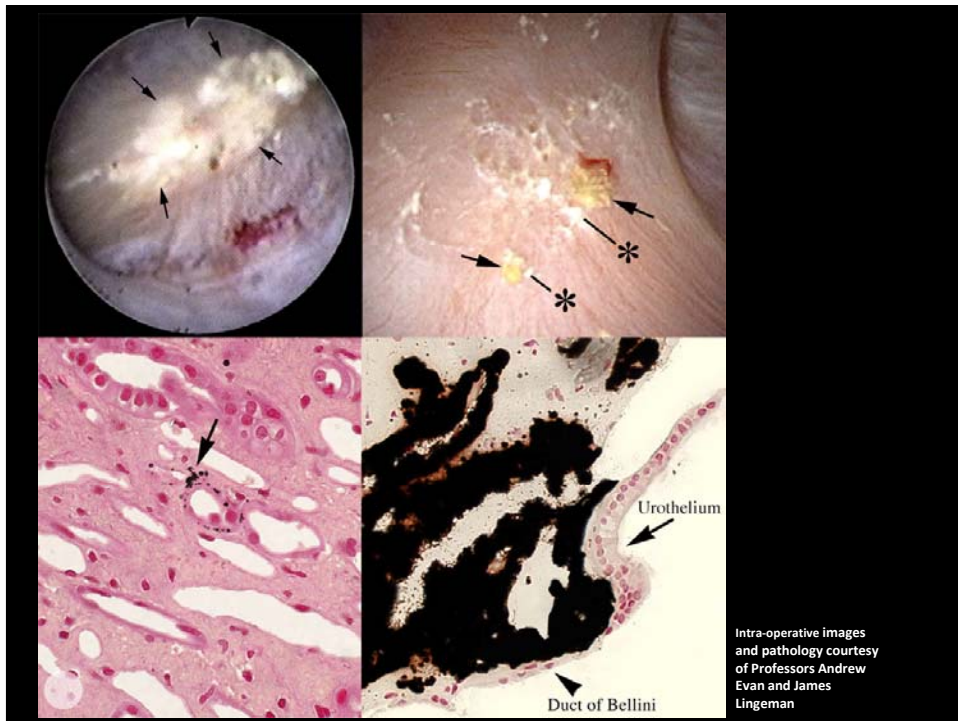
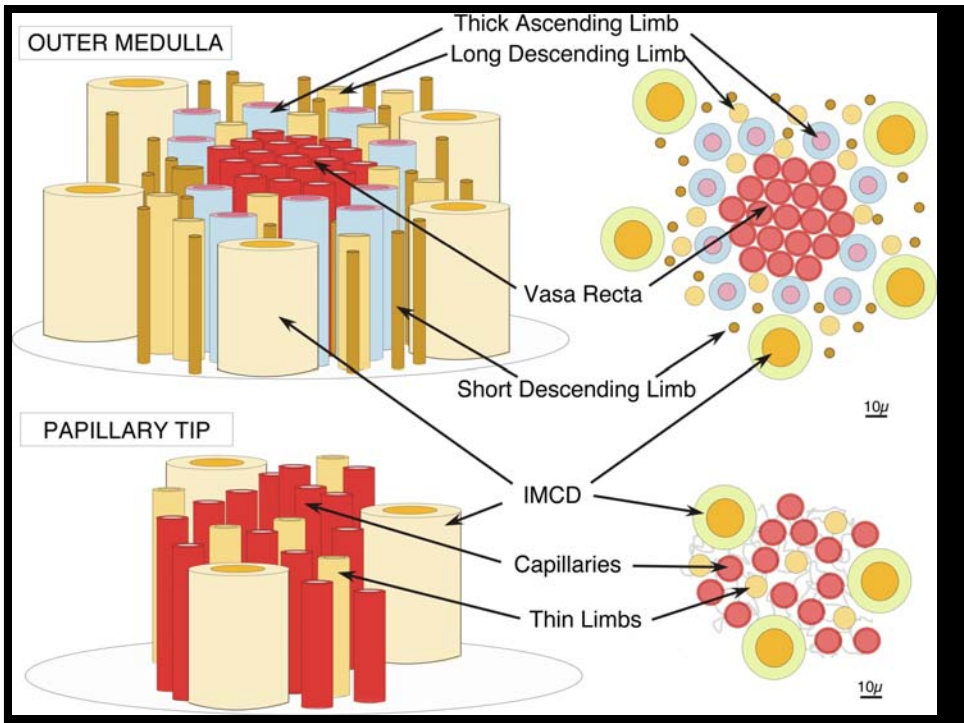
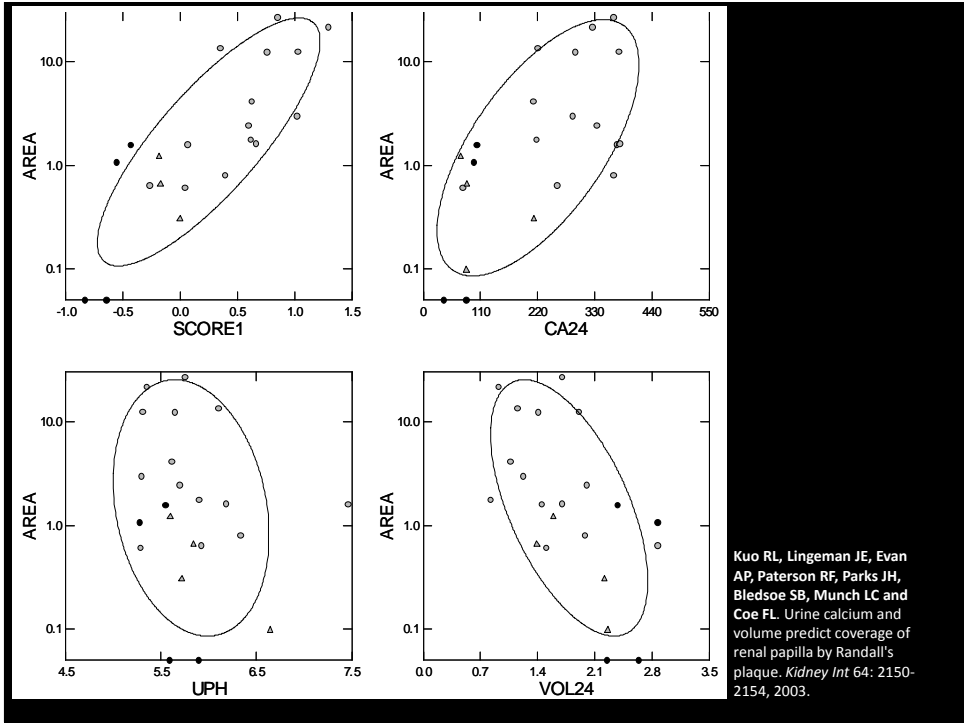


