



CONTRAST-INDUCED NEPHROPATHY

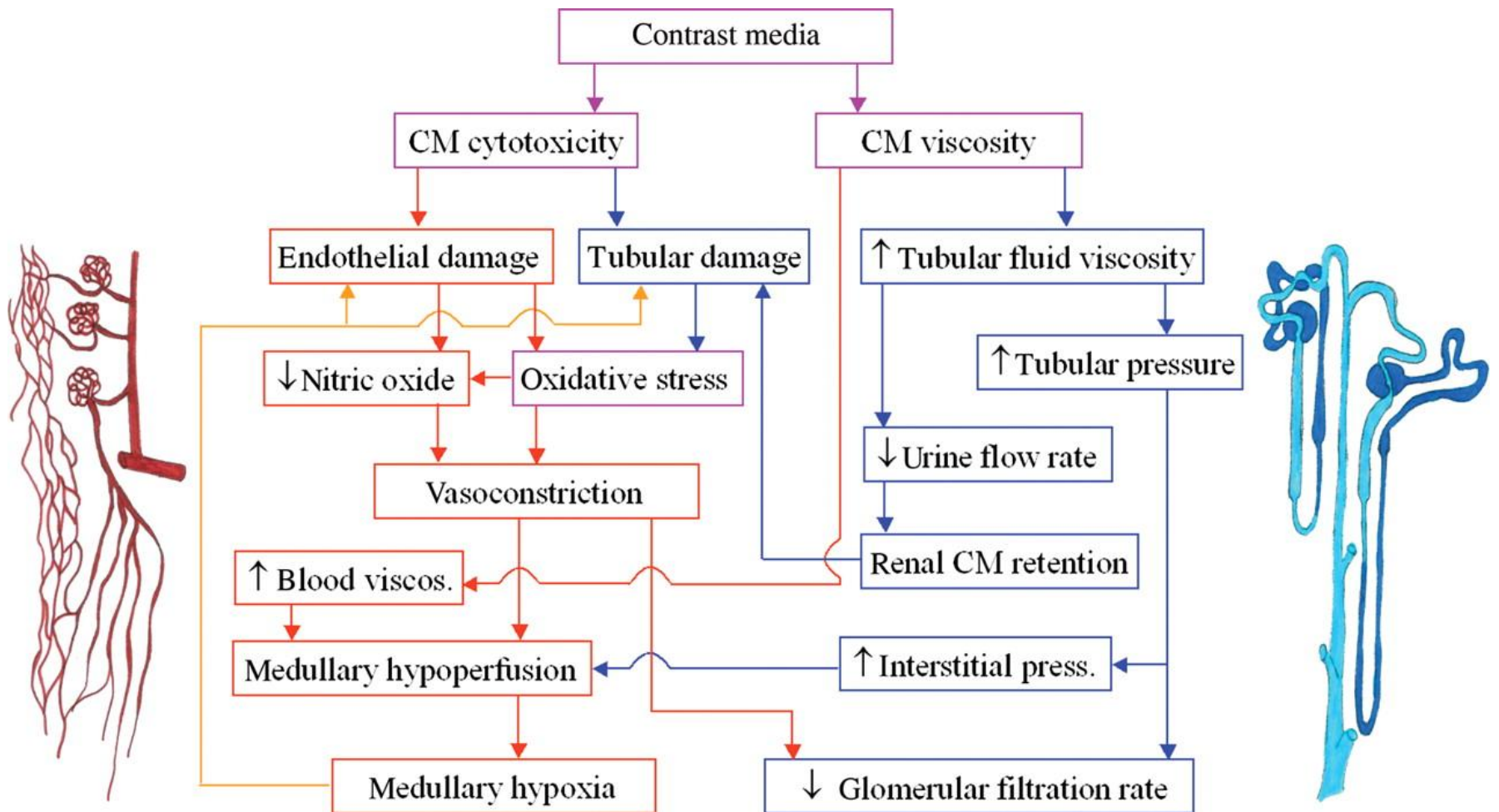
Y HỌC CHỨNG CỨ VÀ BIỆN PHÁP DỰ PHÒNG



DEFINITION

- Reversible form of acute kidney injury that occurs soon after the administration of radiocontrast media.

