



RESEARCH ARTICLE

IRON DEFICIENCY A CAUSE OF THROMBOCYTOPENIA? A CASE REPORT

¹Shrivastava, P., ^{2,*}Verma, S., ³Anand, K. S., ¹Sood, R., ¹Kumar, R. and ²Ramesh, K. L.

¹Department of Anesthesiology, Dr Ram Manohar Lohia Hospital, New Delhi

²Department of Biochemistry, Dr Ram Manohar Lohia Hospital, New Delhi

³Department of Neurology, Dr Ram Manohar Lohia Hospital, New Delhi

ARTICLE INFO

Article History:

Received 22nd June, 2016
Received in revised form
10th July, 2016
Accepted 29th August, 2016
Published online 30th September, 2016

Key words:

Thrombocytopenia, Iron Deficiency
Anemia, Thrombocytosis,
Thalassemia, Menorrhagia,
Thrombopoiesis.

ABSTRACT

Iron deficiency anemia is found commonly associated with nutritional deficiency. It has been found in various studies that increase in platelet count or thrombocytosis is seen in patients with iron deficiency anemia. Rarely has it been reported with low platelet count or thrombocytopenia. The cause of thrombocytopenia in iron deficiency anemia is not well understood. In few studies role of iron in platelet synthesis and aggregation is suggested. This case study here presents a case of young man with iron deficiency and thrombocytopenia with no pathological disease related with thrombocytopenia. Further patient's platelet levels improved to normal with oral iron therapy alone suggesting role of iron in platelet synthesis.

Copyright©2016, Shrivastava et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Shrivastava, P., Verma, S., Anand, K.S., Sood, R., Kumar, R. and Ramesh, K.L. 2016. "Iron deficiency a cause of thrombocytopenia? a case report" *International Journal of Current Research*, 8, (09), 38573-38575.

INTRODUCTION

A young adult of age 27 years came with complaints of progressive generalized weakness from past 1 month and gradually he developed light headedness, weakness and fatigue and was unable to do his daily job of security guard which involved long hours of standing and alertness. He was not suffering from any chronic or infectious disease. He was not having any history of weight loss, bleeding or trauma. Patient was living in a village and use to travel long distance daily for his job.

Physical examination

Physical examination revealed a blood pressure of 112/64 mm hg, respiratory rate of 22 breaths per minute, heart rate of 110 beats per minute and temperature of 98 degree fahrenheit. He was pale with no icterus, no edema, no petechiae, no ecchymoses and no purpuric rashes, no lymphadenopathy. On auscultation his lungs was having bilateral normal breath sound, on cardiovascular examination he was not having any murmurs.

On abdominal examination liver and spleen was not palpable. No bleeding from any site was present.

Laboratory evaluation

Laboratory data is summarized in the Table 1. Patient's hemoglobin level was 10.1g/dl, platelet count was 69,000/mm³, RBC count of 5.43 million/cu mm, PCV 33.1%, MCV of 60.9 fl, MCH 18.7 g/dl, total WBC count 4.1 X 10³/μL, ESR was 1 mm /1st hour, with total serum iron 17.8 μg/dl, TIBC 355.8 μg/dl. Peripheral blood smear showed microcytic hypochromic anemia, red cell distribution width (RDW) was 19.2% suggesting iron deficiency anemia. No platelet clumping was seen. His coagulation profile was normal. Workup for HIV, dengue, immune and non immune mediated thrombocytopenia was unremarkable. His stool occult blood and urine reports were normal. Bone marrow examination revealed decreased number of megakaryocyte and increased M/E ratio which was consistent with thrombocytopenia findings.

Treatment and clinical course

Subject was treated with iron supplementation for 60 days with no other medication prescribed or non-prescribed and was re-

*Corresponding author: Verma, S.,

Department of Biochemistry, Dr Ram Manohar Lohia Hospital, New Delhi.