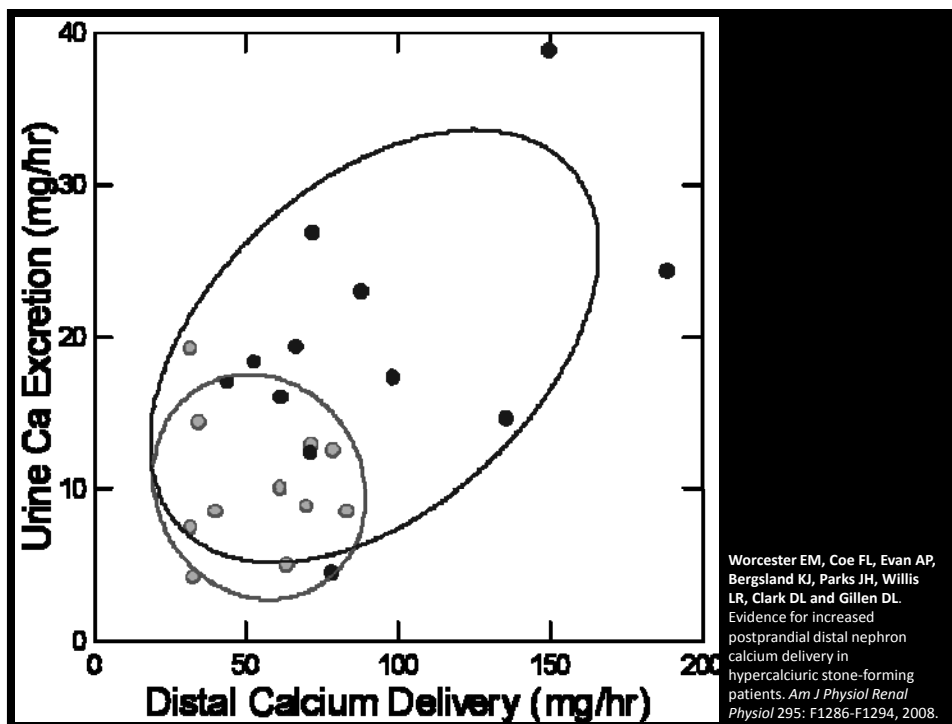
NOVEL TREATMENT OF IDIOPATHIC CALCIUM KIDNEY STONES

