HEMATOLOGY 2

Bleeding disorders

platelet disorder

Affects capillaries

Coagulation factor disorders

Deep bleeding, bleeding recurs after removing pressure

Wet bleeding (Light, watery, indicates structural issues)

Excessive concentrate

Managements DEPENDS on underlying cause

Platelet = platelet transfusion

Plasma concentrate contains ALL CF

for **aminocaproic acid/tranexamic acid** for excessive plasminogen

Avoid contact sports or traumatic sports, continuously inspect for less visible areas for **bleeding**

Test all drainage and excreta

Test for **urinalysis for microscopic blood**, for **feces fecal occult blood test (Gaiac test)**

3 days prior no intake of **red meat**, STOP taking **vitamin C** (can cause false positive of FOBT), STOP anticoagulants, aspirin, NSAIDs, steroids

Thrombocytopenia

DECREASED **production**, INCREASED **destruction and consumption**

Destruction due to immune system and consumption in spleen

150,000-350,000/m3, **bleeding occurs in 20,000-30,000 (petechiae)**

<5,000 -> spontaneous fatal bleeding (CNS, GI)

Bone marrow biopsy:

DECREASE megakaryocyte -> **production** problem

INCREASED megakaryocyte -> **destruction** problem

Screen for Hepa B/C and HIV

Exclude pseudothrombocytopenia

Management:

Platelet transfusion

Thrombopoeitein

Splenectomy (select causes only)

Fall prevention

Bleeding precautions (**soft-brittle toothbrush, electric shaver**)

AVOID **platelet-inhibiting drugs** (**NSAIDs, aspiri**n) NASA BOOK DAW BASAHIN MO HA

Ginseng, garlic, ginko biloba

Immune Thrombocytopenic Purpura (ITP)

Autoimmune platelet destruction

T cells targeting platelets

IF UNKWON = **Primary**

IF **SLE** -> connective tissue, skin, kidney, blood vessels, and **PLATELETS <100,000**

Children and young women

Bone marrow will compensate **by producing more megakaryocytes** but some will be **IMMATURE**

-> DECREASED platelets

Asymptomatic (DEPENDING on platelet count)

Easy bruising, PETECHIAE

Heavy menses

"**Wet purpura**" -> mucusal bleeding (high mortality risk)

Rare spontaneous bleeding

Management:

Corticosteroids (-methasone)

≥30,000-50,000 replace platelets

IVIG for rapid platelet rise

rh postive = anti-D immunoglobulin

Refractory cause: splenectomy, **Rituximab**, **TPO receptor agonist (romipostin, eltrombopag) (daily)**

AVOID invasive procedure -> IM injections, catheters, NGT, surgical or diagnostics

IF NEEDED TRANSFUSE PLATELET PRIOR THE PROCEDURES

Continuously perform **NEUROLOGIC ASSESSMENT**

<10,000 = spontaneous bleeding

Platelet function disorders

Aspirin, NSAIDs, Uremia, MDS (Myodisplastic syndrome [cancer]), Cardiopulmonary bypass (anti-platelet medications), Herbal agents (ginseng, garlic, ginko biloba)

Diagnostic: platelet function tests

STOP the offending agents

Desmopressin (able to increase platelet, not yet understood)

Antifibrolytics for mucosal bleeding

AVOID platelet inhibiting factors

Hemophilia A and B (8, 9)

Von willebrand disease (vWD or Hemophilia C) bind with collagen to start platelet activation

mucosal bleeding

Acquired bleeding disorders

Liver disease (**Liver cirrhosis)**, **Vitamin K deficiency**, **Heparin-induced-thrombocytopenia (HIT)**, **Disseminated intravascular coagulation (DIC)**

Heparin-induced-thrombocytopenia

Immune-related

Platelet count -> **<50%**

High risks of **thrombosis (DVT, PE, stroke)**

Continuous thrombotic activity

STOP heparin (mechanical valve -> DOACs)

AVOID warfarin initially

Disseminated intravascular coagulation (DIC)

Systemic activation of coagulation

Simultaneous thrombosis and bleeding

SEPSIS most common, trauma, malignancy

Inflammatory triggers = **gram negative microorganisms or proteins (malignancy)**

Ectopic pregnancy and abortions, abruption placenta

-> organ ischemia + hemorrhage

Diagnosis:

DECREASED platelets, fibrinogen

INCREASED PT, aPTT, TT, D-dimer & FDPs

Management:

Sepsis -> antibiotic, vasopressor (rapidly increase blood pressure and organ perfusion)

