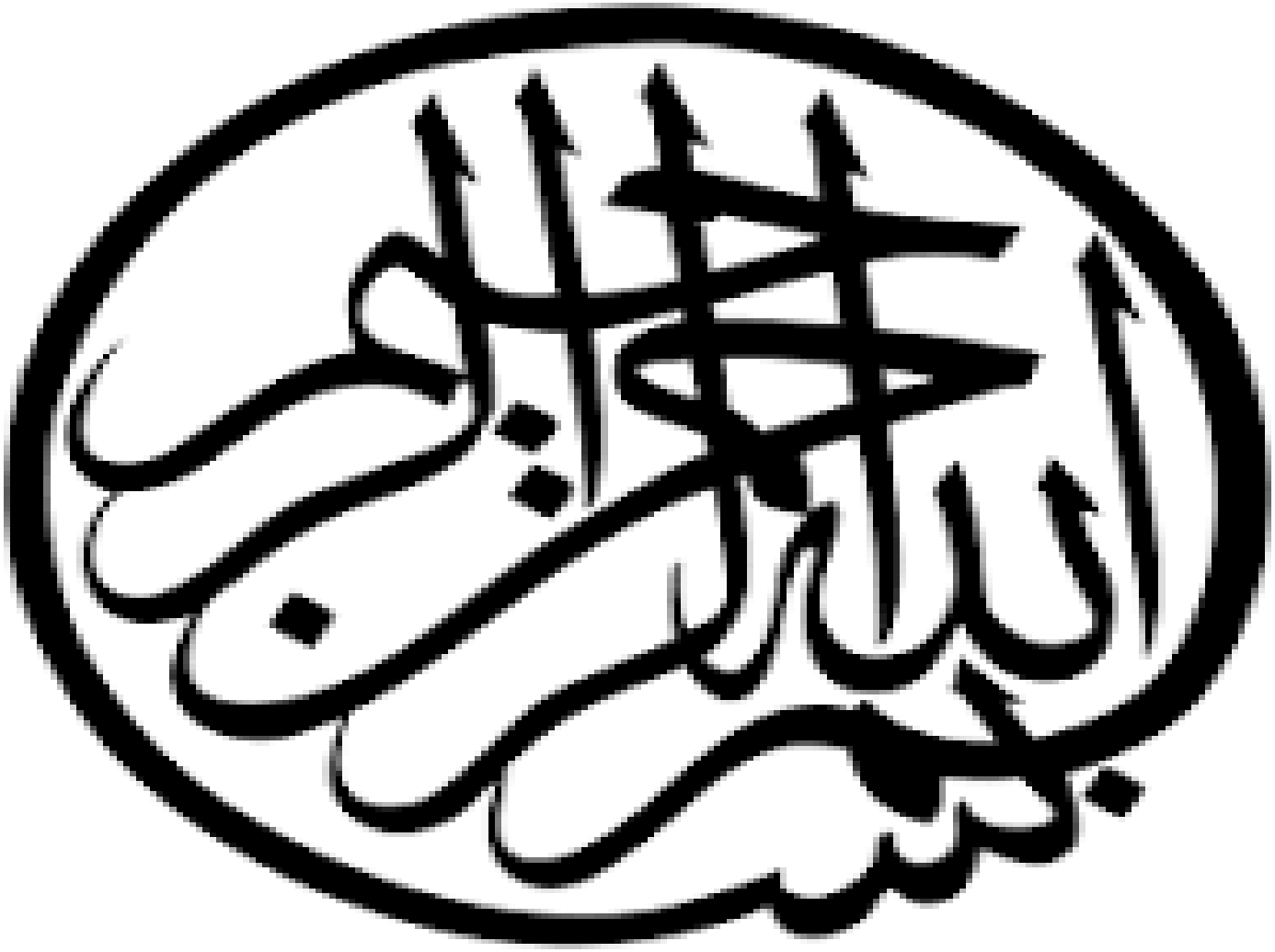


Urinary stones

Objectives:

1-Know the normal urinary pH and describe how its changes can help in diagnosing types of urinary stone

2-List the main chemical types of urinary stones

3-Mention the radiologic appearance of these stones

4-Describe different shapes of urine crystals associated with each type of stone

5-Explain the pathological condition, metabolic disorder that lead to the formation of these stones

Urinary pH

1-The average value for urine pH is 6.0, but it can range from 4.5 to 8.0. Urine under 5.0 is acidic, and urine higher than 8.0 is alkaline, or basic.

