

Pathological Calcification

DR. Saima Nadeem
Assist Professor



@qasiwrites

إِيَّاكَ نَعْبُدُ وَإِيَّاكَ نَسْتَعِينُ

ہم تیری ہی عبادت کرتے ہیں

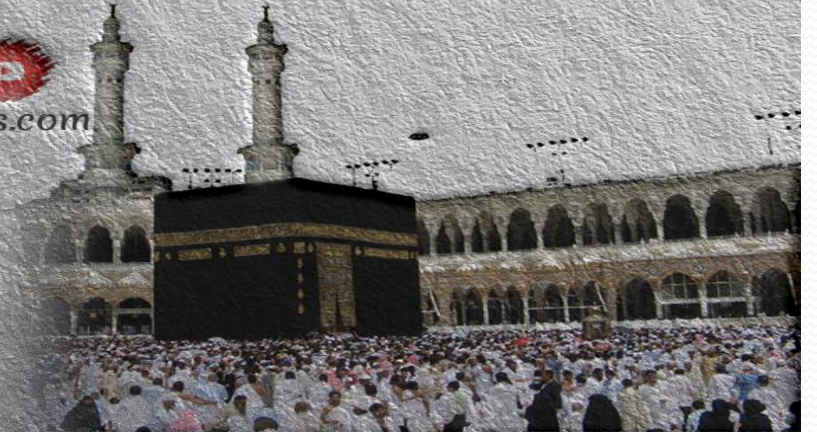
اور تجھ ہی سے مدد مانگتے ہیں

You Alone we worship,
You Alone we ask for help

(سورة الفاتحة: 05)



www.qasiwrites.com



Knowledge gained about Cell injury

Etiology

Morphology

pathogenesis



PATHOLOGIC CALCIFICATION

- Pathologic calcification is a common process in different disease states.
- It is deposition of calcium salts, together with smaller amounts of iron, magnesium, and other minerals in tissues other than bone or enamel.
- It is of two types.
 1. Dystrophic calcification
