

Renal Replacement Therapies for Prevention of Radiocontrast-induced Nephropathy: A Systematic Review

Dinna N. Cruz, MD, MPH,^{a,b} Ching Yan Goh, MD,^{a,c} Giancarlo Marenzi, MD,^d Valentina Corradi, BS,^a
Claudio Ronco, MD,^{a,b} Mark A. Perazella, MD^e

^aDepartment of Nephrology, San Bortolo Hospital, Vicenza, Italy; ^bInternational Renal Research Institute Vicenza (IRRIV), Vicenza, Italy; ^cDepartment of Nephrology, Selayang Hospital, Selangor, Malaysia; ^dCentro Cardiologico Monzino, University of Milan, Milan, Italy; ^eSection of Nephrology, Department of Internal Medicine, Yale University School of Medicine, New Haven, Conn.

ABSTRACT

BACKGROUND: Radiocontrast-induced nephropathy (RCIN) is an important cause of acute kidney injury, increasing in-hospital and long-term mortality. It is controversial whether prophylactic renal replacement therapy (RRT) may reduce a patient's risk of RCIN when compared with standard medical therapy (SMT).

METHODS: We searched through PubMed and bibliographies of retrieved articles. Published studies of RRT for RCIN prevention in patients receiving radiocontrast were included. The primary endpoint was RCIN incidence, defined as an increase in serum creatinine ≥ 0.5 mg/dL. Results were combined on the risk ratio (RR) scale. Random-effects models were used. Sensitivity analyses were defined a priori to evaluate the effects of RRT modality, study design, and sample size.

RESULTS: Nine randomized controlled and 2 nonrandomized trials were included (n = 1010 patients); 8 studies used hemodialysis (HD) and 3 used hemofiltration or hemodiafiltration. Nine studies had data for primary endpoint; RCIN incidence was 23.3% in the RRT group and 21.2% in SMT. RRT did not decrease RCIN incidence compared with SMT (risk ratio [RR] 1.02; 95% confidence interval [CI], 0.54-1.93); however, intertrial heterogeneity was high. In sensitivity analyses, limiting to only HD studies significantly reduced heterogeneity. HD appeared to increase RCIN risk (RR 1.61; 95% CI, 1.13-2.28) and had no effect on need for permanent RRT or progression to end-stage renal disease (RR 1.47; 95% CI, 0.56-3.89).

CONCLUSION: In this updated meta-analysis, periprocedural RRT did not decrease the incidence of RCIN compared with SMT. HD appears to actually increase RCIN risk.

© 2012 Elsevier Inc. All rights reserved. • *The American Journal of Medicine* (2012) 125, 66-78

KEYWORDS: Acute kidney injury; Acute renal failure; Contrast media; Hemodialysis; Hemofiltration; Radiocontrast; Renal replacement therapy

Radiocontrast-induced nephropathy (RCIN) is a well recognized complication of radiocontrast administration and is the third leading cause of hospital-acquired acute kidney injury. It results in increased in-hospital and long-term morbidity and mortality, prolonged hospitalization, and increased health care costs.¹ Due to advancements in diagnostic and interventional radiological procedures, especially

percutaneous coronary interventions, the use of radiocontrast continues to escalate, and it is increasingly being administered to an older population with risk factors for RCIN.²

Currently, use of isotonic intravenous fluids is the only proven preventive therapy.³ Use of low radiocontrast volumes and avoidance of nephrotoxic medications also are accepted as nephroprotective.

Their relatively small size, lack of protein binding, and small volume of distribution make contrast agents well suited for removal with renal replacement therapies (RRTs).⁴ In fact, provision of "prophylactic" hemodialysis (HD) or hemofiltration (HF) immediately following a contrast load has been utilized to reduce the filtered load of contrast and prevent renal damage, particularly in patients

Funding: None.

Conflict of Interest: None.

Authorship: All authors had access to the data and played a role in writing this manuscript.

Requests for reprints should be addressed to Dinna N. Cruz, MD, MPH, Department of Nephrology, San Bortolo Hospital, Viale Rodolfo 37, Vicenza 36100, Italy.

E-mail: dinnacruzmd@yahoo.com

with chronic kidney disease (CKD). We previously noted in a systematic review that periprocedural RRT does not reduce the occurrence of RCIN compared with standard medical therapy (SMT).⁵ Indeed, there was even a nonsignificant trend for a higher RCIN incidence with periprocedural HD (risk ratio [RR] 1.35, 95% confidence interval [CI], 0.93-1.94). Since that publication, new data on this topic have emerged.⁶⁻¹⁰ In one randomized study, prophylactic HD significantly attenuated the increase in serum creatinine concentration (sCr) after coronary angiography, and also resulted in fewer patients needing temporary RRT.⁸ In view of new findings, it was opportune to re-examine whether prophylactic RRT can prevent RCIN and its related complications.

