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Research Paper

Study of Bone Marrow Aspiration Examination In Thrombocytopenic Patients

Pathology

KEYWORDS : Thrombocytopenia, Bone marrow aspiration, Idiopathic thrombocytopenic purpura, bleeding

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ABSTRACT

Aims: To evaluate the role of bone marrow examination in various cases of thrombocytopenia.

Settings and Design: Prospective study done at department of Pathology, BJ Medical College, Civil Hospital, Ahmedabad from June 2007 to August 2009.

Methods and Material: 100 patients of all age groups admitted in Civil Hospital, with haematological diagnosis of thrombocytopenia (<100 x 106/L) on peripheral smear were included in the study. Bone marrow aspiration examination was done in all the cases.

Results and Conclusions: 70% patients had moderate thrombocytopenia (30-100 x 106/l) and 30% had severe thrombocytopenia (<30 x 106/L). Idiopathic thrombocytopenic purpura (50%) was the commonest cause of thrombocytopenia. Other causes were acute leukemias (18%), megaloblastic anaemia (16%), bone marrow suppression (10%) and drug induced thrombocytopenia (6%). The age group studied was from 3-60 years with 80% of the patients having bleeding as chief complaint in the form of petechiae, ecchymosis and epistaxis. The bone marrow cellurality was hypocellular in 24%, hypercellular in 44% and normocellular in 32%.

Introduction: Thrombocytopenia refers to decrease in the number of platelets in the peripheral blood below the normal (<1.5 lacs/cmm). It may be a manifestation of wide variety of disorders, which primarily or secondarily affect the bone marrow[1,2,3]. The thrombocytic series consists of cells which start with basophilic megakaryocyte and ends with the platelets. The life span of platelets has been estimated from 7-10 days and the daily production from 35,000 to 70,000/cmm. They are required for the maintenance of normal haemosatsis and play an important role in bleeding and coagulation disorders[4,6,8]. The presenting symptoms may be bruising, particularly purpura in the forearms, petechia (pinpoint hemorrhages on skin and mucous membranes), nosebleeds, and/or bleeding gums. There can be complain of malaise, fatigue and general weakness. In acquired thrombocytopenia, the patient's history may include the use of one or several offending drugs. The underlying mechanisms of thrombocytopenia are decreased production of platelets, increased destruction of platelets, dilutional thrombocytopenia and increased sequestration[1,3,5,6]. Thrombocytopenia is a serious haematological problem, the underlying cause of which is diagnosed by bone marrow aspiration and biopsy[1,5,7]. Various factors encompassing geographic distribution and genetic disturbances may cause variation in the incidence of disorders causing thrombocytopenia[9,10,11].

Material and Methods: The study was undertaken during the period of June 2007 to August 2009 in department of pathology, BJ medical college, Ahmedabad. Hundred (100) patients of all age groups admitted during the above period, with haematological diagnosis of thrombocytopenia on peripheral smear followed by bone marrow aspiration were included in the study. Clinical history and examination of all the identified cases were done as per the proforma. Bone marrow aspiration was performed in all the patients. In adult patients bone marrow aspiration was done from sternum and in paediatric patients from iliac crest under aseptic precautions with bone marrow needle (Salah's). The peripheral smears and bone marrow aspirates were stained with Leishman's stain. In leukemic cases the bone marrow aspirates were also stained with Periodic Acid Schiff (PAS) to confirm the diagnosis.

Results: All 100 patients had platelet count less than 100 x 10^6/L. Among them 70 (70%) had moderate thrombocytopenia (30-100 x 10^6/L) and 30 (30%) had severe thrombocytopenia (<30 x 10^6/L.

Clinical presentation	Number of cases	Percentage
Bleeding	60	60
Enlarged Liver	30	30
Enlarged Spleen	26	26
Enlarged Liver + Spleen	20	20
Enlarged Lymphnodes	20	20

Table 1 Clinical presentation (n=100)

Clinical diagnosis	Number of cases	Percentage
ITP	50	50
BMS	10	10
DIT	06	06
MA	16	16
ALL	08	08
AML	10	10

Table 2 Clinical diagnosis

ITP:Idiopathic Thrombocytopenic Purpura, BMS:Bone Marrow Suppression, DIT:Drug Induced Thrombocytopenia, MA:Megaloblastic Anaemia, ALL: Acute Lymphoblastic Leukemia, AML: Acute Myeloid Leukemia

	Number of cases	Percentage
Normal	20	20
Increased	40	40
Decreased	30	30
Markedly decreased	10	10

Table 3 Number of Megakaryocytes in Bone Marrow

	Number of cases	Percentage
Megakaryocytic thrombocytopenia	60	60
Amegakaryocytic thrombocytopenia	40	40

