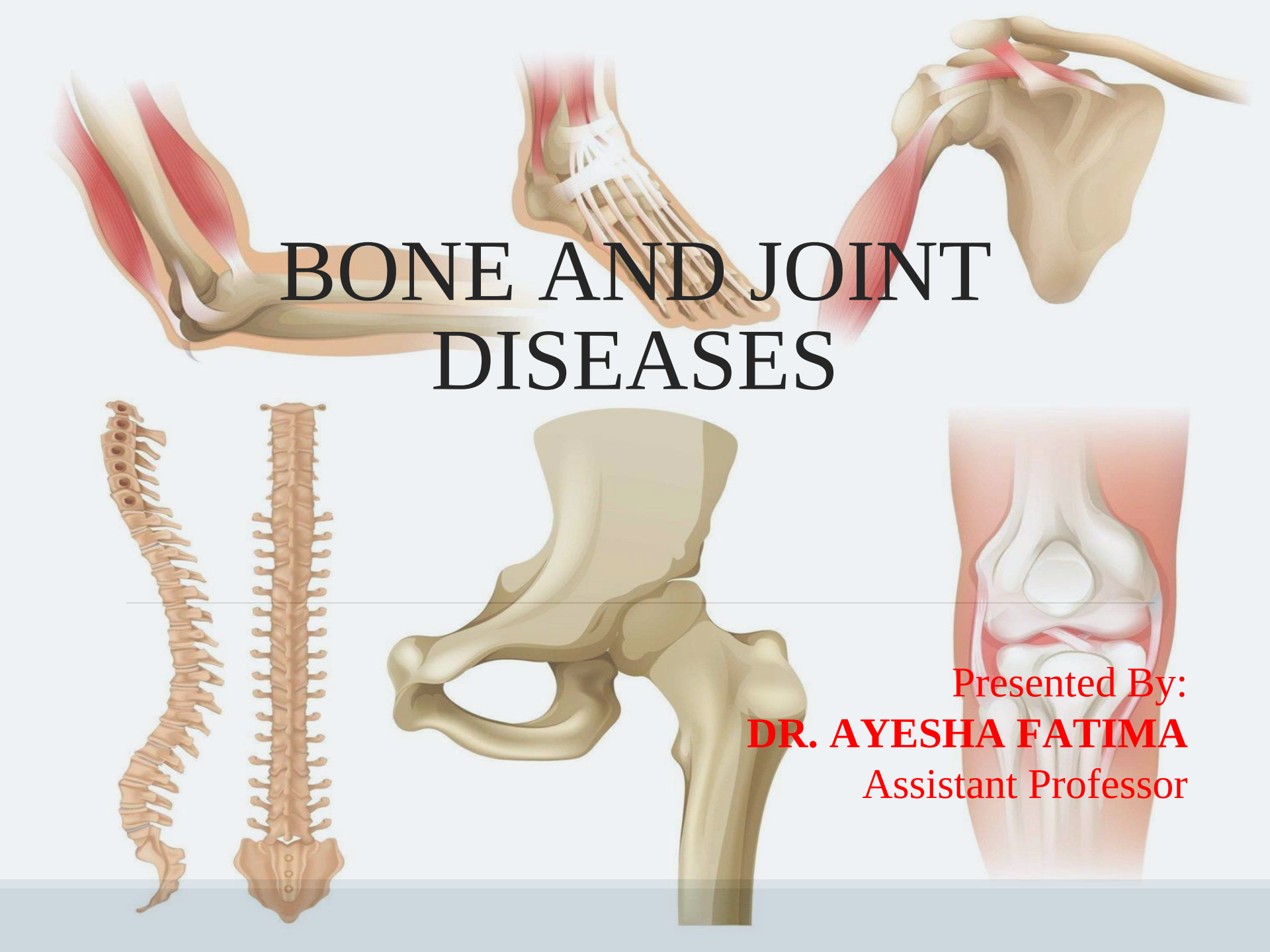




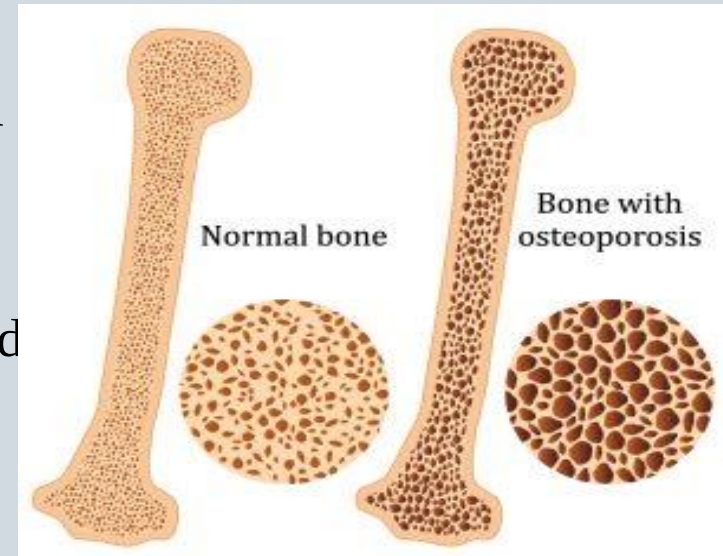
BONE AND JOINT DISEASES

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DISEASES OF BONE

Osteoporosis

- WHO has defined osteoporosis as a systemic skeletal disease characterized by low bone mass and micro architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture.
- Bone density (the amount of bone tissue) is reduced because its deposition does not keep pace with resorption.
- Although the bone is adequately mineralized, it is fragile and microscopically abnormal, with loss of internal structure.
- Peak bone mass occurs around 35 years and then gradually declines in both sexes.
- Lowered oestrogen levels after the menopause are associated with a period of accelerated bone loss in women. Thereafter bone density in women is less than in men for any given age.
- A range of environmental factors and diseases are also associated with decreased bone mass and are implicated in development of osteoporosis.



Box 16.1 Causes of decreased bone mass

Risk factors

Female gender
Increasing age
White ethnic origin
Family history
Lack of exercise/immobility
Diet (low calcium)
Smoking
