RCT Summary

DELTEX MEDICAL

Oesophageal Doppler guided fluid management in patients undergoing bowel surgery reduces complications and length of hospital stay – a surgeon-led double blind randomised controlled trial

Noblett SE, Snowden CP, Shenton BK, Horgan AF. *Randomised clinical trial assessing the effect of Doppler-optimized fluid management on outcome after elective colorectal resection.* Br J Surg 2006; 93:1069-1076

Clinical Application: Intra-operative

This trial was undertaken as part of the development an evidence-based enhanced surgical recovery programme and compared the impact of Doppler guided fluid management (DGFM) - the delivery of fluid based on direct measurement of flow using oesophageal Doppler monitoring (ODM) - with standard management of intraoperative fluid delivery.

Protocol Outline

108 patients undergoing colorectal resection were randomly allocated to intra-operative fluid management based on standard hospital anaesthetic practice (Std) or maximisation of stroke volume as determined by ODM. The primary goal of the study was to compare the duration of post-operative hospital stay between the two groups. The secondary goals of the study were to compare complication rates, time to return of gastro-intestinal function and a variety of biochemical markers of inflammation between the two patients groups.

Results

The range of fluid volumes given to patients in the ODM group was large, as has been reported in earlier studies of DGFM. Patients in the ODM and Std groups however, received on average similar amounts of total fluid.
The key difference in this study was the timing of fluid delivery – ODM patients were given fluid earlier in their procedure, the majority in the first 40 minutes of surgery, than those in the Std group.

Circulatory system performance at the end of the surgery in the ODM group was better than that in the Std group, based on the significantly higher values for stroke volume, flow time and cardiac output compared to Std group patients (92 ml vs. 80 ml, p=0.039; 387 ms vs. 355 ms, p=0.001; 6.9 L/min vs. 5.9 L/min, p=0.031 respectively). Similarly, cardiac index was significantly higher in the ODM group (3.8 L/min/bsa vs. 3.2 L/min/bsa, p=0.014) at the end of the procedure, again indicating a better performing heart and circulatory system.

Patients in the ODM group were fit for discharge sooner (median 9 days vs. 6 days, p=0.003) and experienced a shorter length of hospital stay (median 7 days vs. 9 days, p=0.005) compared to the Std group.

A significant reduction in the intermediate or major complications was seen in the ODM group (2% versus 15%, p=0.043) compared to the Std group.

Six patients in the Std group required unplanned admission to intensive care (ICU), compared to none in the ODM group (p=0.012).

Levels of Interleukin-6, a bio-chemical marker of the systemic inflammatory response associated with major surgical trauma, were significantly lower in the ODM group (p=0.039).

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Commentary

This well designed and well-executed trial demonstrates that DGFM – delivering the right amount of the right fluid at the right time – significantly improves outcomes for patients having major surgery. This trial emphasises the importance of the timing of fluid delivery and the value of the CardioQ-ODM as a rapid and sensitive monitor of circulating blood volume.

DGFM is also shown in this trial to improve the predictability of patients' journey through the hospital as demonstrated by the absence of unplanned ICU visits in the ODM group. Furthermore, the ODM group were able to leave hospital earlier as a consequence of having fewer overall post-operative complications.

In the context of the hospital's enhanced surgical recovery programme, average lengths of stay for the 85% of patients having minimally invasive major bowel surgery were reported at the American Society of Colon and Rectal Surgeons (ASCRS) in June 2006 to be 4 days. At the same time, the investigators reported what is believed to be the lowest mortality and readmission rate for this kind of surgery in the UK.

The CardioQ-ODM™ oesophageal Doppler monitor is the only intra-operative haemodynamic monitor proven to deliver the benefits of DGFM and has been adopted as a standard of care in the enhanced surgical recovery programme at the hospital where this research was conducted.

Deltex Medical Limited • Terminus Road • Chichester • PO19 8TX • United Kingdom
Phone: +44(0)1243 774837 • Fax: +44(0)1243 532534 • Customer Service: 0845 085 0001 • www.deltexmedical.com