Editorial Commentary

Optimal fluid therapy for thoracic surgery

Eun-Ho Lee

Department of Anesthesiology and Pain Medicine, Laboratory for Perioperative Outcomes Analysis and Research, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

Correspondence to: Eun-Ho Lee, MD, PhD. Professor, Department of Anesthesiology and Pain Medicine, Laboratory for Perioperative Outcomes Analysis and Research, Asan Medical Center, University of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea. Email: leho@naver.com.

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Intraoperative fluid optimization is important for improving the prognosis after thoracic surgery (1,2). Several prior studies have demonstrated that excessive intravenous fluid intake may be linked to an increased risk of pulmonary complications following these operations (3-5). Therefore, a restrictive fluid therapy strategy that aims to achieve a negative fluid balance is currently the preferred technique for achieving a good prognosis after thoracic surgery (2,6). Additionally, and despite known adverse effects such as renal injury and coagulation impairment, colloids including hydroxyethyl starch are often used to reduce the total intravenous fluids administered during thoracic operations (6,7).

Wu *et al.* recently performed a single-center retrospective analysis to assess the effects of intraoperative fluid management on postoperative pulmonary complications in 446 patients undergoing a minimally invasive lobectomy (8). Postoperative pneumonia and composite pulmonary complications were observed in 160 and 172 patients, respectively. This cohort was classified according to the intraoperative total fluid infusion rate (restrictive, moderate, moderately liberal, and liberal) and intraoperative colloid infusion rate (no colloid, restrictive, and moderate). The incidences of postoperative pneumonia and composite pulmonary complications were lowest in the moderate group of the intraoperative total fluid infusion rate and intraoperative colloid infusion rate. After adjustments using multivariable regression analysis, compared with the moderate intraoperative total fluid infusion rate group, the restrictive group [odds ratio (OR) 2.368; 95% confidence interval (CI), 1.250–4.485; P=0.002 for pneumonia, OR 2.202; 95% CI, 1.189–4.078; P=0.012 for pulmonary complications], moderately liberal group (OR 2.814; 95% CI, 1.456–5.436; P=0.002 for pneumonia, OR 2.743; 95% CI, 1.451–5.184, P=0.002 for pulmonary complications), and liberal group (OR 2.576; 95% CI, 1.229–5.403; P=0.012 for pneumonia, OR 2.609; 95% CI, 1.278–5.328; P=0.008 for pulmonary complications) were independently associated with an increased risk of postoperative pneumonia and composite pulmonary complications. Furthermore, compared with the moderate intraoperative colloid infusion rate group, the no colloid group (OR 2.327; 95% CI, 1.293–4.187; P=0.005 for pneumonia, OR 2.095; 95% CI, 1.193–3.680; P=0.010 for pulmonary complications) and restrictive group (OR 3.993; 95% CI, 1.920–8.304; P=0.000 for pneumonia, OR 2.911; 95% CI, 1.443–5.873; P=0.003 for pulmonary complications) were also independently associated with an increased risk of these two adverse events. The authors concluded that differences in the infusion rates of intraoperative total fluids or colloids during the minimally invasive lobectomy are associated with significant differences in postoperative pulmonary complications. They further contended that both restrictive and liberal intraoperative fluid administrations are related to adverse postoperative events and that moderate intraoperative fluid management may yield improved postoperative outcomes.

There are some interesting observations in their study. First, the observations of Wu *et al.* (8) are contrary to other studies reporting that a restrictive fluid therapy is associated with a good prognosis after thoracic surgery (3-5). However, it is now well accepted that not only fluid excess but fluid insufficiency can also be harmful due to a worsening cardiac output and consequent deterioration of tissue perfusion (9). Indeed, the findings of Wu *et al.* (8) are in accordance with recent studies showing that the restriction of intraoperative fluid administration can be linked to increased morbidity and mortality (10,11). In a recent report by Shin *et al.* (11), a U-shaped relationship was observed between the amount of fluid administered during surgery and poor postoperative outcomes. Second, Wu *et al.* reported that an intraoperative colloid infusion rate >3.8 mL/kg/h was related to a lower incidence of postoperative pneumonia and composite pulmonary complications, without increasing the risk of postoperative acute kidney injury (8). This finding is in agreement with other previous animal and clinical studies that report beneficial effects of hydroxyethyl starch solution for intravascular volume replacement (12-14). Given the limitation of the study design of Wu *et al.* (8), there is no clear explanation for their findings. However, and as suggested in previous studies, the mechanisms responsible for these results involve a lower incidence of lung edema and decreased mechanical stress, or a lower intraoperative fluid balance (12,13).

Appropriate intravenous fluid therapy is considered to be an integral part of anesthetic care during thoracic surgery in order to reduce postoperative pulmonary complications (1,2). However, despite extensive research to date, there remain ongoing debates about optimal intraoperative fluid therapy. There are also wide variations in current practices in terms of the type, timing and volume of fluid administered between different clinicians and institutions (1-7). The study of Wu *et al.* (8) adds a new perspective to our current knowledge of fluid management during thoracic surgery. However, questions about optimal fluid management strategies such as the type of fluid used, the timing and extent of fluid therapy, and monitoring of the patient's volume status, are still unresolved. Studies aimed at developing optimal fluid therapy protocols for thoracic surgery should therefore continue.

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Footnote

Conflicts of interest: The author has no conflicts of interest to declare.

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