Acidic foods include: grains,fish,sodashigh-protein foods,sugary foods

Alkaline foods include: nuts,vegetables, most fruit.

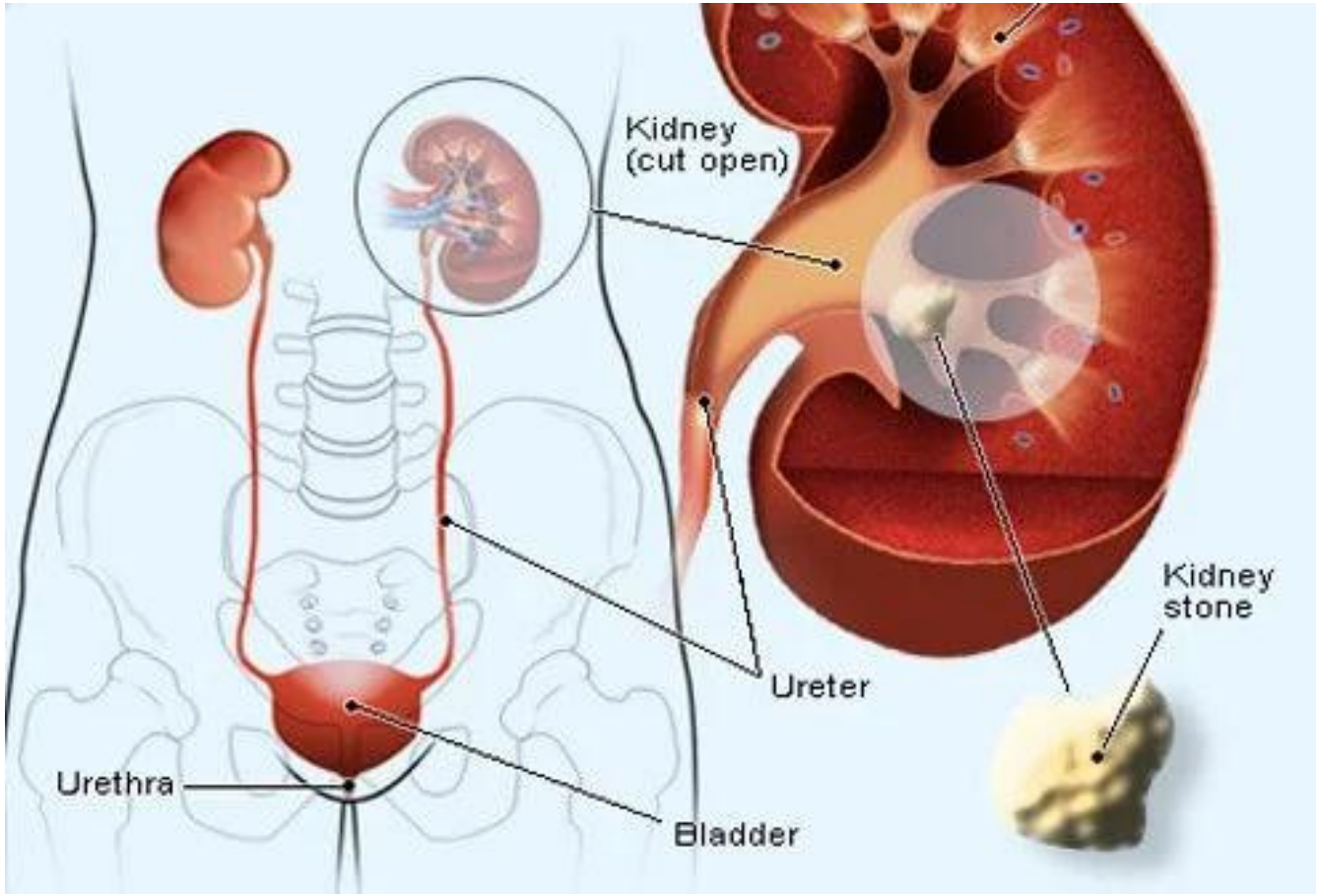
Nephrolithiasis/urolithiasis: The process of forming a kidney stone. Kidney stones are a common cause of blood in the urine and pain in the abdomen, flank, or groin. Kidney stones occur in 1 in 10 people at some time in their life.