Excess alcohol intake
Early menopause/oophorectomy
Thin build (small bones)

Drugs

Corticosteroids

Diseases

Cushing's syndrome
Hyperparathyroidism
Type 1 diabetes mellitus
Rheumatoid arthritis
Chronic renal failure
Chronic liver disease
Anorexia nervosa
Certain cancers

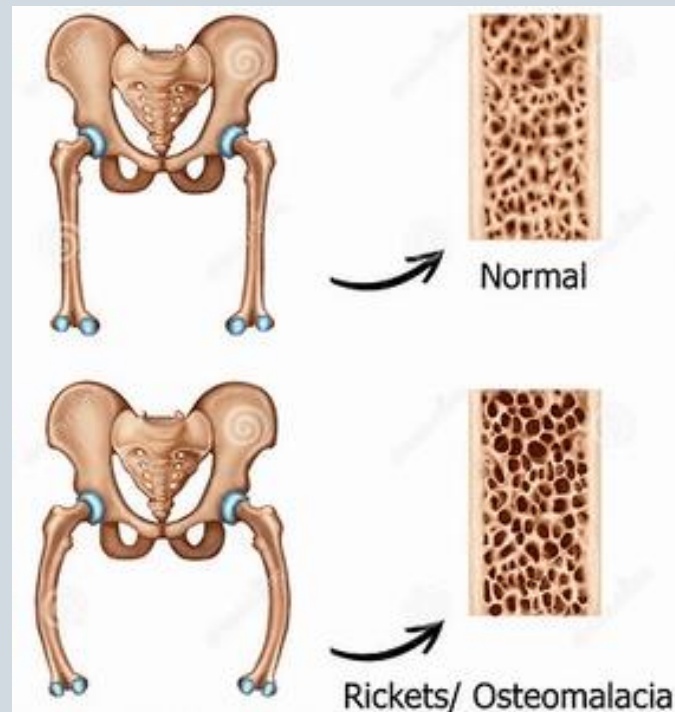
Normal bone

Bone with Osteoporosis

- Exercise and calcium intake during childhood and adolescence are thought to be important in determining eventual bone mass of an individual, and therefore the risk of osteoporosis in later life.
- As bone mass decreases, susceptibility to fractures increases.
- Immobility causes reversible osteoporosis, the extent of which corresponds to the length and degree of immobility.
- For instance, during prolonged periods of unconsciousness, osteoporotic changes are uniform throughout the skeleton, but immobilization of a particular joint following fracture leads to local osteoporotic changes in involved bones only.
- Common features of osteoporosis are:
 - skeletal deformity – gradual loss of height with age, caused by compression of vertebrae
 - bone pain
 - fractures – especially of the hip (neck of femur), wrist (Colles' fracture) and vertebrae.

