Pathophysiology of Musculoskeletal System

Joint is a location at which 2 bones come into contact.
Joint allows movement & provide Mechanical support.

Structurally joints are classified

1. Fibrous → bones connected by collagen
2. Cartilaginous joint → " " cartilage
3. Synovial : → There is a space b/w 2 articulate (Synovial cavity) bones.

Eg: for fibrous : Cranial sutures
Gomphoses : Joints b/w Teeth their roots & sockets in Maxilla & Mandible
joined by tight & inflexible dense connective tissue.
Doesn't allow Movement - in Adults
but in children slightly Movable as they are not solidified.

Cartilaginous : Allows slight Movement.
Eg 1. Pubic Symphysis
2. Joints b/w ribs & Sternum.

Synovial : Synovial joint & diarthrosis joint
often exchangeable

Functional classification : Classified as

1. Synarthrosis — No movement
2. Amphiarthrosis — allow little movement
3. Diarthrosis — allow variety of movements. (flexion, adduction & pronation)

Only Synovial joints are diarthrodial

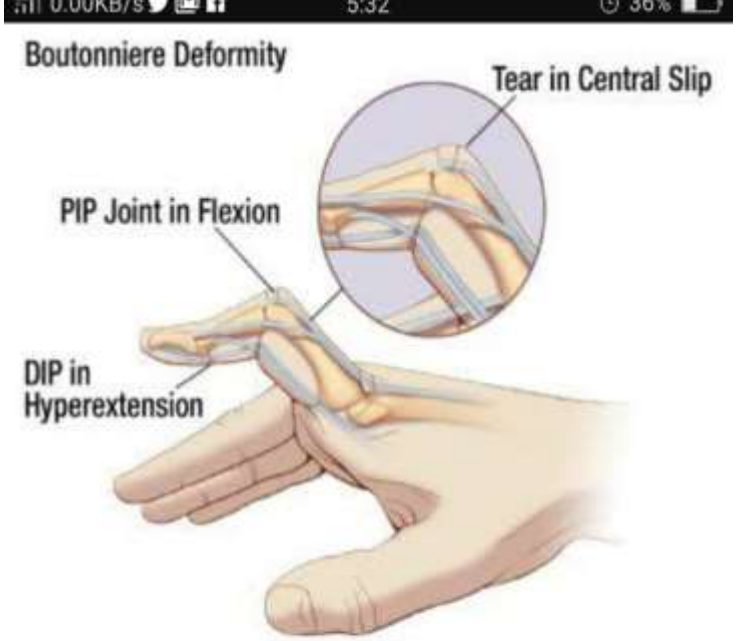
Rheumatoid arthritis (RA) : Chronic inflammatory autoimmune disorder that causes the immune system to attack the joints.

→ RA is a systemic disease affecting Extra articular tissues throughout the body including the skin

→ It is disabling & painful inflammatory condition which can lead to substantial loss of mobility due to pain & joint destruction.

→ Joints are asymmetrically affected & then in symmetrical fashion as the disease progresses.

→ There is stiffness of joints in the morning that lasts for over 1 hr



Oh My Arthritis

Boutonniere Deformity | Oh My Arthritis

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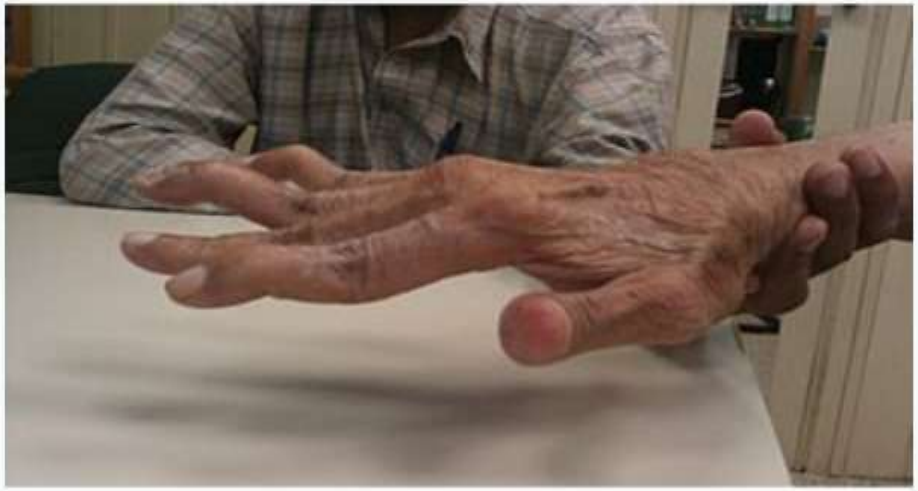
of the finger, in which the joint closest to the fingertip is permanently bent toward the palm while the nearest joint to the palm is bent away from it (DIP flexion with PIP hyperextension). It is commonly caused by injury or inflammatory conditions like rheumatoid arthritis or sometimes familial (congenital, like Ehlers-Danlos syndrome[1]).

