Sterile Precautions and AIDS

Surgery

Stage: 2

Learning objectives

To understand

1-Concept of AIDS.

2-Concept of sterilization, sterile precautions and aseptic technique.

3-Protection of healthcare provider and patients from transmission of AIDS.

AIDS (acquired immune deficiency syndrome)

1-A disease caused by HIV (human immune deficiency virus).

2-The virus attack the immune system of the patient causing AIDS.

3-The disease is transmittable.

AIDS

Routes of HIV transmission in the hospital

1. Injury with needles or sharp instruments contaminated with infected blood.
2. The use of instruments that has been not properly sterilized.
3. Contact between open wounds and infected blood.
4. Transfusion of infected blood or blood products.

So, patients with AIDS are dealt with caution so as not to transmit the disease to healthy people.

Sterilization

Is complete elimination or destruction of all microbial life including spores.

It is accomplished in healthcare facilities by

1-Physical processes

Ex. steam under pressure.

2-Chemicals processes for heat sensitive materials

Ex. ethylene oxide gas.

After sterilization, an object is referred as sterile or aseptic.

Sterilization

Any surgery or medical procedure should be performed under high grade of sterilization.

Sterile precaution:

Is the application of aseptic technique to prevent the transmission of transmittable infection.

Aseptic technique:

The use of standard precaution and sterile equipment to prevent the transmission of infection.

Sterile precautions

General rules

1-Hand washing.

2-The use of barrier protection like gloves and aprons.

3-Safe handling and disposal of sharp and medical wastes.

4. Proper cleaning and sterilization.

Sterile precautions

Protection of the surgical team

1-Protect areas of broken skin and open wounds with watertight dressings.

2-Wear gloves during exposure to blood or body fluids and wash hand with soap and water afterwards.

3-Wear protective glasses where blood splash may occur such as during major surgery.

4- wash out eyes with water as soon as possible when splashed with blood.

5-Wear protective gown.

6-Clean blood spills immediately and safely.

Sterile precautions

Protection in the theater

Anyone entering the operating room should first put on:.

1-Clean clothes.

2-An impermeable mask to cover mouth and nose.

3.A cap to cover all hair.

4-A clean pair of shoes.

Sterile precautions

ACE PPE instructions for the staff requiring sterile PPE (personal protective equipment).

A-N95 (reusable).

B-Face shield (reusable).

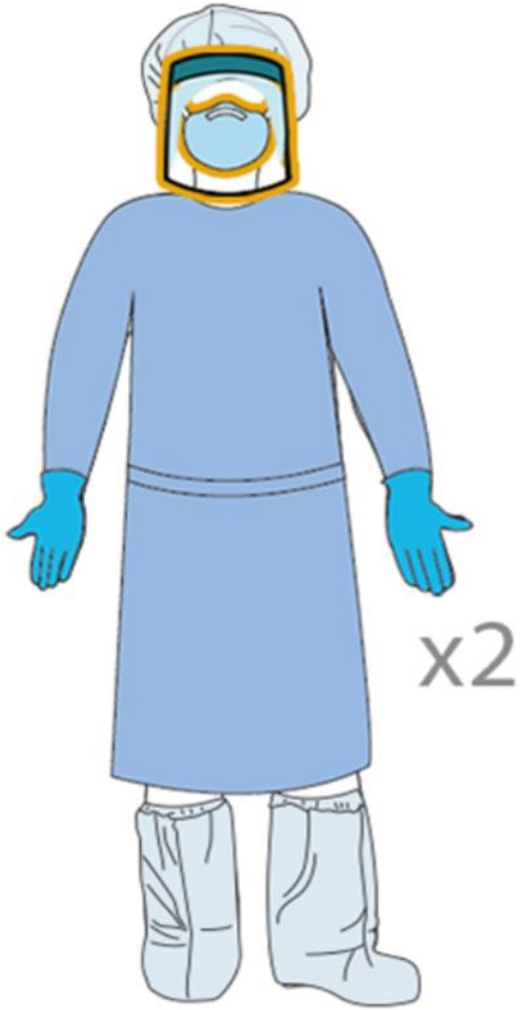
C-Surgical gown.