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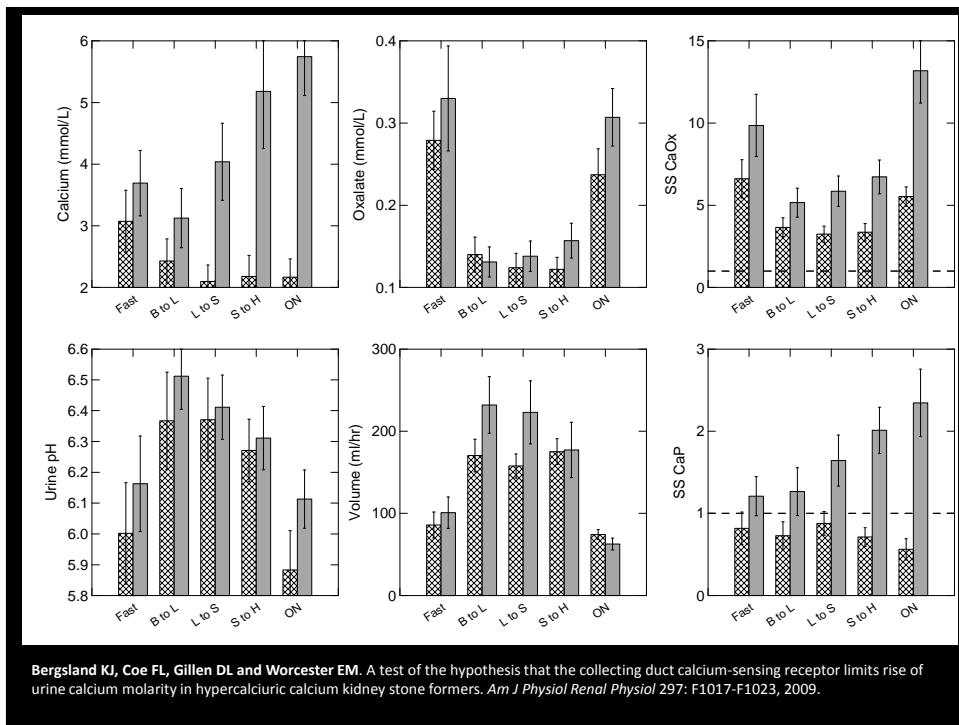
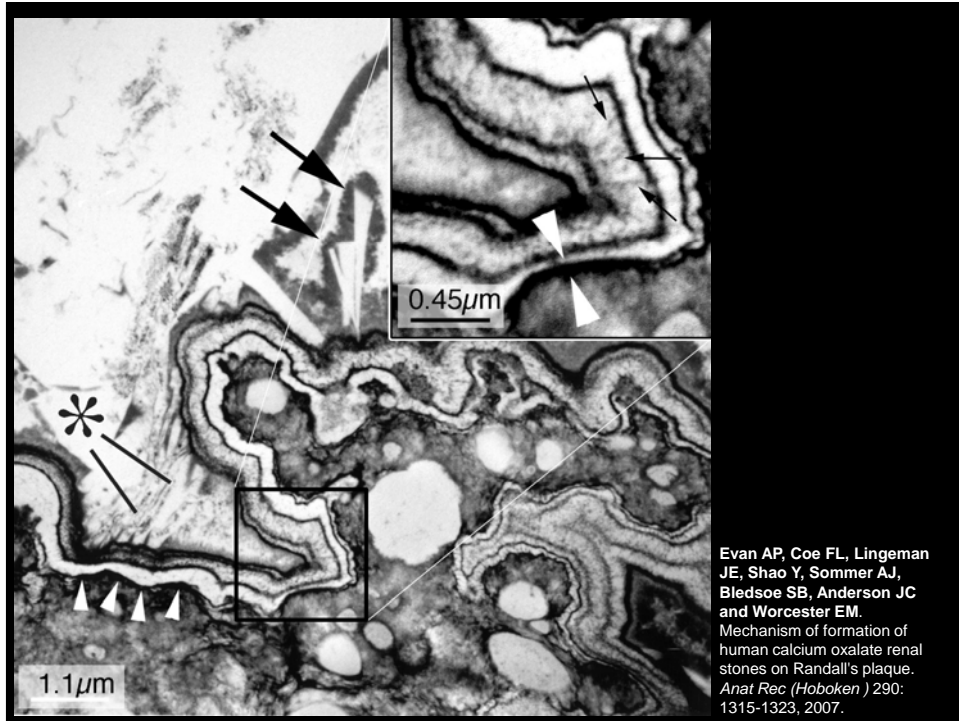






