21. Acidosis in pre-dialysis patients

Background

Acidosis is most commonly a result of metabolism. Metabolic acidosis inhibits lipoprotein lipase activity. Bone is a buffer of the acidotic state, and acidosis can worsen the bone disease of chronic renal failure, and may have deleterious effects on vitamin D synthesis [26]. Acidosis can increase skeletal muscle breakdown through increased protein catabolism [27], and diminish albumin synthesis [28]. These result in the loss of lean body mass and muscle weakness, and may exacerbate the protein malnourished state of chronic renal failure [20].

What is the evidence?

Prospective studies:
One prospective intervention study in patients with near-end-stage renal failure (mean GFR = 0.21ml/sec (approximately 13ml/min)) and a mean plasma bicarbonate of 17mmol/L were shown to have increased skeletal muscle breakdown. The authors then proceeded to correct the plasma bicarbonate to a mean of 24.3mmol/L with oral bicarbonate, resulting in reduced urinary nitrogen loss [21].

Retrospective studies:
None.

Summary of the evidence

Correction of metabolic acidosis in severe renal failure is desirable to minimise skeletal muscle breakdown and associated negative nitrogen balance.

Suggestions for clinical care
(Include information and suggestions based on level III and IV sources)

- Oral sodium bicarbonate should administered to maintain the serum bicarbonate above 22mmol/L (Level III evidence).
Sodium bicarbonate is preferred to sodium citrate if the patient is also on aluminium phosphate binders [29].

Oral sodium bicarbonate in a total daily dose of 0.5 to 1 mmol per kg body weight per day, in divided doses two to three times a day (tailored to the individual patient’s tolerance) should be administered to maintain the serum bicarbonate above 22mmol/l.

Oral bicarbonate is available as the sodium salt. The amount of bicarbonate required to correct the acidosis often results in a sodium load that may exacerbate the patient’s hypertension or oedematous state. A balance between the benefits of correction of the acidosis, and the risks of excessive sodium loading has to be made for each individual.

Each 4g Ural sachet contains 28mmol of sodium.
Each sodium bicarbonate tablet contains 10mmol Na+/tablet.

1 teaspoon (approximately 5g) of baking soda in 60ml of water produces 1mmol HCO3/ml (see sodium guidelines for sodium content).

What do the other guidelines say?

K-DOQI:
Pre-dialysis or stabilised serum bicarbonate levels should be maintained at or above 22mmol/L.

BRA:
Control of serum bicarbonate within normal limits is advocated. A balance has to be met, and assessed for each individual, between the benefits of correcting the acidotic state, and worsening hypertension/ﬂuid control from the sodium load in the bicarbonate therapy.

EDTNA/ERCA:
Not addressed.

Implementation and audit

Monthly blood testing of plasma bicarbonate to assess therapy success and therapy compliance is recommended.

Suggestions for future research

Nil.
References

14. Kopple JD; Levey AS; Greene T; Chumlea WC; Gassman JJ; Hollinger DL; Maroni BJ; Merril D; Scherch LK; Schulman G; Wang SR; Zimmer GS. Effect of dietary protein restriction on nutritional status in the Modification of Diet in Renal Disease Study. Kidney Int 1997;52:778-91.


43. The Longwood Herbal Taskforce: http://www.mcp.edu/herbal/default.htm

Appendices

Out of Date