**Calcium Pyrophosphate Didehydrates (CPPD) crystal deposition:**

CPPD crystal deposition in hyaline and fibrocartilage of joints (chondrocalcinosis) is common age associated phenomenon effect the knee and can cause acute self-limiting synovitis (pseudo gout) or chronic arthritis and showing a strong association with OA.

It is rare under the age 55.

The knees, wrists, and symphysis pubis are the most prevalence sites.

**Etiology:**

It is most commonly sporadic age related disease and associated with following:-

- osteoarthritis


- Familial predisposition: - autosomal dominant presented with polyarticularchondrocalcinosis.

Mineralization of soft tissue is normally prevented by inhibitors such as pyrophosphate and proteoglycans when these protective mechanism breaks down abnormal calcification. And crystal formation will appear as well as increase extracellular pyrophosphate level in joint tissue due to increase chondrocyte metabolism and reduced concentration or activity of alkaline phosphatase and other pyrophosphates resulting in ectopic mineralization.

**Clinical features:-**

**1-acute synovitis(pseudo gout):-**

the most common cause of acute monoarthritis in the elderly. The knee is the most common site followed by wrists, shoulders, ankles and elbows. Trauma or surgery may trigger the attack. The typical attack resembles acute gout develops rapidly with swelling,
stiffness, restricted movement; fever with overlying erythema, attack is self-limited maximum with 6-24 hrs. and take 1-3\52 to resolve.

**D-DX:**

Sepsis and gout:- sepsis is subacute and progressive should think and considered when pseudo gout has been triggered by chest infection or surgery or patient looks un well. But sepsis and psedogout can coexist. so gram stain and culture should undertaken even crystal are identified.

Gout is unlikely in patients over the age of 65 yrs. without preceding history of primary gout or chronic diuretic therapy and seldom involves the knee in first attack.

**2-chronic (pyrophosphate) arthritis:-**

Mostly in elderly women, mostly in knees, wrists, shoulders and elbows lead to chronic pain, stiffness and function impairment. The knee being worst then wrist, shoulder, elbows hips and midtarsal and in the hand second and third MCP joints are most effect. Symptoms are chronic pain, variable early morning and inactivity stiffness and functional impairment. Acute attack may be superimposed. Affected joints show features of OA (bony swelling, crepitus and restriction) with various degrees of synovitis. Effusion and synovial thickening are usually most apparent at knees and wrists. And wrist involvement may result in carpal tunnel syndrome. Examination often reveal more widespread but a symptomatic signs of OA.

**D.DX:-**

Rheumatoid arthritis: but tenosynovitis and extra articular involvement are absent as well as large and medium rather than small joints are targeted.

Severe damage and instability of shoulders and knees may lead to neuropathic joint but neurological findings are normal.
3-**Incidental finding:** seen in elderly and asymptomatic

Due to high prevalence radiographic chondrocacinosis often occur as incidental finding in older people.

**Investigations:**

1-in acute pseudo gout:-

   a- Synovial aspirate under polarized microscopic examination will show CPPD crystals.

   b- Synovial aspirate culture to exclude sepsis.

2- **Radiography:** show chondrocalcinosis with or without OA.

3-screening for metabolic or familial predisposing factors in patient with:

   - early onset disease less than 55 years.

   - polyarticular disease.

   - recurrent acute attack.

   - clinical or x-ray of predisposing disease.

**Management:**

1-acute pseudo gout:-

   - NSAIDs

   - colchicine

   - joint aspiration and intraarticular steroid injection.

2-chronic pseudo gout:-

Treated like OA
**Osteoarthritis and Basic Calcium Phosphate deposition (BCP):**

Modest amount of BCP crystal are commonly found in synovial fluid from osteoarthritis joint either alone or with CPPD crystals and contribute to joint damage or cause minor inflammatory episodes remain unclear and large amount of BCP associated with uncommon but distractive form of OA confined to elderly female characterized by:-

- Involvement of knee, hip or shoulder (large joint) only.
- Rapid progression --- severe pain and disable within few months.
- Development of marked instability and large effusion of knees and shoulders.
- Atrophic X-ray appearance with marked loss of cartilage and bone.

Aspiration yield large volumes of relative non-inflammatory fluid containing abundant BCP aggregates and often cartilage fragments.

**D.DX:**

* End stage of avascular necrosis.
* Chronic sepsis.
* Neuropathic joint.

Unlike sepsis culture –ve.

**Treatment:**

- Analgesic, intra articular steroid, local physical treatment, and physio-therapy.
- Poor outcome.
- Most patients require joint replacement.
- More BCP aggregates more joint damage.
- Apatite associated destructive arthritis represent severe end of OA spectrum.
Calcific periarthritis:

Deposition BCP in supraspinatus tendon incidental X-ray finding 7% of adults.

Periarticular site around greater trochanter of hip, foot, or hand are less commonly affected.

Acute episode occur spontaneously or follow local trauma within few hrs. shoulder pain and tenderness are extreme and area swollen and hot and sometime real fever are common. X-ray show tendon calcification and aspiration inflammatory fluid containing many calcium staining aggregate.

The condition resolve spontaneously over 1-3 weeks often accompanied by complete crystal shedding. Calcified periarticular may result from renal failure, hyperparathyroidism or hypophosphatemia, but measurement serum creatinine, calcium and alkaline phosphatase are usually normal.CRP is elevated during episode.

Treatment:

- Oral analgesic and NSAIDs.

- Attack may be shortened by aspiration and local injection of steroid.

- Large deposit may cause mechanical blocking and painful impairment on abduction rather than acute periarthritis and require surgical removal.
Causes of ectopic calcification:-

*high calcium($\text{Ca}^{++}$) and phosphate ($\text{PO}_4^{-2}$) ionic product(metastatic calcification):-

1-hyperparathyroidism (especially tertiary)
2-renal dialysis.
3-vitamin D intoxication.
4-basal ganglia in pseudohypoparathyroidism.

*altered tissue balance of inhibitors and promoters of crystal formation (dystrophic calcification):-

1-calcific periarthritis.
2-atherosclerotic arteritis.
3-fibrotic lymph nodes.
4- Scarred lung parenchyma.
5-Scarred adrenal glands.
6-Polymyositis.
7-Systemic sclerosis (calcinosis).
8-tumours (e.g. craniopharyngioma).