Table 4

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	Cellularity			Erythropoiesis		Megakaryocyte number		
	Hypo	N	Hyper	Normoblastic	Megaloblastic	Normal	Increased	Decreased
Number of cases	24	44	32	72	28	20	40	40
Percentage	24	44	32	72	28	20	40	40

Table 5 Bone Marrow Aspiration Diagnosis

Hypo – Hypocellular, Hyper – Hypercellular, N - Normocellular

	RBC Morphology					Total WBC counts			Platelet		Premature cells	
	NCy	MC	MaC	HC	NC	N	I	D	D	N	Myeloid	Lymphoid
Number of cases	30	50	20	80	20	40	30	30	100	-	10	08
Percentage	30	50	20	80	20	40	30	30	100	-	10	08

Table 6 Peripheral Smear Diagnosis

NCy – Normocytic, MC – Microcytic, Mac – Macrocytic, HC – Hypochromic, NC – Normochromic,

N – Normal, D – Decreased, I - Increased

Discussion: Thrombocytopenia is one of the major indication for bone marrow examination. There was either isolated thrombocytopenia or thrombocytopenia associated with other pathology like AML, ALL and BMS so bone marrow aspiration was performed to evaluate the cause of thrombocytopenia.

In our study, 70% of the patients had moderate thrombocytopenia and 30% had severe thrombocytopenia. 50% of the patients had ITP, 16% had megaloblastic anaemia, 10% had bone marrow suppression, 10% had acute myeloid leukemia, 08% had acute lymphoblastic leukemia and 06% had drug induced thrombocytopenia.

The findings of our study and similar other studies are compared and following are the observations:

ITP	Age group	Chief complaint	BM examination
Present study	2-12 years	Petechiae/ Ecchymoses	18 – Increased megakaryocytes
William Scharfman[16]	More common in children	Purpura/ Epistaxis	46 - Increased megakaryocytes
Baldini[16]	< 8 years	History of antecedent infection	Normal or Increased megakaryocytes
Edward C. Jones[12,16]	More common in children	Petechiae	27 - Increased megakaryocytes

Table 7 Comparison study of ITP

Megaloblastic anaemia	BM examination
Present study	Megaloblastic erythropoiesis Megakaryocytes – decreased/normal
John R. Kravse[7,15]	Hypersegmented megakaryocytes
Jones N. George[7]	Megakaryocytes decreased or entirely absent

Table 8 Comparison study of Megaloblastic Anaemia

Bone marrow suppression	BM examination
Present study[7,9]	Hypocellular marrow with decreased megakaryocytes, vacuolization of precursor cells
David B. Stoll[17]	Hypocellular marrow with decreased megakaryocytes
John Adamsen[17,18]	Vacuolization of precursor cells in bone marrow
William Best[7]	Bone marrow hypoplasia in 84% of patients. Depression of haematopoietic series with vacuolization of precursor cells

Table 9 Comparison study of Bone marrow suppression

It is found out that the bone marrow examination findings in our study are similar to the findings in the above studies.

Conclusion: The bone marrow aspiration examination were carried out in 100 patients of thrombocytopenia to evaluate its usefulness as a diagnostic procedure. 100 cases were studied of which 70 had moderate thrombocytopenia (30-100 x 10^6/L) and 30 (30%) had severe thrombocytopenia (<30 x 10^6/L).

Acute ITP is more common in children between 2-12 years with mean age of 6 years. Patients usually present with bleeding as chief complaint. History of infection was common 1-3 weeks before onset of bleeding in majority of patients. Splenomegaly does not occur. Thrombocytopenia with bone marrow examination showed normal or increased number of megakaryocytes which are often immature so clinical diagnosis can be made with the help of bone marrow examination.

Megaloblastic anaemia shows generally pancytopenia and macrocytic anaemia on peripheral smear. The diagnosis is confirmed by bone marrow examination. Patients with megaloblastic anaemia rarely present with bleeding as chief complaint. Bone marrow examination showed megaloblastic erythropoiesis with megakaryocytes decreased in majority of cases and markedly decreased in few cases.

Bone marrow suppression was found in 10 cases. Bone marrow examination showed hypocellular marrow with decreased megakaryocytes. Toxic effect of drug on bone marrow is characteristically seen as vacuolization of precursor cells particularly with chloramphenicol.

Drug induced thrombocytopenia is operated through the immunological mechanism. The patients usually present with bleeding as chief complaint. Isolated thrombocytopenia with bone marrow examination showed increased or normal number of megakaryocytes.

Diagnosis of leukemia can be confirmed with the help of bone marrow examination in 18 cases. Among them 10 cases had AML and 08 had ALL. Bone marrow examination showed hypercellular marrow with decreased megakaryocytes with normal morphology.

It was found out that bone marrow examination is very helpful

in cases of thrombocytopenia. It helps in establishing the diagnosis in many cases and in cases where no diagnosis is possible, it provides guidelines for further investigations.

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