 2. Metastatic calcification

1. **Dystrophic calcification**

- When deposition of calcium salts (calcium phosphates) occurs in dead or dying (injured tissues) tissues.
- Normal calcium levels.

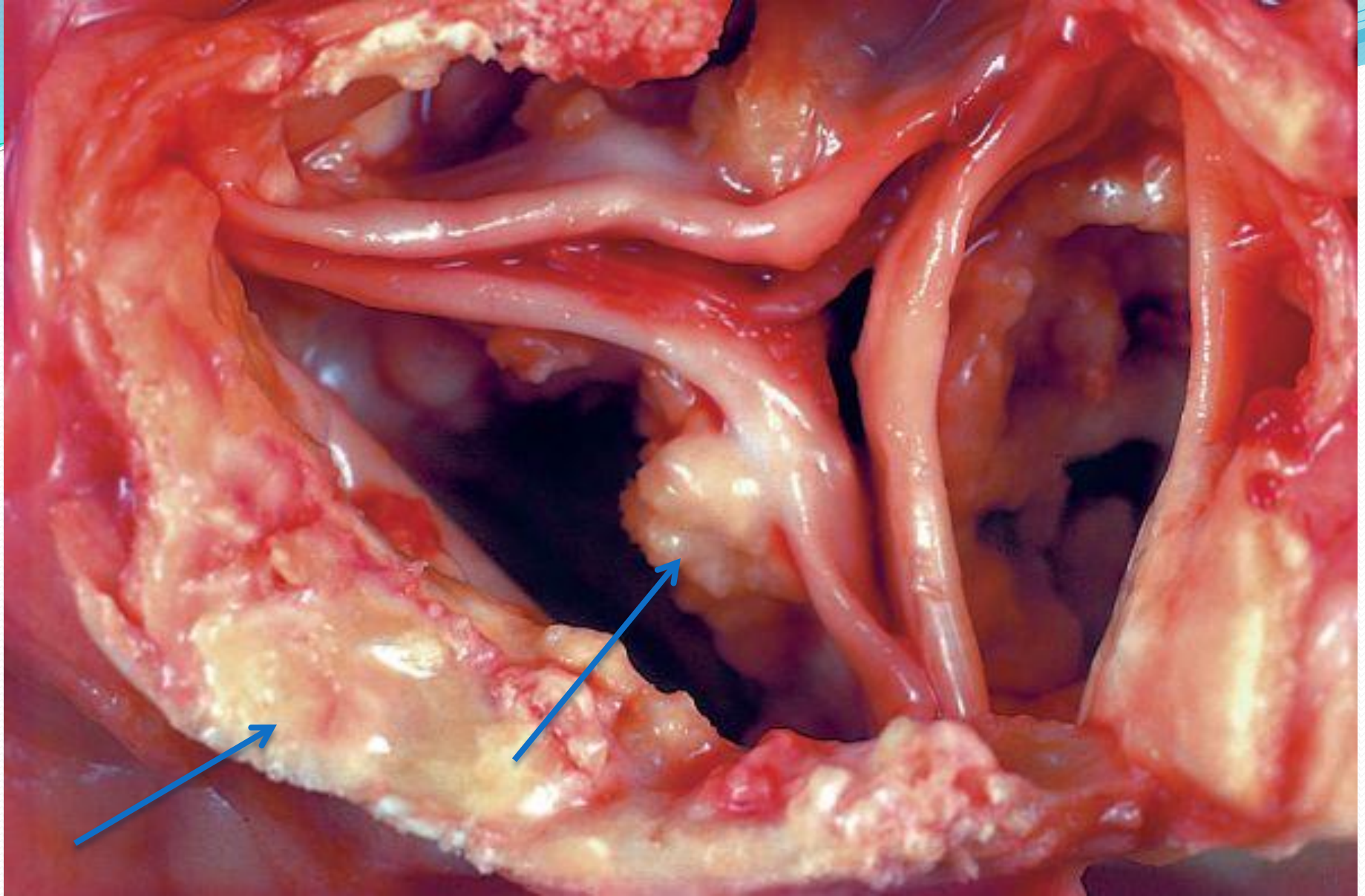
- Dystrophic calcification mostly requires the presence of necrotic/ injured tissue.
- It can be intracellular or extracellular
- There are two phases of pathogenesis
 - a) Initiation: \uparrow Ca levels \longrightarrow activation of phospholipases \longrightarrow phospholipids and phosphates release \longrightarrow binding of calcium with phosphates
 - b) Propagation: structural changes in calcium and phosphate resulting in further propagation

