NORMOCYTIC ANEMIA

DR. SOAD KHALIL AL JAOUNI

FRCP(C)

Associate Professor

Consultant Hematologist

Consultant Pediatrics Hematology/Oncology

Hematology Department

College of Medicine

King Abdulaziz University

CLASSIFICATION OF ANEMIA

Microcytic	Normocytic normochromic	Macrocytic
MCV<80 fl	MCV 80-95 fl	MCV>95 fl
MCV<27 pg	MCV>26 pg	Megaloblastic: vitamin B_{12} or deficiency
Iron deficiency	Many haemolytic anaemias	Non-megaloblastic alcohol, liver disease
Thalassaemia	Anaemia of chronic disease (some cases)	Aplastic anemia
Anaemia of chronic disease (some case)	After acute blood loss Renal disease	Myelodysplastic anemia(MDS)
Lead Poisoning	Mixed deficiencies	
Sideroblastic anaemia (some cases)	Bone marrow failure, post-chemotherapy, infiltration by carcinoma, etc.	

Normocytic, Normochronic Anemia

MCV 80-95 fl

MCH>26 pg

- **Many haemolytic anaemias**
- **Anaemia of chronic disease (some cases)**
- **After acute blood loss**
- **Renal disease**
- **Mixed deficiencies e.g. (iron deficiency and megaloblastic anemia)**
- **Bone marrow failure, e.g. post-chemotherapy, infiltration by carcinoma, etc.**

ANAEMIA OF CHRONIC DISORDERS

One of the most common anaemias occurs in patients with a variety of chronic inflammatory and malignant diseases. The characteristic features are:

1. **Normochromic, normocytic or mildly hypochromic (MCV rarely <75 fl) indices and red cell morphology;**

2. **Mild and non-progressive anaemia (haemoglobin rarely less than 9.0g/dl)- the severity being related to the severity of the disease;**

3. **Both the serum iron and TIBC are reduced; sTfR levels are normal.**

4. **Bone marrow storage (reticuloendothelial) iron is normal but erythroblast iron is reduced.**

CLASSIFICATION OF ANAEMIA

Macrocytic

MCV>95 fl

- **Megaloblastic: vitamin B_{12} or folate deficiency**
- **Non-megaloblastic:alcohol, liver disease,**
- **Myelodysplasia,**
- **Aplastic anaemia, etc.**

Pancytopenia

A reduction in blood count of all major cell lines –

Red cells:

White cells:

Platelets:

Causes of Pancytopenia

Decreased bone marrow function Aplasia

Acute leukaemia, myelodysplasia, myeloma

Infiltration with lymphoma, solid tumours,

Tuberculosis

Megaloblastic anaemia

Paroxysmal nocturnal haemoglobinuria

Myelofibrosis (rare)

Haemophagocytic syndrome

Increased peripheral destruction

Splenomegaly

Causes of aplastic anemia

Primary	Secondary
Congenital(Fanconi and non-Fanconi types)	Ionizing radiations: accidental exposure (radiotherapy, radioactive isotopes, nuclear power stations)
Idiopathic acquired	Chemicals: benzene and other organic solvents, TNT, insecticides, hair dyes, chlordane, DDT
	Drugs
	Those that regularly cause marrow depression(e.g. busulphan, cyclophosphamide, anthracyclines, nitrosoureas)

Cont.

