- **Spur cell anemia**: Hemolytic anemia with bizarre shaped RBC occurs in about 5% of patients with severe hepatocellular damage. These are called spur cells and found in liver disease.
- Defects of red cell membranes in haemolytic anemia:
  - Hereditary spherocytosis - defects in ankyrin, spectrin, anion exchanger and pallidin
  - Hereditary elliptocytosis - Spectrin, **glycophorin C** and protein 4.1
  - Congenital dyserythropoietic anaemia type 2 - glycophorin A and anion exchanger
- In hereditary Spherocytosis, spherocytes do **not** have central areas of pallor (in contrast to normal RBCs)

<table>
<thead>
<tr>
<th>Q. Intermediate grade of NHL is-</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) small cleaved cell</td>
</tr>
<tr>
<td>B) diffuse small cleaved cell----ans</td>
</tr>
<tr>
<td>C) lymphoblastic</td>
</tr>
<tr>
<td>D) large cell immunoblastic</td>
</tr>
</tbody>
</table>

JUST REMEMBER: "All diffuse fall into intermediate group......with one variant: follicular large cell"

27. In Polycythemia vera, all the following are seen except-  
1. Thrombocytopenia----------ans  
2. Increased GI bleed  
3. Thrombosis  
4. Transient visual loss  

Discussion- (H/17 Chap-103 P-672)--->Thrombocytosis

- **PCV (Polycythemia Vera)**-->
  1. Normal Oxygen Saturation  
  2. Pruritis (After hot bath)  
  3. HT  
  4. Peptic ulcer  
  5. Hyper-viscosity syndrome  
  6. Thrombus, Bleeding  
  7. Normal erythropoitein

28. Imatinib mesylate is used in the treatment of-  
1. Acute leukemic leukemia  
2. Non-Hodgkin’s lymphoma  
3. **GIST**---------------------------------ans  
4. Chronic myelomonocytic Leukemia(CMML)  

Discussion- (AIIMS May 08) P=828 KDT  
- Erlotinib- Non small cell lung carcinoma, Pancreatic cancer  
- Gefitinb- Non small cell lung carcinoma  
- Imatinib- CML, GIST  
- Sorafinib- RCC  
- Sunitinib- GIST, RCC

29. Which is **not** a part of classical triad of hairy cell leukemia-  
1. Massive splenomegaly  
2. Pancytopenia  
3. Vasculitis
4. Lymphadenopathy---------------ans

Discussion-

**Hairy Cell leukemia** (ROAMS P-903)
1. Small B lymphocyte (B--> Baal--> Hair)
2. Elderly*
3. Male*
5. **Triad** (Classical):
   A. Massive splenomegaly
   B. Pancytopenia--> Also in PNH
   C. Vasculitis like syndrome i.e. EN, Cutaneous nodules
6. These cell usually type as B lymphocytes but *characteristically express CD-25*
7. A *characteristic test* is the demonstration that the acid phosphatase staining reaction in the cell is resistant to the action of tartrate
8. The *neutrophil alkaline phosphatase score is very high*
9. Cladribine*, Deoxycoformycin

30. Which of the following indicate most advance stage of CLL-
1. TLC Count > 1 Lac/mm
2. Splenomegaly
3. Anemia
4. Thrombocytopenia-------------------ans

Discussion-

**CLL:** (P-901)
1. Small B lymphocyte
2. Elderly
3. **Liver + Spleen + LN+ve**
4. Stage-
   0. Increase TLC
   1. Lymph node
   2. Spleen
   3. Anemia
   4. Thrombocytopenia*(most advanced stage--> because of formation of warm antibodies)
5. Smudge cell
6. Warm antibody
7. Coomb’s positive HA
8. *Rx: Chlorambucil*
9. **Newer Drugs**
   1. Fludarabine
   2. **Rituximab (AIIMS May 2008)**
   3. Alemtuzumab (Anti-CD52)

32. AML M3 is associated with all except-
1. DIC
2. CD-15-------------------ans
3. Responds to retinoids
4. Translocation 15,17

Discussion- (AIPG 07)

AML M3 also k.a. acute *promyelocytic leukemia* has the following features:
• Age of presentation- younger pts (35-40 years)
• Often develop DIC
• Many Auer rods per cell
• t(15,17) is characteristic
• Tretinoin is an oral drug that induces the differentiation of leukemic cells bearing the t(15, 17) translocation. It is not effective in other forms of AML.
• CD-34 is a stem cell marker expressed on haematopoetic stem cells.
• CD-15 is expressed on all granulocytes, also expressed by RS cell in Hodgkin’s disease (not in AML)

Management of AML (For M3 read H/17 --> Chapter 104)
1. Chemotherapy: Drugs used are daunorubicin, cytosine arabinoside, thioguanine and etoposide for remission induction. For consolidation cytosine arabinoside, amsacrine, mitoxantrone are used
2. Allogeneic BMT improves long-term remission to 50%
3. All trans retinoic acid (ATRA)

34. False statement regarding DIC is-
1. Thrombocytopenia
2. Decreased fibrinogen
3. Decreased PTT-----------ans
4. Increased PT

35. Which of the following is poor prognostic factor for ALL-
1. Age > 10 year----------ans
2. Hyperdiploidy
3. L1 morphology
4. Females
Discussion- (AIPG 07)

Some poor prognostic factors are:
• Age < 2 years, > 10 years
• Presence of Philadelphia chromosome
• t(8,14)
• Frequent CNS involvement
• L3 morphology
• Hypodiploidy 8

