How to Avoid the Risk and Cost of Contrast Induced Nephropathy

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DISCLOSURES

 Consultant/Medical/Scientific Boards
- Abbott
- Boston Scientific
- Cardiva
- Cook Medical
- CR Bard
- Lake Regional Medical
- Medtronic
- Spectranetics

 PVD Training
- Abbott
- Bard
- Boston Scientific
- Spectranetics
- TriReme Medical

 Stockholders
- CardioProlific
- Cardiva
- Spectranetics
- Vasamed

 Speaker’s Bureau
- Abbott
- Bard
- Boehringer-ingelheim
- Bristol-Myers-Squibb/Sanofi
- Cardiva
- Cook Medical
- Cordis
- DSI/Lilly
- ACHL/Merck
- Gore
- Spectranetics
 DEFINITION OF CIN

- Rise in serum Cr > .5 mg/dl
- Rise of serum Cr > 25% baseline

Patients on Active Dialysis who are making urine may become anuric following iodinated contrast media. This has a profound negative impact on outcomes.
CIN (Iodinated contrast media)

- 3\textsuperscript{rd} most common cause of hospital acquired acute renal failure (behind shock and nephrotoxic drugs).
- Dramatically increases mortality, morbidity, length of stay, and cost.
- Average increased cost $10,345 in hospital and $11,812 1\textsuperscript{st} year
- Only absolute prevention is no iodinated contrast

Nash et al; Am Jour Kidney Dis.
Dangas, G et al; AmJCardio. 95 2005:13-19
Lindsey, J et al; AmJCardio. 94 2004:786-789
Figure Legend: Postulated Pathophysiology of Contrast-Induced AKI. In the presence of a reduced nephron mass, the remaining nephrons are vulnerable to injury. Iodinated contrast, after causing a brief (minutes) period of vasodilation, causes sustained (hours to days) intrarenal vasoconstriction and ischemic injury. The ischemic injury sets off a cascade of events largely driven by oxidative injury causing death of renal tubular cells. If a sufficient mass of nephron units are affected, then a recognizable rise in serum creatinine will occur.
Scheme to define contrast-induced nephropathy (CIN) risk score. Anemia = baseline hematocrit value <39% for men and <36% for women; CHF = congestive heart failure class III/IV by New York Heart Association classification and/or history of pulmonary edema; eGFR = estimated glomerular filtration rate; hypotension = systolic blood pressure <80 mm Hg for at least 1 h requiring inotropic support with medications or intra-aortic balloon pump (IABP) within 24 h periprocedurally.
From: A simple risk score for prediction of contrast-induced nephropathy after percutaneous coronary intervention: Development and initial validation

The contrast-induced nephropathy risk score derived from the development dataset predicted this complication in the validation set, as well.

Figure Legend:
The contrast-induced nephropathy risk score derived from the development dataset predicted this complication in the validation set, as well. Blue bars = development dataset; Red bars = validation dataset.
From: A simple risk score for prediction of contrast-induced nephropathy after percutaneous coronary intervention: Development and initial validation

In hospital hemodialysis can be predicted by a high or very high risk score value similarly in the development and validation datasets. Blue bars = development dataset; Red bars = validation dataset.

Figure Legend:
In-hospital hemodialysis can be predicted by a high or very high risk score value similarly in the development and validation datasets. Blue bars = development dataset; Red bars = validation dataset.
The prognostic significance of the proposed risk score for contrast-induced nephropathy extended to prediction of one-year mortality, as indicated by the results obtained from both the development and validation datasets. Blue bars = development dataset; Red bars = validation dataset.
Low Risk:
0 Risk Factors

No additional steps necessary

Moderate Risk:
1 Risk Factor

Decompensated heart failure/pulmonary edema or hyponatremia present?

No

Hydration with Saline\(^1\)
OR Bicarbonate\(^2\)

+/-

Acetylcysteine (NAC)\(^3\)
(PO/NG/PT)

High Risk:
\(\geq\) Risk Factors
Or
SC \(r > 2.0\) and/or CrCl \(< 40\)

Decompensated heart failure/pulmonary edema or hyponatremia present?

No

Yes

**Bicarbonate\(^2\) OR Hydration\(^1\)**
+ Acetylcysteine (NAC)\(^3\)
(PO/NG/PT/IV\(**)\)

**see Acetylcysteine Dosing Guidelines\(^3\) for restrictions on IV acetylcysteine
CIN RISK IS INCREASING IN PAD CASES

• Diabetes is epidemic
• More interventions are being performed
• More complex interventions (limb salvage)
• Older patients
• CIN increases acute and long-term mortality
• CIN increases acute and long-term morbidity
• CIN increases acute and long-term cost
• CIN is strongly associated with independent risk factors that should be assessed
• CIN MUST BE AVOIDED
AVOIDING CIN IF IODINATED CONTRAST MUST BE USED

• Aggressive pre and post hydration
• Withhold nephrotoxic drugs
• Maintain adequate blood pressure
• Use iso-osmolar contrast
• Avoid anemia (meticulous access site management)
• Limit contrast
• ? Mucomyst and Bicarbonate
CONCLUSION

• The only way to absolutely avoid CIN is to not administer iodinated contrast.

• In PAD there are viable options
  • External duplex guidance
  • CO2 angiography - THIS HAS TOTALLY CHANGED MY PRACTICE
    • 1) No renal function too impaired
    • 2) No limit on imaging – better results
    • 3) No pre-admission or prolonged stay
    • 4) Can image with smaller catheters (less viscous)
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