Table 1. Laboratory results of patient on first visit to hospital and after 60 days of medication

Laboratory	On 1 st day	Values after 60 days	Reference values
RBC(million/cu mm)	5.43	5.5	3.80-5.3
Hemoglobin (g/dl)	10.1	12.8	12.0-16.0
Packed cell volume	33.1%	34%	34-45%
Mean corpuscular volume (fl)	60.9	71	77-97
Mean corpuscular hemoglobin (g/dl)	18.7	34	33-36
Red cell distribution width (RDW) (%)	19.2	12.7	11.5-14.5
Total WBC count	4.1 x 10 ³ /μL	4.3 x 10 ³ /μL	4-11 x 10 ³ /μL
Neutrophil (%)	46	54	40-70%
Lymphocyte (%)	42	41	17-45%
Monocyte (%)	5	4	4-13%
Eosinophils (%)	6	1	1-6%
Basophil (%)	1	0	0-2%
Platelet count	69 x 10 ³ /μL	250 x 10 ³ /μL	150-450 x 10 ³ /μL
ESR (mm/1 st hour)	1	3	0-20
Serum Iron (μg/dl)	17.8	62	50-170
TIBC (μg/dl)	355.8	282	270-450
Serum vitamin B12 (pg/ml)	191	N/A	>150-200
Serum folate (ng/ml)	16.2	N/A	2.7-17
Serum Creatinine (mg/dl)	0.9	0.7	0.8-1.2
AST(U/L)	17	22	5-35
ALT (U/L)	22	24	7-56
Alkaline Phosphates (U/L)	38	36	50-
Total protein (g/dl)	6.1	7.0	6-8
LDH (U/L)	311	257	230-460
PT (Seconds)	11	12	11-13.5
INR	1.1	1.0	0.8-1.2
PTT (seconds)	23	25	25-35

examined on 60th day shown an increase in his total serum iron of 62 μg/dl, TIBC 282 μg/dl, platelet count increased to 250 X 10³/μL. Patient was also relieved of his complaints and was feeling better.

DISCUSSION

Iron deficiency anemia is commonly associated with under-nutrition and malnutrition (Chellan, 2010). Presenting clinical features of early iron deficiency anemia generalized weakness, fatigue, lethargy which is also seen in patients with thrombocytopenia in early stages. However thrombocytopenia may be fatal and can lead to death in severe cases when left unattended (Kazuo, 2005). Iron deficiency anemia is often reported with thrombocytosis and in very few incidences it has been reported with thrombocytopenia. This case report presents a case of iron deficiency anemia and associated thrombocytopenia without any disease pertaining to cause of thrombocytopenia. It was also observed that iron supplementation corrected the associated thrombocytopenia where it is not associated with any other pathological condition. This suggested the role of iron in platelet synthesis (Ibrahim *et al.*, 2015).

This function of iron in platelet synthesis was also described by Karpatkin and colleagues suggesting dual role of iron in thrombopoiesis. They plebotomized guinea pigs and found that chronic blood loss resulted in 1.4 fold increase in platelet count and chronic blood loss with iron supplementation therapy resulted in 2.5 fold increase in platelet count. They also found that in animals that bled while in iron deficient diet, megakaryocyte decreased indicating iron requirement in platelet synthesis. This hypothesis was further supported by Kiem *et al.* (1979) who showed that iron is present in platelet approximately 12.28 μg/g and supported the hypothesis of Karpatkin *et al.* (1973).

Later Karpatkin and Freedman suggested two compartment models for the role of iron in maintaining platelet counts and the changes leading to thrombocytosis. The first compartment or the “inhibitor compartment” iron directly or indirectly by unknown mechanism inhibited rise in platelet count above a steady state. This postulation accounted for thrombocytosis seen after iron decrease seem after blood loss or when the subject is iron deficient state. The second compartment known as “essential compartment” which showed iron is required for synthesis or production of platelet. According to hypothesis when iron is deficient it first effects the inhibitor compartment leading to thrombocytosis and once the iron deficiency is severe it effects the essential compartment leading to thrombocytopenia. This model suggested the variation seen in platelet counts due to iron deficiency.