36. Vit. B-12 and folic acid are given together because-
1. If folic acid is given alone blood picture does not improve
2. If folic acid is given alone neurological manifestations occur-----------ans
3. If Vit.B12 given alone neurological manifestations occur
4. If Vit.B12 given alone blood picture does not improve
Discussion-

Vitamin B-12 deficiency-
1. Dementia
2. Optic neuritis
3. SC degeneration (Spinal Cord)
4. Peripheral neuritis

37. In anemia of chronic disorders
1. Serum iron is decreased
2. Serum ferritin is decreased--------------ans
3. Total iron binding capacity is increased
4. All

Discussion-

ANAEMIA OF CHRONIC DISEASE-

Characteristic features:

<table>
<thead>
<tr>
<th>ACD</th>
<th>Iron deficiency anemia</th>
<th>Thalassemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Ferritin</td>
<td>Increase*</td>
<td>Decrease</td>
</tr>
<tr>
<td>S. Iron</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>TIBC</td>
<td>Decrease</td>
<td>Increase</td>
</tr>
</tbody>
</table>

38. Splenomegaly is never a feature of:
   1. Acute lymphocytic leukemia
   2. Anemia of chronic disease
   3. Aplastic anemia----------------------ans
   4. Megaloblastic anemia

Discussion-

Aplastic anemia:

Clinical features-
1. Decrease Hb: Fatigue
2. Decrease TLC: Infection, fever
3. Decrease Platelet: Bleeding

Criteria for severe Aplastic Anemia:
   a. Neutrophils < 500/ul
   b. Platelets < 20000/ul (Spontaneous bleeding occurs at this level)
   c. Reticulocytes < 1% (N= 0.5 – 1.5% but in anemia it should be higher and if it is say 1% then it means that BM is not producing new red cells at a rate that will correct reticulocyte count)

39. In beta thalassemia, there is-
   1. Inc. in Beta chain, dec. in Alpha chain
   2. Dec. in Beta chain, Inc. in Alpha chain---------ans
   3. Dec. in Beta chain, dec. in Alpha chain
   4. Inc. in Beta chain, dec. alpha chain

Discussion- Robbin's 632
   • Actually beta globin chain decrease and alpha-globin chain synthesis remains the same
   • Hemoglobin consists of 2 different pairs of peptides chains (one alpha and the other beta) with the haem molecule attached to each peptide.
   • Adults have 95% HbA (alpha-2beta-2) + 5% HbA-2 (alpha-2delta-2)
   • Fetuses have HbF (alpha-2gamma-2) which continues to persist in beta-thalassemia
   • In thalassemias, there is a reduced rate of production of one or more globin chains leading to precipitation of other globin, and anemia occurs as a result of ineffective erythropoiesis and hemolysis

40. In hereditary spherocytosis, membrane defect occurs due to all except-
   1. Ankyrin
2. Band-3
3. Spectrin
4. Glycophorin-C

41. PNH is associated with all of the following condition except-
   1. Aplastic anemia
   2. Increased leucocyte alkaline phosphates acores------------------------ans
   3. Venous thrombosis
   4. Iron deficiency anemia

Discussion- (AIIMS Nov 07/ AIPG 08)
- PNH(Paroxysmal Nocturnal Hemoglobinuria) --> Mutation in hematopoietic stem cell-->
  Increased susceptibility of all the three cell lines to complement mediated lysis. Leads to
  pancytopenia.

PNH-
- Red Cell--> Intravascular hemolysis--> Anemia/Hemoglobinuria/ Hemosiderinuria/Reticulocytosis
- Granulocyte(Stedman-->N/E/B)---> Increased lysis--> Granulocytopenia
- Platelet--> Increased lysis--> Thrombocytopenia

Bone marrow in PNH: Normoblastic hyperplasia is the characteristic finding in P.N.H

Complication: AML can occur in 10% cases

43. High reticulocyte count is seen in all except-
   1. Nutritional deficiency--------ans (AA-1 P=292)
   2. PNH
   3. Acute hemorrhage
   4. Congenital dyserythropoiesis

44. A 40 year old female presents with jaundice and anemia for 1 month. Her blood picture
shows multiple spherocytes. Which of the following investigation should be advised-
   1. Coomb’s test------------------ans
   2. Osmotic fragility
   3. Hb electrophoresis
   4. Retic count

Discussion- Confusing question (LQ)

Coomb’s test
- In spherocytes, the basic pathology is the loss of membrane
- Spherocytes are seen in hereditary spherocytosis and immunohemolytic anemia
- In present case, the cause is immunohemolytic anemia
- Hereditary spherocytosis presents in children. Patient is a female of 40 years.
- Immunohemolytic anemia is best diagnosed by positive Coomb’s test

46. Microangiopathic hemolytic anemia is seen in all except-
   1. HUS
   2. TTP
   3. Malignant hypertension
   4. Malaria------------------------ans

Discussion- The common pathogenic feature in Microangiopathic hemolytic anemia is a microvascular
lesion that results in luminal narrowing, often due to the deposition of fibrin and platelets. These
vascular changes produce shear stresses that mechanically injure passing red cells. It is most commonly seen with DIC, but it also occurs in TTP, HUS, malignant hypertension, SLE and disseminated cancer. Regardless of the cause, traumatic damage leads to the appearance of red cell fragments (schistocytes), “burr cells,” “helmet cells,” and “triangle cells” in blood smears.

