Clin. Lab. 2024;70:XXX-XXX

CASE REPORT

Involvement of the Laboratory Department in MDT Discussion for the Diagnosis of Unexplained Leukocytosis

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SUMMARY

Background: **This paper reports the diagnostic process of a case involving an 86-year-old male patient who was admitted with cough, sputum, and fever, accompanied by persistent leukocytosis.**
Methods: **Through a multidisciplinary team (MDT) discussion, the laboratory department identified elevated ferritin levels, prompting clinical consideration of potential malignancy.**
Results: **Further investigations confirmed the diagnosis of thyroid cancer with multiple lung metastases.**
Conclusions: **This case highlights the potential value of ferritin in tumor diagnosis, offering new insights into the etiology of abnormal leukocyte elevation. Additionally, the active involvement of the laboratory department in MDT discussions proves to be crucial for diagnosing challenging cases.**
(Clin. Lab. 2024;70:xx-xx. DOI: 10.7754/Clin.Lab.2024.240123)

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Case Report accepted January 31, 2024

KEYWORDS

ferritin, MDT discussion, leukocytes, tumor

INTRODUCTION

The emerging model of multidisciplinary collaboration teams (MDT) has demonstrated significant importance in the field of medicine. The core concept of MDT lies in bringing together experts from various professional fields to collaboratively discuss cases, aiming for more comprehensive, precise diagnostic, and treatment plans [1]. When facing challenging cases, MDT provides a platform for collective brainstorming, enabling healthcare professionals from diverse backgrounds to jointly analyze patient situations. The involvement of the laboratory department not only facilitates the interpretation of extensive laboratory data but also contributes a unique perspective to the MDT, providing crucial information for the comprehensive assessment of challenging cases [2].

In various challenging cases, unexplained leukocytosis presents a particularly complex and difficult-to-treat condition. The complexity arises from the multitude of potential causes and the intricate symptoms, requiring a thorough and in-depth analysis [3]. Involving the labo-

ratory department in MDT consultations for the diagnosis of abnormal leukocyte elevation allows for the rapid acquisition of diverse information, promptly identifying underlying issues. This, in turn, enables earlier and more accurate diagnoses, securing valuable time for patient treatment.

This paper illustrates the experience of the laboratory department's participation in MDT discussions for the diagnosis of unexplained leukocytosis by presenting a case study. Through this, we aim to share insights into the laboratory department's role in MDT discussions for the diagnosis of challenging cases involving elevated white blood cell counts.

CASE PRESENTATION

Clinical Data

Medical history

The patient is an 86-year-old male admitted due to a 10-day history of "cough, sputum, and fever." He has a 2-year history of hypertension, a 2-year history of coronary heart disease, a 2-year history of type 2 diabetes, and a 2-year history of cerebral infarction. Additionally, he has a 1-year history of lumbar vertebral injury, leading to current limitations in mobility.

Physical examination

Upon admission, the patient's temperature was recorded as 36.0℃, heart rate at 98 beats per minute, respiratory rate at 30 breaths per minute, and blood pressure at 117/60 mmHg. Bilateral lung breath sounds were coarse, and moist rales were audible in both lower lungs. The patient's temperature was within the normal range, with a slight increase in respiratory and heart rates. Coarse breath sounds were noted, and moist rales were audible in both lower lungs.

Laboratory tests

Upon admission, the patient's blood routine revealed the following results: white blood cell count 42.49 x 10^9/L ↑, neutrophil percentage 92.10% ↑, lymphocyte percentage 3.20% ↓. Blood CRP was elevated at 156.6 mg/L ↑, and high-sensitivity CRP was > 5.0 mg/L ↑. Coagulation parameters showed prolonged prothrombin time (PT) at 16.40 sec ↑ and decreased PT activity at 49.40% ↓. Fibrinogen content was reduced to 1.240 g/L ↓.

