

## Kidney Stones

Kidney Stones	Characteristics	Main causes		Treatment
<b>1-Stones of calcium salts</b>	<b>80%</b> of all cases <b>Type of salt depends on:</b> pH of urine & availability of oxalate <b>Characters:</b> white, hard & radioopaque Ca + Phosphate: staghorn in renal pelvis (big) Ca + Oxalate: smaller, lodge in ureter	<b>1- Hypercalcuria:</b> daily urinary calcium excretion more than 6.2 mmol in <b>fem.</b> & 7.5 mmol in <b>males</b> - due to hypercalcemia may be <u>with no</u> hypercalcemia	<b>2- Hyperoxaluria</b> (more important) - favours formation of calcium oxalates (even with <i>no hypercalciuria</i> ) - <i>causes:</i> -exogenous (diet rich in oxalate) -increased absorption (in fat malabsorption) -primary hyperoxaluria: inborn errors, in childhood, u. Oxalates > 400 mmol/24 hours	<b>Treatment of primary condition</b> (i.e. Infection, hypercalcemia, hyperoxaluria) <b>Reducing oxalates in diet</b> (not recommended to reduce calcium in diet) <b>Fluid intake increase</b> (if no glomerular failure). <b>Acidification of urine</b> (as ppt. Is favoured by alkaline conditions)
<b>2-Uric acid stones</b>	<b>~ 8%</b> of renal stones contains uric acid may be associated with <b>hyperuricemia</b> (with or without clinical <b>gout</b> )	<b>Character:</b> small, friable & yellowish may form staghorn (if big) radiolucent (can not be seen be plain X-ray) visualized by ultasonography or I.V. Pyelogram	<b>ppt.</b> Is favoured by acidification of urine	<b>Treatment:</b> - Treatment of cause of hyperuricemia - Reduction of purine-rich diet - urine Alkalinization - Fluid intake increase
<b>3- Magnesium ammonium phosphate stones</b>	<b>~ 10%</b> of all renal stones With chronic urinary tract infection (by urease splitting oraganisms as <i>Proteus</i> species, which produces ammonia from urea) Urine pH > 7		<b>Treatment:</b> treatment of the cause (urinary tract infection) Urine acidification Fluid intake	
<b>4- cystine stones</b>	Rare, occurs in cases of homozygous <b>cystinuria</b> (inborn error of amino acid metabolism)	Soluble in alkaline urine ( <b>ppt.</b> by acid urine) <b>Radio-opaque</b>	<b>Treatment:</b> - Fluid intake - Alkalinization of urine - Penicillamine	<b>OTHER kinds of stones : xanthine</b>
<b>Investigations</b>	<b>1. Stone is available:</b> <i>stone chemical constituents:</i> - to know the cause - for decision of lines for preventive treatment)	<b>2. Stone is <u>not</u> available:</b>	<b>Blood analysis:</b> calcium & uric acid <b>Urine analysis:</b> volume, calcium & oxalate <b>Urine pH:</b> > 8 suggestive of urinary tract infection (mag. amm. phosph.) <b>Screening of urine for cystine:</b> qualitative (if +ve: <i>24 hours urine</i> ) <b>Renal tract imaging:</b> ultrasonography & I.V. pyelogram	
<b>Conditions favouring kidney stones formation</b>				
<b>1- High urinary concentrations of one or more constituents of glomerular filtrate due to:</b> <b>- decreased urinary volume (with normal renal function)</b> restricted fluid intake increased fluid loss over a long period of time <b>- increased rate of excretion of metabolic products forming stones</b> increased plasma (that increases filtrate level) decreased tubular reabsorption from filtrate	<b>2- Change in pH of urine</b> - often due to bacterial infection - increased precipitation of different salts at different pH	<b>3- Urinary stagnation:</b> - due to obstruction of urinary outflow	<b>4- Lack of normal inhibitors in urine</b> - as citrates, pyrophosphate, glycoproteins - inhibit the growth of calcium phosphate & calcium oxalate crystals - in type I renal tubular acidosis, hypocitraturia leads to renal stones	