- Calcification is almost always present in
 - a. Atheromas of advanced atherosclerosis.
 - b. It also commonly develops in aging or damaged heart valves.
- Dystrophic calcification of the aortic valves is an important cause of aortic stenosis in the elderly.
- c. Sometimes a tuberculous lymph node is converted to stone.

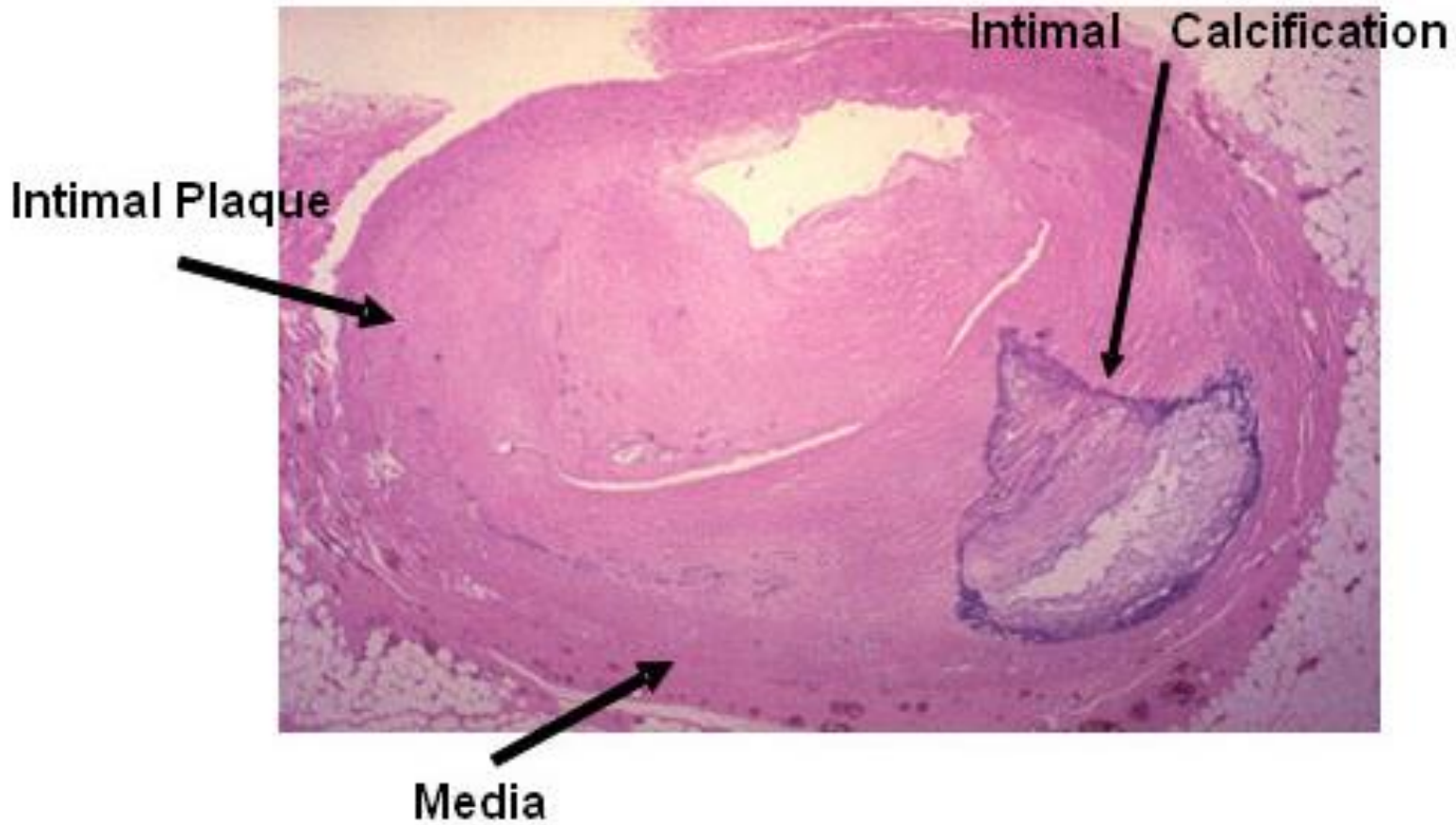


- **Morphology:**

- Whatever the site of deposition, the calcium salts appear macroscopically as fine, white granules or clumps.
- Histologically, calcification appears as intracellular or extracellular bluish color deposits.



Dystrophic calcification of the aortic valves





Dystrophic calcification in degenerated tunica media of muscular artery of uterine myometrium in Mönckeberg's arterio sclerosis.

● **Metastatic calcification:**

- It is the deposition of calcium salts in normal tissues.
- It reflects deranged calcium metabolism, in contrast to dystrophic calcification, which has its origin in cell injury.
- Metastatic calcification is associated hypercalcemia.
- Any disorder that increases the serum calcium level can lead to calcification

- The four major causes of hypercalcemia are

- (1) Increased secretion of parathyroid hormone due to either primary parathyroid tumors or production of parathyroid hormone-related protein by other malignant tumors.
- (2) Destruction of bone due to different disorders like malignancies of bone, destruction of bone due to the effects of accelerated turnover (e.g., Paget disease), immobilization, or tumors (increased bone catabolism associated with multiple myeloma, leukemia, or diffuse skeletal metastases);




3) Vitamin D-related disorders (Hypervitaminosis D or Sarcoidosis)