D-Double gloves.

E-Cloth hat.

F-Bouffant.

G-Boot cover.



Sterile Procedures for High-Risk Interactions

1. Handling Blood and Bodily Fluids

- Always use appropriate **personal protective equipment (PPE)** such as gloves, gowns, and eye protection.
- Ensure **strict hand hygiene** before and after handling fluids to prevent cross-contamination.
- Use **disposable equipment** whenever possible, and dispose of it safely after single use.
- Carefully contain and dispose of contaminated materials in **designated biohazard containers**.

Sterile Procedures for High-Risk Interactions

2. Safe Handling of Needles and Sharps

- Use **needleless systems** and **safety-engineered sharps** when available.
- Do not recap or bend needles after use; dispose of them **immediately in puncture-resistant sharps containers**.
- Position sharps containers at **eye level** and **within reach** to minimize handling and avoid injury.
- Avoid passing sharps directly between personnel; use **safe passing techniques** or a neutral zone to reduce risk.

Sterile Procedures for High-Risk Interactions

Proper Sterilization of Medical Equipment

- **Autoclave** equipment that can withstand high heat and pressure; this method kills all microorganisms.
- Use **chemical sterilants** (e.g., ethylene oxide, hydrogen peroxide gas plasma) for heat-sensitive items.
- Follow specific sterilization protocols for each type of instrument to ensure efficacy.
- **Regularly check** and **maintain sterilization equipment** to ensure consistent results.

Calcium Metabolism and Calcification

Surgery

Stage: 2

Learning Objectives

To understand:

1- Calcium Homeostasis including intestinal absorption and kidney excretion.

2-Process of calcification and formation of calcium deposits.

Calcium

Bone acts as a calcium storage center for deposits and withdrawals of calcium

as needed.

More than 90% of calcium of the body is stored in bone which act as the main storage organ for calcium.

Two types of cells in the bone regulate calcium:

1-Osteoblast: increase deposition of calcium in bone.

2-Osteoclast: increase the release of calcium from bone.

Calcium

Function

Calcium is important for

1-Skeletal strength.

2-Muscle contraction,

3-Nerve conduction.

4-Blood clotting.

Calcium

Daily calcium absorption and excretion

1-Diet contain about 20-25mmol of calcium, only about 5mmol of dietary calcium is absorbed by intestine and the remaining 15mmol is excreted by feces.

2-15 mmol of calcium is excreted by bile and reabsorbed again by intestine.

3-5mmol of calcium is excreted by kidney.

Calcium is found in 3 forms in the body the active one is the free ionized calcium.

The concentration of calcium ions in the plasma is about **1.4 mmol/L.**

Calcium

Calcium homeostasis

Normal calcium level in plasma is maintained by action of:

1-Parathyroid hormone PTH secreted by parathyroid glands.

2-Calcitonin hormone secreted by the thyroid gland.

3-Vitamin D3 (calcitriol) formed and secreted by the kidney.

Calcium

Calcium Homeostasis

- The body regulate calcium in two pathways:
- 1-Pathway that signaled to turn on when blood calcium level drop below normal (hypocalcemia).
- 2-Pathway that signaled to turn on when blood calcium levels are elevated (hypercalcemia).

Calcium

Calcium Homeostasis

Hypocalcemia(decrease in serum calcium level): the calcium level in the blood is regulated by:

Stimulation of parathyroid gland to secrete parathyroid hormone which act on:

A-bones to activate osteoclasts to release free calcium to plasma.

B-kidney to decrease excretion of calcium and increase the production and secretion of calcitriol(Vitamin D3).

C-Calcitriol(Vitamin D3) stimulate the absorption of calcium from intestine.

All these processes contribute to rise in serum calcium.