Swan neck deformity



Swan neck deformity in a 65-year-old rheumatoid arthritis patient.

with the progression of the disease,
↓
Inflammatory activity leads to erosion & destruction of the joint surface
with impairment of Movement & leads to deformity

Fingers will deviate towards little finger ulnar
&
assume characteristic shapes.
The deformities in RA are Boutonniere deformity.
Swan neck deformity

Etiology: Auto immune reaction
&
Environmental → smoking } triggers autoimmune
- Infection }
- industrial pollutants } leading to
- silica crystals. ↓

hyperplasia hypertrophy
&
Ch. Joint inflammation
along with Extra articular
Manifestations.

Signs & Symptoms: Often begins with fever
Arthralgias
weakness beg
before Inflamed

— Additional symptoms : Persistant symmetric polyarthritis of hand & feet.

→ progressive articular destruction

→ Extra articular involvement.

→ Difficulty performing activities of Daily life.

Extra articular Symptoms : Due to consequences of Disease or Consequences of due to side effects of drugs like NASIADS

↓

" GI bleeding"

Splenomegaly : Concurrent leukopenia

Dermatological : Subcutaneous nodules on Extensor surface of elbow

Pulmonary : Lungs May involve as primary process of disease or secondary due to consequence of therapy. (Fibrosis)

Renal : Amyloidosis →

Cardiovascular : Pericarditis, Endocarditis
Left ventricular failure

Ocular : Keratoconjunctivis sicca (dry eyes)

Neurological : Mononeuritis Multiplex

Pathophysiology

Genetic predisposition
+
Environmental factors
↓
RA factor & anti cyclic citrullinated Peptide antibody

