

Perioperative fluid therapy

Fluids are usually administered perioperatively to maintain euvolaemia and adequate oxygen delivery, but administration of too little or too much fluid can cause problems. This article summarises the current evidence on the type of fluid and volume best administered in the perioperative period.

Introduction

Fluids are usually administered perioperatively to maintain euvolaemia and adequate oxygen delivery. Too little fluid risks organ dysfunction and shock, while too much fluid can lead to pulmonary oedema, tissue oedema, wound infections and anastomotic breakdown. This article summarises the current evidence on the best type and volume of fluid to be administered in the perioperative period. The key recommendations for perioperative fluid therapy are summarised in [Table 1](#).

Type of fluid

Balanced crystalloids such as Hartmann's solution are preferred to 0.9% sodium chloride as intravenous maintenance fluids, as they contain similar concentrations of sodium, potassium and chloride to plasma. Owing to its high chloride content, 0.9% sodium chloride may cause hyperchloraemic acidosis and acute kidney injury. Whether colloids have any benefit over crystalloid solutions when volume replacement is needed remains unclear (Miller and Myles, 2019). In a patient with a major haemorrhage, blood products remain the best way of restoring circulating volume.

Preoperative phase

Unrestricted consumption of clear fluids is routinely allowed up to 2 hours before elective surgery, and such patients should not be allowed to become dehydrated and hypovolaemic. If there is concern about the fluid status of a patient undergoing elective surgery, intravenous fluids should be started. Enhanced recovery after surgery pathways encourage use of oral carbohydrate-containing solutions as they reduce protein catabolism and improve insulin sensitivity (Thiele et al, 2016). Most patients undergoing emergency surgery will need preoperative intravenous fluids.

Intraoperative phase

Restrictive fluid management has been popular as part of enhanced recovery after surgery pathways, as it was shown that there was no significant difference between outcomes using

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Table 1. Key recommendations for perioperative fluid therapy

1. Minimise fasting times – allow clear fluids until 2 hours before elective surgery
2. Moderately liberal approach to intravenous fluids – 1–2 litres positive fluid balance or 10–12 ml/kg/hr for major abdominal surgery intraoperatively and 1.5 ml/kg/hr in the first 24 hours postoperatively
3. Ensure intravascular volume status is optimised before starting vasopressors
4. Use haemodynamic monitoring to measure fluid responsiveness in high-risk patients undergoing major surgery
5. Switch from intravenous to oral fluid therapy early

Adapted from Miller and Myles (2019)

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this or goal-directed fluid therapy (Brandstrup et al, 2012). However, current evidence now favours a moderately liberal approach to fluid administration over a restrictive one. The RELIEF trial showed that restrictive regimens significantly increase the risk of acute kidney injury, although they do not reduce disability-free survival (Myles et al, 2018). For major abdominal surgery, a moderately liberal fluid regimen has been suggested as 10–12 ml/kg/hr of crystalloid during the intraoperative period. In simple terms, this can be achieved by aiming for a positive fluid balance of 1–2 litres at the end of surgery. Day-case procedures, such as laparoscopic cholecystectomy, require less fluid, needing a net balance of 0–1 litres (Miller and Myles, 2019).

The evidence surrounding goal-directed fluid therapy is beyond the scope of this article. Goal-directed fluid therapy may not benefit all patients undergoing elective major abdominal surgery, particularly those on enhanced recovery after surgery pathways (Rollins and Lobo, 2016). However, most institutions agree that high-risk patients undergoing major surgery may benefit from cardiac output monitoring. Fluid volume status should be optimised before commencing vasopressors to treat hypotension (Miller and Myles, 2019).

Postoperative phase

Early resumption of oral fluid intake should be encouraged, as excess intravenous fluid can cause tissue oedema and poor wound healing. However, the RELIEF study showed that continuing a restrictive fluid regimen 24 hours postoperatively led to increased rates of oliguria and acute kidney injury (Myles et al, 2018). For this reason, intravenous fluids should be continued when patients are unable to maintain their oral intake. Crystalloid solutions at a rate of 1.5 ml/kg/hr have been suggested for this purpose (Miller and Myles, 2019).

Conclusions

Current evidence favours a moderately liberal approach to fluids in major surgery, using a balanced crystalloid solution as first-line. Oral fluids should be continued until 2 hours before elective surgery, and recommenced as soon as possible afterwards.

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