Calcium

Calcium Homeostasis

Hypercalcemia (increase in serum calcium level): the calcium level in the blood is regulated by:

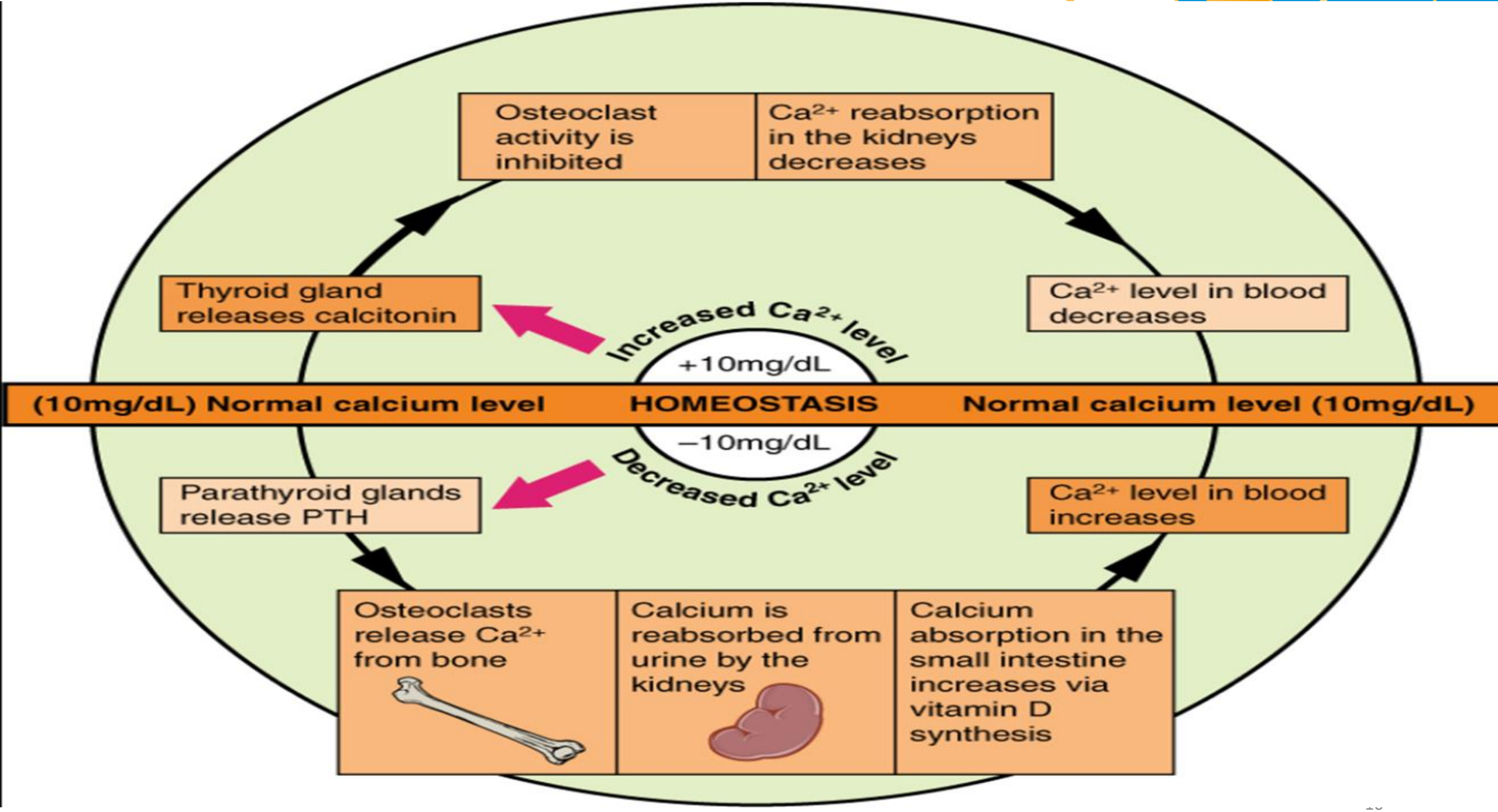
Stimulation of thyroid gland to secrete calcitonin hormone which act on:

A-Bone to stimulate osteoblasts to deposit calcium in bone from the plasma.

B-Kidney to increase excretion of calcium.