Serum enzyme profile indicated elevated lactate dehydrogenase (LDH) at 288.00 U/L ↑ and alpha-hydroxybutyrate dehydrogenase (α-HBDH) at 202.00 U/L ↑. Total protein was decreased to 54.30 g/L ↓, albumin was 25.70 g/L ↓, and alkaline phosphatase was increased to 146.00 U/L ↑. Renal function parameters showed a decreased glomerular filtration rate of 59.17 mL/min ↓. Blood glucose was elevated at 18.98 mmol/L ↑ (random blood glucose). Ferritin level was measured at 953.4 ng/mL. Glycated hemoglobin (HbA1c) was elevated at 9.50% ↑.

Blood gas analysis (with 3 liters/minute oxygen supplementation) indicated a pH of 7.417, PO2 of 146 mmHg ↑, PCO2 of 35.7 mmHg, sPO2 of 99%, HCO3 of 22.5 mmol/L, BE -1.6 mmol/L, lactate level of 1.6 mmol/L, and PO2/FIO2 ratio of 695 mmHg. Electrolytes, stool routine + occult blood, blood lipids, and cardiac markers showed no significant abnormalities. Blood cell morphology examination revealed elevated total white blood cell count, increased granulocyte ratio, occasional multi-lobed nucleus granulocytes, and some granulocytes with toxic granules and vacuoles in the cytoplasm (Figure 1). Bone marrow aspiration showed active bone marrow hyperplasia, with 75.5% occupied by granulocytes, increased NAP score, 12% occupied by red blood cells, and visible megakaryocytes (Figure 2).

Imaging examination

Thyroid ultrasonography revealed cystic and solid nodules in the left lobe, with enlargement and echo disturbances in the right lobe. Chest and cardiac CT scans showed multiple infections in both lungs, left pleural effusion, and multiple nodules in both lungs.

Treatment

The patient received symptomatic treatment, including anti-infection, cough relief, expectorant, diuretics, albumin supplementation, and blood sugar control. Despite these interventions, the white blood cell count remained at elevated levels: 16.76 x 10^9/L ↑ (June 21), 34.03 x 10^9/L ↑ (June 27), 27.65 x 10^9/L ↑ (June 30).

MDT Discussion

On July 4th, a multidisciplinary team (MDT) discussion was conducted, involving specialists from endocrinology, infectious diseases, ultrasound, laboratory, radiology, hematology, cardiology, and oncology. The outcomes of the MDT discussion are summarized as follows:

Suspected hematological disorders

Symptoms and laboratory results indicative of abnormalities in the blood system, such as significantly elevated white blood cell counts, increased granulocyte ratios, and findings from bone marrow aspiration showing a higher proportion of granulocytes, raise suspicions of hematological disorders. Conditions such as leukemia or myeloproliferative disorders may be considered in this context.

Suspected infection with rare pathogens

The patient's symptoms and abnormal laboratory indicators suggest the possibility of an infection caused by rare pathogens. Particularly concerning is the lack of improvement in the early stages of treatment, prompting consideration of an infection by uncommon pathogens. Further microbiological examination and culture may be necessary to confirm this possibility.