47. Plasma exchange is useful in
   1. HUS
   2. TTP-----------------ans
   3. DIVC
   4. Autoimmune hemolytic anemia

48. Most early and common reaction in patient receiving cell component transfusion is-
   1. FNHTR --------------------------ans
   2. Hemolysis
   3. Anaphylactic reaction
   4. Transfusion hemolytic anemia

Discussion-
   • Most frequently associated with transfusion of cellular blood components is a febrile nonhemolytic transfusion reaction (FNHTR)
   • These reactions are characterized by chills and rigors and a >1 C rise in temperature
   • FNHTR is diagnosed when other causes of fever in the transfused patient are ruled out
   • Antibodies directed against donor leukocytes and HLA antigens may mediate these reactions; thus frequently transfused patients and multiparous women are felt to be at increased risk

49. Pseudo tumour syndrome is seen in
   1. SSA
   2. Thal asemia
   3. Hemophilia------------------------ans
   4. Hyperparathyroid

Discussion- Pseudotumour is a serious, but very rare, complication; it is a progressive cystic swelling involving muscle, produced by recurrent bleeding. (H/17, P-726 Chap 110)

1. 5% blast cells are positive for MPO in a M/39 years patient, the diagnosis is-
   1. AML-M2
   2. AML-M5
   3. AML-M1-----------------ans
   4. ALL IN ADULTS

Discussion-

<table>
<thead>
<tr>
<th></th>
<th>Survival--&gt; wks-mths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proliferation and malignancy high</td>
</tr>
<tr>
<td>Chronic leukaemia</td>
<td>Survival--&gt; mths-yrs</td>
</tr>
<tr>
<td></td>
<td>Proliferation and stoppage of apoptosis</td>
</tr>
</tbody>
</table>

**Acute leukaemia**

FAB 1976 (based on morphology and cytochemistry): >30% blasts--> Acute leukaemia-->Based on cytochemistry (MPO)-->
   • AML--> Myeloid cells (>3% blast cells +ve for MPO)
   • ALL--> Lymphoid cells (B cell, T cell)

2001 WHO: 20% blast-->Acute leukaemia
### Myeloid cell

<table>
<thead>
<tr>
<th>M0: MPO positivity seen in EM* not light microscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1: 3-10% blasts +ve for MPO</td>
</tr>
<tr>
<td>M2: &gt;10% blasts +ve for MPO (M/C type of AML &gt;35%)</td>
</tr>
<tr>
<td>M3: Different--&gt; Acute Promyelocytic</td>
</tr>
<tr>
<td>Associated with DIC (Schistocytes in PBS), Hand-Mirror cells, Drugs ATRA--&gt;If resistant use --&gt;Arsenic trioxide</td>
</tr>
</tbody>
</table>

### Monocytic series (NSE +ve)

<table>
<thead>
<tr>
<th>M4: Myelomonocytic leukaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPO/SBB/NSE +ve</td>
</tr>
<tr>
<td>Leukaemia cutis, Hypokalemia, CNS infestation [More common with M5]</td>
</tr>
<tr>
<td>M5: Monoblasts</td>
</tr>
<tr>
<td>NSE +ve</td>
</tr>
<tr>
<td>M6: Erythroleukaemia</td>
</tr>
<tr>
<td>Only myeloid leukaemia in which dyserythropoiesis is seen--&gt;Binucleation/Multinucleation, Chromatin bridging, Blebing</td>
</tr>
<tr>
<td>M7: Megakaryocytes</td>
</tr>
<tr>
<td>a/w BM fibrosis(Dry tap); Markers CD 41, CD 61</td>
</tr>
</tbody>
</table>

3. F/35 years with hepatosplenomegaly, exhibiting 35% cells positive for NSE & Negative for SBB, the diagnosis is-

1. ALL-L3
2. AML-M2
3. AML-M5-------------ans
4. AML-M4

2. CD36 positive cells are-

1. NEUTROPHILS
2. LYMPHOCYTES
3. PLATELETS
4. NONE-------------------ans

**Discussion**: CD-36: Attaches to RBCs before getting destroyed--> seen in falciparum malaria (also associated with thrombus formation)

- B Cell markers--> CD-19,CD-20(m/c), CD-22c, CD-79a(most specific)
- T cell markers--> CD-2, CD-3c(most accurate marker), CD-5, CD-7, CD-8
- Megakaryocytes/Platelets--> CD-41,CD-61
- RBCs--> Glycophorin A*, Carbonic anhydrase

**IHC(Immunohistochemistry)**: Localisation of antigen in cells by using antibodies-

- S- Surface/Membrane
- C- Cytoplasm
- N- Nucleus

4. M/38 years with hepatosplenomegaly with lymphadenopathy shows 55% cells are positive for Glycophorin A, 35% are PAS positive, the diagnosis is-

1. AML-M6-------------------ans
2. AML-M0
3. AML-M4
4. NONE

**Discussion:**

<table>
<thead>
<tr>
<th>Myeloblast</th>
<th>Lymphoblast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opened up chromatin (transparent)</td>
<td>Coarse chromatin</td>
</tr>
<tr>
<td>Multiple nucleoli</td>
<td>Nucleoli can not be seen</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Bigger in size</td>
<td>Smaller</td>
</tr>
<tr>
<td><strong>Auer rods</strong>*(Most specific)</td>
<td>Not seen</td>
</tr>
</tbody>
</table>

5. **CD41 & CD61 positive cells are seen in which leukemia**-
   1. ALL-L1/L2
   2. AML-M6
   3. AML-M7--------------------------ans
   4. AML-M0

**Discussion**-

<table>
<thead>
<tr>
<th>BM aspirate (Cytopathology)</th>
<th>Like FNAC--&gt;Take cells to see morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/C Stain---&gt; Giemsa (Jenner giemsa is used now)</td>
<td></td>
</tr>
<tr>
<td>BM biopsy (Histopathology)</td>
<td>Used ot differentiate b/n metastasis and bone mass</td>
</tr>
<tr>
<td>M/C stain H+E</td>
<td></td>
</tr>
</tbody>
</table>

In HCL both are used.........