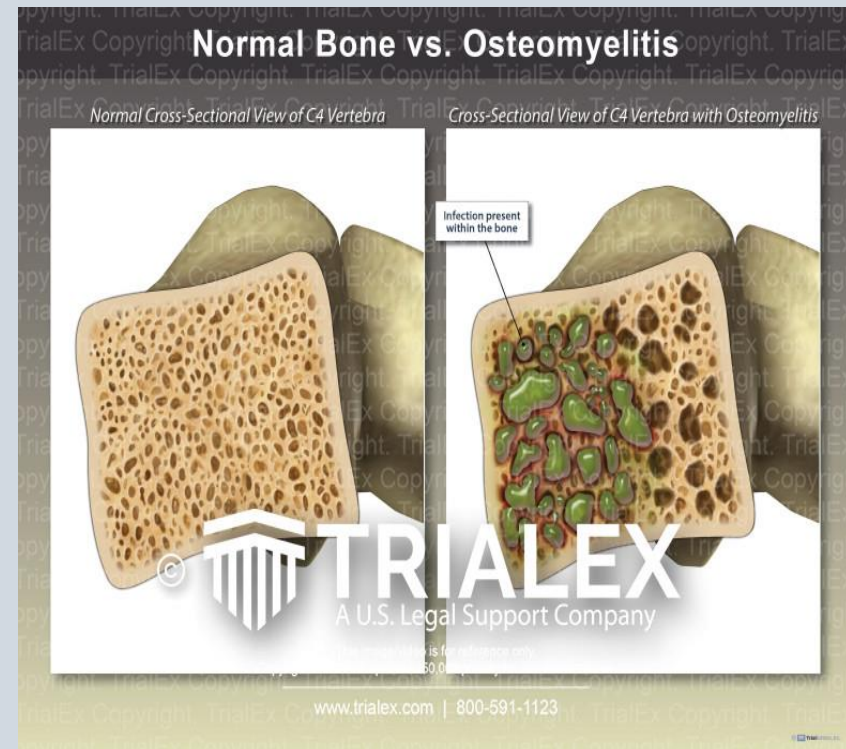
Rickets and osteomalacia

- The underlying abnormality in osteomalacia and rickets is inadequate mineralisation of bone, usually because of vitamin D deficiency, or sometimes because of defective vitamin D metabolism.
- In children, whose bones are still growing, this leads to characteristic bowing and deformity of the lower limbs, and is called rickets.
- In the adult, who still requires vitamin D for normal turnover of bone, deficiency leads to osteomalacia, which is associated with increased risk of fracture and bone pain.
- Deficiency may be caused by poor diet, or by limited exposure to sunlight (needed for normal vitamin D metabolism).
- Some people are genetically unable to metabolise vitamin D normally, leading to poor bone mineralisation, and occasionally malabsorption may also lead to deficiency.



Osteomyelitis

- The general term for bacterial infection of bone is osteomyelitis.
- This may follow an open fracture or surgical procedures, which allow microbial entry through broken skin.
- It may also be a consequence of blood-borne infection from a focus elsewhere, such as the ear, throat or skin; this is most commonly seen in children.
- If promptly and adequately treated, the infection can resolve without permanent damage, but if not, it may become chronic, with sinus formation draining pus to the skin, fever and pain.



Developmental abnormalities of bone

1. Achondroplasia

- This is caused by a genetic abnormality that prevents the proper ossification of bones that develop from cartilage models, such as the long bones of the limbs, leading to short limbs and characteristic dwarfism.



2. Osteogenesis imperfecta ('brittle bone syndrome')

- This is a group of conditions in which there is a congenital defect of collagen synthesis, resulting in failure of ossification. The bones are brittle and fracture easily, either spontaneously or following very slight trauma.