CLINICAL MEASURES THAT MAY REDUCE PLAQUE FORMATION

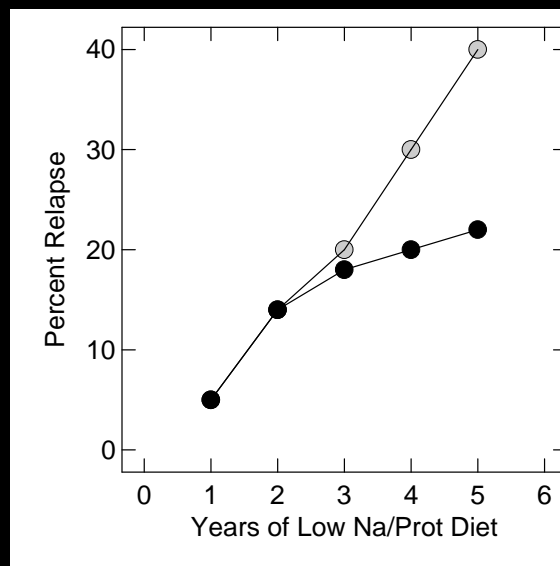
1. **Reduced sodium and protein intake**
 - a) Increases PT reabsorption
 - b) Reduces distal calcium delivery
2. **High water intake**
 - a) mTAL reabsorption is driven by vasopressin via the V2 receptor
 - b) High fluid intake reduces vasopressin levels; why plaque is inverse to urine volume
 - c) High fluid intake leads to medullary washout – lowers interstitial calcium
 - d) Consider 1x nocturia in severe stone disease: reduce period of highest [VP]
3. **Thiazide:** Increases PT reabsorption in rodents and presumably in humans
4. **All are prudent measures for stone prevention per se**
5. **May be considered after even one stone in that plaque is essential for stones and may precede stone formation**
6. **Modern urologists use URS in preference to SWL and can assess plaque abundance**