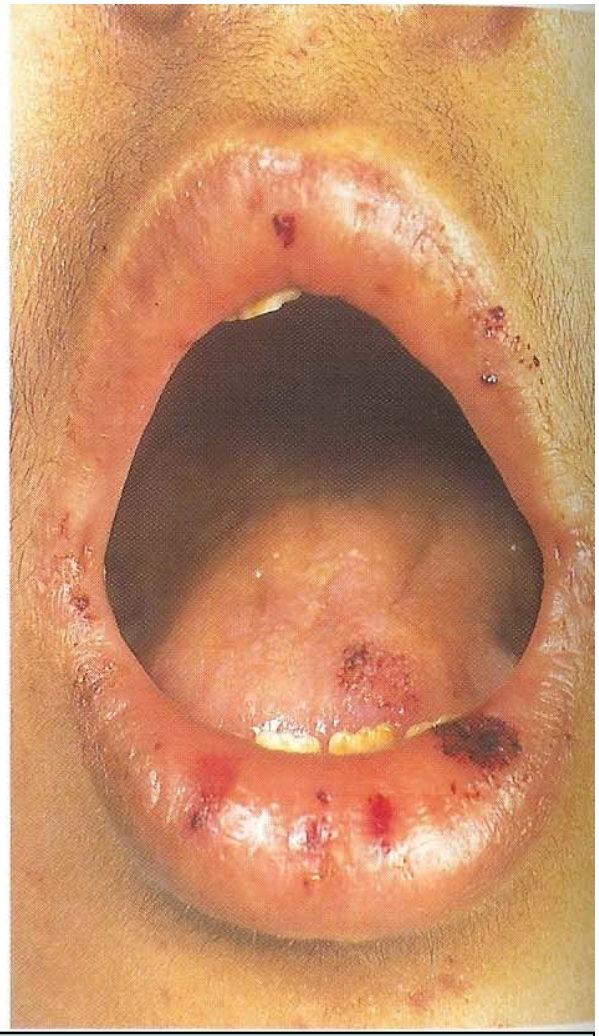
Those that occasionally or rarely cause marrow depression (e.g. chloramphenicol, sulphonamides, gold and others)

Infection: viral hepatitis (A or C)

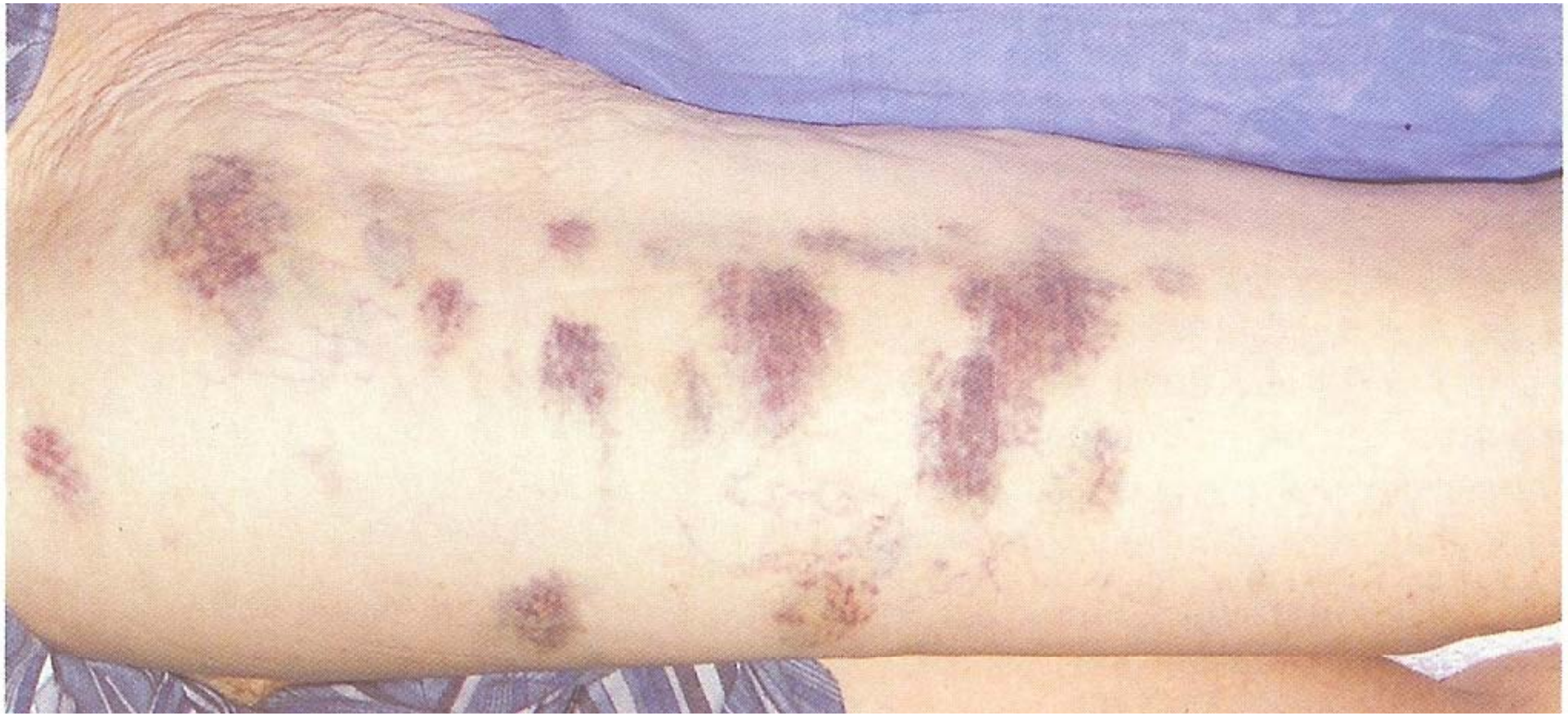
Aplastic anemia is defined as pancytopenia resulting from aplasia of bone marrow