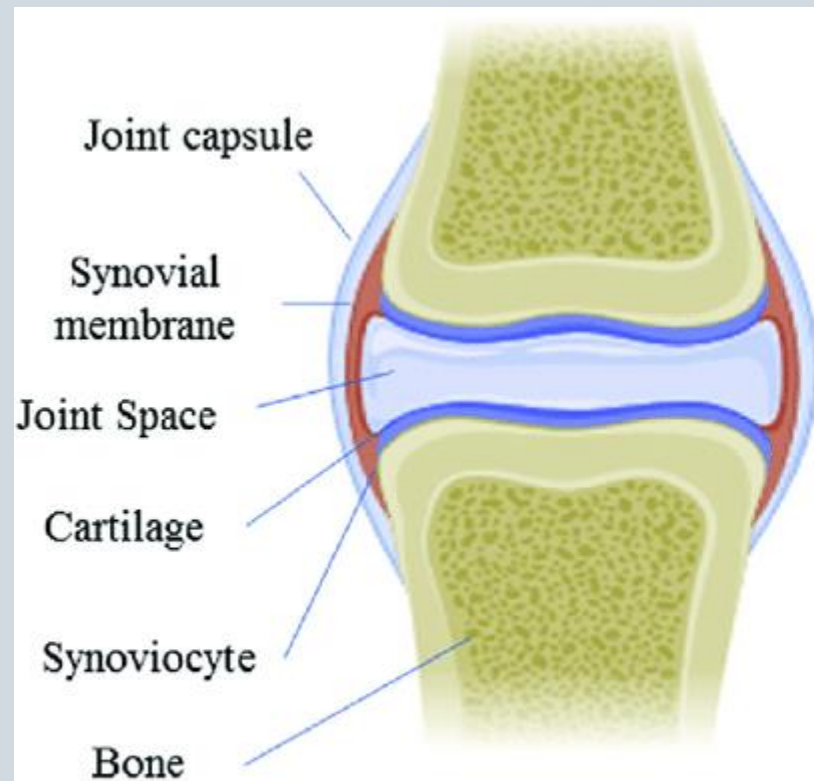


Disorders of joints

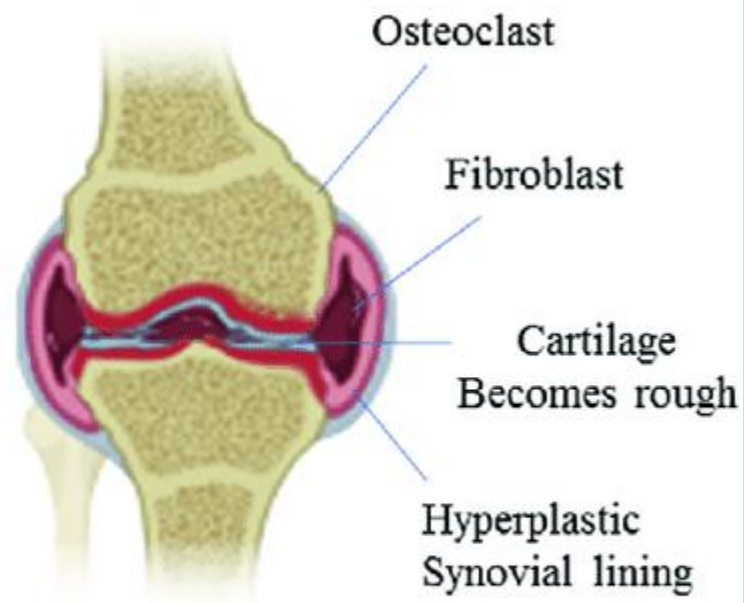
Inflammatory joint disease (arthritis)

Rheumatoid arthritis (RA, rheumatoid disease)

- This is a chronic progressive inflammatory autoimmune disease mainly affecting peripheral synovial joints.
- It is a systemic disorder in which inflammatory changes affect not only joints but also many other sites including the heart, blood vessels and skin.
- It is more common in females than males and can affect all ages, including children (Still's disease), although it usually develops between the ages of 35 and 55 years.
- The cause is not clearly understood but development of autoimmunity may be initiated by microbial infection, possibly by viruses, in genetically susceptible people.
- Risk factors include:
 1. age – risk increases with age
 2. gender – premenopausal women are affected three times as commonly as men
 3. genetic risk – there is a strong familial link in some cases, and some markers on the surface membranes of white blood cells have also been associated with higher risk of the disease.



Healthy bone joint capsule



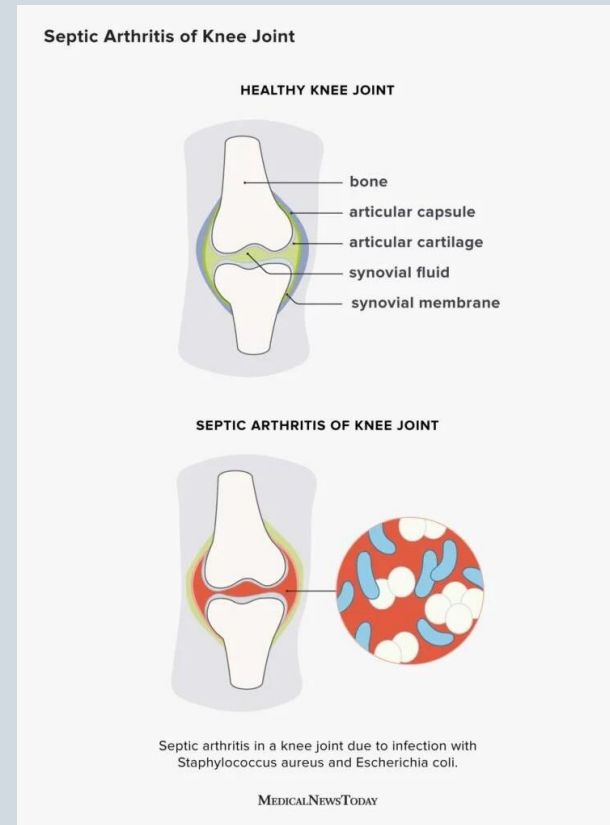
RA bone joint capsule

- Affected individuals have rheumatoid factor (RF autoantibodies) in their body fluids. High levels of RF, especially early in the disease, are strongly associated with accelerated and more severe disease.
- Symptoms include joint pain and stiffness, particularly in the morning and after rest. Joints can be visibly swollen, hot and tender.
- Acute exacerbations of rheumatoid arthritis are usually accompanied by fever, and are interspersed with periods of remission.
- The joints most commonly affected are those of the hands and feet, but in severe cases most synovial joints may be involved.
- With each exacerbation there is additional and cumulative damage to the joints, leading to increasing deformity, pain and loss of function.
- The early changes, which may be reversible, include hypertrophy and hyperplasia of synovial cells and fibrinous inflammatory effusion into the joint. Progression of the disease usually leads to permanent tissue damage.

