Viewpoint

Fluids in abdominal surgery: what is the goal?

Oliver S. Eng

Division of Surgical Oncology, Department of Surgery, City of Hope National Medical Center, Duarte, CA, USA

Correspondence to: Oliver S. Eng, MD. Division of Surgical Oncology, Department of Surgery, City of Hope National Medical Center, 1500 E Duarte Rd, Duarte, CA 91010, USA. Email: oeng@coh.org.

Provenance: This is an invited Viewpoint commissioned by Editor-in-Chief Yilei Mao (Department of Liver Surgery, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing, China).

Comment on: Myles PS, Bellomo R, Corcoran T, *et al.* Restrictive versus Liberal Fluid Therapy for Major Abdominal Surgery. N Engl J Med. 2018;378:2263-74.

Submitted Jun 06, 2018. Accepted for publication Jun 11, 2018.

doi: 10.21037/hbsn.2018.06.07

View this article at: http://dx.doi.org/10.21037/hbsn.2018.06.07

In the early 2000s, the approach to perioperative fluid management in major abdominal surgery underwent a paradigm change in favor of restrictive, rather than standard or liberal, fluid regimens. The basis for this shift in philosophy was a result of randomized controlled trials such as one by Brandstrup *et al.*, which demonstrated improved morbidity and outcomes with perioperative fluid restriction (1). With similar results reported across a variety of other prospective trials, the practice of perioperative fluid restriction garnered more support and acceptance (2,3).

Myles *et al.* recently published a randomized controlled international trial of 3,000 patients undergoing major abdominal surgery who were at risk for perioperative complications (4). Patients were randomized to either a restrictive or liberal perioperative fluid administration protocol, with the primary endpoint of disability-free survival at 1 year. The authors found that contrary to their original hypothesis, disability-free survival did not differ between the groups, and the patients who received a restrictive fluid regimen experienced a higher rate of acute kidney injury. Thus, the authors concluded, "*a regimen that includes a modestly liberal administration of fluid is safer than a restrictive regimen.*" (4).

The findings by Myles *et al.*, while unexpected, may not be completely surprising. In an Editorial response by Dr. Brandstrup, she comments that the 1.6 and 0.3 kg weight increases in the liberal and restrictive arms respectively were much less compared to the previously reported trials that did indeed show a difference between regimens (1,5). In addition, intraoperatively, the median infusion rate of intravenous fluids was 10.9 mL/kg/hr in the liberal arm versus 6.5 mL/kg/hr in the restrictive arm. In contrast, Nisanevich *et al.* stratified patients to a liberal arm which included a 10 mL/kg fluid bolus on induction followed by intravenous fluids at 12 mL/kg/hr intraoperatively, and a restrictive arm of 4 mL/kg/hr intraoperatively (with no bolus on induction) (2). Complications, length of stay, and time to return of bowel function were increased in the liberal arm (2). Another study demonstrated poorer postoperative pulmonary function and increased hypoxemia with an intraoperative fluid regimen of 18 mL/kg/hr in patients undergoing elective colon surgery, while fluid rates greater than 15.7 mL/kg/hr in patients undergoing cytoreductive surgery with hyperthermic intraperitoneal chemotherapy are associated with increased overall morbidity (6,7).

In the context of the current literature, the concept of an optimal amount of fluid administration in major abdominal surgery remains an open question. How much is enough? How much is too much? In a time where heterogeneity exists amongst fluid regimens across randomized trials, it can be challenging to interpret the meaning of results, especially discordant ones. Strengths of the Myles *et al.* trial include its multicenter international cohort of 3,000 patients and long duration of follow up (4). However, what is particularly noteworthy in this trial is that both liberal and restrictive arms utilized goal-directed fluid therapy devices and algorithms. Furthermore, safeguards utilizing goal-directed therapy (GDT) for bleeding and hypotension were integrated into the protocols (4). The concept of GDT has also been reported extensively in the literature (3). For example, in 2005, Wakeling *et al.* published on a randomized trial

comparing esophageal Doppler-guided intraoperative fluid management versus central venous pressure (CVP)-based management, and found that patients in the Doppler-guided group experienced shorter lengths of stay, faster return of bowel function, and decreased overall morbidity (3).

Maintaining a state of "zero balance" has been one of the main tenets of restrictive fluid regimens due to the significant reduction of complications seen in other studies (1,5). Nevertheless, the findings from Myles *et al.* provide a cautionary reminder about potential consequences of fluid restriction (4). Independently, the concept of GDT in itself is based on giving intravenous fluids in relation to a dynamic assessment of physiologic need. As such, an understated but significant contribution that this study provides is a window into the effects of different fluid regimens in the context of GDT algorithms. In addition, many non-invasive hemodynamic monitoring devices exist to aid in GDT.

In summary, we must remain mindful of the negative sequelae of both fluid overload and under-resuscitation (1,4). The trial by Myles *et al.* is a well-designed, comprehensive assessment of fluid management in contemporary abdominal surgery, showing that in the context of GDT, a modestly liberal fluid regimen is safe. As we have evolved in our thinking about how to manage patients in the perioperative period, perhaps focusing our resuscitation efforts on GDT with the aid of hemodynamic monitoring devices, rather than philosophical fluid administration, may be the best way to optimize outcomes.

Acknowledgements

None.

Cite this article as: Eng OS. Fluids in abdominal surgery: what is the goal? HepatoBiliary Surg Nutr 2018;7(3):227-228. doi: 10.21037/hbsn.2018.06.07

Footnote

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

References

1. Brandstrup B, Tønnesen H, Beier-Holgersen R, et al. Effects of intravenous fluid restriction on postoperative complications: comparison of two perioperative fluid regimens: a randomized assessor-blinded multicenter trial. Ann Surg 2003;238:641-8.
2. Nisanevich V, Felsenstein I, Almogy G, et al. Effect of intraoperative fluid management on outcome after intraabdominal surgery. Anesthesiology 2005;103:25-32.
3. Wakeling HG, McFall MR, Jenkins CS, et al. Intraoperative oesophageal Doppler guided fluid management shortens postoperative hospital stay after major bowel surgery. Br J Anaesth 2005;95:634-42.
4. Myles PS, Bellomo R, Corcoran T, et al. Restrictive versus Liberal Fluid Therapy for Major Abdominal Surgery. N Engl J Med. 2018;378:2263-74.
5. Brandstrup B. Finding the Right Balance. N Engl J Med. 2018;378:2335-36.
6. Holte K, Foss NB, Andersen J, et al. Liberal or restrictive fluid administration in fast-track colonic surgery: a randomized, double-blind study. Br J Anaesth 2007;99:500-8.
7. Eng OS, Dumitra S, O'Leary M, et al. Association of Fluid Administration With Morbidity in Cytoreductive Surgery With Hyperthermic Intraperitoneal Chemotherapy. JAMA Surg 2017;152:1156-60.

