Review: Low-dose dopamine does not prevent acute renal failure or reduce mortality or need for hemodialysis

Kellum JA, Decker JM. **Use of dopamine in acute renal failure: a meta-analysis.** Crit Care Med. 2001 Aug;29:1526-31.

QUESTION

In critically ill patients with or at risk for acute renal failure (ARF), does low-dose dopamine reduce the incidence or severity of ARF, mortality, or the need for hemodialysis?

DATA SOURCES

Studies in all languages were identified by searching MEDLINE (1966 to 1999) and by scanning bibliographies of relevant original studies and reviews.

STUDY SELECTION

Studies were selected if they were clinical trials or meta-analyses that evaluated low-dose dopamine (< 5 µg/kg per min) for the prevention or treatment of ARF in humans and reported outcome data for mortality, need for dialysis, or development or worsening of ARF.

DATA EXTRACTION

Data were extracted on study design (patient selection and randomization procedure), patient characteristics, hospital mortality, incidence and severity of ARF, and use of hemodialysis.

MAIN RESULTS

58 studies were identified; ≥ 1 of the primary outcomes was reported in 24 studies; 17 randomized controlled trials (854 patients) were included in the analysis. Patients who received dopamine did not differ from those who received placebo for mortality (11 trials, n = 508) {P = 0.69}*, development of ARF (11 trials, n = 511) {P = 0.50}*, or need for hemodialysis (10 trials, n = 618) {P = 0.86}* (Table).

CONCLUSION

In critically ill patients with or at risk for acute renal failure, low-dose dopamine does not reduce the incidence of acute renal failure, mortality, or the need for hemodialysis.

Source of funding: No external funding.

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*P values calculated from data provided by author.

Low-dose dopamine vs control for acute renal failure (ARF)†

Outcomes‡	Weighted event rates		RRR (95% CI)	NNT
	Dopamine	Control§		
Mortality	4.9%	5.6%	14% (–66 to 56)	Not significant
Development of ARF	17.9%	19.5%	20% (–14 to 44)	Not significant
Need for hemodialysis	16.2%	16.5%	10% (–21 to 34)	Not significant

†Abbreviations defined in Glossary; RRR, NNT, and CI calculated from data provided by author. A fixed-effects model was used.
‡Duration of follow-up not reported.
§Usually placebo (saline) or no treatment.

COMMENTARY

The long-recognized role of impaired renal blood flow and medullary hypoxia in causing ARF in critically ill patients has prompted the clinical use of interventions aimed at preserving renal hemodynamics and parenchymal perfusion. These interventions have been evaluated in several clinical trials of limited methodologic value; thus, few have been proved to consistently reduce the incidence of ARF, the need for hemodialysis, or death.

Among these interventions, low-dose (< 5 µg/kg per min) dopamine infusion has been advocated on the basis of its potential, shown in preliminary experiments, to increase renal blood flow and urine output by the stimulation of renal dopaminergic receptors and cardiac and arterial adrenergic receptors. However, the direct diuretic effects of dopamine on renal tubules could lead to increased distal solute delivery and increased medullary oxygen consumption, potentially neutralizing the beneficial effect of increased renal blood flow. These phenomena, associated with a potential desensitization of renal dopamine receptors, might explain why the results of most clinical trials are so inconsistent.

The comprehensive meta-analysis by Kellum and Decker included 58 trials published over 33 years. Only 17 studies were randomized controlled trials, and only 24 reported primary outcomes. As often occurs in critical-care settings, the criteria for ARF or indications for hemodialysis were not standardized. 2149 patients were divided into 3 groups according to their clinical indication for dopamine infusion: radiocontrast dye administration; medical or surgical heart disease; or other critical conditions, including transplant patients and neonates. Within each group, as for the whole study population, the results of the meta-analysis are clear and reject the hypothesis of a beneficial effect of dopamine on renal function.

Since the writing of this review, 4 new randomized trials have been published comparing the effects of dopamine alone (1–3) or combined with diuretics (4) to either placebo, saline, or loop diuretics. 3 trials (1–3) failed to show a beneficial effect of dopamine on renal function. Dopamine infusion, alone or with loop diuretics only, should no longer be used to prevent ARF.

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