- Growth of inflammatory granulation tissue, called *pannus*, distorts the joint and destroys articular cartilage, exposing the bone below and causing further damage.
- Fibrosis of the pannus reduces joint mobility.
- Pain, stiffness and deformity severely restrict the use of affected joints, and as a result the associated muscles start to waste.
- About a third of patients, usually those with the most aggressive form of the disease, develop nodules of connective tissue (rheumatoid nodules), usually in the forearm or elbow.
- Extra-articular symptoms can include anaemia, peripheral neuropathy, cardiac abnormalities, pleurisy and vasculitis.
- In the later stages of the disease, the inflammation and fever are less marked.
- The extent of disability varies from slight to severe.

Infective arthritis

- Joint infection (septic arthritis) usually results from a blood-borne systemic infection (septicaemia, mainly staphylococcal), although it may also be caused by a penetrating joint injury.
- Often the joint has been damaged by pre-existing disease, making it more susceptible to infection.
- Normally, only one joint is involved, which becomes acutely inflamed, and the patient is likely to be ill from the associated septicaemia.
- Complete resolution is possible if treatment is prompt, but permanent joint damage occurs early in the disease.



Other types of polyarthritis

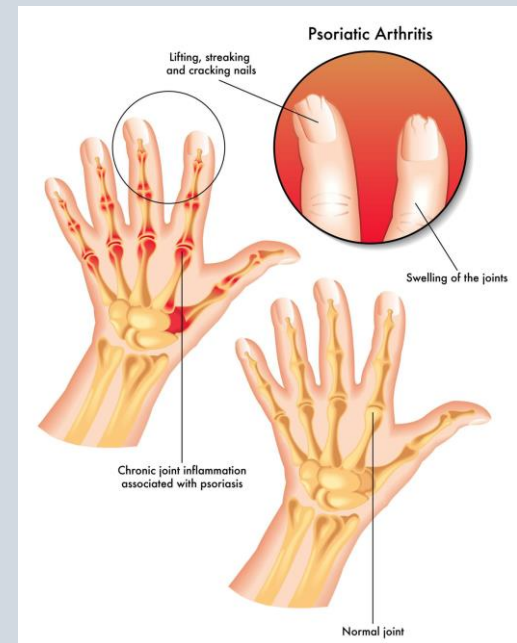
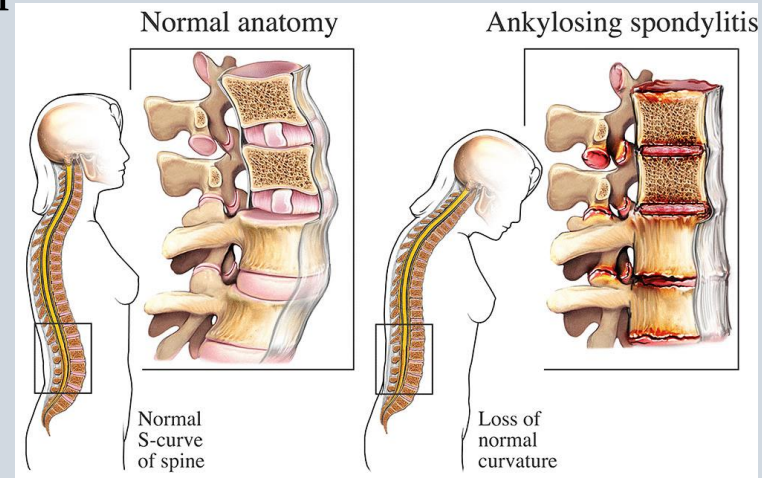
Polyarthritis means inflammation of more than one joint. This group of autoimmune inflammatory arthritic diseases has many characteristics similar to rheumatoid arthritis but the rheumatoid factor is absent. The causes are not known but genetic features may be involved.

1. Ankylosing spondylitis

- This tends to occur in young adults, and affects the joints of the vertebral column. Calcification of the intervertebral joints and laying down of new bone leads to reduced spinal flexibility and permanent deformity.

2. Psoriatic arthritis

- This occurs in a proportion of people who suffer from psoriasis, especially if the nails are involved. The joints most commonly affected are those of the fingers and toes.