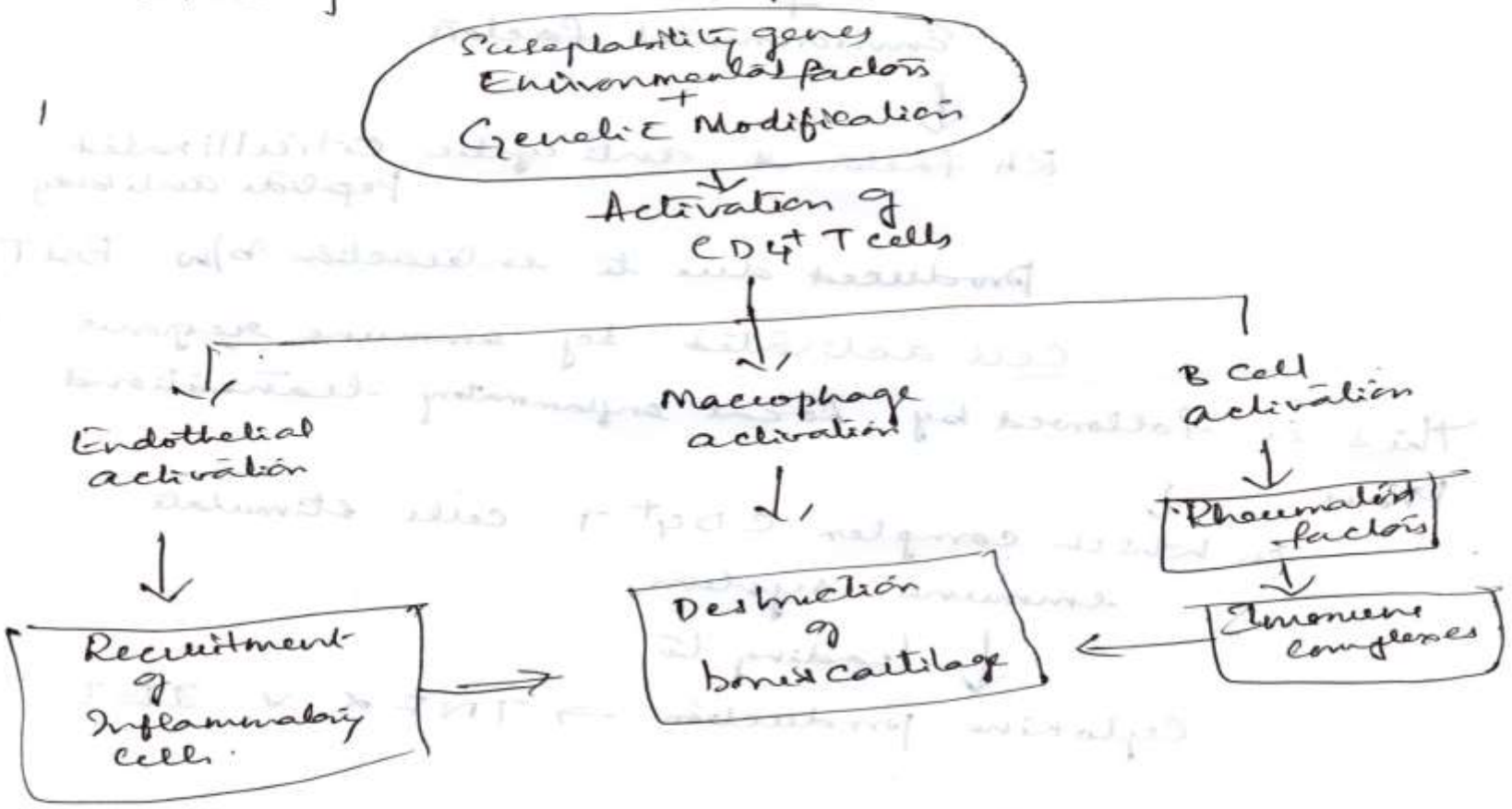
Produced due to interaction b/w B & T cell activated by immune response

→ This is followed by local inflammatory transition phase ↓ in which complex CD4+ T cells stimulate immune system ↓ leading to Cytokine production → TNF α & IL-1

→ Primary inflammatory site is Synovium

→ TNF IL-1B. & ~~Inter~~ IL-6 & Prostaglandin E2
& proteases can be produced by various cell to cell interaction occuring in Synovium tissues

Inflammation, Perforation Proliferation & degeneration resulting in destruction of synovium cartilage & bone.



Diagnosis

Morning stiffness of >1 hr
Arthritis & Swelling of Soft tissue >3 to 14 days
Symmetric arthritis / hand joint

1. RA-factor
-ve does not
(2.) Anti citrullinated Antibodies presence (Early stages of Disease)
ESR raised

Liver Enzymes →

Antinuclear antibody →

Treatment : 1. Xenobiotics → Azathioprine
Cyclosporin
D-penicillamine
Gold salli
Hydroxychloroquine
Methotrexate
Sulfasalazine

2. Biological agents : TNF α blocker like
- Enbrel
- Remicade
- Humira.

3. Interleukin I blocker:
- Riteuxan
- Anakinra

4. T cell blocker: :- Orencia

5. Anti inflammatory & analgesics : NSAIDs, Acetaminophen
Glucocorticoids.
Opioles.

6. Topical Diclofenac joint

7. Other therapies : Physiotherapy
Occupational therapy

Joint Replacement surgeries Ex-knee Replacem

(8)

Prevention : Regular Exercise } Reduce pain
Carefully controlled diet } ↓
Stiffness & flare ups

GOUT :

Gout :

Metabolic arthritis → due to defective uric acid Metab

→ Monosodium urate crystals deposited on articular cartilage of joints & in tendons

↓ causing
Inflammatory reaction to then tissues

→ Then deposits often increase in size & burst through the skin to form sinuses discharging a chalky white Material.

→ Elevated levels of uric acid forms crystals & are deposit they may also form uric acid stones in kidneys.

Etiology : Due to hyperuricemia :

1. Medication :- life style factors such as high purine diet
Triggering : Diuretics obesity & Excessive alcohol intake
Chemotherapy
uricacid lowering 2. Diet → Sweat sodas, Not taking Enough fluid

Symptoms: Pain & Swelling are Main symptoms

Sudden pain, Swelling
Redness, warmth
Stiffness of joint
Low fever.