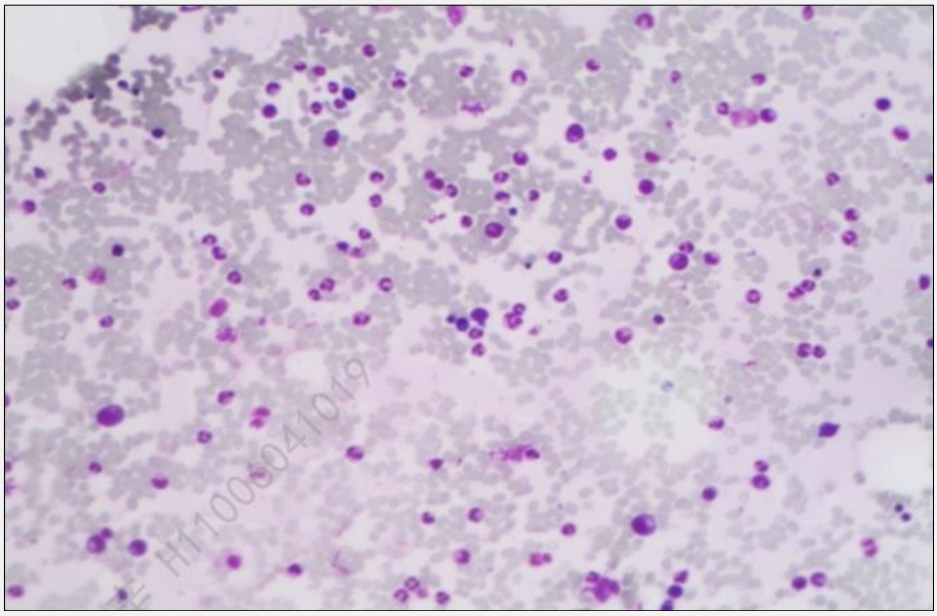

Figure 1. Morphological examination of blood cells in the patient.

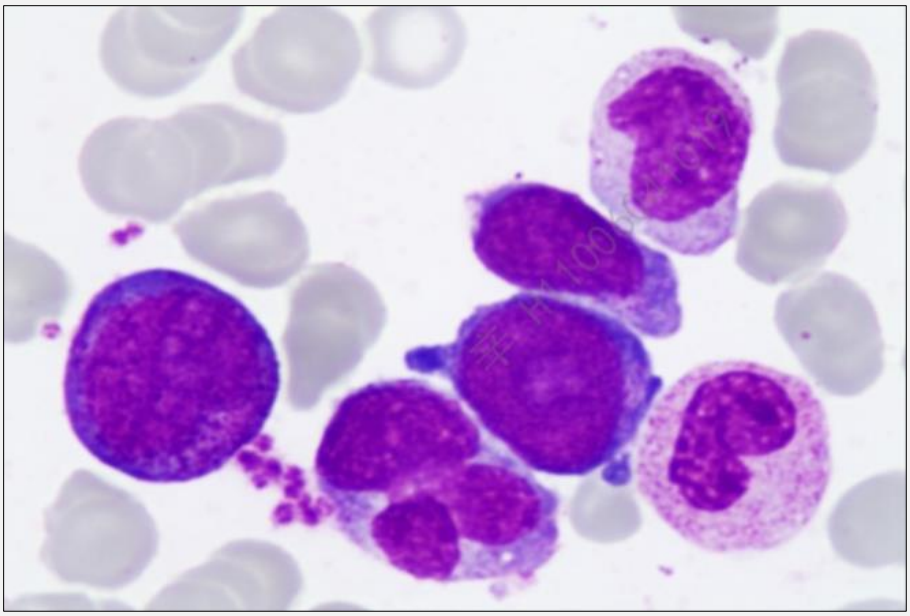

Figure 2. Morphological examination of bone marrow smear in the patient.

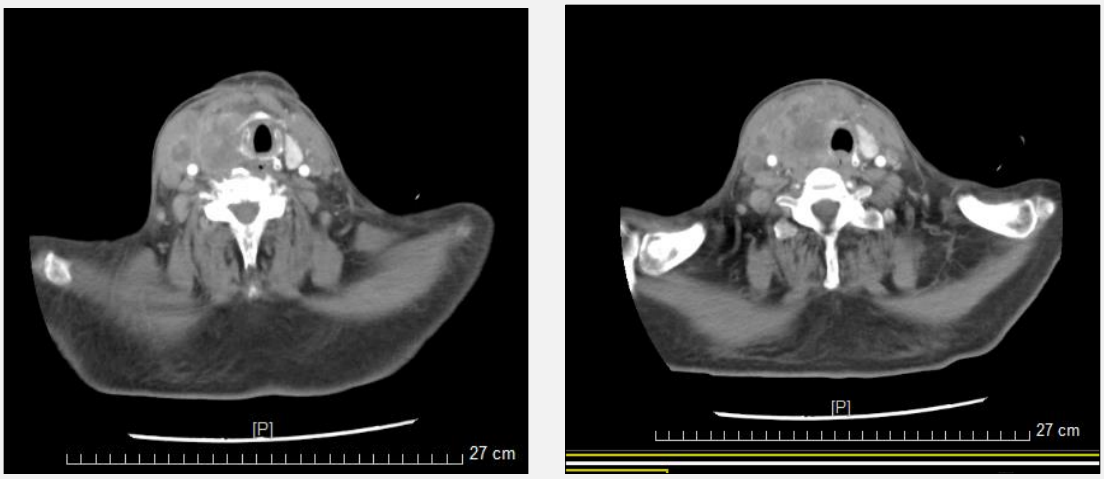

Figure 3. Patient's enhanced chest CT results.