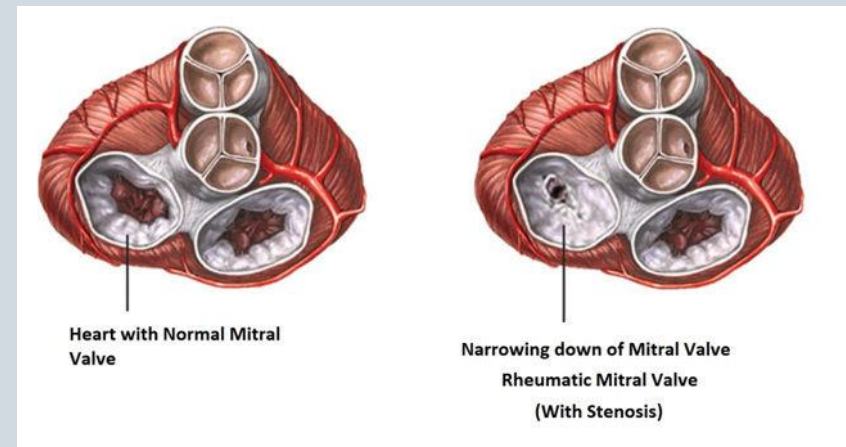


3. Reiter's syndrome (polyarthrititis with urethritis and conjunctivitis)

- This syndrome, it is believed, may be precipitated by infection with *Chlamydia trachomatis*; the affected joints are usually those of the lower limb.

4. Rheumatic fever

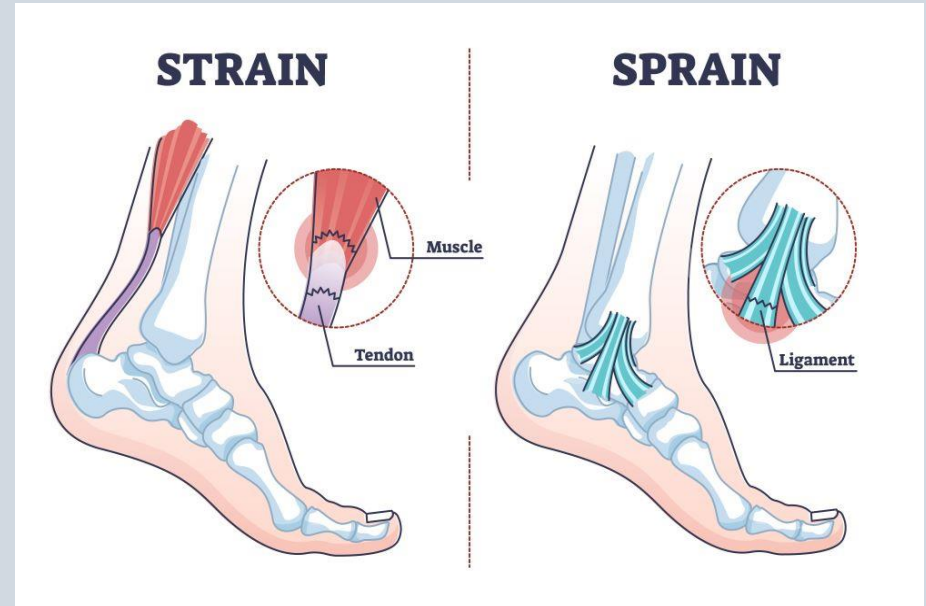
- Rheumatic fever is a diffuse inflammatory condition that affects many connective tissues.
- Polyarthrititis is a common presenting feature, often involving the wrists, elbows, knees and ankles.
Unlike cardiac effects, arthritis usually resolves spontaneously without complications.



Traumatic injury to joints

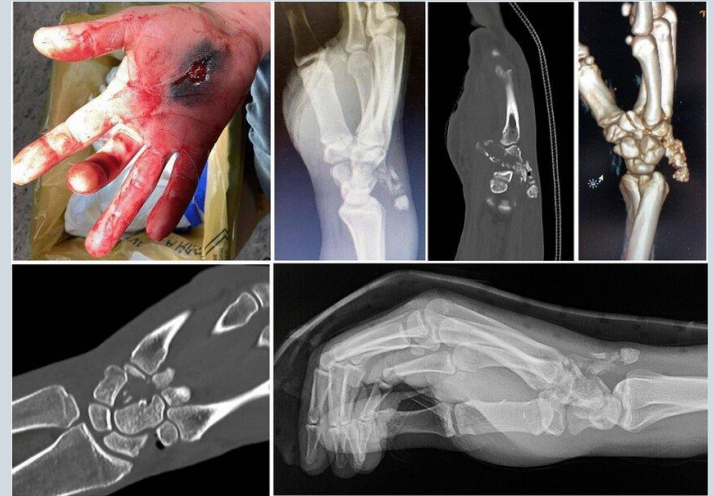
1. Sprains, strains and dislocations

- These damage the soft tissues, tendons and ligaments round the joint without penetrating the joint capsule.
- In dislocations there may be additional damage to intracapsular structures by stretching, e.g. to the long head of biceps muscle in the shoulder joint, the cruciate ligaments in the knee joint, or the ligament of head of femur in the hip joint.
- If repair is incomplete there may be some loss of stability, which increases the risk of repeated injury.