The development of the stones is typically related to increased excretion of stone-forming components such as calcium, oxalate, urate or cystine.

In nephrolithiasis/urolithiasis, urine pH has been thought to modulate kidney stone formation at various steps, including crystallization, growth, aggregation and retention. In addition, pH is an important factor that can enhance the generation of solid phase and affects solubility of kidney stones. Moreover, several stone types, including calcium oxalate (CaOx), calcium phosphate, uric acid, etc., have been reported to be modifiable by urine pH. The basic urine pH favors formation of phosphate-containing stones, whereas the acidic urine pH is associated with uric acid and cystine stone

Kidney stones are small masses of salts and minerals that form inside the kidneys and may travel down the urinary tract. Kidney stones range in size from just a speck to as large as a ping pong ball.

The kidneys regulate levels of fluid, minerals, salts, and other substances in the body. When the balance of these compounds changes, kidney stones may form. The type of kidney stone is based on its chemical composition.


Kidney
(cut open)
Kidney
stone
Ureter
Urethra
Bladder

Types of kidney stones

May be pure or mixed:

1-pure: include;

Calcium oxalate, Calcium phosphate, Uric acid, Cystine and Nonspecific organic material

2-mixed: a combination of two or more of the substances mentioned above.

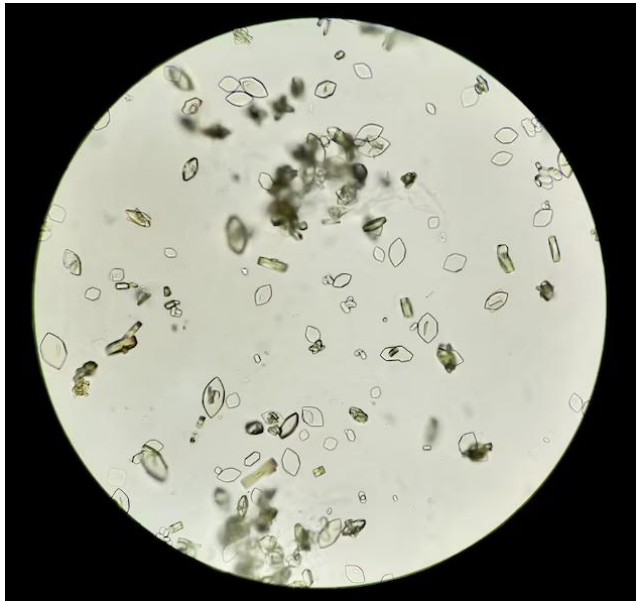
Types Of Crystals In Urine

You can classify the urine crystals into diverse types based on the different chemical composition of the crystals. So, each urine crystals has a different treatment plan based on its type.

1-Uric Acid Crystals

The crystals appear yellow or orange-yellow in color. The crystals have different shapes. So, the technician can observe diamond, plate-like or barrel shape under the microscope. The crystals appear even in healthy urine due to high protein. So, healthy people who consume protein-rich diet can have uric acid crystals. But, the high uric acid crystals indicate health problems.


Copyright 1999, Mary Ann McLane/Vickie Silcott
University of Delaware



Conditions associated with uric acid crystals

1- Kidney stones

2-Chemotherapy

3-Gout

Drinking a good amount of water is useful irrespective of the underlying health problem.