Causes of Aplastic Anaemia
Congenital
Fanconi
Non-Fanconi
Associated with dyskeratosis congenita
Acquired
Idiopathic
Secondary
drugs:
hypersensitivity, e.g. phenylbutazone, chloramphenicol, gold, sulphonamides
cytotoxics, e.g. busulphan, cyclophosphamide
irradiation
infection: postviral hepatitis
toxins: e.g. insecticides, benzene

Blood Count in Severe Aplastic Anaemia	
Hb	6.2 g/dl
RBC	2.0×10^{12}/l
PCV	22%
MCV	110fl
MCH	31pg
reticulocytes	0.1%
WBC	0.9×10^{9}/l
neutrophils	13%
eosinophils	0%
basophils	0%
monocytes	21%
lymphocytes	66%
platelets	5×10^{9}/l



Aplastic anemia spontaneous mucosal hemorrhage



Spontaneous bruising over the thigh & leg
Idiopathic acquired aplastic anemia

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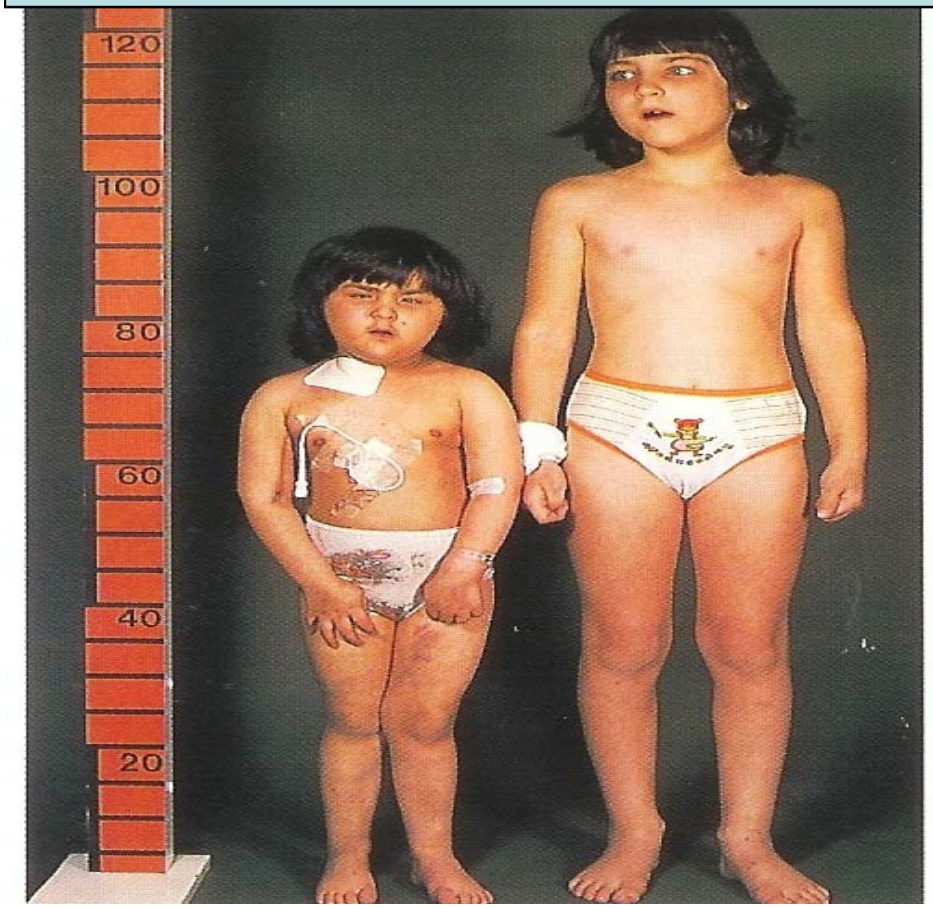
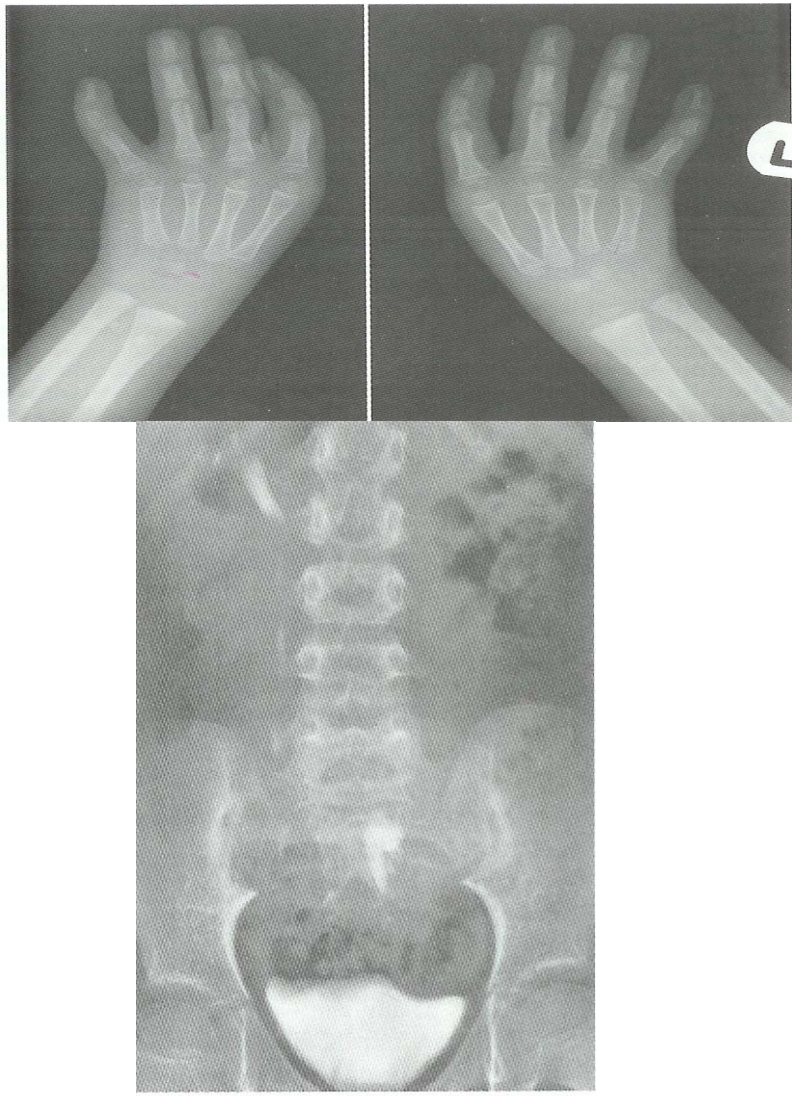
Fanconi Anemia