2. Penetrating injuries

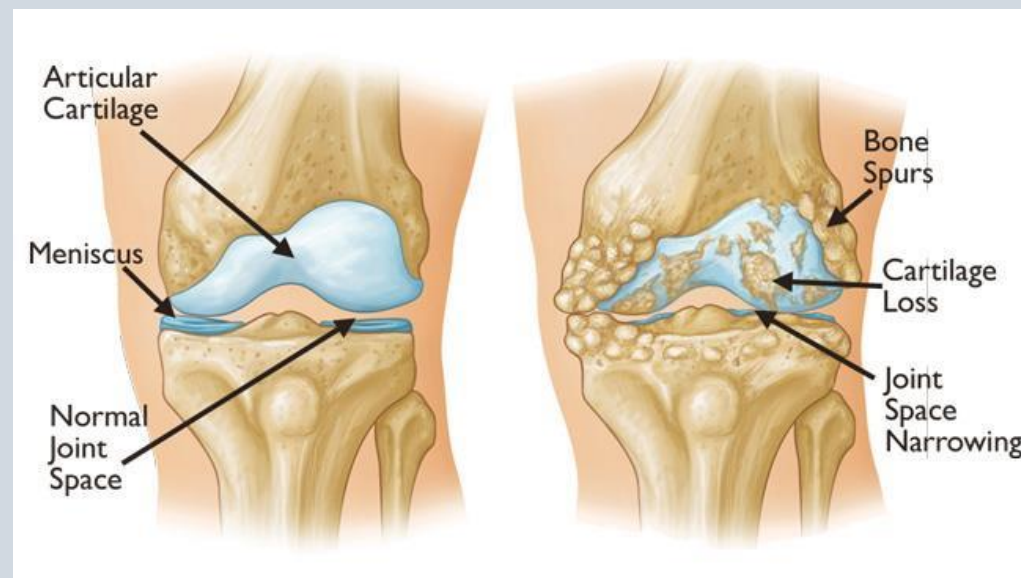
- These may be caused by a compound fracture of one of the articulating bones, or trauma caused by, e.g., gunshot.
- Healing may be uneventful or it may be delayed by the presence of fragments of damaged or torn joint tissue (bone, cartilage or ligaments), which cannot be removed or repaired by normal body mechanisms and prevent full joint recovery.
- Infection is another risk.
Development of chronic inflammation can lead to permanent degenerative changes in the joint.



Osteoarthritis (osteoarthrosis, OA)

- This is a degenerative non-inflammatory disease that results in pain and restricted movement of affected joints.
- In its early stages, OA is often asymptomatic. It is very common, with the majority of over-65s showing some degree of osteoarthritic changes.
- Articular cartilage gradually becomes thinner because its renewal does not keep pace with its breakdown. Eventually the bony articular surfaces come in contact and the bones begin to degenerate.
- Bone repair is abnormal and the articular surfaces become misshapen. This is often the reason for reduced mobility of the joint.
- Chronic inflammation develops with effusion (collection of fluid) into the joint, possibly due to irritation caused by tissue debris not removed by phagocytes.
- Sometimes there is abnormal outgrowth of cartilage at the edges of bones that becomes ossified, forming *osteophytes*.

