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IP Journal of Diagnostic Pathology and Oncology

Journal homepage: www.innovativepublication.com

Case Report

Type III ABO discrepancy aiding in diagnosis of multiple myeloma

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ARTICLE INFO

Article history:
Received 23-03-2020
Accepted 24-04-2020
Available online 04-06-2020

Keywords:
ABO discrepancy
Agglutination
Anaemia
Plasma cell myeloma
Rouleaux

ABSTRACT

Plasma cell myeloma is characterized by monoclonal proliferation of plasma cells, causing destructive bone lesions and other systemic manifestations. The disease spans a clinical spectrum from asymptomatic to highly aggressive disease. M protein caused by myeloma cells results in type III ABO discrepancy, in which rouleaux formation can be misinterpreted as agglutination. We present a case of a 54year old male admitted in our hospital with breathlessness, severe pallor and fever. Blood transfusions were advised as the haemoglobin was low. Initially there was a discrepancy between forward and reverse grouping which resolved with saline washes. On further investigations like peripheral smear and bone marrow examination, the patient was diagnosed as a case of plasma cell myeloma. In our case the blood grouping revealed type III ABO discrepancy which upon further investigation was found to be a case of plasma cell myeloma.

Key Messages: Plasma cell myeloma has varied presentations. In our case, the patient presented with severe anaemia, plasma cells in peripheral blood and type III ABO discrepancy. Rouleaux formation should not be interpreted as agglutination. Careful vigilance by technicians in blood bank and thorough knowledge regarding various discrepancies will help in the management of the patient.

1. Introduction

Plasma cell myeloma is a bone marrow based, multifocal neoplastic proliferation of plasma cells, usually associated with an M protein and/ or urine and evidence of organ damage related to the plasma cell neoplasm.[1] Plasma cell myeloma can present in a range of ways, for example, anaemia, hypercalcaemia, renal failure and bone pains or fractures. We report a case of plasma cell myeloma presenting as anemia and type III ABO discrepancy. An ABO discrepancy exists when the results of red cell grouping (forward grouping) do not agree with serum grouping (reverse grouping). Both forward and reverse grouping are necessary for donors and patients because each grouping serves as a check on the other. Myeloma patients have excess of plasma proteins, which case rouleaux formation. This pseudoagglutination can be misinterpreted as true agglutination leading to type III ABO discrepancy.

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2. Case History

A 54year old male came with chief complaint of generalized weakness, right sided chest pain, breathlessness with palpitations and fever since 5 days, which is insidious in onset, gradually progressive. A provisional diagnosis of pneumonia was made and treated. Blood counts showed Haemoglobin (Hb) - 2.8 gm/dl, Red blood cell count (RBC) – 0.9 millions/mm^3, White blood cell (WBC) count -11000 cells/mm^3 and Platelets- 65000/mm^3. Dengue serology was negative. Blood, urine cultures were negative. Urine Bence Jones proteins were negative.

Because of low Hb, blood transfusions were advised, for which blood sample was sent for blood typing and crossmatching. On forward grouping, heavy clumps were found with anti B sera, anti AB sera, anti D and mild clumping with anti A sera. Upon washing patient's RBC with saline water for 4-5 times, aggregations disappeared (Table 1). So forward grouping result after saline washes was B+ blood group.

https://doi.org/10.18231/j.jdpo.2020.042

On reverse grouping by tube method, 1+ agglutination was found with B red cells and O red cells, 4+ agglutination was found with A red cells. The positivity seen with B cells and O cells during reverse grouping disappeared after saline washes, confirming B + ve group (Table 2).

Cross matching with B+ve blood was done by mixing 2 drops of patient's serum and 1drop of donor RBC's and centrifuged at 1000rpm for 1min. On examining under microscope, clumps were found. 200μl of serum is taken and mixed with 200μl of saline and incubated at 45^{o}c and washed with normal saline. 2 drops of antihuman globulin was added. When observed under microscope, no clumps were noted. Direct coombs test and Indirect coombs tests were also done which are negative. The other investigations done in our case are listed in Table 3.

Meanwhile peripheral smear examination revealed microcytic hypochromic RBC with rouleaux formation. There was lymphocytic preponderance with plasmacytoid cells and moderate thrombocytopenia. MRI was advised, which revealed multiple lytic lesions in skull, vertebral bodies and posterior elements. The differential diagnoses on MRI were Plasma cell myeloma/ metastases. So a bone marrow study was planned. Initial bone marrow examination was a dry tap. A repeat aspirate with bone marrow biopsy was done which revealed near total replacement of marrow by sheets of plasma cells. Clinicians were informed regarding the diagnosis, but the patient was lost to follow up, as they wanted treatment elsewhere.

Table 1: Forward grouping results

	Anti A	Anti B	Anti AB	Anti D
Before saline wash	1+	4+	4+	4+
After saline wash	-	4+	4+	4+

Table 2: Reverse grouping by tube method

	A cells	B cells	O cells
Before saline wash	4+	1+	1+
After saline wash	4+	-	-

3. Discussion

M protein produced by plasma cells leads to elevated levels of globulin or light chains of immunoglobulin. Abnormally elevated paraprotein causes the rouleaux formation in which stacks or aggregations of RBC give stacked coin appearance. This is due to reduction in zeta potential (charge on RBC membrane). This pseudoagglutination could be mistaken for true agglutination by medical technicians and it can be removed by multiple saline washings in forward grouping. In reverse grouping, the saline addition technique

