CALCIFICATION

Deposition of calcium is called calcification

Physiological Calcification may be a part of normal growth of skeletal and teeth.
Process by which organic tissue becomes hardened by the physiologic deposit of calcium salts.
As a normal ageing process normal calcification may be seen in prostate, brain or in blood vessels

There may be pathological calcification
Pathological calcification
Pathologic calcification is the abnormal tissue deposition of calcium salts, together with smaller amounts of iron, magnesium, and other mineral salts.
There are two forms of pathologic calcification.

1- Dystrophic calcification
2- Metastatic calcification
Calcification in dead tissue

- **Caseous necrosis**: in T.B. is most common site of dystrophic calcification.
- **Liquefactive necrosis**: in chronic abscesses may get calcified.
- **Fat necrosis** following acute pancreatitis or traumatic fat necrosis in breasts results in deposition of calcium soaps.
- **Infarcts** may undergo D.C.
- **Thrombi**, especially in veins, may produce phlebolithis.
- **Haematomas** in the vicinity of bones may undergo D.C.
- **Dead parasites** like schistosoma eggs may calcify.
- **Congenital toxoplasmosis** or rubella may be seen on X-ray as calcifications in the brain.
Dystrophic Calcification (D.C.) is the calcification occurring in degenerated or necrotic tissue, as in hyalinized scars, degenerated foci in leiomyomas, and caseous nodules. This occurs as a reaction to tissue damage, including as a consequence of medical device implantation.
Unopened aortic valve in a heart with calcific aortic stenosis. The semilunar cusps are thickened and fibrotic. Behind each cusp are seen irregular masses of piled-up dystrophic calcification.
Dystrophic Calcification – Medial Sclerosis
Calcified hematoma - an example of dystrophic calcification
Dystrophic calcification in CREST syndrome. Dystrophic calcification frequently occurs in connective tissue diseases. Scleroderma and CREST syndrome (scleroderma)
Metastatic calcification

Deposition of calcium salts in consequence of high serum Ca level into healthy organs.

A hypercalcaemia also enhances the extent of dystrophic calcification.

A metastatic calcification has nothing to do with tumorous metastasis!!! It refers to the extensive calcification.
Causes of hypercalcaemia:

- Increased secretion of (PTH) parathyroid hormone (in parathyroid tumors)
- Malignant tumors secret PTH-related protein
- Destruction of bone tissue in Multiple myeloma,
- Paget disease,-increased parallel synthesis and resorption of bone tissue
- Breast carcinoma mets in bone
- Vitamin D-related disorders /overdosage/
- Sarcoidosis- 1,25-dihydroxyvitamin D(calcitriol) production by alveolar macrophages
- Renal failure, causes retention of phosphate, leading to secondary hyperparathyroidism
• **Major localisation of metastatic calcification:**
  - Kidney
  - Lung
  - Arteries of systemic circulation
  - Pulmonary veins
  - Mucous membrane of stomach
  - Anywhere in the body

• **Morphology:** Calcium salts look like in dystrophic calcification

• **Symptoms occur in case of massive calcium deposition.** (Impairment of kidney function, problems of breathing.)
—39-year-old man with metastatic calcification in end-stage renal disease due to glomerulonephritis.
Metastatic calcification of the lung
Hyper D vitaminosis
Stones

The formation of calculi in the hollow organs or ducts of the body.

Calculi are build up of mineral salts and may irritate, inflame, or obstruct the organ in which they form or lodge.

Lithiasis occurs most commonly in the gallbladder, kidney, and lower urinary tract, salivary duct

Lithiasis may be asymptomatic, but more often the condition is extremely painful
Nomenclature:

Kidney: Nephrolithiasis- nephrolith

Gallbladder: cholelithiasis gallstone

Urinary bladder: urolithiasis

Stone of salivary gland: sialolith

Bezoar: stone of stomac
When the urine becomes supersaturated with one or more calculogenic (crystal-forming) substances, a seed crystal may form through the process of nucleation.

Adhering to cells on the surface of a renal papilla, a seed crystal can grow and aggregate into an organized mass.
Renal stone classification

<table>
<thead>
<tr>
<th>Renal stone classification [8]</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium oxalate monohydrate papillary</td>
<td>13</td>
</tr>
<tr>
<td>Calcium oxalate monohydrate unattached (formed in renal cavities)</td>
<td>16</td>
</tr>
<tr>
<td>Calcium oxalate dihydrate</td>
<td>34 74%</td>
</tr>
<tr>
<td>Calcium oxalate dihydrate/hydroxyapatite mixed</td>
<td>11</td>
</tr>
<tr>
<td>Hydroxyapatite</td>
<td>7</td>
</tr>
<tr>
<td>Struvite infectious</td>
<td>4</td>
</tr>
<tr>
<td>Brushite</td>
<td>1</td>
</tr>
<tr>
<td>Uric acid</td>
<td>8</td>
</tr>
<tr>
<td>Calcium oxalate/uric acid mixed</td>
<td>3</td>
</tr>
<tr>
<td>Cystine</td>
<td>1</td>
</tr>
</tbody>
</table>
Kidney stones in the minor and major calyces of the kidney

Kidney stone in the ureter
Hydronephrosis
Complications

Renal colic
Inflammation
Bleeding
Hydronephrosis
Renal insufficiency
Cholelithiasis

- Stone in the gallbladder, or in the bile ducts.
- It is an accretion developed from the components of bile.
- The name comes from the greek *chole* (bile)+ *lithos*, stone words.
Gall bladder opened to show numerous gallstones. Their brownish to greenish color suggest they are cholesterol calculi.
Complications

- Gallstone attack
- Cholecystitis (acute or chronic)
- Choledocholithiasis (stone in the common bile duct)
- Cholangitis (inflammation of bile duct)
- Sepsis (the presence of pus-forming bacteria/toxins in blood)
- Gallstone pancreatitis
- Gallstone ileus