Isotonic hydration reduced contrast media-associated nephropathy in elective or emergency coronary angioplasty

Mueller C, Buerkle G, Buettner HJ, et al. **Prevention of contrast media-associated nephropathy. Randomized comparison of 2 hydration regimens in 1620 patients undergoing coronary angioplasty.** Arch Intern Med. 2002 Feb 11;162:329-36.

QUESTION

In patients scheduled for elective or emergency coronary angioplasty, is isotonic hydration more effective than half-isotonic hydration for preventing contrast media-associated nephropathy?

DESIGN

Randomized {allocation concealed*}†, unblinded,* controlled trial with follow-up to 48 hours after coronary angioplasty.

SETTING

A tertiary care cardiac center in Bad Krozingen, Germany.

PATIENTS

1620 patients scheduled for elective or emergency coronary angioplasty. Exclusion criteria were end-stage renal failure with regular hemodialysis, cardiogenic shock, or mechanical ventilation. 1383 patients (85%) (mean age 64 y, 74% men) were included in the analysis.

INTERVENTION

Patients were allocated to isotonic hydration (0.9% saline) (n = 809) or to half-isotonic hydration (0.45% sodium chloride plus 5% glucose) (n = 811). Hydration for emergency angioplasty began immediately on arrival in the catheter laboratory. The infusion rate during angioplasty was adjusted to clinical conditions and was 1 mL/kg of body weight per hour after the procedure until 8:00 the next morning. Hydration for elective angioplasty began at 8:00 the morning of the procedure, with an infusion rate of 1 mL/kg per hour.

MAIN OUTCOME MEASURES

Contrast media-associated nephrotoxicity (increase in serum creatinine level of ≥ 44 µmol/L within 48 h after angioplasty).

MAIN RESULTS

Analysis was by intention to treat. Isotonic hydration reduced contrast media-associated nephrotoxicity more than did half-isotonic hydration (P = 0.04) (Table). Subgroup analysis showed that isotonic hydration reduced nephrotoxicity more than did half-isotonic hydration in women, patients with diabetes, and patients who received ≥ 250 mL contrast (Table).

CONCLUSION

In patients scheduled for elective or emergency coronary angioplasty, isotonic hydration reduced contrast media-associated nephropathy more than did half-isotonic hydration.

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*See Glossary.

†Information provided by author.

Isotonic vs half-isotonic hydration to prevent contrast media-associated nephropathy at 48 hours after elective or emergency coronary angioplasty‡

Patient groups	Isotonic	Half-isotonic	RRR (95% CI)	NNT (CI)
All	0.7%	2.0%	64% (4 to 86)	79 (38 to 1859)
Women only	0.6%	5.1%	89% (34 to 98)	22 (12 to 73)
Patients with diabetes	0%	5.5%	100% (36 to 100)	19 (9 to 54)
Patients receiving ≥ 250 mL contrast	0%	3.0%	100% (49 to 100)	34 (18 to 69)

‡Abbreviations defined in Glossary; RRR, NNT, and CI calculated from data in article.

COMMENTARY

Hypovolemia is a known risk factor for the development of radiographic contrast nephropathy, and it has been shown that hydration with half-isotonic saline lowers the incidence of this adverse outcome. The study by Mueller and colleagues extends these findings by showing that the use of an isotonic solution provides additional benefit. The key to achieving this benefit is ensuring that patients receive an adequate volume of fluid before, during, and after angioplasty (approximately 430, 360, and 1220 mL, respectively, in this study). While such fluid volume may be possible for patients receiving percutaneous coronary intervention, most of whom have at least a 24-hour hospital stay, it would be more challenging to achieve such a volume for diagnostic procedures that require contrast but are done in outpatient settings (e.g., same-day cardiac catheterization and computed tomography). However, optimizing hydration using this safe, effective, and inexpensive intervention is an ideal quality-improvement activity.

One methodologic limitation should be noted: With such a low event rate (2% in the control group), the study was fortunate to detect a difference because it was substantially underpowered (power = 0.46). For patients at particularly high risk, such as those with a history of radiographic contrast nephropathy, elevated baseline creatinine levels, diabetes, or heart failure, some small studies suggest that the use of N-acetylcysteine (1) or fenoldopam (2) may be helpful.

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References

1. **Diaz-Sandoval LJ, Kosowsky BD, Losordo DW.** Acetylcysteine to prevent angiography-related renal tissue injury (the APART trial). Am J Cardiol. 2002;89:356-8.
2. **Kini AS, Miltre CA, Kamran M, et al.** Changing trends in incidence and predictors of radiographic contrast nephropathy after percutaneous coronary intervention with use of fenoldopam. Am J Cardiol. 2002;89:999-1002.