M/C stain for FNAC--> MGG (May–Grünwald–Giemsa)---> Dry the smear

6. **In AML type-7 del(7q) cytogenetic picture is indicative of**-
   1. EXCELLENT PROGNOSIS
   2. UNFAVOURABLE PROGNOSIS---------ans
   3. HAS NO CO-RELATION
   4. FAVOURABLE PROGNOSIS

**Discussion**-

<table>
<thead>
<tr>
<th>AML Good prognosis</th>
<th>t15-17(M3); t8-21; Inv.16(M4Eo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AML Poor prognosis</td>
<td>Inv. 3, Deletion 5, Deletion 7, Trisomy 8</td>
</tr>
</tbody>
</table>

7. **M/3 months presented with thrombocytopenia with skin lesions and hepatosplenomegaly with MPV-5.5fl. It is suggestive of**-
   1. CONGENITAL NEUTROPENIC SYNDROME
   2. JMML
   3. ALL
   4. NONE----------ans

**Discussion**-

<table>
<thead>
<tr>
<th>MCV</th>
<th>81-99 fl (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100-109 fl (Macrocyst)</td>
</tr>
<tr>
<td></td>
<td>&gt;100 (Megaloblast)</td>
</tr>
<tr>
<td>MPV(Mean Platelet Volume)</td>
<td>6-8 fl (N)</td>
</tr>
</tbody>
</table>

D/D of thrombocytopenia-
   1. **Bernard shoulier syndrome**---> Giant platelets in peripheral blood
   2. Autoimmune thrombocytopenia--> Antibody against Ib-IXa, IIb-IIIa
   3. Viral infection
**Ristocetin**- Antibiotic from **Nocardia**. Causes thrombocytopenia as S/E(both in vivo and vitro). It was found that in vMD thrombocytopenia does not occur--> so now it is used to diagnose vMD

8. **HTLV virus is associated with**-
   1. ALL-L1
   2. ALL-L2
   3. AML-M0
   4. NONE-----------------ans

**Discussion**-

<table>
<thead>
<tr>
<th>HTLV-1</th>
<th>Adult T-cell lymphoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCV</td>
<td>Lymphoplasmacytic lymphoma</td>
</tr>
<tr>
<td>Coeliac disease</td>
<td>Enteropathic T-cell leukaemia</td>
</tr>
<tr>
<td>Crohn's disease</td>
<td>Hepatosplenic T-cell lymphoma</td>
</tr>
</tbody>
</table>

9. **M/5 years with bleeding with hepatosplenomegaly, TOTAL COUNT 3500/CUMM exhibits cells PAS positive & ACID POSITIVE & THE DIAGNOSIS IS-**
   1. ALL-L1-------------------ans
   2. ALL-L3
   3. CONGENITAL LEUKEMIA
   4. JMML

**Discussion**- ALL-L1--> PAS positivite and Acid phosphatase +ve

10. **Immunologically Tdt+, tRAT+, Cig-ive and Sig –ive cells are suggestive of-**
    1. B-CELL ALL
    2. PRE-B CELL ALL
    3. T-CELL ALL-----------------ans
    4. NONE

**Discussion**- Ig are poor markers--> concentrate on tRNA, bRAT

<table>
<thead>
<tr>
<th>T-Cell ALL</th>
<th>tRAT +ve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre B-Cell ALL</td>
<td>No development of Ig</td>
</tr>
<tr>
<td><strong>B-Cell ALL</strong></td>
<td><strong>brAT +ve, C1g +ve, S1g +ve (C-Cytoplasmic; S-Surface)</strong></td>
</tr>
</tbody>
</table>

12. **The cell line has Tdt +ve, tRAT +ve, bRAT –ve, Cig -ve Sig –ve. Immunologically, the diagnosis according to FAB classification would be-**
    1. ALL-L1/L2---------------------ans
    2. ALL-L3
    3. AML
    4. ANLL

**Discussion**- also ALL-L3 in peripheral blood Buritt's lymphoma--> CD10,19,20,22c(ROAMS P=899)

13. **CD79+VE, CD22+VE, CD3+VE & myeloid antigens +ve, the diagnosis suggested would be-**
    1. AML M0
    2. AML-M7
    3. ALL-L3
    4. NONE-------------------ans

**Discussion**-
CD 79 +ve--> B-Cell lymphoid markers
CD 22 +ve--> B-Cell
14. The translocation in gene study in Large granular mixed phenotypic Leukemia is-
   1. BCR-ABL
   2. TCRB & IGH------------------------ans(just mug)
   3. E2A –PBX1
   4. ETV-6-CBFA2

15. Pre-B ALL with t(1:19)with poor prognosis, the molecular change is-
   1. E2A-PBX1----------------------------ans(MTR)
   2. BCR-ABL
   3. ETV 6-CBFA 2
   4. MLL-AF4

Discussion-

<table>
<thead>
<tr>
<th>ALL Good prognosis</th>
<th>T(12:21); Hyperdiploidy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL Poor prognosis</td>
<td>t(9:22), t(4:11), t(1:9); Hypodiploidy</td>
</tr>
</tbody>
</table>

16. MLL-AF4 is the molecular change with B –precursor ALL with poor prognosis, the
cytogenetics would be-
   1. t(4:11)------------------------ans
   2. t(8:14)
   3. t(1:14)
   4. t(2:8)