Suspected immunodeficiency
The abnormal elevation of white blood cells and other inflammatory markers may suggest abnormalities in the immune system. This could be due to immunodeficiency, leading to an insufficient response to infection, or an overactive immune system. Further immunological investigations may help clarify this aspect.

Elevated ferritin levels raise suspicion of tumor
The abnormal increase in ferritin levels raises suspicion of a potential tumor. This phenomenon may be related to an underlying malignant neoplasm, especially considering the patient's clinical symptoms and imaging results, such as thyroid ultrasonography and chest CT. Elevated ferritin levels could serve as an indicator of tumorous diseases, suggesting the need for further oncological examinations and assessments.

Final diagnosis
On July 5th, the results of the enhanced chest CT indicated the presence of malignant thyroid tumors with multiple metastases (lymph nodes, both lungs). Subsequently, the patient was transferred to the oncology department for further treatment.

DISCUSSION

Common causes of elevated white blood cells
Elevated white blood cells, as a non-specific clinical manifestation, may be indicative of various underlying physiological and pathological processes. Common causes include infection, inflammation, stress, hematological disorders (such as leukemia, lymphoma), and drug reactions [4,5]. In this case, the patient's symptoms of cough, sputum, and fever, along with the elevated total white blood cell count observed in blood tests, suggest a possible association with infection or inflammation. The increased bone marrow activity in the bone marrow aspiration results also raises concerns about hematological disorders. However, it is essential to note that relying solely on these factors might be oversimplified, and further in-depth examinations are needed to exclude or confirm these potential blood system issues. In clinical practice, considerations should extend beyond typical causes like infection, inflammation, and hematological disorders, with tumors also included in the scope of possibilities [6,7].

Clinical significance of ferritin
Ferritin is commonly used to assess iron-deficiency anemia and overall nutritional status in the body [8]. However, in the context of malignant tumors, the abnormal elevation of ferritin holds clinical significance. This may be a physiological response to the release of iron due to inflammation, tissue damage, or malignant tumors [9]. Therefore, although ferritin is typically employed for iron metabolism evaluation, in cases of unexplained white blood cell elevation, elevated levels of ferritin contribute to a heightened awareness of potential tumors. Consequently, the assessment of ferritin should be approached from a more comprehensive and multidimensional perspective, providing enhanced guidance for the clinical management and treatment decisions of patients.

Significance of laboratory department participation in MDT

In this case, the active involvement of the laboratory department in the Multidisciplinary Team (MDT) is crucial, with in-depth interpretation of various indicators and a focus on identifying diagnostic clues based on the characteristics of the case. Particularly when dealing with challenging cases, the laboratory department employs the latest knowledge in laboratory testing, challenges conventional thinking, and provides unique insights to the MDT, achieving a more precise understanding of the patient's condition [10,11]. It is noteworthy that the role of the laboratory department in the MDT goes beyond the interpretation of laboratory indicators; it also contributes unique perspectives and professional insights. Therefore, in future developments, the laboratory department needs to strengthen collaboration with other departments, share professional insights, ensure the integrity and accuracy of information, enhance communication, delve into the understanding of laboratory data, comprehensively assess the patient's condition, and provide stronger support to the MDT, facilitating more accurate diagnostic foundations. Additionally, the laboratory department must continually update its knowledge, expand its professional domain, and better adapt to changes in the medical environment, offering more profound and comprehensive support for MDT decision-making.

In summary, this case emphasizes the need for a comprehensive approach to possible diagnoses when faced with unexplained white blood cell elevation. The importance of ferritin testing is highlighted, and the collaboration of the laboratory department in the MDT proves crucial for achieving more accurate diagnoses of challenging diseases. This case report provides valuable insights for the management of similar cases in the future.

Declaration of Interest:

We declare no conflicts of interest.

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