



Journal of Anaesthesiology Clinical Pharmacology

Vol. 26**No. 1****January, 2010**

EDITORIAL

Fluid Therapy During Major Bowel Surgery - Restrictive or Liberal ?

Major bowel surgery is commonly performed for cancer, diverticulitis and inflammatory bowel disease. To improve quality of perioperative care, evidence-based enhanced recovery (ER) protocol for colorectal surgery has been suggested. Fluid therapy is an important component of ER protocol.¹ There is evidence that fluid regimen influences postoperative complications and outcome.

During major bowel surgery number of factors modify fluid requirement including preexisting medical conditions, type and duration of surgery, anaesthetic technique, set targets e.g. urine output, central venous pressure. The stress response associated with it causes fluid retention. More 'liberal' approach includes fluid administration as preloading before establishment of regional anaesthesia, to counter vasodilatation induced by anaesthetic drugs and to compensate for preoperative bowel preparation. Consequently, daily positive fluid balance is not uncommon during postoperative period.

Recently, fluid management has been focus of number of studies,^{2,3} metanalysis^{4,5} and systematic reviews.⁶ Traditional concepts and methods of fluid administration during perioperative period have been challenged. Various terminologies have emerged like, standard (routine), liberal (high volume), restrictive (low volume) and goal directed (targeted) fluid therapy.

Routinely, fluid requirement is calculated by taking considerations of pre-existing deficits, maintenance requirements and replacement of loss depending on mild, moderate or major surgery. Since early sixties, practise of large amounts of fluid administration was established in order to replace 'third space' loss. This is still standard in many hospitals. Jacob et al⁷ have questioned the existence of third space.

There are no clear definitions to describe volume status - normo or hyper or hypovolemia. Various authors have studied 'liberal' and 'restrictive' fluid therapy and their effects on postoperative outcome.⁶ Volume administered was variable among these studies. Rahbari et al⁴ have made an attempt to define 'standard (as per Miller's textbook recommendation), 'restrictive' (less than 10% of standard) and 'supplemental' (more than 10% of standard) fluid therapy. Based on these definitions, their metanalysis showed significant reduction in postoperative morbidity with restrictive fluid administration. Another interesting finding was that fluid restriction should include intraoperative period to gain its beneficial effects. With restrictive fluid regimen reduction in length of stay, improved pulmonary function and better gastrointestinal recovery have been reported after major colon surgery.³ In contrast, Holte et al⁸ reported increased morbidity following fast track colon surgery with fluid restrictive regimen. In fact, one trial of restricted IV fluid therapy (<1.5 L/24 hrs) during postoperative patients in patients undergoing major abdominal surgery was abandoned due to increased risk for major complications and prolonged hospital stay (<http://www.trialsjournal.com/content/10/1/50> accessed on 9th November, 2009). The varying results are due to differences in the methodology of these studies, for example, lack of standardization for volume and type of fluid chosen for replacement.⁶

'Standard' (routine), 'liberal' or 'restrictive' regime may not be appropriate for high risk patients for major bowel surgery. Patients with poor organ functional reserve demand an individualized fluid management to achieve optimal fluid balance. To assess volume status of patient wide range of clinical (e.g capillary refill), physiological (e.g heart rate and pulse pressure, urine output) and biochemical parameters (blood base deficit and lactate level) are useful. Commonly used continuous parameters such as circulating pressures or filling pressures (e.g. CVP) often do not correlate with volume status of the patient. They are also affected by a wide variety of factors such as concurrent drug therapy and type of

ventilation. Stroke volume (SV) measurement with the use of Oesophageal Doppler (OD) is frequently studied end point for goal directed (GD) fluid management during major abdominal surgery.⁵

In principle, GD strategy allows early detection of fluid deficits and timely intervention in the form of administration of fluid boluses to optimize targeted haemodynamic goal. Usually, colloids are used as fluid bolus and the targeted haemodynamic parameter is SV. GD fluid therapy with OD has been found to reduce gastrointestinal complications (paralytic ileus, postoperative nausea and vomiting) following both major abdominal and other surgery.⁵ It is associated with overall improved postoperative outcome, early oral intake, less requirement of ICU admission and shorter hospital stay.^{4,5} Optimal circulating volume achieved with GD fluid balance also corrects splanchnic hypoperfusion which is an important cause of minor and major gastrointestinal complications.⁵ However, OD is not suitable for use in awake patients and involves cost issue. GD strategy has been reported with other dynamic variables derived from arterial pulse contour analysis (PCA) like systolic pressure variation, pulse pressure variation, stroke volume variation. Yet, there is no robust comparison of SV derived from OD with other PCA derived targets to judge fluid responsiveness during surgery. GD therapy with central venous oxygen saturation monitoring has been found to reduce mortality in patients with sepsis but is not widely used during perioperative period.

As far as choice of fluid is concerned, combination of crystalloid and colloid may be useful. There are differences in the pharmacokinetics and systemic effects of individual crystalloid and colloid fluid. The judicious use of oxygen therapy, vasopressors and adequate Hb level can complement fluid management and improve systemic oxygen delivery. It is important to change fluid prescription with changes in patient's clinical condition or physiological parameters e.g. electrolyte imbalance or development of sepsis.

In summary, fluid therapy is not a simple and routine task. Balance among various body fluid compartments is a continuous and dynamic process. Optimal fluid therapy is challenging as the exact loss of fluid is difficult to determine and organs do not respond uniformly to such losses. There is no single fluid regime which will provide optimal fluid volume to all surgical patients all the time. Extreme approaches of 'restrictive' and 'liberal' fluid administration can lead to hypo and hypervolemia respectively. Volume and type of fluid administered and its timing are important determinants of postoperative outcome. Currently, GD strategy to optimize fluid management with OD has been found to be beneficial for patients undergoing major colo-rectal surgery. This evidence is from small number of studies involving few hundred of patients. However, it has set the stage for large multi-centre trials.

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