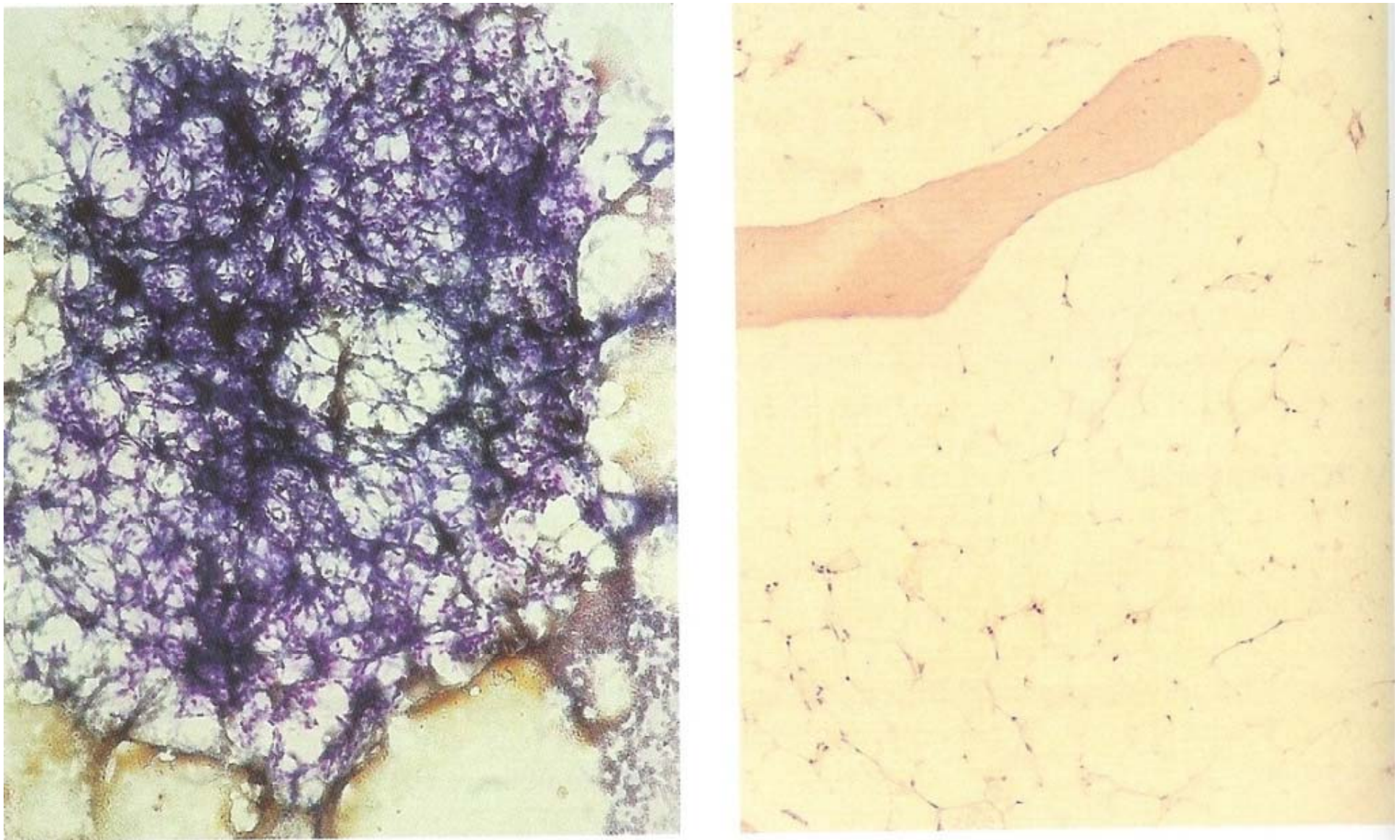
8 Years

9 Years

Short stature microcephacy



(a) X-rays showing absent thumbs in a patient with Fanconi's anaemia (FA).
(b) Intravenous pyelogram in a patient with FA showing a normal right kidney but a left kidney abnormally placed in the pelvis.