Malignancy -> chemotherapy, surgery

Bleeding -> give oxygen, supplementary fluids and blood products

Replace CF via plasma concentrate and heparin (heparin leads to higher risk for bleeding)

AVOID contact sport, **invasive** procedure

THROMBOTIC DISORDERS

Venous thrombosis -> **lungs**

DVT, PE

Arterial thrombosis -> anywhere, brain (stroke), renal (prerenal injury),

Peripheral arterial disorders (intermittent claudication -> ulcerations)

Hypercoaguable states (**Thrombopenia**)

Inherited or acquired (genetic testing)

NOT indicated for acquired disorders

Smoking (endothelial damage) and obesity

Bleeding

Hormonal replacement (**estrogen**)

INHERITED

Hyperhomocysteinemia

increased **homocysteine** -> endothelial damge -> **thrombosis**

DVT, acute coronary syndrome, ischemic stroke

Folic, B6, B12 deficiency

Vitamins **does NOT reduce recurrence**

Antithrombin (AT) deficiency

AT **INHIBITS** **thrombin and CF**

Mostly inherited, liver disease, nephrotic syndrome, DIC, Estrogen therapy

Deep leg and mesenteric vein

Heparin resistance possible

Family screening

Protein C deficiency

Vitamin K-dependent anticoagulant

LOW levels -> **spontaneous thrombosis**

Complications: **WARFARIN induced-skin necrosis**

STOP vitamin K

Heparin, fresh-frozen plasma, **Protein C concentrate (IF severe)**

Protein S

Cofactor of protein C

SAME management with PROTEIN C

Activated Protein C Resistance & Factor V Leiden

Most common inherited thrombophilia = FACTOR V LEIDEN

INCREASES in **smoking, estrogen**

Antiphospholipid Antibody Syndrome (APS)

Immune system DESTROYS phospholipids

DECREASED **amnexin V (anticoagulant protein)** -> no coagulation

Associated: stroke, recurrent miscarriages, Venous & arterial thrombosis

Primary and Secondary (SLE MOST COMMON)

Malignancy-Associated Thrombosis

Pancreatic, lung, ovarian, gastric cancers

Managements:

Anticoagulants (**Heparin, Warfarin, DOAC**)

Provoking factors and reccurents

LIFE-LONG coagulations and monitor for risk of bleeding

Prevent venous stasis: early ambulation, ROM exercise, compression stockings

DVT, PE

Endothelial damage: smoking, HTN, bleeding precautions

Wear medical bracelets -> before any treatment reverse anticoagulation

AVOID obesity

BLOOD and LYMPHATIC CANCERS

Leukemia

Unregulated proliferation of leukocytes (**both immature and mature**)

Persistent leukocytosis = malignancy

In **bone marrow**

-> **anemia, thrombocytopenia, infection risks**

-> **organ infiltration (liver, spleen, CNS, skin) metastasis**

By **cell**: **myeloid leukemia or lymphoid**

Acute Leukemia

ABRUPT onset (within weeks)

Blasts ≥20% in marrow

IMMATURE cells

Rapid progression

Higher mortality

Chronic Leukemia

INSIDIOUS onset (month-years)

MATURE cells

Prolonged disease course

Vague symptoms

Acute Myeloid Leukemia (AML)

IMMATURE myeloid blast cells

-> erythrocytes and platelets

Crowding in marrow -> pancytopenia

Spleen and Liver takes over -> **splenanomegaly**

68 years old

More common in **males**

Exposure to chemical: **benzine (pesticides)**, **prior chemotherapy**, smoking, genetic (down syndrome)

5-10% of cancers are genetically linked

-> anemia, neutropenia, thrombocytopenia, bone pain (***sternum, hips, vertebrae***), ***gingival hyperplasia, hepatosplenomegaly***

All low **EXPECT WBC** (can also be low, **when wbc are immature they can die easily**)

Absolute neutropenic count (500/mm3)

Bone marrow biopsy -> **>20% immature leukocytes**

APL (acute premyelolitic leukemia)

DIC

COMPLETE REMISSION

Chemotherapy

-> non-specific and destroys all rapid growing cells

2-4 phases (AML 4 phases)

Induction

- **high dose**, **frequent schedule** of chemotherapy (kill majority of cancer cells)

- **most side/adverse effect**s are manifested

Cytrarabine + anthracycline (Daunorubicin, idarubicil)

Hospitalized **4-6 weeks**

Neutropenic <100

Prevent bleeding and infection

Consolidation

- **Recover patient first** before consolidation

- **lower doses**, **longer schedules** (kill all remaining cancer cells)

