion. However, Auer rod-like inclusions were negative for POX, PAS, SBB, and CAE, and positive for α-NAE, ACP, and β-Gluc [8,9]. However, Lin Zhu et al. [10] reported a case of MM patient with positive POX and negative α-NAE and ACP staining of Auer rod-like inclusions, which was not entirely consistent with the results of the previous case study. This has led to inconsistencies in the researchers' understanding

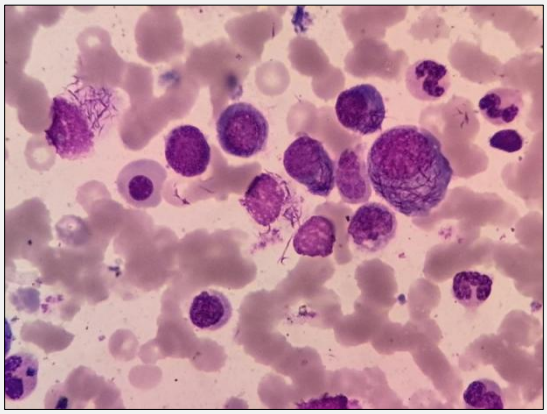

Figure 1. Plasma cells with multiple Auer rods-like inclusions in a bone marrow smear from a patient with multiple myeloma.

Wright-Giemsa stain, x 1,000.

of the source of Auer rod-like inclusions. Previous studies found that Auer rod-like inclusions may be formed by immunoglobulin or lysosomal deposition [11].
Kenta Hayashino et al. [12] found that MM patients with abnormal ultrastructure inside plasma cells may develop drug resistance due to the special processing inside the cells. Through this case, we also found that the patient had been relieved by chemotherapy and radiotherapy in the early stage, but this disease still recurs and even aggravates the progression of the disease, leading to the death of the patient. Therefore, it is all the more important for us to face the challenge and pay attention to the mechanism of Auer rod-like inclusions production. Not only the morphological features, but also laboratory tests and special staining methods should be taken seriously, which could help us comprehensively judge the patient's disease progression and prognosis, based on the medical history, and improve the patient's physical condition.

Declaration of Interest:

None.

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