

# Prophylactic hemodialysis after coronary angiography improved renal outcomes in patients with advanced renal failure

Lee PT, Chou KJ, Liu CP, et al. Renal protection for coronary angiography in advanced renal failure patients by prophylactic hemodialysis. A randomized controlled trial. *J Am Coll Cardiol*. 2007;50:1015-20.

**Clinical impact ratings:** Cardiology ★★★★★☆ Nephrology ★★★★★☆

## QUESTION

In patients with advanced renal failure, does prophylactic hemodialysis after coronary angiography prevent contrast-induced nephropathy (CIN)?

## METHODS

**Design:** Randomized controlled trial.

**Allocation:** {Concealed}†.\*

**Blinding:** Blinded {cardiologists and nephrologists}†.\*

**Follow-up period:** 4 days after coronary angiography and at discharge.

**Setting:** Veterans general hospital in Taiwan.

**Patients:** 90 patients > 20 years of age who had advanced renal failure, were referred for coronary angiography, and had stable serum creatinine levels (> 3.5 mg/dL with < 0.5 mg/dL change in 1 mo). Exclusion criteria included administration of an intravascular contrast medium or exposure to nephrotoxic drugs in the past 7 days, use of metformin or nonsteroidal antiinflammatory drugs in the past 48 hours, severe concomitant disease, renal transplantation, and long-term dialysis.

**Intervention:** Prophylactic hemodialysis using a high-flux polysulfone membrane dialyzer (BS1.8 Toray Industries, Tokyo, Japan) ( $n = 42$ ) or no dialysis ( $n = 40$ ) after coronary angiography using nonionic iohexol as the radiocontrast medium. All patients received

intravenous (IV) normal saline, 1 mL/kg per hour, for 6 hours before and 12 hours after contrast-medium exposure. Dialysis was started as soon as possible after angiography, primed by 200 mL normal saline, and given over 4 hours (150 mL/min blood flow and 500 mL/min dialysate flow) through a double-lumen IV femoral catheter inserted before angiography.

**Outcomes:** Change in creatinine clearance from baseline to day 4. Secondary outcomes included elevated creatinine at discharge ( $\geq 1$  mg/dL above baseline) or need for temporary dialysis (oliguria for > 48 h despite administration of > 1000 mg/d IV furosemide or serum potassium level > 6 mEq/L despite administration of oral kayexalate) or permanent dialysis (creatinine clearance < 5 mL/min/1.73 m<sup>2</sup>).

**Patient follow-up:** 91% were included in the analysis (mean age 66 y, 65% men).

## MAIN RESULTS

The prophylactic dialysis group had less reduction in creatinine clearance than the control group (mean decrease 0.4 vs 2.2 mL/min/1.73 m<sup>2</sup>,  $P < 0.001$ ). Day 4 (5.1 vs 6.3 mg/dL,  $P = 0.01$ ) and peak (5.3 vs 6.7 mg/dL,  $P = 0.005$ ) serum creatinine levels were lower in the dialysis group. Fewer patients in the dialysis group required temporary dialysis after angiography or permanent dialysis after discharge (Table).

## CONCLUSION

In patients with advanced renal failure, prophylactic hemodialysis after coronary angiography maintained creatinine clearance and reduced risk for permanent renal damage.

*Source of funding:* No external funding.

*For correspondence:* Dr. H.C. Fang, Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan. E-mail hcfang@isca.vghks.gov.tw. ■

\*See Glossary.

†Information provided by author.

## Prophylactic hemodialysis vs no prophylactic hemodialysis (control) after coronary angiography in patients with advanced renal failure†

| Outcomes                                  | Dialysis | Control | RRR (95% CI)     | NNT (CI)    |
|---|----------|---------|------------------|-------------|
| Temporary dialysis during hospitalization | 2.4%     | 35%     | 93% (63 to 99)   | 4 (3 to 6)  |
| Permanent dialysis after discharge        | 0%       | 13%     | 100% (31 to 100) | 8 (4 to 29) |

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

## COMMENTARY

Chronic kidney disease (CKD) is a major risk factor for CIN. However, few published trials have included patients with advanced CKD, and no study of CIN prophylaxis (including *N*-acetylcysteine) has been large enough to evaluate clinically meaningful endpoints (e.g., need for dialysis or death). Lee and colleagues found prophylactic hemodialysis to be beneficial in preserving creatinine clearance in patients with advanced CKD who were undergoing coronary angiography. In addition, they reported significant reductions in length of hospital stay and need for dialysis.

4 previous studies (1) examined prophylactic hemodialysis for prevention of CIN in patients with CKD, all using different dialysis prescriptions, study endpoints, and lengths of follow-up. Despite showing effective removal of radiocontrast (30% to 80% per session), none of the studies showed a benefit, and the largest study ( $n = 113$ ) showed increased risk for subsequent hemodialysis in the intervention group. All studies had significant methodological flaws and low statistical power.

2 possible reasons for the observed benefit of treatment in Lee and colleagues' study include the use of higher-risk patients than in previous studies (mean serum creatinine at baseline 4.9 mg/dL) and a lower volume of administered radiocontrast (100 vs 250 mL in most comparable

studies), which may be more effectively removed by treatment. However, effective clearance of radiocontrast with the prescribed dialysis dose administered in this study is questionable, and although the need for temporary dialysis was reduced in the dialysis group, too few patients ( $n = 5$ ) needed permanent dialysis to make definitive conclusions.

The results of this small study support the findings of 2 recent studies (1) that evaluated hemofiltration for CIN prevention; however, the benefits of reducing the risk for temporary dialysis in a predialysis population must be weighed against the cost of providing the treatment to all high-risk patients. Larger multicenter trials of contrast-removal strategies using clinically relevant endpoints are warranted. The risks and benefits of procedures requiring parenteral radiocontrast should be carefully evaluated in patients with advanced CKD.

Adam Romanovsky, MD  
Neesh Pannu, MD  
University of Alberta  
Edmonton, Alberta, Canada

## Reference

- Pannu N, Wiebe N, Tonelli M, for the Alberta Kidney Disease Network. Prophylaxis strategies for contrast-induced nephropathy. *JAMA*. 2006; 295:2765-79.