Prevent relapse

Cytarabine-based regimens

Remission

- **after consolidation**

Relapse -> cancer cells proliferate again

In AML, **HSOT will not cure AML**

No raw meat, half-cook, plants, flowers

BOTH NURSE AND PX SHOULD WEAR MASK

Chronic Myeloid Leukemia (CML)

Abnormality in the genes, **chromosomes 9 and 22**

Transmutation of the genes

Philadelphia chromosomes

BCR-ABL fusion gene -> EXCESS **tyrosine kinase activity**

-> Stimulate **uncontrolled leukocyte production (Mature)**

Overcrowding in bone marrow -> **splenomegaly**

Insidious progression

Chronic phase:

Asymptomatic, **incidental** leukocytosis

Accelerated phase:

After 5 years

Worsening counts, fatigue, anemia, splenomegaly

Treatment should be here and chronic phase

Blast crisis

Acute leukemia-like

Infection, bleeding, leukostasis

Poor prognosis

Management:

Tyrosine kinase inhibitors (-tinib)

Imatinib (first-line)

Bosutinib, ponatinib (secondary-line)

A lot of drug-drug interactions

-> it affect CYP450, can lead to decrease activity or toxicity

-> necrosis

HSOT = ONLY curative option (select patient)

ALL (acute lymphocytic Leukemia)

Same with AML but mostly immature

CLL

Very curable (stem cell transplant)

Management:

Neutropenic and bleeding precautions

Lymphoma

Malignancy in lymphoid cells

Spleen, lymph node, bone marrow

hodgkin-lymphoma (HL)

-> biopsy = **reed stern berg cells**

-> treatable

-> **younger**

-> **stage 1-3: 92-94%**

-> **stage 4: 78%**

-> **viral** infections

-> **cytotoxin exposure**

-> **Agent orange** -> lymphoma risk

-> **unicentric origin** -> low chance of metastasis

-> **nodular sclerosis** (most common, younger)

-> **Mixed cellularity** (older)

-> **most severe and aggressive subtype (lymphocyte-depleted)**

-> **lymphocyte-ish**

-> (B cells origin, nodular-lymphocyte predominant HL)

-> **Painless lymphadenopathy** (cervical most common, supraclavicular, mediastinal)

- organ suppression (mediastinal mass -> dyspnea)

-> night-sweats and low grade fever **lymphadenopathy** (hard, firm, non-mobile)

-> lymph node biopsy = **reed stern berg**

-> **Cure = PRIMARY GOAL**

-> **ABVD or Stanford V(shorter)**

-> **LONGER radiation therapy + chemotherapy**

Non-hodgkin-lymphoma (NHL)

-> **NO reed stern berg**, other findings (B cells)

-> **NOT treatable**

-> **heterogenous group**

-> **unpredictable spread**

-> **65-70 years old**

Indolent

Less severe

Aggressive

More severe

Common in **elderly**

Multiple Myeloma

M protein - non functional monoclonal protein

-> increased myoplastic -> **increased bone destruction**

plasmacytomas

Mostly **bone manifestations**

Male, age, african-american

Agent orange, smoking

-> **C.R.A.B.**

HyperCalcemia

Renal dysfunction (due to hypercalcemia, **Bence-Jones protein AS DX MARKER**)

Anemia

Bone destruction (fracture, spine changes ***kiphosis**)

FIND if there are M protein present

-> **Serum protein electrophoresis (ALBUMIN AND GLOBULIN)**

Renal function: **creatinine and BUN INCREASES**

Ca will INCREASE

Albumin will DECREASE

Rouleaux formation (LINEAR STACKING)

NO CURE

Control symptoms, delayed symptoms, provide quality of life

Management:

STOP production of **proteasome**

-> **-imib + immunomodulators (domide) + dexamethasone**

Autologous HSCT

Tandem transplant possible

Continue immunomodulators

Bortezomib (high-risk patients)

bi-phosphonate/phosphate binders

INABILITY of B cells to produce

Hyperviscosity syndrome:

Bleeding, visual changes, HF, oncologic emergency

Neurologic:

Spinal cord compression

Peripheral neuropathy

Continuously assess neurologic assessment

at least 3 liters per day

VTE (venous thromboembolism)

BONE PAIN

Start with **NSAIDs**

-> **IF renal and bleeding SHIFT to OPIOIDS**

Prevent infections (**reverse isolations**)

Developing activity limitations

MGUS and Disease progression

Monoclonal Gammophathy of undetermined Significance

No cancer yet

M-protein present -> AT RISK for Multiple Myeloma

Progression rate of **0.5-1% per year**

REQUIRES long term monitoring