2-Calcium Oxalate Crystals

The calcium oxalate crystals look like envelopes or dumbbells. You can find the crystals in healthy urine. It appears colorless. In most cases, the calcium oxalate crystals indicate kidney stones. Consuming oxalate-rich food like spinach predisposes to developing the crystals

Treatment For Calcium Oxalate Crystals

The oxalate causing kidney stones have the following treatment option to relieve the distress:

- **Increase water intake**
- **Consume less salt**
- **Avoid processed foods**
- **Make dietary changes to reduce oxalate accumulation**

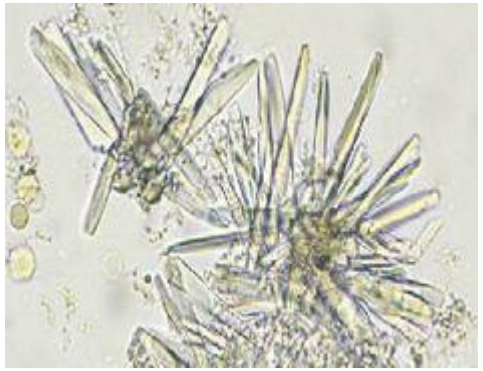
3-Calcium Phosphate Crystals

The calcium phosphate crystals have a needle-like, star-like, or plate-like appearance under the microscope. The colorless crystals may appear alone or in clusters. You can observe it in normal as well as alkaline urine. In some rare cases, the calcium phosphate crystals in your urine appear due to hypoparathyroidism. When you have the crystals in your urine, you can suffer from several signs like: Muscle cramping and tingling in your hands

Treatment For Calcium Phosphate Crystals

The treatment option for alleviating the problem due to calcium phosphate crystals may include:

- **Drinking water to stay hydrated**
- **Consuming calcium-rich food or supplements**
- **Taking Vitamin D supplements.**



Cysteine Crystals

Cysteine crystals are developed in the urine due to the presence of cysteine acid, an amino acid that binds together to form crystals. The condition referred to cystinuria occurs rarely in people. So, the cysteine acid can result in kidney stones that have a larger size compared to other stones. In most cases, genetics play a significant role in developing the condition. When the urine is observed under the microscope, the cysteine crystals have a hexagonal shape. It is usually colorless.

Radiographic features of kidney stones

Imaging tests may show kidney stones in the urinary tract. Options range from simple abdominal X-rays, which can miss small kidney stones, to high-speed or dual energy computerized tomography (CT) that may reveal even tiny stones.

Other imaging options include an ultrasound, a noninvasive test, and intravenous urography, which involves injecting dye into an arm vein and taking X-rays (intravenous pyelogram) or obtaining CT images (CT urogram) as the dye travels through your kidneys and bladder

Plain radiograph

Calcium-containing stones are radiopaque:

calcium oxalate +/- calcium phosphate

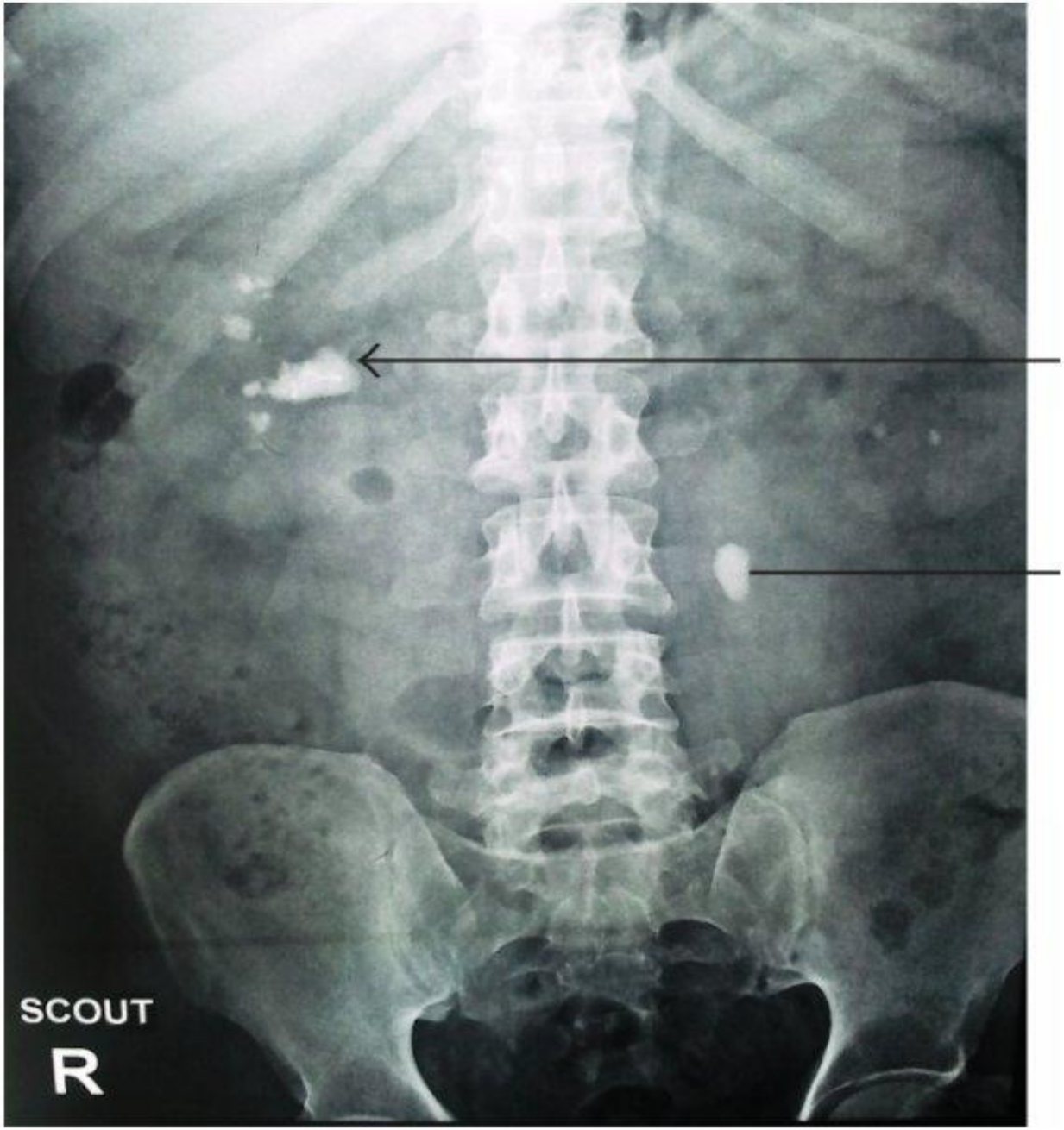
struvite (triple phosphate) - usually opaque but variable

pure calcium phosphate

Lucent stones include:

uric acid

Cystine


SCOUT
R

Treatment

Treatment for kidney stones varies, depending on the type of stone and the cause.

Small stones with minimal symptoms

Most small kidney stones won't require invasive treatment. Patient may be able to pass a small stone by

1-Drinking water. Drinking as much as 1.9 to 2.8 liters a day may help flush out the urinary system.

2-Pain relievers. Passing a small stone can cause some discomfort. To relieve mild pain, pain relievers such as ibuprofen (Advil, Motrin IB, others), acetaminophen (Tylenol, others) or naproxen sodium (Aleve).

3-Medical therapy. alpha blocker, relaxes the muscles in ureter, helping pass the kidney stone more quickly and with less pai

Large stones and those that cause symptoms

1-Using sound waves to break up stones
2-Surgery to remove very large stones in the kidney
3-Using a scope to remove stones. To remove a smaller stone in ureter or kidney, a thin lighted tube (ureteroscope) equipped with a camera passed through y urethra and bladder to ureter
4-Parathyroid gland surgery:Hyperparathyroidism sometimes occurs when a small, benign tumor forms in one of parathyroid glands or another condition that leads these glands to produce more parathyroid hormone. Removing the growth from the gland stops the formation of kidney stones.


thank
you!