IMPLICATIONS OF APATITE AS THE INITIAL PHASE IN CAOx STONE FORMATION

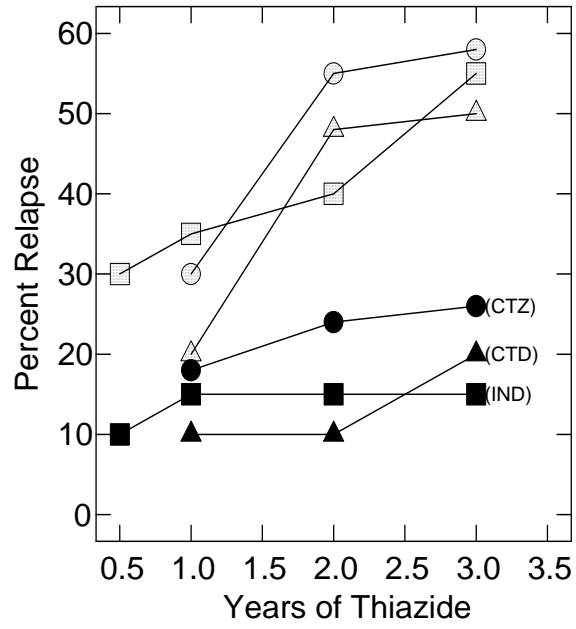
- 1. CaP SS is perhaps even more crucial to minimize than CaOx SS**
 - a) Control of urine calcium: Reduced diet protein & Na; thiazide
 - b) High urine volume
- 2. Overnight urine [Ca] and CaP SS is remarkably abnormal in stone formers; 1x nocturia could reduce risk in active disease**
- 3. Use of potassium citrate in hypocitraturic CaOx SF is complex**
 - a) Reduces urine calcium and complexes calcium
 - b) 2 RCT document efficacy of potassium citrate
 - c) Citrate is a very efficient inhibitor of apatite nucleation and growth
 - d) Citrate raises urine pH and therefore CaP SS for any level of [Ca]
 - e) Dosage: enough to reduce urine ammonia by 1/2 to 2/3
- 4. Do not neglect urine oxalate even in an apatite centered conversation**
 - a) Often high from diet: high oxalate or low calcium
 - b) When very high (>80 mg/day) consider PHO
- 5. Hyperuricosuria promotes CaOx stones**
 - a) May reduce CaP and CaOx solubility via salting out
 - b) 1 RCT supports allopurinol; diet should be effective but no RCT