Table 3: Other blood investigations

1	SGPT	1164 U/L	Increased
2	SGOT	810 U/L	Increased
3	Total bilirubin	3.6 mg/dl	Increased
4	Indirect bilirubin	2.5 mg/dl	Increased
5	Direct bilirubin	1.1 mg/dl	Increased
6	Serum proteins	9.1 gm/dl	Increased
7	Albumin	3.1 gm/dl	Decreased
8	Globulin	6.0 gm/dl	Increased
9	A:G ratio	0.5	Reversal
10	PT	31	Increased
11	INR	2.76	Increased
12	Urea	56 mg/dl	Increased
13	Creatinine	2.6 mg/dl	Increased
14	Sodium	143 mmol/L	Normal
15	Potassium	3 mmol/L	Decreased
16	Phosphorus	4.8 mmol/L	Increased
17	Magnesium	1.85 mmol/L	Normal
18	Calcium	12.6 mg/dl	Increased
19	Lactate Dehydrogenase	3614 U/L	Increased
20	Iron	255 μg/dl	Increased
21	Total Iron Binding Capacity	203 μg/dl	Decreased
22	Ferritin	$<$2000 ng/ml	Decreased
23	Vitamin D	7.2 ng/dl	Decreased

get rids of paraproteins from the RBC membranes and frees the RBC from rouleaux formation. In true agglutination, red cells will continue to clump after addition of normal saline. In our case, the positivity with anti A before saline wash is not true agglutination but due to rouleaux formation. Rouleaux formation is the most striking feature on blood smears and is related to the quantity and type of M protein.[1]

In a study by Mishra et al. type III ABO discrepancies accounted for 2.7% of the total cases.[2] Arumugam et al. identified type III ABO discrepancies in 4% of their cases. They emphasized that tube technique is more advantageous than coloumn agglutination technique in resolving rouleaux formation in type III ABO discrepancy.[3] In our study also we carried out tube method for reverse grouping. Wilson also found type III ABO discrepancy in multiple myeloma patient.[4] Initial ABO discrepancy was resolved by washing patient's red cells with normal saline. Kim et al. found ABO discrepancy in a IgA kappa type multiple myeloma caused by loss of isoagglutination.[5] On blood group testing, cell type was B+ but anti A was not detected in her serum. Her blood type was confirmed as B + by polymerase chain reaction with restriction fragment length polymorphism. Park et al identified combined group I and group III ABO discrepancies in myeloma patient of IgG lambda type.[6] It occurred because of loss of anti B isoagglutinnin and rouleaux formation in this patient. Genotyping confirmed her blood group as A+.

The most common ABO discrepancy found in multiple myeloma patients is Type III discrepancy causing false positive reactions in reverse grouping with all the cells requiring multiple saline washes.[7] ABO discrepancies are divided into four major types.[8] Type 1 discrepancies are discrepancies in reverse grouping due to weakly reacting or missing antibodies. Group II discrepancies are discrepancies in forward grouping due to weakly reacting or missing antigens. Group III discrepancy occurs due to excess plasma proteins. Group IV discrepancies occur due to miscellaneous causes like cold auto antibodies, cold alloantibodies and Bombay phenotype. Group III discrepancy can also occur in conditions like Hodgkin lymphoma, cord blood and plasma expanders like dextran & polyvinyl pyrrolidone.[3]

Whenever a discrepancy is encountered, repeat tests are done on the same sample using washed red cells before carrying out additional investigations. Where discrepancy persists, tests are done on new blood specimens obtained from the donor unit or patient to resolve discrepancies. If such discrepancies are diligently approached with available resources, most of them can be resolved serologically even before resorting for high end investigations.[3]The importance of clinical details and associated disease states cannot be underscored and should be gathered in all cases of discrepancies.[9]

4. Acknowledgments

None.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Swerdlow SH, Campo E, Harris NL, Jaffe ES, Pileri SA, Stein H, et al. Plasma cell myeloma In. WHO classification of tumours of haematopoeitic and lymphoid tissues. vol. 2017;. p. 243–50.
2. Mishra D, Parida P, Mahapatra S, Sahoo BB. Resolving blood group discrepancy in patients of tertiary care centre in Odisha, India. *Int J Res Med Sci*. 2018;6(7):2348–53.
3. Arumugam P, Hamsavardhini S, Ravishankar J. Resolving ABO discrepancies by serological workup-an analysis of few cases. *Int J Res Med Sci*. 2017;5(3):893–900.
4. Wilson JA, Jacobs A. ABO discrepancy in a multiple myeloma patient: a case study. *Clin Lab Sci*. 2002;15(4):204–7.
5. Kim SY, Oh SH, Park KS, Kim MJ, Lim G, Cho SY, et al. ABO discrepancy in an elderly patient with IgA kappa-type multiple myeloma. *Ann Hematol*. 2010;89(7):747–8.
6. Park J, Jekarl DW, Park SY, Shin S. Combined Group I and III ABO Discrepancies in Multiple Myeloma with IgG-Lambda Type: A Case Report. *Med Princ Pract*. 2017;26(1):90–2.
7. Kumar IC, Babu B, Arun R, Babu KS, Praveen MD, Sriranjitha TN, et al. Blood group discrepancy: Is it Group I or Group III? *J Clin Scientific Res*. 2019;8(1):42–3.
8. Harmening DM. Modern Blood Banking and transfusion practice; 2013. p. 136–43.
9. Sharma T, Garg N, Singh B. ABO blood group discrepancies among blood donors in Regional Blood Transfusion Centre GTB Hospital, Delhi, India. *Transfus Apheresis Sci*. 2014;50(1):75–80.

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Cite this article: Ramya C, Renuka IV, Rizwana S, Sowjanya KKS. **Type III ABO discrepancy aiding in diagnosis of multiple myeloma**. *IP J Diagn Pathol Oncol* 2020;5(2):220-222.