Discussion- Pre B-Cell ALL M/C

17. M/25 years old with t(9:22) +ve, MRD +ve at the end of six weeks induction,WBC is
55,000/ul the prognosis is-
   1.POOR----------------------------ans
   2.EXCELLENT
   3.MODERATE
   4.DIFFICULT TO COMMENT

Discussion- MRD (Minimal residual disease) +ve --> V.Poor prognostic finding. t(9:22)--->bad
prognosis

18. M/38years with splenomegaly with bleeding has 25%blasts on the peripheral smear with
25% basophils, platelets count 90000/ul with eosinophils 8% & bone marrow shows fibrosis.
The diagnosis is-
   1. AML-M7
   2. CLL
   3. CML-BLAST CRISIS----------------ans
   4. NONE

Discussion-
CML: Disease of firsts-
   • Leukaemia term was used first
   • Gene product targeted chemotherapy was first started(Imatinib)

Stages-
   • Chronic phase: 85% of patients with CML are in the chronic phase at the time of diagnosis.
     During this phase, patients are usually asymptomatic or have only mild symptoms of fatigue
     or abdominal fullness. < 2% blasts.
   • Accelerated Phase- Blast 2-19%, Severe basophilia
Blast Crisis - LAP >100. Blast crisis is the final phase in the evolution of CML, and behaves like an acute leukemia, with rapid progression and short survival. Blast crisis is diagnosed if any of the following are present in a patient with CML.

- >20% myeloblasts or lymphoblasts in the blood or bone marrow
- Large clusters of blasts in the bone marrow on biopsy
- Development of a chloroma (solid focus of leukemia outside the bone marrow)

Histopathology -

- Balanced tranloction - t(9:22)---> P-210(M/C)

52. True about chloroma are all except-

1. Found in ALL------------------ans(CML-->Blast crisis)
2. Most common site is skull
3. The color is green due to myeloperoxidase
4. Also called granulocytic sarcoma

Discussion- 1-->Myeloid sarcoma or chloroma--> tumor has greenish tint d/t presence of MPO

- Most frequent site of involvement-->Orbit-->Skull
- Marker--> CD- 33,117

CD-99 → Ewing's; Granuloma cell tumor (inhibin +ve coffee bean shaped nucleus)

22. M/79 years presented with bleeding,lymphadenopathy,mediastinal mass with WBC count 29,500/ul, platelet count is 45000/ul with 90% blasts in marrow smears with t(9:22) present, the diagnosis is-

1. AML – M5
2. CLL
3. NHL
4. NONE-------------------ans

Discussion-

- t(9:22)
- Mediastinal mass
- 90% blasts

<table>
<thead>
<tr>
<th>CML blast crisis---&gt; leads to</th>
<th>AML -- 70% (m/c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL --&gt; 30%</td>
<td></td>
</tr>
</tbody>
</table>

Topoisomerase inhibitors--> 11q23 abnormality--> AML
RAEB-2--> AML

19. Hb Gower 1 constitutes-

1. EPSILON 2 ZETA 2------------------ans
2. EPSILON 2 GAMMA 2
3. ALPHA 2 ZETA 2
4. NONE

Discussion-

<table>
<thead>
<tr>
<th>Hb Gower I*</th>
<th>Epsilon-2 Zeta-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb Gower II</td>
<td>Alpha-2 Zeta-2</td>
</tr>
</tbody>
</table>
20. M/15 years old with 18% premature cells of myeloid series with 2% basophils with dysplasia present and Ph1/BCR-ABL negative-
   1. JMML
   2. LEUKEMOID REACTION OF MYELOID TYPE
   3. ACML------------------ans
   4. NONE

Discussion- ACML is a chronic myeloproliferative disorder with a clinical and hematological picture similar to chronic myelogenous leukemia (CML) but lacking Philadelphia chromosome and BCR-ABL or PDGFRBeta rearrangements. Atypical CML is characterized by the combination of: 10-20% of immature granulocytes; marked granulocytic dysplasia and both less than 2% of basophils and less than 10% of monocytes.

Chronic myeloproliferative disorders-
- CML
- Polycythemia rubra vera
- Essential thrombocytopenia
- Myeloproliferation

2008-->Myeloproliferative Neoplasm:

<table>
<thead>
<tr>
<th>MPN</th>
<th>Ph+</th>
<th>Ph-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classical CML</td>
<td>Atypical CML</td>
<td>JMML</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mast cell leukaemia</td>
</tr>
</tbody>
</table>

21. M/5 years presented with skin lesions with hepatosplenomegaly, WBC is 25000 with blasts 9%, peripheral monocytes 1200/ul, the diagnosis is-
   1. JMML------------------ans
   2. AML-M3
   3. ALL-L3
   4. CONGENITAL INFANTILE LEUKEMIA

Discussion-

Juvenile Myelomonocytic leukaemia-
- Monocyte increase in peripheral circulation(diagnostic feature)
- Skin involvement
- Blasts+Monocyte <20%
- Monosomy 7--> M/C chromosomal alteration

PNH-
H/17-->Chapter 101(P=661)
New drug-->Eculizumab(humanised monoclonal Ab)
Gold standard for diagnosis--> Flow cytometry (HAMS test, Sucrose lysis test used previously)
C/F:
- Thrombosis at unusual sites at unusual ages
- Recurrent infections
- Pancytopenia
Basic defect: X-Chromosome-->**Acquired** somatic mutation--> PIGA gene mutation. Leads to shortage of:
- GPI anchor
- CD55
- CD14*
- CD87*
- AchE(Myasthnia like symptom)