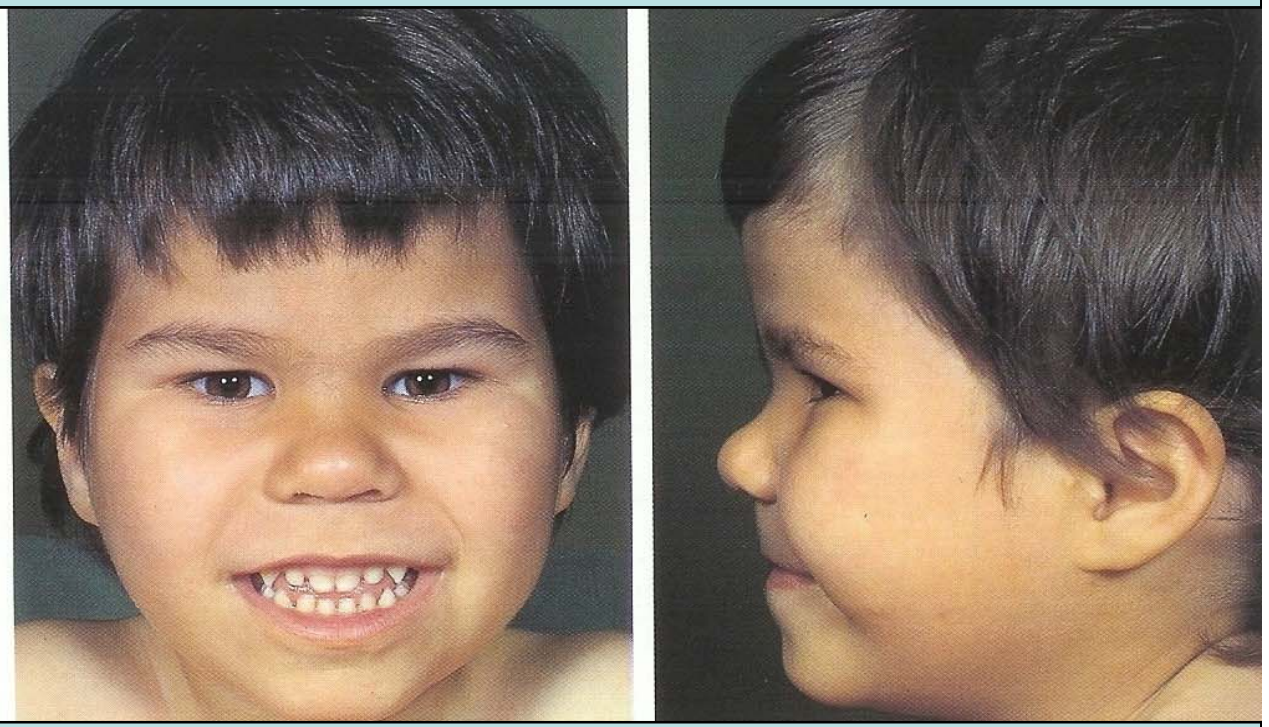
Aplastic anaemia: low power views of bone marrow show severe reduction of haemopoietic cells with an increase in fat spaces (a) Aspirated fragment. (b) Trephine Biopsy.