Comparison of low calcium with reduced Na Protein Diet

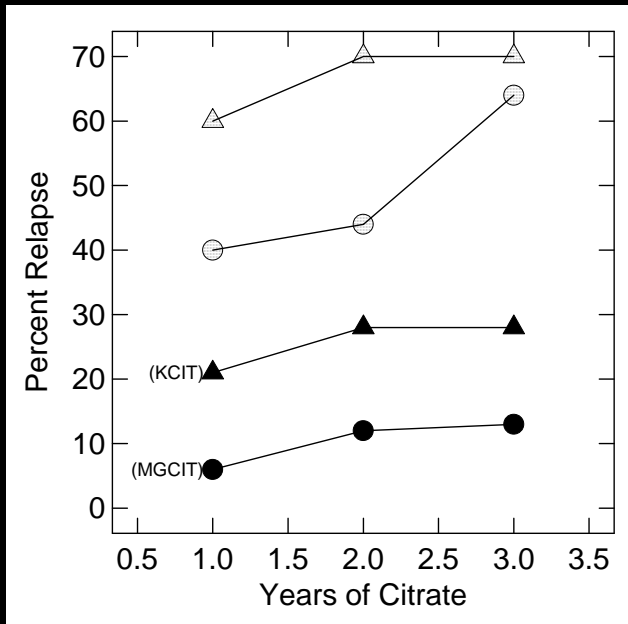


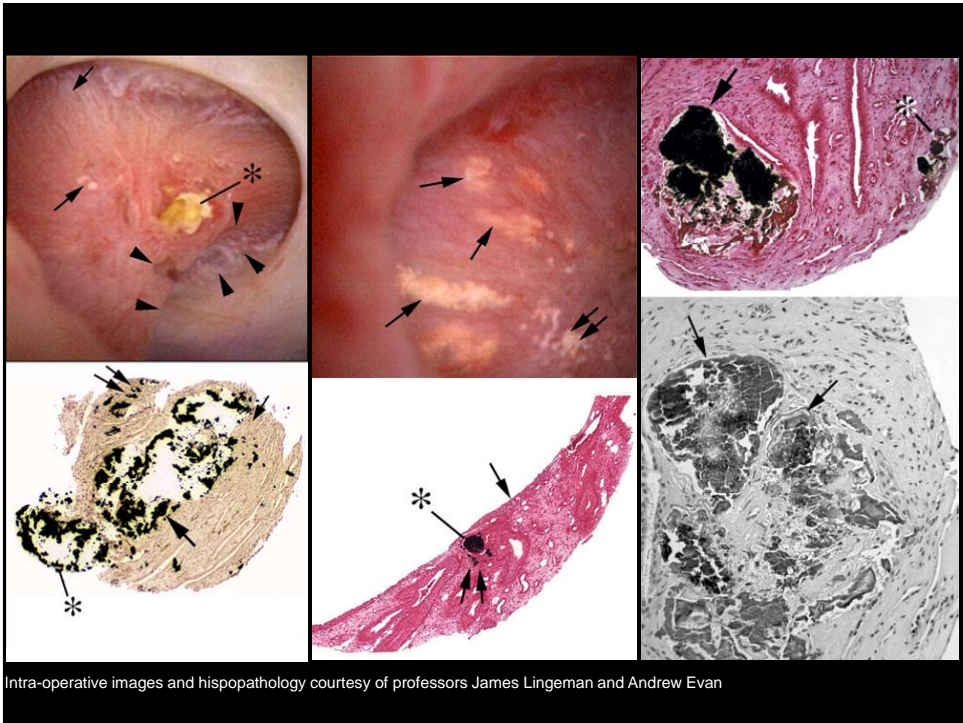
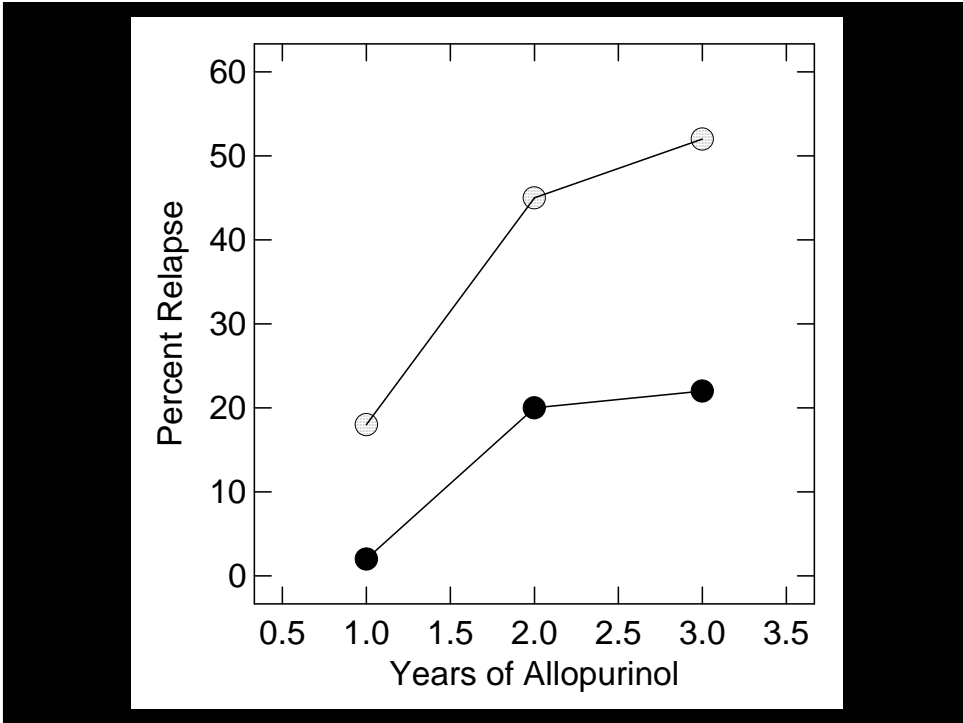
Borghi et al; NEJM 346:77-84, 2002. Men only; IH; CaOx stones
Grey circles represent reduced calcium diet, not uncontrolled diet