Red cells have an increased susceptibility to complement (C), due to the deficiency on their surface of proteins (particularly CD59 and CD55) that normally protect the red cells from activated C. Normally:
- CD55-->DAF-->Inhibits-->C3b Convertage
- CD59*-->MIRL-->Inhibits--> C5b-9

**PANDA Classification**- For Leukaemia(Peroxidase activity Nuclear Density Analysis)
**MIC-M**-->Acute Leukaemia(Morphology Immunophenotypic Cytochemistry Molecular Genetics)

23. M/60 years with supraclavicular lymph node enlargement ,WBC 18000/ul, 75% mature looking lymphocytes seen on peripheral smear with cells +ve for CD 19 & CD 20. The diagnosis is-
- 1. ALL IN ADULTS
- 2. NHL
- 3. NONE--------------------------ans
- 4. PLL(Prolymphocytic leukaemia)

**Discussion**-
**CLL**-
- Leukaemia of old age
- Basic defect inhibition of apoptosis
- Excessive number of mature looking lymphocytes
- Parachute cell/Smudge cell/Basket cell

Most specific marker--> Zap 70--> Poor prognosis

24. Trisomy 12 changes in CHR 14 particularly translocation with chr11,cells usually positive for SmIg. The diagnosis is-
- 1. NHL
- 2. ALL
- 3. CLL--------------------------ans
- 4. HCL

25. Lymphocytosis on P/S, lymph node are enlarged, no Hepatosplenomegaly. According to Rai staging, the stage is-
- 1. STAGE 1--------------------------ans
- 2. STAGE 2
- 3. STAGE 3
- 4. STAGE4

**Discussion**- Rai staging--> CLL

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Stage 0</th>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III</th>
<th>Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>Only lymphocytosis</td>
<td>Lymphocytosis+Lymphadenopathy</td>
<td>Lymphocytosis+Splenomegaly/Hepatomegaly</td>
<td>Lymphocytosis+Anemia</td>
<td>Lymphocytosis+Thrombocytopenia</td>
</tr>
<tr>
<td>Intermediate risk</td>
<td>Stage I</td>
<td>Stage II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High risk</td>
<td></td>
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</tr>
</tbody>
</table>
26. M/68 years old shows peripheral cytopenias, splenomegaly with cutaneous skin nodules with CD 11 C, CD 103, CD 22 POSITIVE. The diagnosis is-
1. ALL
2. HCL--------------------------ans
3. ALL IN ADULTS
4. PLL

Discussion-

HCL (P=683)
- B-cell neoplasm (B se Baal-->Hairy)
- Can be diagnosed on peripheral blood smear (characteristic hairy cells)
- BM aspiration--> dry tap
- Stain m/c used-->retic stain
- BM aspirate: Decreased N:C ratio; pale vacuolated cytoplasm
- B/M biopsy-->fried egg appearance
- RLC-->Ribosomal Lamellar Complex-->Seen in electron microscope(Hallmark)

Markers of HCL-
- Pan B-Cell marker(CD 19,20,22c,79a)
- CD-11
- CD-25
- CD-103
- DBA 44-->Most specific marker for HCL

Richter's transformation- Complication of B cell chronic lymphocytic leukemia (CLL) or hairy cell leukemia (HCL) in which the leukemia changes into a fast-growing diffuse large B cell lymphoma

27. What is the percentage of BJ proteins present in the patients of Multiple Myeloma-
1. LESS THAN 50%----------------ans(MTR)
2. BETWEEN 50-60%
3. BETWEEN 60-70%
4. ABOVE 80% OF CASES

28. M/48 years with hepatosplenomegaly with 25% of plasma cells on peripheral smear & 45% in bone marrow with multiple lytic lesions, the diagnosis is-
1. CLL
2. CLL-PLL
3. MM
4. NONE------------------------ans(MM patients never present with hepatosplenomegaly)

Discussion-
WHO 2008-->
- CRAB Criteria for myeloma (Plasma cell % can be anything)
  - C-->Calcium level increased
  - R--> Renal failure
  - A-->Anemia
  - B-->Bony lesion

Lymphoplasmoid cells 30-90%--> Walderstrom's microglobulinemia

29. Patients of MM with Hb 7.5%, serum calcium 25 gm/dl with more than three lytic lesions with IgG 80gm/l, IgA 60g/l, the diagnosis is-
1. STAGE 1
2. STAGE 2
3. STAGE 3-----------------ans
4. STAGE 4

Discussion-

Durie salmon staging:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>Hb &gt; 10 mg/dl</td>
</tr>
<tr>
<td></td>
<td>Ca &lt; 12 mg%</td>
</tr>
<tr>
<td>Stage II</td>
<td>Intermediate of I and III</td>
</tr>
<tr>
<td>Stage III</td>
<td>Hb &lt; 8.5 mg/dl</td>
</tr>
<tr>
<td></td>
<td>Ca &gt;12 mg%</td>
</tr>
</tbody>
</table>

30. Granulocyte precursors are 3% on peripheral smear, 15% on bone marrow smears with marked dysplasia, the entity of MDS is-
1. RARS
2. RAEB-t
3. CMML
4. NONE----------------ans

Discussion-
- MDS-->
  - Premalignant symptom formally known as Pre-leukaemia.
  - Elderly (60-70 yrs of age)

WHO 2008:

