Major elective gastrointestinal surgery: does fluid restriction improve outcome?

Controversy regarding fluid therapy for major surgery dates back to the 1950s and is largely based on two differing concepts: the first, that the metabolic and stress response to surgery causes water and sodium retention, and the second, that there is redistribution of fluid into a hypothetical 'third space' leading to a fall in intravascular volume. Aggressive perioperative fluid resuscitation is the standard of care provided by many anaesthetists, however, evidence seems to suggest that this is flawed. Unfortunately, the answer is not as simple as following a restrictive fluid regimen.

Restrictive perioperative fluid administration

Fluid replacement is normally guided by calculation of preoperative deficits and maintenance requirements, fluid preloading (epidural insertion), and replacement of perioperative blood loss, urine output, and perceived loss into the third space. The numerous confounding factors governing any one of these parameters mean that there is no accurate way of estimating the amount of volume needed. There is an association between excessive postoperative intravascular volumes and increased morbidity and mortality. Lowell et al (1990) found that patients who gained more than 20% body weight had a 100% mortality rate, and those who gained 10% body weight had 31.6% mortality rate *vs* 10.3% in those who gained <10% of their body weight.

Excess fluid may contribute to pneumonia and respiratory failure. It increases cardiac demand leading to myocardial dysfunction and pulmonary oedema. Intestinal oedema may inhibit gut motility and prolong postoperative ileus, predisposing to bacterial translocation and thus sepsis. Coagulopathy and impaired wound healing as a result of cutaneous oedema may also result (Girish, 2005).

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Studies suggest that a restrictive fluid regimen favours a better outcome in intra-abdominal surgery. Studies where patients were randomized to either 'restrictive' or 'liberal' fluid resuscitation, in the intraoperative or postoperative periods, have showed reductions in complication rate and hospital stay, shortening of gastric emptying time, and improvement in time to return of normal bowel function (Brandstrup et al, 2003; Nisanevich et al, 2005).

Liberal perioperative fluid administration

It is important to look at the compatibility of published studies with what is routine practice in the UK before any conclusion can be reached. Standard practice in Scandinavia, where Brandstrup's study was conducted, differs from that in the UK. Not all the patients in the study were treated with bowel preparation; this can result in a fluid deficit of up to 2.5 litres. Thus, patients in the UK may have a larger preoperative deficit compared to the patients in that study. Fluid management in both the restrictive and standard groups were guided by the blood pressure, heart rate and urine output. These are poor markers of intravascular volume status and may have contributed to the standard protocol group receiving larger amounts of fluids.

Other studies, where fluid administration was guided using more accurate measures of haemodynamic status, such as oesophageal Doppler, show a decrease in morbidity and length of hospital stay after major surgery in patients having goal directed intraoperative fluid therapy (Gan et al, 2002; Noblett et al, 2006).

Hypovolaemia and an inadequate cardiac output lead to splanchnic hypoperfusion before systolic blood pressure falls. This may contribute to gut hypoperfusion, bacterial translocation, and the release of the cytokine IL-6. It is not the total volume but early goal-directed filling and maintenance of intra-operative haemodynamic parameters that limit increases in IL-6 levels (Noblett et al, 2006).

Conclusions

Too much or too little fluid can affect outcome. The aim should be to optimize circulatory volume while avoiding overloading the patient. This should be goal directed, using the various haemodynamic monitors we have at our disposal rather than by the application of fluid regimens that are generically applied to all patients. Doctors should also ensure patients are normovolaemic before the start of surgery. Other factors such as patient co-morbidity, duration of preoperative fasting period and surgery, the type of fluid used, pain management, return to oral feeding and patient mobilization all play a role in outcome. More studies assessing all these variables need to be conducted before any conclusions are reached regarding fluid management. BJHM

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