Classification of pure red cell aplasia

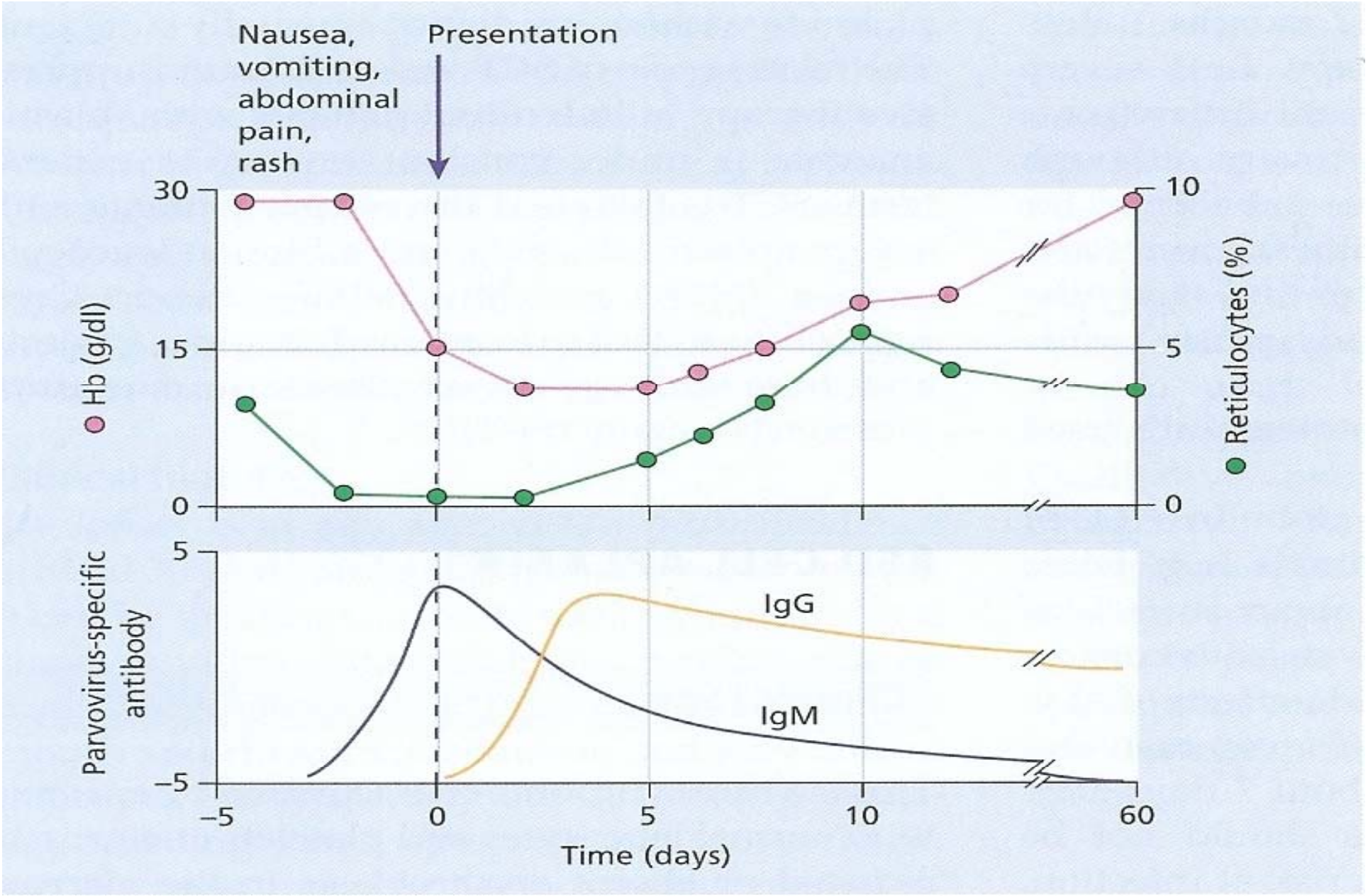
Acute, transient	Congenital	Acquired
Parvovirus infection Infancy and childhood Drugs, e.g. azathioprine, co-trimoxazole	Diamond-Blackfan syndrome	Idiopathic Associated with thymoma, lymphoma, systemic lupus erythematosus, chronic B-cell lymphocytic leukaemia or large granular lymphocytic leukaemia (T cell)

Red Cell Aplasaia

Causes of Red Cell Aplasia
Congenital
Diamond – Blackfan syndrome
Acquired
Chronic: idiopathic associated with thymoma & lymphoma
Acute (transient): parvovirus other infections drugs riboflavin deficiency



Diamond-Blackfan Syndrome
3 Years typical face sunben bridge of nose
(red cell aplasia)



Parvovirus infection: flow chart showing transient fall in haemoglobin and reticulocytes in a patient with hereditary spherocytosis

CASE STUDY

40 Years Old Saudi Female admitted thru ER because of nose bleed and bleeding in the skin.

CBC

WBC 3.0

Hb 5.0g/dl

MCV 89

Plt. 10/ul

Retic% 1.0

Blood Film ….

