

Renal Tubular Acidosis

= hyperchloremic metabolic acidosis

- comes in 4 distinct flavours;

TYPE 1: DISTAL HYPOKALEMIC: failure of the collecting duct to dump enough hydrogen ions with ammonium
Thus, acid retention. **VERY ALKALINE URINE.**

TYPE 2: PROXIMAL, BICARB-WASTING: failure of the proximal tubule to resorb enough bicarbonate;
Thus, alkali loss. Usually a mild acidosis.

TYPE3: just a variant of Type 1; but also has bicarbonate wasting.
Thus, severe acidosis. This one also occurs often in children.

TYPE4: DISTAL HYPERKALEMIC; due to aldosterone deficiency; therefore loss of normal potassium and hydrogen dumping.
Thus, very alkaline urine, serious metabolic acidosis AND HYPERKALEMIA

A NON-ANION-GAP acidosis; there is no extra weird acid like lactic acid or ketones in the blood; its simply more acidic because the kidneys cannot excrete enough hydrogen ions.

ELECTROLYTES AND BLOOD GASES ARE ENLIGHTENING:

- Chloride HIGH.
- Bicarbonate LOW
- Potassium (maybe high if type 4; maybe low if types 1-3)
- Anion gap should be NORMAL
- The pH will be LOW

Most of this can also be caused by diarrhoea, which causes a loss of bicarbonate through the bowel

URINALYSIS: look at the BICARBONATE and apply the formula,

$$\text{Fraction of excretion} = \frac{(\text{uHCO}_3 \times \text{sCr})}{(\text{sHCO}_3 \times \text{uCr})};$$

Where FE-HCO₃ is fractional excretion of bicarbonate,

uHCO₃ is urine bicarbonate

sHCO₃ is serum bicarbonate

uCr is Urine Creatinine

sCr is Serum Creatinine

FRACTION OF EXCRETION less than 5% = DISTAL RTA

More than 15% = PROXIMAL RTA

OSTEOMALACIA and RICKETS are common childhood complications.

A little MANAGEMENT:

- replace the bicarbonate; AND the potassium- because you will start losing potassium together with bicarbonate
- mainstay of long term treatment (when there is no obvious cause to address) is **alkali supplementation**, to replace the lost bicarbonate, or buffer the abnormally retained acid.
- In TYPE 4, you can often remedy the problem by replacing the missing aldosterone (eg. with fludrocortisone)