C-Intestine to inhibit absorption of calcium and increase excretion by feces.

All these processes contribute to decrease in serum calcium.


Osteoclast activity is inhibited
Ca^{2+} reabsorption in the kidneys decreases
Thyroid gland releases calcitonin
Ca^{2+} level in blood decreases
Increased Ca^{2+} level
+10mg/dL
(10mg/dL) Normal calcium level
HOMEOSTASIS
Normal calcium level (10mg/dL)
−10mg/dL
Decreased Ca^{2+} level
Parathyroid glands release PTH
Ca^{2+} level in blood increases
Osteoclasts release Ca^{2+} from bone
Calcium is reabsorbed from urine by the kidneys
Calcium absorption in the small intestine increases via vitamin D synthesis

Calcification(Calcium deposits)

Accumulation of calcium salt in body tissue.

Types

1-Normal calcification occur in the process of bone formation.

2-Abnormal deposition in soft tissue causing it to harden and may interfere with their function.

Calcification(Calcium deposits)

Causes

1-Inflammation.

2-Aging.

3-Calcium metabolism disorders like hypercalcemia.

4-Cancer treatment like radiation therapy.

5-Certain autoimmune disorders.

Calcification(Calcium deposits)

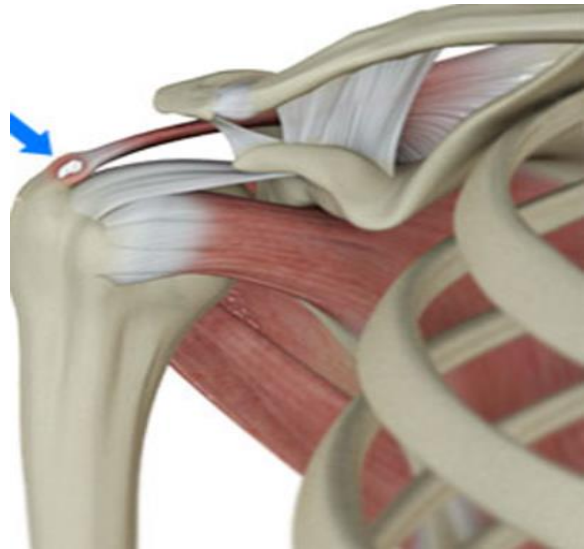
Types

Shoulder

Calcium deposits in shoulders can cause:

1-Pain and discomfort on movement of the shoulder.

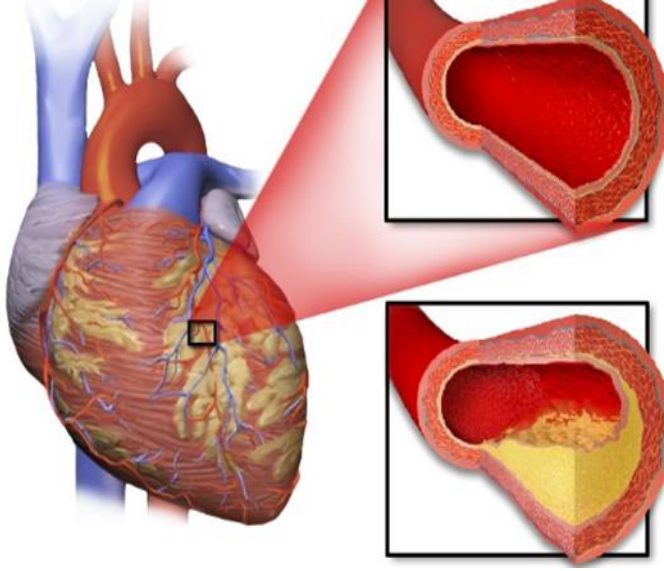
2-Decreased range of motion.



Calcification(Calcium deposits)

- Types
- Kidney
- A condition called **nephrocalcinosis** occurs when too much calcium builds up in the kidneys.

Calcification(Calcium deposits)



Types

Arteries

Calcium deposits in the arteries (blood vessels) can cause them to stiffen. Coronary artery calcification increases the risk for problems with the cardiovascular system.