Other role of iron was linked to platelet aggregation. In a study done by Polette *et al.* in animal model demonstrated, iron as a key element in lipid peroxidation which plays a vital role in platelet aggregation. Iron produces oxygen free radicals that cause release of arachidonic acid and thromboxane A2 from platelet phospholipids (Barradas *et al.*, 1989). It was also found by Barradas *et al.* (1989) that iron chelators such as deferoxamine inhibited platelet aggregation, production of thromboxane and lipoxygenase activity thus indicating platelet aggregation is dependent on iron (Barradas *et al.*, 1989). Akay *et al.* (2008) further evaluated the effect of iron deficiency on platelet function and found that iron deficiency anemia in women caused arachidonic acid induced platelet dysfunction through iron containing enzymes mainly and may lead to increased menstrual blood loss, which can be further reversed by iron therapy (Akay *et al.*, 2008). Thus it was evident from these studies that iron was associated with both platelet synthesis and aggregation.

Conclusion

This case presented with severe iron deficiency anemia and thrombocytopenia. The explanation to this case was at the time of presentation the essential compartment was already exhausted and subject presented with thrombocytopenia. This correlation was further strengthened by iron supplementation leading to increase in platelet levels to normal by iron supplementation alone. This low platelet levels associated with iron deficiency is often overlooked by clinicians due to less common presentation. The level of iron deficiency when the essential compartment is exhausted is not known. Therefore further studies should be done to find out exact values of iron level which may lead to thrombocytopenia and window period of presentation of thrombocytopenia associated with iron deficiency anemia.

REFERENCES

- Akay, O.M., Akin, E., Mutlu, F.S. *et al.* 2008. Effect of iron therapy on platelet function among iron-deficient women with unexplained menorrhagia. *Pathophysiol Haemost Thromb.*36(2):80-3.
- Barradas, M.A., Jeremy, J.Y., Kontoghiorghes, G.J. *et al.* 1989. Iron chelators inhibit human platelet aggregation, thromboxane A₂ synthesis and lipoxigenase activity. *FEBS Lett.*245:105-9.
- Beard, M.E. Johnson, S.A.1978. Thrombocytopenia and iron deficiency anemia in alpha-1 thalassemia trait. Response to iron therapy. *Care report Acta Haematol.*59:114-8.
- Berger, M., Brass, L.F. 1987. Severe thrombocytopenia in iron deficiency anemia. *Am J Hematol.*24(4):425-8.
- Chellan, R. Paul. 2010. Prevalance of iron deficiency anemia in India: Results from a large nationwide survey. *J of pop and social stud.*19:60-80.
- Cook, J.D. 1982. Clinical evaluation of iron deficiency. *Semin Hematol.*19:6.
- Freedman, M.L. and Karpatkin, S.1973. Requirement of iron for platelet protein synthesis. *Biochem res Commun.* 54:475-81.
- Ibrahim, R., Khan, A., Raza, S. *et al.* 2015. Triad of iron deficiency anemia, severe thrombocytopenia and menorrhagia – a case report and literature review. *Libertas Academica.*2015:5 23-27.
- Kazuo dan M.D., PhD Editorial, Internal Medicine, Vol-44,1025-6, No10 (October 2005).
- Kiem, J., Borberg, H., Iyengar, G.V. *et al.* 1979. Elemental composition of platelet part II. Water content of normal human platelets and measurements of their concentration of Cu, F, K and Zn by neutron activation analysis. *Clin Chem.*, 25: 705-10.
- Polette, A., Blache, D. 1992. Effect of vitamin E on acute iron load potentiated aggregation, secretion, calcium uptake and thromboxane biosynthesis in rat platelets. *Atherosclerosis.* 1992;96:171-9.