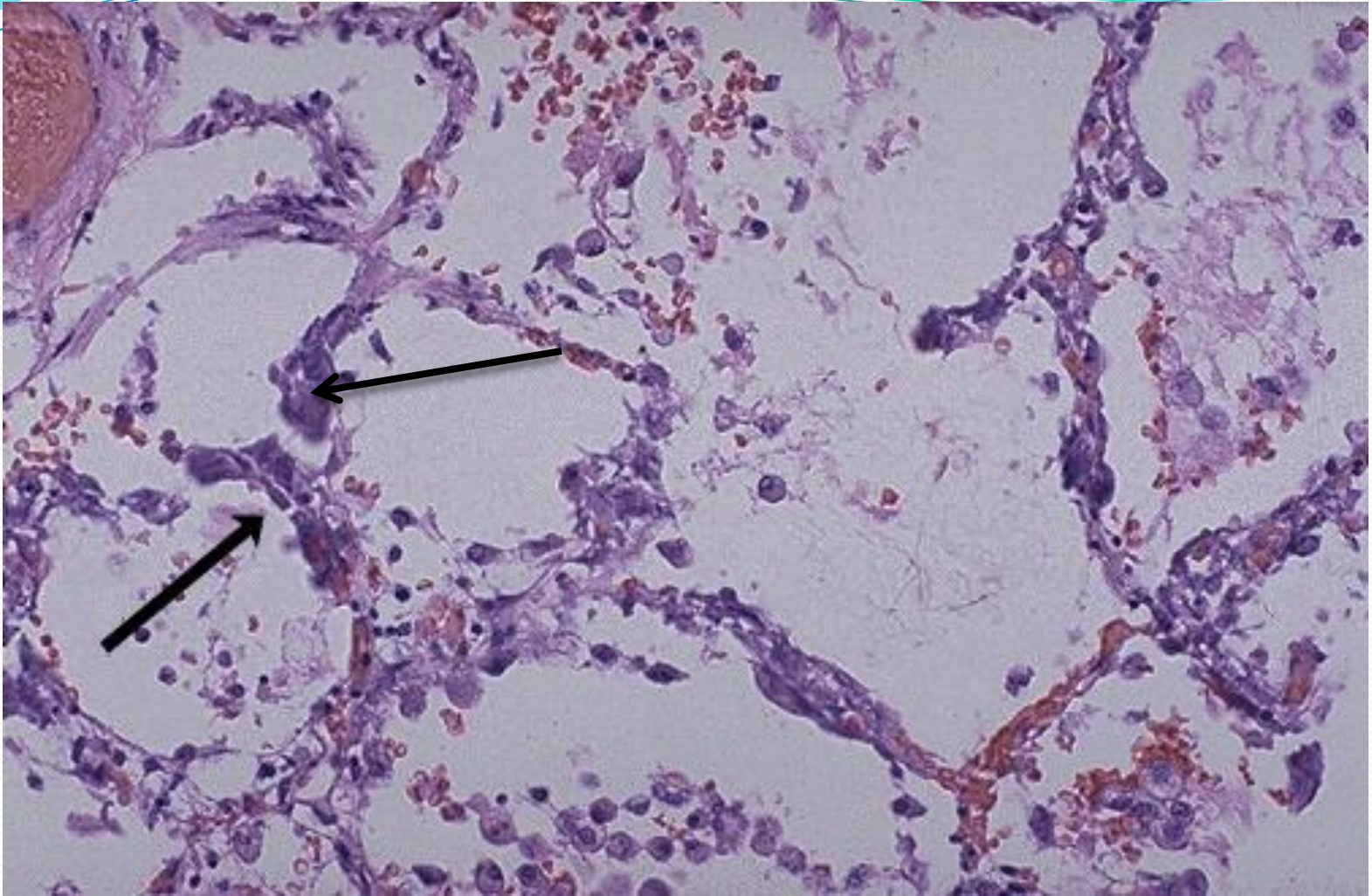
(4) Renal failure, in which phosphate retention leads to increased secretion of parathyroid gland.

● **Morphology :**

- a. Metastatic calcification can occur throughout the body but principally affects
 - b. Interstitial tissues of the vessels.
 - c. Kidneys, lungs, and gastric mucosa.
- The calcium deposits morphologically are like dystrophic calcification.

- 
- Mostly they do not cause dysfunction but extensive calcifications in the lungs may produce remarkable radiographic and respiratory problems.
 - Massive deposits in the kidney (**nephrocalcinosis**) can cause renal damage.





Metastatic calcification in the lung of a patient with a very high serum calcium level (hypercalcemia).

- Most important factor in irreversible cell injury is
 1. Endoplasmic reticulum damage
 2. Decreased protein synthesis
 3. Decreased pH
 4. Membrane damage
 5. Loss of intracellular K^+

• Metastatic calcification

1. Causes widespread tissue damage
2. Occurs in patients with normal calcium levels.
3. Is associated with hypercalcemia.
4. Occurs in patients with hypovitaminosis D
5. Is associated with dead tissues.

SEQS

- 1) Define cell injury and homeostasis?
- 2) Enlist causes of cell injury?
- 3) Enumerate biochemical changes seen in irreversible injury?
- 4) Draw a flow chart showing consequences of ATP depletion?
- 5) Draw death receptor and mitochondrial pathways of apoptosis?
- What are the four mechanisms of intracellular accumulations?

Umar ibn al-Khattab رضي الله عنه said,

“If one of you knew what is for him (in reward) in saying to his brother,

بِحَزْرِكَ وَاللَّهِ خَيْرًا

(may Allah reward you with good)

you would
increase in saying it
to one another.”

المصنف لابن أبي شيبة

The Musannaf of Ibn Abi Shaybah, no.26519