

Kidney stones

Conditions favoring kidney stones formation

<p>1- High urinary conc. of constituents of GF.</p> <p>Due to:</p> <ul style="list-style-type: none"> - ↓ Urinary volume - Restricted fluid intake. - ↑ fluid loss over a long period of time. - ↑ rate of excretion of metabolic products forming stones: <ul style="list-style-type: none"> - ↑ plasma volume (that increases filtrate level) - ↓ tubular reabsorption from filtrate 	<p>2- pH of urine</p> <p>Acid → uric Acid stone</p> <p>Alkaline → Ca²⁺ stone → Upper UTI → Mg ammonium phosphate crystals (Struvite stone)</p>	<p>4- Urinary stagnation</p> <p>Due to obstruction of urinary outflow.</p>	<p>5- Lack of normal inhibitors of stone formation in urine.</p> <p>- e.g.:</p> <ol style="list-style-type: none"> 1- Citrates. 2- Pyrophosphate. 3- Glycoproteins <p>- Inhibit the growth of Ca²⁺ salts crystals.</p> <p>- In type I renal tubular acidosis, hypocitraturia → renal stones.</p>
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Constituents of Kidney Stones

Condition	Types \ characteristics	Causes	Notes
<p>Stones of Ca²⁺ salts</p>	<p>- Type of salt depends on:</p> <ul style="list-style-type: none"> - pH of urine - Availability of oxalate <p>1- Ca²⁺ oxalate → <u>Most common</u> form of stones. → <u>smaller</u>, lodge in ureter.</p> <p>2- Ca²⁺ phosphate → Less common. → staghorn, in renal pelvis (big)</p>	<p>1- Hypercalciuria:</p> <ul style="list-style-type: none"> - Due to hypercalcemia (1^{ary} hyperPTH) - SMTM there is no hypercalcemia. <p>2- Hyperoxaluria: "more imp"</p> <ul style="list-style-type: none"> - Formation of Ca²⁺ oxalates. → Caused: <ul style="list-style-type: none"> - exogenous (diet) - 1^{ary} hyperoxaluria - ↑ absorption (in fat malabsorption) <p>لما يقل الألبوريشن للفات، يزيد الألبوريشن للoxalate ولما يزيد الأوكز ألبيت = بيرتبط مع الكالسيوم في الدم ويتسوى له فلتريشن، بعدها ببسبب الكالسيوم ستونز مع كثرته.</p>	<p>Management:</p> <ul style="list-style-type: none"> - Never tell the pts to reduce Ca²⁺ intake. لأن الأوكز ألبيت لما ما يلقي كالسيوم يرتبط معه بيصير يمتصه من أوقفانز ثانية تحتاجه فيسوي مشكلة أكبر. - Acidification of urine (bc Ca²⁺ stones favor alkaline urine)
<p>Uric acid stones</p>	<ul style="list-style-type: none"> - May be associated w\ hyperurecemia. - Favors acid urine. - Characteristics: <ol style="list-style-type: none"> 1- Small, friable & yellowish. 2- may form staghorn if big. 3- Radiolucent "can't be seen by plain x-ray". 3- Visualized by ultrasonography, or IV pyelogram. 	<p>Treatment</p> <ul style="list-style-type: none"> - Treat the cause of hyperuricemia. - ↓ purine-rich diet. - Alkalinization of urine (e.g. by potassium citrate). 	

Mg²⁺ ammonium phosphate stones	<ul style="list-style-type: none"> - Caused by chronic UTI. → By urease enzyme → splitting organisms' uric acid to urea → NH₃ product - Favors alkaline urine (infection) 	<ul style="list-style-type: none"> - Urine acidification. - May require complete stone removal (percutaneous nephrolithotomy) - treatment of future urinary tract infection
Cystine stones	<ul style="list-style-type: none"> - Rare. - Occurs in case of homozygous cystinuria - <u>Soluble</u> in alkaline urine = favors acid to form stone. 	<ul style="list-style-type: none"> - Alkalinization of urine. - Penicillamine. (analog the amino acid <u>cysteine</u>)
Investigations of patients with renal calculi	<p>1- Stone is available (with urine or by surgical intervention) (يعني ملموسة، نستطيع رؤيتها وتتحسسها باليد)</p>	<p>Laboratory investigations for detection of stone chemical constituents:</p> <ul style="list-style-type: none"> - to know the cause. - for decision of lines for preventive treatment.
	<p>2- Stone is not available بمعنى إنها تعمل أثر لكن لا نستطيع رؤيتها أو تحسسها باليد</p>	<p>Blood analysis: Ca²⁺, uric acid & PTH. Urine analysis: volume, Ca²⁺ & oxalate Urine pH: > 8 suggestive of UTI (Mg amm. phosph.) Screening of urine for cystine: qualitative (if +ve: 24 hs urine) Renal tract imaging: CT, ultrasonography & IV pyelogram</p>

Notes

- ↑ PTH may cause stones. (Ca²⁺ stones).
- Bacterial infection → persistent pH change.
- Uric acid stone → not seen in x-ray, we can see it by **ultrasonography**.
- For all forms of stones we advise the pts to ↑ **fluid intake**, except for pts with glomerular failure.

Extra (imp. In pathology)

Radoopaque	Radiolucent
<ul style="list-style-type: none"> - Ca²⁺ oxalate - Ca²⁺ phosphate - Mg²⁺ amm. Phosph 	Uric acid