<table>
<thead>
<tr>
<th>AML chances increases downwards</th>
<th>RA</th>
<th>less than 5% myeloblasts in the bone marrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>less than 5% myeloblasts in the bone marrow</td>
<td></td>
</tr>
<tr>
<td>RAMD</td>
<td>&gt;15% Ring sideroblasts</td>
<td></td>
</tr>
<tr>
<td>RAEB-1</td>
<td>5-9% blasts</td>
<td></td>
</tr>
<tr>
<td>RAEB-2</td>
<td>10-19% blasts</td>
<td></td>
</tr>
</tbody>
</table>
| 5q- Syndrome                    | loss of the long arm of chromosome 5, Macrocytosis, Thrombocytosis (should not be confused with cri-du-chat syndrome which is a deletion of the short arm of the 5th chromosome)

31. Normal red cell volume for women is-
1. 30ml/kg----------------ans(MTR)
2. 40ml/kg
3. 50ml/kg
4. 55ml/kg

33. The values of Serum Ferritin for absolute diagnosis of Iron deficiency anaemia is-
1. LESS THAN 15 UG/L
2. LESS THAN 25 UG/L
3. LESS THAN 12 UG/L-----------------ans
4. LESS THAN 10 UG/L

Discussion-

<table>
<thead>
<tr>
<th>Iron</th>
<th>Duodenum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Folate | Jejunum
---|---
B-12 | Ileum

Hepcidin synthesized in liver regulate iron absorption in ferrous form.

35. Cells having high specific gravity, low MCV, high MCHC, little HbF, increased content of calcium are-
   1. NORMOCYTE
   2. ACANTHOCYTE
   3. SICKLE-----------------ans
   4. SCHITOCYTE

36. HbA -20%, HbA2-5%, HbF-5% and HbS-70%-
   1. SICKLE CELL BETA THAL +ve ------------------ans
   2. AS
   3. SS
   4. S-BETA 0

37. HbA -30%, HbA2-4%, HbF-66%, THE DIAGNOSIS IS-
   1. THALMAJOR-PLUS
   2. THAL MINOR-----------------ans
   3. THAL-SICKLE
   4. NUTRIONAL
   Discussion: HbA2 >3.5 % → Thalassemia minor

38. Intrinsic factor antibodies of blocking type seen in Pernicious anemia-
   1. IgG
   2. IgA-----------------ans (MTR)
   3. IgM
   4. IgE

39. Commonest neoplasm seen associated with warm antibodies is-
   1. ALL
   2. CLL-----------------ans
   3. AML
   4. NHL
   Discussion- also leukaemia a/w hypogammaglobulinemia--> CLL

40. Donath Landsteiner bithermic cold hemolysin is demonstrated in-
   1. PCH-----------------ans
   2. PNH
   3. UNSTABLE HAEMOGLOBIN
   4. CHAD

41. The APTT is positive when the test __________more than control-
   1. 5 sec
   2. 10 sec-----------------ans (Robbin's P=649)
   3. 15 sec
   4. 20 sec

42. ITP is characterized by all of the above except-
   1. Splenomegaly-----------------ans
   2. Thrombocytopenia


3. Megakaryocytic hyperplasia
4. Platelet antibodies are of IgG

**Discussion** - Aplastic anemia also ruled out d/t splenomegaly

43. **Characteristic features of Waldenstrom’s macroglobulinaemia** is-
   1. Well differentiated lymphocytes
   2. Plasma cells in lymph nodes
   3. Monoclonal IgM in serum
   4. All------------------------ans

45. **Histologically in Burkitt’s lymphoma, all are present except**-
   1. Monotonous cells
   2. Uniform nuclei
   3. 2-5 nucleoli
   4. Mitosis rare----------------ans

**Discussion**

**Burkitt Lymphoma** (P=677)
- High grade lymphoma --> Increased mitosis
- **Starry sky appearance** d/t --> tangible body macrophages --> Macrophages from apoptotic malignant cells

<table>
<thead>
<tr>
<th><strong>Endemic (African)</strong></th>
<th><strong>Sporadic (American)</strong></th>
<th><strong>Aggressive (HIV associated)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaws (Maxilla/Mandible)</td>
<td>Abdominal mass, Intestinal obstruction, Intestinal perforation</td>
<td>Generalised lymphadenopathy</td>
</tr>
<tr>
<td>100% a/w EBV</td>
<td>30-35%</td>
<td>20-25% a/w EBV</td>
</tr>
</tbody>
</table>

47. **Mycosis fungoides** is so called since-
   1. Tumour resembles mycotic infection
   2. There is fungal injection of viscera
   3. Tumour has mushroom-like appearance----------------ans
   4. None

**Discussion** - **Mycosis fungoides and Sézary syndrome** are different manifestations of a tumor of CD4+ **helper T cells** characterised by marked predilection to involve skin. **Sézary syndrome** is a variant in which skin involvement is manifested as a **generalized exfoliative erythroderma**. (Robbin's P=685)

48. **Histiocyte markers are**-
   1. EAC rosette
   2. Anti HLA-DR
   3. Muramidase
   4. All------------------------ans

**Discussion** - also CD 67

| Plasma cell markers: 38,138 |

49. **Reed Sternberg cell does not have the following trait**-
   1. Scanty cytoplasm----------------ans
   2. Owl eyed nucleoli
   3. Bilobed or multilobed nuclei
   4. It is a giant cell
Discussion-

**RS Cells**
- Owl's eye appearance
- Eosinophilic nucleolus
- Markers of RS cells--> CD15(70% sensitive), CD30(100% most sensitive)
- Most specific marker--> DAX 5
- Variants of RS cells-
  - Mummified RS cells  → lymphocyte depleted HD
  - Lacunar  → Nodular sclerosis (Lacunar cells m/c in females)
  - L&H cells/Popcorn cells

**100. Maximum RS cells are seen in which type of Hodgkin’s lymphoma**-
1. Lymphocyte predominant
2. Lymphocyte depleted
3. Mixed cellularity---------ans
4. Nodular sclerosis