Three Prospective Randomized Double Blind THZ Trials

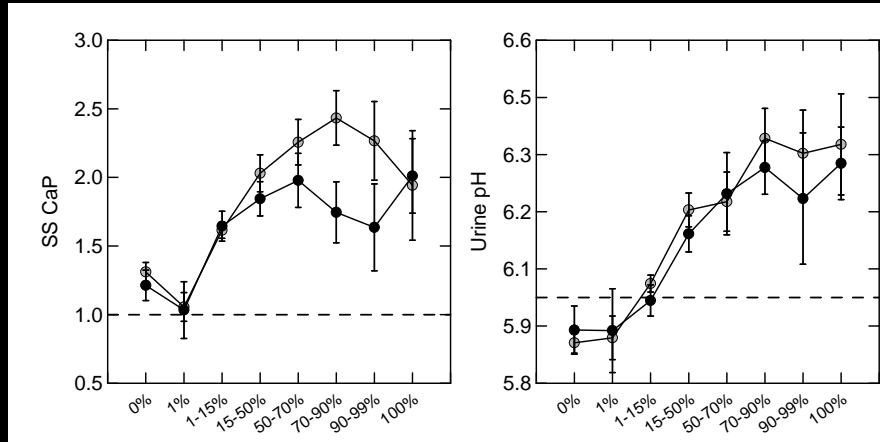


Two RCT of citrate in calcium stone formers with hypocitraturia





Intra-operative images and hispopathology courtesy of professors James Lingeman and Andrew Evan



Parks JH, Worcester EM, Coe FL, Evan AP and Lingeman JE. Clinical implications of abundant calcium phosphate in routinely analyzed kidney stones. *Kidney Int* 66: 777-785, 2004.

MANAGEMENT OF IDIOPATHIC CAP STONE FORMERS

1. **Role of potassium citrate is not clear even given hypocitraturia**
 - a) May be ideal as an apatite inhibitor
 - b) May foster phosphate stones or deposits via increased pH
 - c) An RCT is needed for this considerable group of patients
2. **Thiazide, water, and reduced diet Na and protein are reasonable**
3. **Renal pain unrelated to stone passage conceivable could arise from inflammation around plugged BD and surgical excision via URS is being explored as a surgical option in some centers**
4. **At URS the surgeon can warn physicians about plugging even when stone analyses are not available; plugging never occurs in idiopathic CaOx stone formers**

NOVEL THOUGHTS ABOUT ACCEPTED TREATMENTS:

CAOX STONE FORMERS

1. Plaque must precede new CaOx stones
2. CaP SS is as important as CaOx SS in CaOx stone formers
3. Reduced diet sodium and protein may prevent plaque
4. Increased fluids may prevent plaque
5. Thiazide may reduce urine CaP and CaOx SS and prevent plaque
6. Modest nocturia may make all the difference in difficult cases
7. Dose potassium citrate by urine ammonia lowering – keep pH from rising overly
8. Modern URS can estimate plaque abundance

CAP STONE FORMERS

1. Stone phosphate abundance >50% points to IMCD and BD crystal plugging
2. Water, thiazide, and reduced Na and protein diet are ideal for CaP stone formers
3. Potassium citrate may not be ideal for CaP stone formers: Need an RCT
4. Modern URS can warn of tubule plugging and estimate plaque abundance

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