Turk J Anaesthesiol Reanim 2016; 44: 322-3 DOI: 10.5152/TJAR.2016.26539

Intraoperative Fluid Therapy: Revision is Desirable

İntraoperatif Sıvı Tedavisi: Tekrar Gözden Geçirmek Gerekli

Enrico Giustiniano[1], Fabio Procopio[2]

[1]*Department of Anesthesia and Intensive Care, Humanitas Clinical and Reseach Hospital, Rozzano, Milan, Italy*

[2]*Department of Hepatobiliary and General Surgery, Humanitas Clinical and Research Hospital, Rozzano, Milan, Italy*

Goal-directed fluid therapy (GDFT) has been shown to affect the perioperative outcome in major surgery. Specifically, a 'restrictive' volume load is preferable to 'liberal' management, given that the first protocol is associated with lower morbidity and mortality (1, 2).

What does 'restrictive' fluid administration mean? A target rate of volume load may be not enough for some cases or may be excessive for others.

More than 30 years ago, Chan et al. (3) reported that in an animal model, even 5 mL kg^{-1} h^{-1} of crystalloids may double the tissues' oedema due to surgical manipulation (3). We learned that the 'third space' does not exist as a quantitative 'place'. It is a not so well-defined compartment where the fluid may shift from the intravascular space.

Given this uncertainty about the intraoperative fluid load, we consider that the least worst approach may be haemodynamic-targeted intraoperative fluid management.

Moreover, the choice of fluid plays a crucial role. Crystalloids quickly abandon the intravascular bed towards the interstitial space, whereas colloids have a more haemodynamic-sustaining effect. Along with surgical insult, crystalloids may deteriorate the endothelial glycocalyx. Colloids are 'context sensitive'; when administered during normal volaemia, they leave the vascular bed towards the interstitial space, whereas during hypovolemia, they have been shown to be haemodynamically effective (4).

Based on these premises, we intuitively consider how it is important to both monitor haemodynamics and adopt effective therapy to restore or maintain the cardiocirculatory balance: Volume load or vasoactive drugs? Which fluid solution? How much do we have to fill the circulatory bed?

Nowadays, several methods, which are less invasive than a pulmonary artery catheter that is affected by risks of its invasiveness, are available to answer the above-mentioned questions. The UK National Health Service protocol of fluid management that resulted in ameliorated postoperative outcome and a cost-saving policy demonstrated that it is not important which device is used, rather how the therapy is monitored.

It is difficult to manage intraoperative fluid therapy without a guide. We consider that the fluid balance (next to 'zero' in enhanced recovery after surgery protocols) cannot be assumed as a unique target for adequate volume load. Patient, type of surgery and cardiovascular function cannot be depicted by the difference between fluid input and output.

In has recently been reported that GDFT may not the main factor affecting outcome; on the contrary, monitoring plays a crucial role (5). The new concept of 'functional haemodynamic monitoring' (introduced by Pinsky MR and Peyen D) may be very helpful to understand whether circulatory impairment will recover by volume load, vasoactive drugs or both (6).

Finally, almost all studies on GDFT used colloid-based solutions for restrictive therapy or compared hetastarch and crystalloid solutions. After the European Medicines Agency and United States Food and Drug Administration in 2013 drastically limited the administration of hetastarch solutions, we have not any equally hemodynamically effective fluid. Consequently, we suggest that previous indications for GDFT be reviewed.

Address for Correspondence/Yazışma Adresi: Enrico Giustiniano E-mail: enrico.giustiniano@humanitas.it

Received / Geliş Tarihi : 18.10.2016
Accepted / Kabul Tarihi : 20.11.2016

The debate between Della Rocca and Licker (7-10) on the 'optimisation' of fluid management compares two points of view: a monitored fluid regimen and a target-rate fluid administration. In particular, Licker questions the thoracic surgery theatre and reports that 1–3 mL kg^{-1} h^{-1} of balanced solutions may be the best choice. We consider that despite the fact that it may be true for a 'simple' pulmonary resection, it may not be true for pleural resection as such an operation is affected by a very high fluid loss. We disagree with the assumption that monitoring is justified only for educational and scientific purposes. Fortunately, hemodynamic monitoring is adopted worldwide, and because of it, we understand circulatory impairment and its prediction and treatment in detail.

Furthermore, despite the concept of fluid responsiveness decays in open chest surgery, reports exist in the literature about the usefulness of hemodynamic functional indices in pulmonary resection surgery (11).

In conclusion, GDFT should consider the health status of the patient including comorbidities, the type of surgery and 'functional' hemodynamic monitoring. Based on these considerations, the new definition may be patient-monitored fluid therapy. Researchers can really *grapple* with new studies.

References

1. Grocott MP, Mythen MG, Gan TJ. Perioperative fluid management and clinical outcomes in adult. Anaesth Analg 2005; 100: 1093-106. [CrossRef]
2. Brandstrup B, Tønnesen H, Beier-Holgersen R, Hjortsø E, Ørding H, Lindorff-Larsen K, et al.; Danish Study Group on Perioperative Fluid Therapy. Effects of intravenous fluid restriction on perioperative complications: comparison of two perioperative fluid regimens. A randomized assessor-blinded multicenter trial. Ann Surg 2003; 238: 641-8. [CrossRef]
3. Chan ST, Kapadia CR, Johnson AW, Radcliffe AG, Dudley HA. Extracellular fluid volume expansion and third space sequestration at the site of small bowel anastomoses. Br J Surg 1983; 70: 36-9. [CrossRef]
4. Rehm M, Haller M, Orth V, Kreimeier U, Jacob M, Dressel H, et al. Changes in blood volume and hematocrit during acute preoperative volume loading with 5% albumin or 6% hetastarch solutions in patients before radical hysterectomy. Anesthesiology 2001; 95: 849-56. [CrossRef]
5. Pearse RM, Harrison DA, MacDonald N, Gilles M, Blunt M, Ackland G, et al.; for the OPTIMISE Study Group. Effect of perioperative, Cardiac Output-guided hemodynamic therapy algorithm on outcome following major gastrointestinal surgery. JAMA 2014; 31: 2181-90. [CrossRef]
6. Pinsky MR, Peyen D. Functional Hemodynamic Monitoring. Update in Intensive care Medicine. Jean-Luis Vincent Series Editor. 2011 Springer-Verlag Berlin Heidelberg.
7. Della Rocca G, Vetrugno L. What is the Goal of Fluid Management "Optimization"? Turk J Anaesthesiol Reanim 2016; 44: 224-6. [CrossRef]
8. Licker M, Triponez F, Ellenberger C, Karenovics W. Fluid Therapy in Thoracic Surgery: A Zero-Balance Target id Always Best! Turk J Anaesthesiol Reanim 2016; 44: 227-9. [CrossRef]
9. Licker M, Triponez F, Ellenberger C, Karenovics W. Less Fluids and a More Physiological Approach. Turk J Anaesthesiol Reanim 2016; 44: 230-2. [CrossRef]
10. Della Rocca G, Vetrugno L. Fluid Therapy Today. Where are we? Turk J Anaesthesiol Reanim 2016; 44: 233-5. [CrossRef]
11. Suehiro K, Okutani R. Stroke volume variation as a predictor of fluid responsiveness in patients undergoing one-lung ventilation. J Cardiothorac Vasc Anesth 2010; 24: 772-5.[CrossRef]