→ Crystals present inside joint cause intense pain when even affected area is moved

→ Inflammation of tissues around the joint causes them to swell, tender & sore.

→ Usually big toe is involved, Also affect ankle, heel
- Knee
- wrist
- Elbow
- fingers & spine.
- Sometimes small toes.

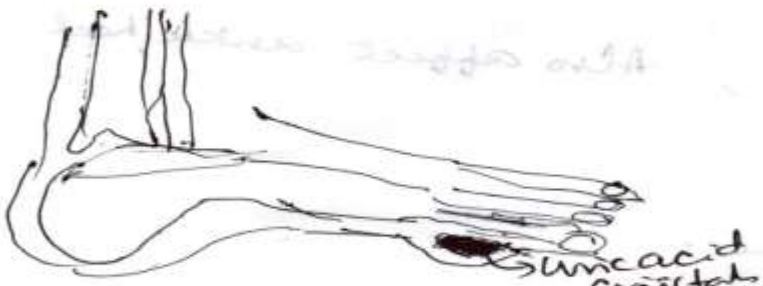
→ patients — gout → with long lasting hyperuricaemia can have uric acid crystal deposits in other tissues called 'Tophi' Eg: The helix of ear

Diagnosis Hyperuricaemia → uric acid > 420 mol/L i.e 7.0 mg/dl in males
> 380 mol/L in females.

Perfect Diagnosis of Gout is Microscopy of joint
↓
fluid aspirated from joint
↓
To demostrate Intracellular Monosodium urate crystals in Synovial fluid.

Pathogenesis of Gout :

↑↑ uric acid
↓
Blood
↓
React to sodium
↓
Sodium crystal deposit in joints
↓
Inflammation
↓
Infiltration of granulocytes
Phagocytose the urate crystals
↓
Generate free radicals which damage the tissue
↓
Release Proteolytic Enzyme glycoprotein
↓
Release lactic acid
More PPt of urate crystals



Destruction of joints
↑
Release of Lysosomal Enzymes

It is linked c purine metabolism

↓

Is organic compound found in the body

to Metabolised to uric acid

Either ↑sed production / Impaired Excretion of uric acid

or combination of both

Other Studies → believes that gout develops -

Several years of Excessive alcohol consumption

c Lacking physical activity

a diet lacking in purine Nourishing foods. Eg. berries fruits & vegetables.

Gout can also develop due to other diseases

Polycythemia
Leukemia
Obesity
DM
HTN
Hemolytic anemia
Renal disorders.

} Secondary Gout.

Gout has got 4 stages.

1. Asymptomatic → NO symptoms only Uric acid levels ↑ses.
2. Acute
3. Intercritical
4. Chronic

→ First attack of gout Marks acute stage

3. Intercritical :

Several attacks occurs, After initial attack person enters into intercritical stage i.e symptom free interval

→ May last for months to yrs.
Second attack may be within 6 months to 2 yrs from 1st Episode.

4. Chronic stage : Attacks are frequent & becomes polyarticular affecting Multiple joints at one time

→ In Advanced cases of Ch gout → Kidney damage, HT 2, Kidney Stones } May develop

(√3)

Treatment: Indomethacin NSAIDs, Intra articular glucocorticoids.

Colchicine was previously drug of choice in acute attacks.

as it impairs mobility of granulocytes ✗ prevent → inflammatory cells Responses which is the cause of initial attack of gout.

→ Its side effects GI upset complicated ili use.

→ NSAIDs are preffered Ibuprofen can reduce Pain & Inflammation.

→ Long term treatment of antihyperuricomic therapy.

→ High purine foods like Meat, fish, lentils, peas, Spinach, Asparagus cauliflower.

Purine ✗ Neutralising foods such as cherries & strawberries.

~~Avoid~~ Alcohol ✗ — To avoid.

→ Allopurinol — xanthine oxidase inhibitor reduces uric acid production

Should be given as Maintainence for lifelong

(14)

Febuxostat : Non purine inhibitor of xanthine oxidase

↓

Superior to allopurinol

→ Probenecid → uricosuric drug :
Promotes Excretion of uric acid
Used on conjugation of colchicine.

Surgery : Necessary to remove large crystals & Correct deformity

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