1. What you would like to ask in the history?

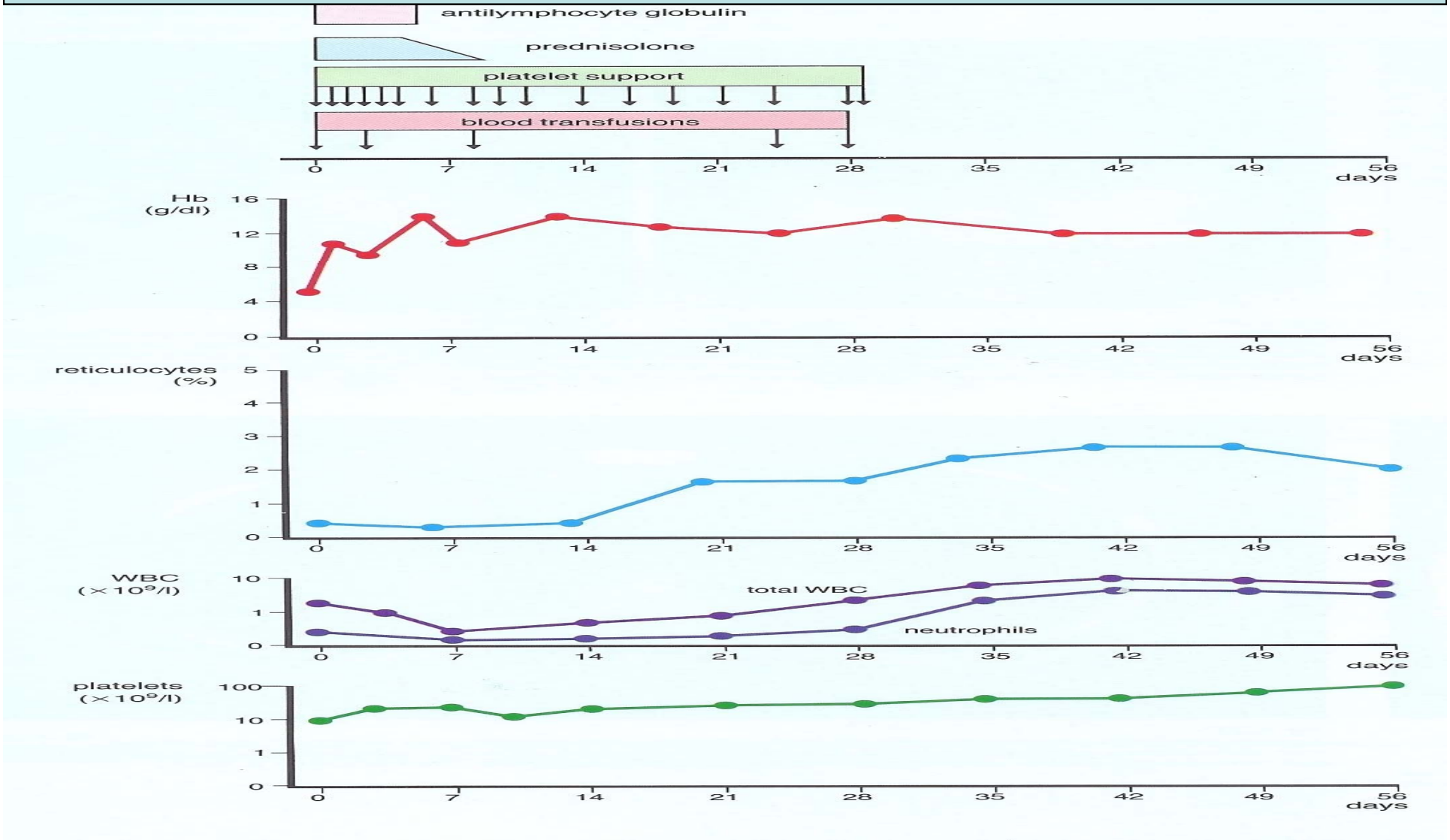
2. What important in physical examination?

3. What additional investigation you would like to add?

4. What is your provisional diagnosis?

5. What confirmatory test to confirm your diagnosis?

An excellent hematological response to ATG adult male with severe aplastic anemia



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With Compliment of:

Dr. Soad Al Jaouni