ACUTE KIDNEY INJURY

Time to get personal with fluid administration and keep contrast-induced injury at bay

The results of the POSEIDON trial (Prevention of Contrast Renal Injury with Different Hydration Strategies) have recently been reported. They show that a personalized hydration strategy—guided by intracardiac pressure—significantly decreases the rate of contrast-induced acute kidney injury (AKI) compared with a standard fluid administration protocol. These findings have important implications for the considerable number of patients who are at risk of contrast-induced AKI.

In patients who are undergoing cardiac catheterization, current clinical practice is to administer fluid around the time of exposure to the imaging agent to avoid contrast-induced AKI. “While fluid administration is generally recommended, preferably with normal saline, there are no head to head comparisons of normal saline fluid administration protocols in patients at risk of contrast nephropathy,” explains lead investigator Somjot Brar. Furthermore, the optimal volume, rate and duration of fluid administration has not been determined in a controlled study, leading to considerable variation in practice. “The lack of clinical trial data on how best to administer normal saline for the prevention of contrast nephropathy is surprising.”

In their study, the researchers used left ventricular end-diastolic pressure, a known intravascular volume metric, to guide volume expansion in patients undergoing cardiac catheterization ($n = 196$). The rate of fluid

administration was adjusted depending on the cardiac pressure (increased for patients with low pressure, reduced for those with high pressure). The rates of AKI and other adverse events after the procedure were compared with patients in the control group who were given fluid at a rate of 1.5 ml/kg per hour ($n = 200$).

The primary end point was an increase in serum creatinine concentration $>25\%$ from baseline, or an absolute increase of 0.5 mg/dl, within 4 days of the procedure. Secondary end points included all-cause mortality, myocardial infarction and the need for renal replacement therapy at 30 days and 6 months.

The overall incidence of contrast-induced AKI was 6.7% in the pressure-guided group and 16.3% in the control group ($P = 0.005$). At 6 months, four patients in the control group and only one patient in the pressure-guided group required renal replacement therapy; this difference was not statistically significant. Furthermore, patients in the pressure-guided group required more volume than those in the control group (1,727 ml versus 812 ml; $P < 0.0001$). Patients who required larger volumes of saline—up to 5 ml/kg per hour in this study, the highest fluid administration rate studied to date—had lower rates of contrast-induced AKI than those who received smaller volumes. “I believe that linking the fluid administration rate to the left ventricular end-diastolic pressure is important to minimize the risk of volume overload,” comments Brar.

Although promising, these results must be regarded carefully. Fluid administration, in particular at the aggressive rate studied

in this trial, is not applicable to all patients undergoing cardiac catheterization. “Physicians should exercise caution in fluid administration for patients with volume overload, acute decompensated heart failure or severe valvular heart disease,” explains Brar. “Further research is needed to identify preventative strategies in these patient populations for whom aggressive fluid administration might not be permissible.”

Indeed, contrast-induced AKI is an area of active research, with researchers looking at a range of factors from biomarkers that can predict risk of injury before contrast administration to factors that might influence the severity of injury in different populations. Brar suggests that noninvasive methods that assess intravascular volume status might enable more-aggressive fluid administration in patients whose left ventricular end-diastolic pressure is not measured. More research is needed to identify what these noninvasive methods might be, and assess them in clinical trials.

“I hope that these data will renew the focus on the importance of fluid administration for the prevention of contrast nephropathy, and heighten the recognition that contrast nephropathy is associated with both short-term and long-term adverse events,” concludes Brar.

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Original article Brar, S. S. *et al.* Haemodynamic-guided fluid administration for the prevention of contrast-induced acute kidney injury: the POSEIDON randomised controlled trial. *Lancet* 383, 1814–1823 (2014).