**Hodgkin’s disease**  *(Prurigo nodularis is seen in HD)*

<table>
<thead>
<tr>
<th>Classical HL</th>
<th>CD 15+/30+/20-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodular lymphocyte predominant HL (NLPHL)</td>
<td>CD 20+/CD15-/CD30-</td>
</tr>
</tbody>
</table>

**Types**
1. Nodular Sclerosing--> M/C in females
2. Mixed cellularity--> M/C in India(IL-5,6,13)
3. Lymphocyte rich
4. Lymphocyte depleted (usually d/t HIV--> Very poor prognosis)

**DLBCL**(Diffuse large B-Cell lymphoma) is M/C NHL all over the world.

- **t(2:5) → diagnostic for ALC(LAnaplastic large cell lymphoma)**
  - Horse-shoe cells
  - Skin involvement
  - Only type of NHL +ve for CD30(HD marker)
  - CD3 -ve(though it is T-Cell)
  - EMA+(Epithlial membrane antigen)
  - ALK+ =>Better prognosis 5yr 78-80%
  - ALK- =>Poor prognosis 5yr 48%

**50. Necrosis is seen in**-
1. Lymphocyte predominant
2. Nodular sclerosis
3. Lymphocyte depleted------------------ans
4. Mixed cellularity

**Discussion**- Folliculocytosis-->Seen in HIV infectd LN(Hallmark)

**51. Lacuner cells are so called since**-
1. Multiple vacuoles are present in cytoplasm
2. On fixation cytoplasm retracts so nucleus lies in clear space--------------ans
3. Lacunae are present in the nucleus
4. Multiple nucleoli with halo around them give appearance of lacunae

53. Lymph node enlargement is maximum in which type of AML-
   1. Promyelocytic
   2. Myelomonocytic
   3. Monocytic---------------------an
   4. Myeloblastic

54. Which is common in leukaemias-
   1. Heart failure
   2. Liver failure
   3. Renal failure
   4. None------------------------ans
   Discussion- But if you have to go then go for renal failure
   Also, Anemia of leukaemia-->Anemia of chronic d/e(Scarcity among abundance- Storage of good amount of Fe but body is unable to utilise them)

55. Hairy cell leukaemia is also known as-
   1. Malignant histiocytosis
   2. Lymphosarcoma cell leukaemia
   3. Granulocytic sarcoma
   4. Leukaemia reticuloendotheliosis----------------ans

56. Which is not a feature of adult T cell leukaemia-
   1. Occurs in Japanese
   2. Associated with HTLV-III----------------ans(HTLV-1)
   3. Frequent skin involvement
   4. Hypercalcaemia
   Discussion-
   Endemic- Japan, Carribean island.
   Skin involvement common
   PBS- Flower Cell*(nucleus looks like flower)
   A/W hypercalcemia
   SPL-TCL=> Subcutaneous panniculitis like T-Cell leukaemia

58. Morphology of cells in the marrow is best studied by-
   1. Bone marrow biopsy
   2. Bone marrow aspiration and smear---------ans(Biopsy for metastasis only)
   3. Prussian blue staining of marrow
   4. None

59. Sideroblasts are-
   1. Normoblasts overloaded with iron
   2. Abnormal erythroid precursors
   3. RBC containing lysosomes stuffed with iron
   4. Normoblasts containing ferritin------------------------ans
   Discussion- Ring sideroblasts seen in-->MDS

60. Intravascular haemolysis is manifested by all but-
   1. Haemoglobinenaemia
   2. Haemoglobinnuria
   3. Haptoglobinuria---------------------ans[Haemoglobunria-->Intravascuar(Not extravascular)]
   4. Haemosiderinuria
61. **Spherocytes are not found in**-
1. Thalassemia-------------------ans
2. Hereditary spherocytosis
3. G6PD deficiency
4. Autoimmune haemolytic anaemia

**Discussion**-
- Spherocytes- HS, AIHA, G6PD, Alocoholism
- Which infection is associated with lot of spherocytes---> Clostridium welchii
- Which metabolic disorder is diagnosed by spherocytes in blood---> Hypophosphatemia
- In HS only site of destruction is Spleen---> No IV destruction

**Bite cells** (Not pathognomic)---> G6PD--> RBC membrane abnormal d/t sulphhydryl group of compounds--> Loose normal elasticity--> Microvasculature can-not flex--> Bite

62. **Crew hair cut appearance of skull in X-ray is a feature of**-
1. Sickle cell anaemia
2. Thalassemia-------------------ans(Robbin's P=630 found in SCA also)
3. Hereditary spherocytosis
4. G6PD deficiency

63. **Prussian blue stains**-
1. Iron
2. Haemosiderin-------------------ans
3. Ferritin
4. Melanin

**Discussion**-
Iron storage forms-
- Hemosiderin → Less protein coated
- **Ferritin** → More protein coated

**Prussian blue staining**-
- Freshly prepared
- Greenish-blue colour
- Composition: 0.5 N HCL + Potassium ferricyanide
- Colour is developed d/t Potassium ferricyanide
- Iron grading in BM done from 0-4

**Parvovirus B-19 infection**-
- PRCA(Pure Red Cell aplasia)
- Diagnosed by BM aspirate only
- Prominant nucleolus
- Blood profile-
  - **Hb- 2.5** (RBC precusor are nearly absent in BM. Erythroblasts <5%)
  - WBC- 7500 (N)
  - Platelet- 2.5 lakh (N)
- Association-
  - Thymoma(M/C)
  - GI Tract adenocarcinoma(2nd most common)