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Resuscitation with hyperoncotic colloids in the intensive care unit

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Sir,

Artificial colloids display nephrotoxicity, and the pathophysiological mechanisms are of considerable clinical interest [1]. In a cohort study report, Schortgen and collaborators [2] pose the question whether “high-oncotic forces rather than the chemical nature of fluids have a deleterious effect on renal function”. Unfortunately, the question is left unanswered.

The study population of 1,013 intensive care unit patients was divided into four groups according to whether they received (1) crystalloids only, (2) hypo-oncotic colloids (gelatins and/or 4% albumin) with or without crystalloids, (3) artificial hyperoncotic colloids with or without crystalloids or hypo-oncotic colloids, or (4) hyperoncotic 20–25% albumin with or without crystalloids or other colloids. Dextrans and/or hydroxyethyl starches (HES) were placed in the hyperoncotic artificial colloid category. This classification scheme of itself already makes the study uninterpretable.

The in vitro colloid osmotic pressure (COP) of human plasma is approximately 28 mmHg, and

resuscitation fluids of comparable in vitro COP expand the intravascular space by roughly 100% of the administered volume. Such fluids are iso-oncotic. Concentration is a powerful determinant of oncotic properties. All 6% HES solutions, regardless of molecular weight and substitution, are essentially iso-oncotic, whereas 10% HES with an in vitro COP of 80 mmHg is hyperoncotic [3]. Therefore, the designated artificial hyperoncotic colloid group evidently received an unspecified mixture of iso- and hyperoncotic fluid.

Oncotic forces in vivo will also heavily depend on the volumes and properties of co-administered fluids. There was no accounting for concomitant crystalloid used in the three colloid groups or of other colloids with different oncotic properties in the two hyperoncotic colloid groups. Crucially, the plasma COP after fluid infusion was not measured. Consequently, the actual oncotic forces at work in patients remained totally undefined.

Further confounding interpretation was clear bias in fluid selection. Hyperoncotic colloids were reserved for the sickest patients, as evidenced by significantly greater organ dysfunction, high-dose vasopressor use and need for mechanical ventilation at study entry. Multivariate adjustment and propensity scores were applied, but these methods cannot correct for unmeasured variables, and numerous known independent risk factors for acute renal failure (ARF) were not evaluated in this study. Indeed randomized trial evidence makes plain that the attempts to adjust for bias were unsuccessful. Thus, Schortgen et al. observed poorer renal function and increased mortality in the hyperoncotic albumin group. In contrast, in a recent meta-analysis of 25 randomized clinical trials evaluating hyperoncotic

albumin for volume expansion among 1,485 total patients, there was no evidence of renal injury due to hyperoncotic albumin and no effect on survival (relative risk 0.95; 95% confidence interval 0.78–1.17) [4].

Available evidence shows that the type of fluid can govern renal effects irrespective of oncotic properties per se. For example, in randomized trials both iso- and hyperoncotic HES solutions have increased the incidence of ARF in patients with severe sepsis or septic shock [5]. Conversely, in model system studies and clinical trials albumin solutions, including hyperoncotic albumin, have displayed renoprotective activity [1, 4]. Further mechanistic studies are needed to define more precisely the effects of colloids on the kidney.

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