METHODS

Studies Eligible for Review

Detailed study methods are provided in the Appendix (online). Studies were eligible if they evaluated the use of periprocedural RRT for the prevention of RCIN, as compared with SMT. Studies must have contained 10 or more human subjects. We searched the MEDLINE (PubMed interface) and EMBASE up to March 31, 2011, using Boolean search strategies, without language restriction, as well as searching the top 50 citations for each article through the "related articles" feature of PubMed, and manual search of references from relevant studies. Two authors (CYG, DNC) independently assessed studies for inclusion and extracted data of interest; disagreements were resolved by consensus with the aid of a third party (VC). Study quality was assessed using the Jadad score.¹¹

Data Abstraction and Outcomes

A standardized data abstraction form was used to collect data on study characteristics and outcomes of interest. The primary outcome of interest was RCIN, defined a priori as an increase in sCr ≥ 0.5 mg/dL (44 $\mu\text{mol/L}$).¹² Secondary outcomes of interest were the need for temporary acute RRT, need for permanent RRT (ie, end-stage renal disease), long-term changes in renal function, and death.

Statistical Analysis

Analyses were performed with Review Manager, version 5.0 (RevMan; The Nordic Cochrane Centre, The Cochrane Collaboration 2008, Copenhagen, Denmark). Data from eligible studies were combined by using a random-effects

model, expressed as RR and 95% CIs for outcomes in patients treated with RRT compared with SMT. Level of statistical significance is set at $P < .05$.

Statistical heterogeneity was quantified for pooled results using the I^2 statistic.^{13,14} Sensitivity analyses were planned a priori to evaluate potential sources of heterogeneity, including RRT modality (HD vs HF/hemodiafiltration [HDF]), study design (randomized vs not), and sample size (≥ 20 and ≥ 50 in each group). Post hoc analyses were performed by CKD stages (4-5 vs 3) and discussed separately. For certain endpoints, it was not possible to do all the subgroup analyses because of the small number (≤ 2) of studies involved. We did not assess publication bias because each pooled estimate included fewer than 10 trials.¹⁵

RESULTS

Identification of Eligible Studies

A total of 210 potentially relevant citations were identified and screened. A PRISMA flow diagram¹⁶ detailing the process of study identification and selection is shown in Figure 1. In one observational study, low-risk patients were preferentially treated by hydration only, and high-risk patients treated with HD.⁷ Since the use or non-use of HD depended on baseline risk for RCIN, this would give a biased result and the study was excluded. Eleven studies fulfilled the selection criteria and were included in the quantitative analysis: 9 randomized controlled trials,^{8,9,17-23} and 2 observational studies^{24,25} (Table 1). Of these, 8 evaluated HD while 2 studied HF and one HDF. Two of the 8 HD studies expressed results as change in renal function over time, and were therefore included only in analyses for the need for temporary acute RRT⁸ and chronic RRT.^{8,18} Two trials involved more than 2 intervention arms. In a recent HD study, there were 2 arms that did not receive periprocedural HD for RCIN prevention.⁹ One group received intravenous hydration only, and the other received hydration and oral N-acetylcysteine. Because the objective of our study was to compare an RRT strategy to SMT, the 2 groups were combined for the purpose of this meta-analysis. One HF study compared intravenous hydration and 2 different HF protocols;²⁰ for the current meta-analysis, the 2 HF arms were combined.

Study Quality

The overall methodologic quality of the studies was suboptimal. The median Jadad score was 2, and 1/11 studies had

CLINICAL SIGNIFICANCE

- Despite effective contrast removal, radiocontrast-induced nephropathy (RCIN) occurs at an equal or higher rate in patients undergoing periprocedural hemodialysis than in control patients.
- In contrast to other forms of renal replacement therapy, hemofiltration performed before/after contrast appeared to reduce RCIN in single-center studies.
- Although the data are mixed, patients with advanced chronic kidney disease and other risk factors for RCIN may benefit from periprocedural renal replacement therapy. Future studies should focus on these patients using standardized prophylaxis in controls.

Download English Version:

<https://daneshyari.com/en/article/2716520>

Download Persian Version:

<https://daneshyari.com/article/2716520>

[Daneshyari.com](https://daneshyari.com)