PATHOGENESIS



RISK FACTORS

Chronic kidney disease

Diabetic nephropathy with renal insufficiency

Heart failure or other causes of reduced renal perfusion

High total dose of contrast agent

First generation of hyperosmolal ionic contrast agents

Percutaneous coronary intervention

Multiple myeloma

Circulation. 2002 May 14;105(19):2259-64.

Incidence and prognostic importance of acute renal failure after percutaneous coronary intervention.

Rihal CS¹, Textor SC, Grill DE, Berger PB, Ting HH, Best PJ, Singh M, Bell MR, Barsness GW, Mathew V, Garratt KN, Holmes DR Jr.

+ Author information

- 7586 patients
- The overall incidence of AKI: 3,3%
- Baseline creatinine 20 – 29 mg/l: 22%
- Baseline creatinine > 30 mg/l: 31%

N Engl J Med. 1989 Jan 19;320(3):143-9.

Contrast material-induced renal failure in patients with diabetes mellitus, renal insufficiency, or both. A prospective controlled study.

Parfrey PS¹, Griffiths SM, Barrett BJ, Paul MD, Genge M, Withers J, Farid N, McManamon PJ.

Creatinin baseline > 16,9 mg/l

Diabete vs Nondiabete: 8,8% vs 4,0%

Kidney Int. 1995 Jan;47(1):254-61.

Nephrotoxicity of ionic and nonionic contrast media in 1196 patients: a randomized trial. The Iohexol Cooperative Study.

Rudnick MR¹, Goldfarb S, Wexler L, Ludbrook PA, Murphy MJ, Halpern EF, Hill JA, Winniford M, Cohen MB, VanFossen DB.

250 patients, creatinine > 15 mg/l: diabete vs nondiabete 33% vs 12%

341 patients, creatinine < 15 mg/l: no difference

CLINICAL FEATURES

- Creatinine increase: onset within minutes exposure, most patients: nonoliguric, observed within 24-48 hrs
- Urinary sediment: muddy brown granular, epithelial cell casts, absence => not exclude the diagnosis
- Protein excretion: absent or mild
- Ultrasound & renal biopsy: exclude other causes of AKI, rarely

DIAGNOSIS

- Clinical presentation: rise in serum creatinine (first 24-48 hrs after exposure)
- Exclusion other causes of AKI

MANAGEMENT

- no specific treatment
- maintain fluid and electrolyte balance
- best treatment of contrast-induced kidney injury is prevention

PREVENTION - OVERVIEW

1. The use without radiocontrast agents, particularly in high-risk patients
2. Lower doses of contrast, avoidance of repetitive studies
3. Avoidance of volume depletion or nonsteroidal anti-inflammatory drug
4. The administration of intravenous saline or possibly sodium bicarbonate
5. The administration of the antioxidant acetylcysteine
6. The use of selected low or iso-osmolal nonionic contrast agents

PREVENTION – TYPES OF CONTRAST AGENT





JACC: Cardiovascular Interventions

Volume 2, Issue 7, July 2009, Pages 645–654



Clinical Research

The Relative Renal Safety of Iodixanol Compared With Low-Osmolar Contrast Media : A Meta-Analysis of Randomized Controlled Trials

Michael Reed, MD^{*}, Pascal Meier, MD^{*}, Umesh U. Tamhane, MD^{*}, Kathy B. Welch, MS, MPH[†], Mauro Moscucci, MD[‡], Hitinder S. Gurm, MD^{*}  

Received 24 April 2009, Accepted 3 May 2009, Available online 21 July 2009

- A meta-analysis of 16 randomized trials also suggested that iodixanol was associated with a reduction in risk among patients with chronic kidney disease who received contrast when compared to iohexol but not when compared to other nonionic low osmolal contrast agents

