Journal Club
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P: In patients requiring contrast enhanced CT scans
I: Does the use of NAC or Bicarbonate
C: Compared to fluid hydration alone
O: Decrease the likelihood of contrast induced nephropathy

Clinical Scenario: A 70 year old diabetic male presents to the ED with sudden onset of shortness of breath and pleuritic chest pain. He just had knee surgery 2 weeks ago and has been recovering at home. Your cardiac workup is initially negative, but O2 sats remain at 90% without supplemental oxygen. You suspect PE and order a CTA of the chest. His creatinine is 2.0 and you wonder if there is anything besides hydration that may decrease his chances of CIN.

Background info: 2006:
CIN consensus working panel: only hydration works
So whats new?

Author	Patients	Study	Outcomes	Results	Weaknesses
Chen, SL et al June 2008 China	936 pts for PCI 4 groups: Creatinine <1.5 Hydration (330) Non-hydration (330) Creatinine >1.5 NAC + hydration (188) NAC+nonhydration(188) Used isoosmolar nonionic contrast Hydration: 1/2NS 1ml/kg/hr, 12 hrs before and 6hrs afterward NAC: 1200mg 12 hr before and right after PCI	PRCT Multi-center	Primary: Rates of CIN: Defined as absolute increase SCr>0.5mg/dl or increase of 25% from baseline at 48hrs after PCI Secondary: Clinical In-hospital	Normal group: Hydration: 6.67% Non-hydration: 6.97% P>0.05 Abnl group: NAC+hydration: 21.28% NAC alone: 34.04% P<0.01 +CIN vs. no CIN Arrhythmias: Nl: 39.5% vs. 0.4% Abnl: 75% vs. 12.8% Dialysis: Nl: 0% vs. 0% Abnl: 19.3% vs 0.5% Death: Nl:2.3%vs0% Abnl: 11.5% vs 0.5%	Cardiologists could use diuretics, ACE inhibitors, varying contrast amounts First dose of NAC useful? Study done on PCI patients Used 1/2NS to hydrate. Non-significance of hydration likely from mismatched age, contrast volume, PVD. No RR or CI calculated

Masuda, M et al March 2007 Japan	59 patients with creatinine >1.1mg/dl schedule for emergent diagnostic or PCI 2 groups: Sodium Bicarbonate 154mEq/L (30) Sodium Chloride 154mEq/L (29) 3ml/kg/hr for 1 hr before, then 1ml/kg/hr during and for 6hrs afterward Non-ionic low-osmolality contrast used	PRCT Non-blinded Single center	Primary: Rates of CIN, inc. creatinine >0.5 or >25% from baseline Within 2 days Secondary: Hosp. Comp.	Risk of CIN in bicarbonate group significantly lower: Bicarb: 7% NaCl: 35% RR 0.19 (0.046 to 0.8) Hemodialysis: 3% vs 10% P 0.35 Death 0% vs 7% P 0.24	Low sample size Enrollment stopped early b/c increased CIN risk shown in NaCl group Creatinine 1.1 deemed as renal insuff. (avg 1.3) No power to detect diff. in clinical outcomes
El-Hajjar et al March 2008 USA	400 patients Creatinine 1.5 to 2.5 Subdivided into 3 groups based on creatinine clearance <30ml/min 30-60ml/min >60ml/min Preventive Measures: Non-ionic iso-osmolar contrast NAC 600mg P.O. BID -started 1 day prior Sodium Bicarb -150mEq/L @ 3ml/kg/hr for 45min prior and 45 min after MDCTA	Prospe ctive Cohort study	Primary: CIN rate Defined as increase creatinine of ≥0.5mg/dl 3 to 5 days after scan	CIN: 7 patients (1.75%) 5 were diabetic 7 were over 80 2 had >1.0 increase 0 needed dialysis No sig. diff among subgroups. Diabetes RR 5.9 (1.03-33.3)	No control arm
Ozcan, et al March 2007 Turkey	264 patients with creatinine>1.2 for angiography or PCI 3 groups: NaHCO3 (88) NS (88) NS + NAC (88) Fluid: 1ml/kg/hr 6 hrs pre and post procedure NAC: 600mg P.O. BID 1 day prior and day of Contrast: low-osmolality Ionic	PRCT	Primary: Rate of CIN Increase in Cr by 25% or 0.5 at 48hrs.	NS: 12/88 (13.6%) NS+NAC: 11/88 (12.5%) NaHCO3: 4/88 (4.5%) NaHCO3 vs. NS: RR 0.29 (0.09-0.96) NaHCO3 vs NS+NAC RR 0.34 (0.1-1.14) NAC+NS vs. NS RR 0.84 (0.34-2.06)	Small sample size (88) Ionic contrast used CIN after 2 days?

Schmidt et al January 2007	96 patients that underwent coronary angiography Pts had: At least one dose of NAC (600mg) Hydration NS,1/2NS, NaHCO3 Nonionic low-osmolar contrast 2 groups: NAC+standard hydration (49) NAC +hydration with NaHCO3 (47)	Retro-spective Single center	Primary: Rate of CIN Cr. Increase >0.5 Within 72hrs	NAC + NaHCO3 group: 7/47 (14.9%) NAC + NS or 1/2NS group: 6/49 (12.2%)	Very small sample size Some got NS, others 1/2NS Retrospective Total fluids or NAC doses given not accessed 2002 vs 2005 collection times for the 2 groups
New-house et al August 2008 USA	32,161 patients with serial creatinine levels measured on each of 5 days from urban academic medical center No contrast exposure 1995 to 2004	Retro-Spective study	Creatinine levels Literature Comparison "CIN"	Avg. baseline 1.65 >0.5 increase: 7% (0.6to1.2) 14% (1.3-2.0) 19% (2.1-3.0) 31% (>3.0) Range 0% to 76% Most <20%	Didn't control for how sick pts were i.e. not a true control group many patients were extremely sick and not excluded previous h/o contrast?

Clinical Bottom Line:

When possible, all patients undergoing contrast enhanced studies should be well hydrated with normal saline and non-ionic iso or low-osmolality contrast should be used. The newer studies using NaHCO3 are encouraging however larger trials need to be performed before a true effect is known. The role of NAC is still unclear.

It should remain at the physician's discretion whether to use these adjunctive treatments.

Sentara Norfolk's Contrast Protocol:

Stop Metformin must hydrate, minimum contrast use, use iso-osmolar agents, NAC and Bicarbonate can be considered