

Fluid balance in major abdominal surgery deserves more exploration

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Professor Myles and his team have published their latest study entitled “*Restrictive versus Liberal Fluid Therapy for Major Abdominal Surgery*” in the *New England Journal of Medicine* (1). This international study enrolled 2,983 patients undergoing major abdominal surgery in seven countries. The patients were randomized into two groups using different perioperative and postoperative fluid management, and several outcomes were evaluated. The researchers concluded that a significantly higher morbidity rate for acute kidney dysfunction was observed in the restrictive fluid therapy (RFT) group than in the liberal fluid therapy (LFT) group. This indicates that LFT appears to be a better choice for major abdominal surgery patients throughout the perioperative period, which is contrary to the enhanced recovery after surgery (ERAS) recommendations (2-5). We consider this finding warrants further detailed discussion owing to differences with respect to previous published data.

In this study, patients in the LFT group received almost twice the crystalloid volume than those in the RFT group during surgery or on day 1 postoperatively. One multicentre study found that non-survivors had 500 mL of excess liquid (1,950 and 1,400 mL in the LFT and RFT groups, respectively), and fluid balance was an independent factor for death after surgery, which was further confirmed in a study of rectal cancer surgery (6,7). More fluid balance also implies a longer stay in ICU, a higher infection probability, and cardiorespiratory

complications (6). However, patients in Myles *et al.*'s study had a considerably higher fluid volume in both the RFT and LFT groups than in previous studies, and excess fluid in the LFT group, although this resulted in a similar incidence of complications such as a septic outcome, death or pulmonary oedema, and markedly lower surgical site infection rate. No difference in pancreatotomy complications was observed between the LFT and RFT groups (8). However, a more elaborate multicentre random trial used three levels of fluid therapy in pancreatotomy: restrictive, intermediate, and liberal fluid administration. That study concluded that RFT was associated with a reduced mortality, less severe complications, and shorter length of hospital stay (9). From the perspective of ERAS, more liberal fluid than necessary would lead to more postoperative complications, including delayed intestinal function recovery, delayed wound healing, and even acute cardiac dysfunction. It is noteworthy that these markers were not included in the analysis of Myles *et al.* Another pooled study indicated that “goal-directed” fluid therapy also used more fluid than in their LFT group, although the outcomes were completely different. In that study, LFT was associated with a higher risk of pneumonia, renal complications, time to first bowel movement, and length of hospital stay (10). In addition, more centres participating in the study increases the potential risk of an evaluation bias. Researchers from different centres had different standards for judgment, despite training, as the results from New

Zealand on death or disability in this study indicated. A subgroup analysis also seems necessary for the secondary results. Additionally, fewer than 1/3 of the patients had been managed in accordance with ERAS practice, thus masking possible differences between the LFT and RFT groups.

Moreover, we noted that patients in this study were selected with moderate-to-high risk after surgery (1,11). They were older or suffered from cardiac or renal diseases or were diagnosed with a higher body mass index or with hypoproteinaemia. In particular, patients with renal disorders are likely to have acute renal injury (ARI) because of inadequate renal perfusion. Generally, they require re-evaluation to determine whether they are fit for liquid restriction, especially when applying an ERAS approach. In this study, the ARI rate in patients with renal disease needed to be evaluated after fluid management, as well as the percentage of patients with existing heart disease who developed acute heart dysfunction. With more sophisticated comparisons, it would be possible to evaluate the extent of the effects of different fluid strategies in response to those with moderate-to-severe renal failure.

Furthermore, Myles *et al.* identified that patients in the LFT group had a decreased percentage of oliguria or anuria compared to those in the RFT group. Two points need to be considered. One is that more patients used diuretics in the LFT group than in the RFT group, although without statistical significance. Another is that the patients only gained approximately 1.6 kilograms in the LRT group in this study, while patients in other studies gained between 3 and 6 kilograms, which is also a variate. Besides these considerations, many other factors, such as the type of fluids, organ function monitoring standards, and risk stratification of the targeted populations, could become new interference covariates (12). Nevertheless, Myles *et al.* also concluded that the results of this study cannot be considered as strong evidence in support of excess intravenous fluid due to incomplete blinding bias in clinical practice and the loss of some data.

In conclusion, this multicentre study using the largest sample size to date encourages a reconsideration of the importance of fluid management during the perioperative period. We look forward to more associated studies with various stratifications of risk populations and targeted discussion.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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