

Cold agglutinin interferes with blood routine: a case report

Li Shuwen, Yuan Jiali, Zhang Xiaomeng

Department of laboratory medicine, Quzhou AiYan Hospital, Hebei, China

Cold agglutination refers to the phenomenon that red blood cells agglomerate in a cold environment caused by autoantibodies. The cold agglutination reaction generally appears below 31 °C, the strongest at 0-4 °C, and the erythrocyte agglutination is the most obvious. With the increase of temperature, the antigen antibody complex gradually dissociates, and the clot disappears [1]. The blood of healthy people usually contains low titer cold agglutinin. The titer of this substance may be elevated under certain specific pathological conditions. Although this situation may not cause obvious clinical symptoms, when patients receive blood routine testing, cold agglutination phenomenon may cause interference to the test results [2-4]. Our hospital recently found a related case, which is now reported.

Medical Records

The patient, a 67 year old man, came to the hospital on December 28, 2023 due to senile cataract. Preoperative blood routine: total white blood cell (WBC) $23.88 \times 10^9/l$, total red blood cell (RBC) $0.52 \times 10^{12}/l$, hemoglobin (Hgb) 154g/l, the total number of white blood cells and red blood cells of the patient were abnormal, and the total number of red blood cells and hemoglobin were seriously mismatched. It was suspected that the instrument was unstable when it was just started up, so it was rechecked, and the results were the same as before. Doubting the influence of instrument pipeline channel and cuvette, the "recoil gem hole" and "soak red blood cell Cup" were carried out, and the total number of red blood cells and hemoglobin still did not match. The blood samples of other patients were tested, and the results were normal, excluding the abnormal working state of the instrument. Undergraduate staff suspected that the patient's own special red blood cells. After saline smearing of the blood sample, the agglutination was visible to the naked eye, and the red blood cells were observed under the microscope as massive distribution. It was considered that the patient's body had high titer cold agglutinin. The blood samples were incubated in 37 °C water incubator for 30 minutes and then detected, WBC $5.08 \times 10^9/l$, RBC $2.45 \times 10^{12}/l$, Hgb 156g/l, the total number of white blood cells returned to the normal range, the total number of red blood cells increased, but the total number of red blood cells and hemoglobin still did not match. The hanging blood state of EDTA-K2 vacuum blood collection tube wall between this patient and normal patients was observed. The blood of this patient was distributed in fine sand like particles, while this situation did not exist in normal patients. Considering the seasonal reasons, the indoor temperature is low, and there are also uncontrollable factors such as instrument pipeline temperature and reagent temperature, which make the sample take out from the incubator to the detection process, and condensation occurs again. At 4:30 p.m., the patient was arranged to take venous blood under the condition of relatively high temperature in the laboratory department, and immediately put on the machine for detection after mixing upside down: WBC $4.83 \times 10^9/l$, RBC $4.77 \times 10^{12}/l$, Hgb 141g

1, blood routine results were normal. The patient's family members described that the patient had purpura like patches on the instep of his feet when the weather was cold. It is clear that the patient's previous abnormal test results are caused by cold agglutination, send the last test report to the clinic, communicate with the patient's surgeon, and recommend that the liquid should be heated to 37 to 40 degrees when flushing with liquid for surgery, so as to prevent blood coagulation when the patient's vascular blood contacts with low-temperature liquid, affecting the surgical effect and the patient's own health status. The surgeon took this advice, and the patient was discharged safely and smoothly.

Discussion

Cold agglutinin is a monoclonal or polyclonal autoantibody, mainly IgM complete antibody [5-6]. Cold agglutinin exists in the blood of most normal people, but its titer is mostly less than 1:16. In some disease cases, such as infection, mycoplasma pneumonia, infectious mononucleosis, etc., the antibody titer can be increased. High titer antibodies can reversibly bind to human red blood cell class I antigen at lower than 30 °C, resulting in aggregation of red blood cells, significantly interfering with the detection results of blood routine analyzer, resulting in false reduction or increase of many parameters.

There are several conventional methods to solve the problem of cold agglutinated blood samples: 1. put the samples in a 37 °C water bath box immediately, and then put them on the machine immediately after about half an hour. 2. take the patient to the laboratory, draw venous blood next to the blood routine instrument, mix it upside down, and then test it immediately on the machine within a few seconds. 3. exchange the plasma with the same amount of normal saline, centrifuge the specimen, remove the plasma, add the same amount of normal saline, and then use the machine for detection. 4. use dilution method: dilute the whole blood with diluent and use pre dilution mode for detection. Or dilute it with normal saline according to a certain proportion and then convert it to the undiluted result. 5. traditional microscope counting: add 10ul of blood incubated at 37°C to 2.0ml of 37°C warm salt water, mix evenly, and drop it onto the counting plate for counting (the counting plate can be put into a 37 °C water bath for heating in advance).

Medical and laboratory staff should pay attention to the influence of cold agglutination on diagnosis and treatment. If the test result is abnormal, it should find out whether it is the influence of cold agglutinin, and re test to ensure accuracy. At the same time, strengthen the communication with clinical departments, provide useful information, and improve the service quality.

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