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SOUTH CAROLINA COLLEGE OF PHARMACY

Characterizing Contrast-Induced Nephropathy and Use of Prophylactic Agents

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Background

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- Contrast induced nephropathy (CIN) is associated with increased morbidity and mortality
  - Increased hospitalization time, acute renal failure, dialysis
- Defined as increase in SCr > 0.5 mg/dl within 72 hours or > 25% increase from baseline

Van Praet JT, et al. Curr Opin Nephrol Hypertens. 2007; 16:336-47.

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Background

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Risk Factors

- Acute myocardial infarction
- Advanced age
- Anemia
- Contrast characteristics
- Diabetes
- Heart failure
- Hypertension
- Hypoalbuminemia
- Hypotension
- Intra-aortic balloon pump
- Peripheral vascular disease
- Preprocedural Shock
- Renal insufficiency
- Urgent procedure

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Background

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- Mechanism of CIN hypothesized to be mediated by free radical induced renal ischemia
- Prophylactic Strategies
  - N-acetylcysteine
  - Ascorbic acid
  - Sodium bicarbonate
  - Others
    - Calcium channel blockers, fenoldopam, theophylline, IV fluids

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Objectives

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- To compare the incidence of CIN in patients receiving no prophylaxis, sodium bicarbonate, N-acetylcysteine, ascorbic acid, or combination at MUSC
- To validate previously determined risk factors for CIN

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Methods

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- Inclusion Criteria
  - 18 years or older
  - Received IV contrast between 7/31/07 and 10/31/07
  - Admitted to:
    - Medicine
    - Family medicine
    - Cardiology
    - Neurology
    - Pulmonary/MICU
- Exclusion Criteria
  - More than one dose of contrast during 3 month period
  - No baseline creatinine
  - No creatinine measurement within 72 hours of contrast administration

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Methods

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- Retrospective cohort analysis
- Identified all patients charged for contrast agents
- Collected demographic data, disease state information based on ICD-9 codes, concomitant nephrotoxic medications, and pertinent laboratory values

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Results

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Baseline Characteristics n = 194	
Service, n (%)	
Cardiology	87 (44.9)
Neurology	54 (27.8)
Medicine	29 (15)
MICU/Pulmonary	16 (8.3)
Family Medicine	8 (4.1)
Gender, n (%)	
Male	109 (56.2)
Female	85 (43.8)
Contrast Agent, n (%)	
Iohexol (Omnipaque®)	151 (77.8)
Iodixanol (Visipaque®)	41 (21.1)
Iopamidol (Isovue®)	2 (1)

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Results

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	No CIN (n=170)	CIN (n=24)
Baseline CrCl* (mL/min)	60.4	44.4
Post-contrast CrCl*	62.5	30.33
Prophylaxis, n (%)		
None	121 (71.2)	14 (58.3)
Sodium bicarbonate	8 (4.7)	3 (12.5)
Ascorbic acid	2 (1.2)	0 (0)
N-acetylcysteine	24 (14.1)	4 (16.7)
N-acetylcysteine + Sodium bicarbonate	13 (7.6)	3 (12.5)
N-acetylcysteine + Ascorbic acid	2 (1.2)	0 (0)

*CrCl determined by 4-variable MDRD equation, reported as median

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Results

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Risk Factors, n (%)	No CIN (n = 170)	CIN (n = 24)
Acute myocardial infarction	14 (8.2)	2 (8.3)
Advanced age	41 (24.1)	4 (16.7)
Anemia	24 (14.1)	6 (25)
Concomitant nephrotoxic medications	135 (79.4)	20 (83.3)
Diabetes	72 (42.4)	10 (41.7)
Heart failure	43 (25.3)	14 (58.3)
Hypertension	120 (70.6)	13 (54.2)
Hypoalbuminemia*	66 (38.8)	17 (70.8)
Hypotension	11 (6.5)	6 (25)
Peripheral vascular disease	10 (5.9)	1 (4.2)
Preexisting renal failure	18 (10.6)	7 (29.2)
Urgent procedure	126 (74.1)	15 (62.5)

*Unable to obtain albumin value for 54 (27.8%) of patients

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Results

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- Prophylactic treatments have no effect on the incidence of CIN in this population
  - Combined prophylactic treatments
  - $p = 0.4289$*

***Data analyzed using Fisher's exact test**

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Results

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Developed CIN

Baseline SCr	Total	Prophylaxis		
		N-acetylcysteine	$NaHCO_3$	NAC + $NaHCO_3$
≤ 1.0	8	1	-	-
1.1 to 1.4	7	1	2	1
1.5 to 2.0	3	1	-	-
2.1 to 3.0	3	1	1	1
3.1 to 4.0	2	1	-	1
> 4.0	1	-	-	-

- All had at least one risk factor for CIN
- Median number of risk factors was four

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Conclusions

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- Prophylactic agents may not reduce the rate of CIN
  - May support the recent study showing sodium bicarbonate may be harmful
- One-third of patients that developed CIN had normal baseline serum creatinine
  - Future studies evaluating the effects of CIN prophylactic agents may need to include patients without preexisting renal insufficiency

From AM, et al. Clin J Am Soc Nephrol. 2008;3:10-8.

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Limitations

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- Small sample size
- Lack of IV fluid data
- Not all identified risk factors evaluated
- Retrospective study design

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Acknowledgements

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- Nicole Bohm, PharmD
  - Adult Internal Medicine Clinical Specialist
    Clinical Assistant Professor, South Carolina College of Pharmacy
- Susan Perrone, MS
  - Statistician, Demographics and Workforce Section
    Weldon Cooper Center for Public Service, University of Virginia
- Rachel Herbert
  - Decision Support Services, Assistant Professor, Medical University of South Carolina

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