PREVENTION – TYPES OF CONTRAST AGENT

- ACC/AHA guidelines on percutaneous coronary intervention were revised to suggest the use of either an iso-osmolal contrast agent or a low molecular weight contrast agent other than iohexol or the ionic low osmolal agent.
- The 2012 KDIGO guidelines recommended low-osmolal or iso-osmolal rather than high osmolal contrast agents

PREVENTION – TYPES OF CONTRAST AGENT

| Compound | Name | Type | Osmolarity | |
|-----------|----------------------------------|---------|------------|-----|
| Non-ionic | <u>Iopamidol</u> (Isovue 370) | Monomer | 796 | Low |
| Non-ionic | <u>Iohexol</u> (Omnipaque 350) | Monomer | 884 | Low |
| Non-ionic | <u>Ioxilan</u> (Oxilan 350) | Monomer | 695 | Low |
| Non-ionic | <u>Iopromide</u> (Ultravist 370) | Monomer | 774 | Low |
| Non-ionic | <u>Iodixanol</u> (Visipaque 320) | Dimer | 290 | Iso |

PREVENTION – INTRAVENOUS SALINE

1416

THE NEW ENGLAND JOURNAL OF MEDICINE

Nov. 24, 1994

EFFECTS OF SALINE, MANNITOL, AND FUROSEMIDE ON ACUTE DECREASES IN RENAL FUNCTION INDUCED BY RADIOCONTRAST AGENTS

**RICHARD SOLOMON, M.D., CRAIG WERNER, M.D., DENISE MANN, R.N., JOHN D'ELIA, M.D.,
AND PATRICIO SILVA, M.D.**

- Isotonic saline: lowest incidence if acute kidney injury
- Isotonic saline + mannitol: no added benefit
- Isotonic saline + furosemide: increased the risk

PREVENTION – INTRAVENOUS BICARBONATE

KDIGO guidelines 2012:

“We recommend i.v. volume expansion with either isotonic sodium chloride or sodium bicarbonate solutions, rather than no i.v. volume expansion, in patients at increased risk for CI-AKI. (IA)”

PREVENTION – ACETYLCYSTEINE

REVIEW

Annals of Internal Medicine

Meta-analysis: Effectiveness of Drugs for Preventing Contrast-Induced Nephropathy

Aine M. Kelly, MD, MS; Ben Dwamena, MD; Paul Cronin, MD, MS; Steven J. Bernstein, MD, MPH; and Ruth C. Carlos, MD, MS

- 2008
- 41 studies
- N-acetylcysteine significantly lowered the risk for contrast-nephropathy compared with saline alone (relative risk, 0.62, 95% CI 0.44 to 0.88).

PREVENTION – ACETYLCYSTEINE

Am Heart J. 2004 Sep;148(3):422-9.

A randomized controlled trial of intravenous N-acetylcysteine for the prevention of contrast-induced nephropathy after cardiac catheterization: lack of effect.

Webb JG¹, Pate GE, Humphries KH, Buller CE, Shalansky S, Al Shamari A, Sutander A, Williams T, Fox RS, Levin A.

⊕ Author information

KDIGO guidelines 2012:

“We suggest using oral NAC, together with i.v. isotonic crystalloids, in patients at increased risk of CI-AKI. (2D)”

RECOMMENDATION

1. If possible, CT scanning **without** radiocontrast agents

2. NOT using high osmolal agents

3. Use of iodixanol or nonionic low osmolal agents rather than iohexol

4. Use lower doses of contrast and avoid repetitive

5. Avoid volume depletion and nonsteroidal antiinflammatory drugs

RECOMMENDATION

6. If there are no contraindications to volume expansion, we recommend isotonic intravenous fluids prior to and continued for several hours after contrast administration

7. Acetylcystein be administered the day before and the day of the procedure, based upon its potential for benefit and low toxicity and cost

8. Suggest not using intravenous acetylcystein

9. Recommend NOT using mannitol or other diuretics prophylactically

10. Recommend NOT performing prophylactic hemofiltration or hemodialysis after contrast exposure