

Sodium Bicarbonate Infusion Found to Reduce Risk of Contrast-Induced Nephropathy

Contributed by Michael J. Metro, MD
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BERKELEY, CA (UroToday Inc.) - Contrast-induced nephropathy remains a common complication of radiographic procedures. Acute renal failure from ischemia and contrast are postulated to occur from free-radical injury. Radiocontrast nephropathy is a common cause of hospital-acquired acute renal failure and has been associated with increased in-hospital mortality and length of stay. Many protocols to prevent contrast-induced nephropathy include an infusion of sodium chloride. No studies have evaluated the efficacy of sodium bicarbonate for prophylaxis against contrast-induced renal failure. It alkalinizes the urine and reduces free-radical formation,.

A randomized controlled trial was performed to examine the efficacy of sodium bicarbonate compared to sodium chloride for preventive hydration before and after radiographic contrast. The study, performed at the Carolinas Medical Center, was reported by G. J. Merten, et al. and published in the May 19, 2004 issue of JAMA.

One-hundred and nineteen patients with a creatinine of at least 1.1 mg/dL were randomized to receive either an infusion of sodium chloride (NaCl) or sodium bicarbonate (NaHCO₃) before (a bolus of 3mL/kg over 1 hour) and after (an infusion of 1 mL/kg/hr for 6 hours) the procedure. Serum creatinine levels were measured at baseline and 1 and 2 days after contrast. The primary endpoint was contrast induced nephropathy, defined as an increase in serum creatinine of 25% or more within 2 days of contrast injection.

The mean patient age was 68 years old and the most frequent radiographic procedure was cardiac catheterization. Mean baseline creatinine values were 1.71 mg/dL for the NaCl group and 1.89 mg/dL for the NaHCO₃ group. The primary end point of contrast induced nephropathy occurred in 8 patients (13.6%) infused with sodium chloride but only 1 (1.7%) of those receiving sodium bicarbonate (mean difference, 11.9%, P=.02). A follow-up registry of 191 consecutive patients receiving prophylactic NaHCO₃ resulted in only 3 cases of contrast-induced nephropathy (1.6%).

Additional data analysis revealed that patients receiving sodium bicarbonate achieved urine pH's of 6.5 as opposed to 5.6 with those receiving sodium chloride. This alkalinization is theorized to have a protective effect against the formation of free-radicals that may cause nephropathy.

An editorial, provided by G. M. Chertow from University of California San Francisco, discussed the limitations of prior studies that attempted to evaluate other techniques to reduce contrast induced nephropathy. These included N-acetylcysteine administration and hemofiltration. These techniques for prevention required complex interventions (dialysis for hemofiltration) or a delay in the performance of the study (1-2 days for oral administration of N-acetylcysteine). The efforts of the Carolina group were applauded for the power of their study and completion of the trial even though it appeared to be a strongly positive study during initial data collection. The authors and the editorial both concluded that a brief infusion of isotonic sodium bicarbonate pre- and post-exposure to contrast should now be considered the treatment of choice for prevention of radiocontrast nephropathy.

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