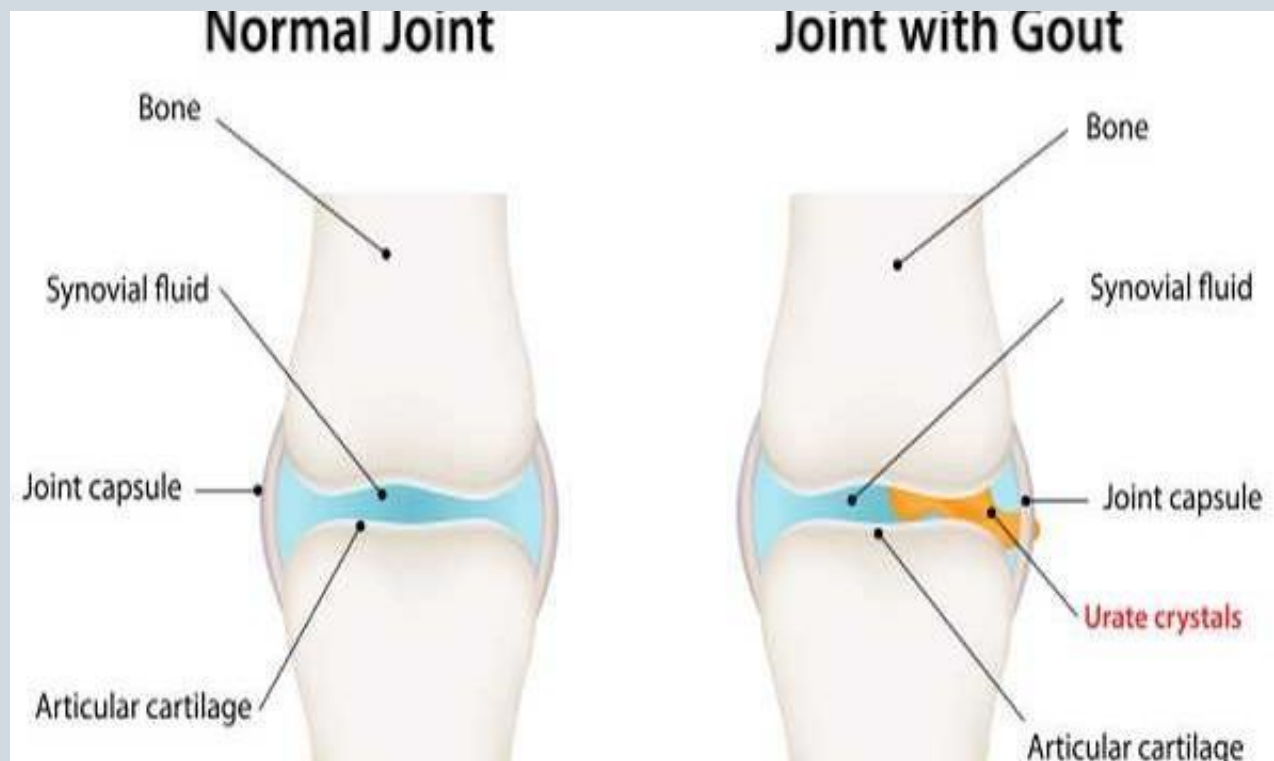
- In most cases, the cause of OA is unknown (primary OA), but risk factors include excessive repetitive use of the affected joints, female gender, increasing age, obesity and heredity.
- Secondary OA occurs when the joint is already affected by disease or abnormality, e.g. trauma or gout.
- Osteoarthritis usually develops in late middle age and affects large weight-bearing joints, i.e. the hips, knees and joints of the cervical and lower lumbar spine.
- In many cases only one joint is involved.



Gout

- It is caused by the deposition of sodium urate crystals in joints and tendons, provoking an acute inflammatory response.
- This condition is more prevalent in males than females and there is a familial tendency. Risk factors include obesity, heredity, hyperuricaemia and high alcohol intake.
- *Primary* gout, the commonest form, occurs almost always in men and is associated with reduced ability to excrete urate or increased urate production.
- *Secondary* gout occurs usually as a consequence of diuretic treatment or kidney failure, both of which reduce urate excretion.
- In many cases only one joint is involved (monoarthritis) and it is typically red, hot and extremely painful.
- The sites most commonly affected are the metatarsophalangeal joint of the big toe and the ankle, knee, wrist and elbow joints.

- Episodes of arthritis lasting days or weeks are interspersed with periods of remission.
- After repeated acute attacks, permanent damage may occur with chronic deformity and loss of function of the affected joints.
- Gout is sometimes complicated by the development of renal calculi.



FRACTURES



A fracture is a full or partial break in the normal continuity of bone tissue. Fractures can occur in any bone in the body. They are usually the result of high-impact force or stress. They may also be a sign of medical conditions such as osteoporosis or cancer.

General Classification of Fractures

Open	Closed	Stable	Displaced
			
Broken bone protrudes through skin.	Broken bone does not puncture skin.	Broken ends of bone are aligned.	Broken ends of bone have moved out of alignment.

Types of bone fractures

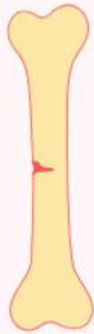
There are different types of bone fractures. Some common types are as follows.

1. **Simple fracture or Closed fracture:** The broken bones remain within the body. The skin remains intact and there is no damage to the surrounding tissues.
2. **Compound or Open fracture:** When the broken bones penetrate the skin or if the force of injury breaks the skin, causing a risk of infection.
3. **Complicated fracture:** When broken bone damages the surrounding structures (Organs). There may be a damage to arteries, veins and nerves. The complicated fractures heal more slowly.

Types of bone fractures



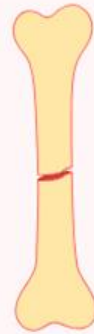
Normal



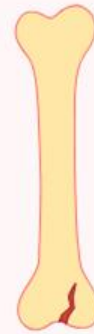
Greenstick



Oblique



Transverse



Impacted



Torus



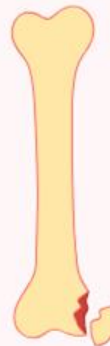
**Oblique
Displaced**



Comminuted



Segmental



Avulsed



Spiral



Linear

*thank
you*

