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CLINICAL PRACTICE

Effect of goal-directed haemodynamic therapy on postoperative complications in low–moderate risk surgical patients: a multicentre randomised controlled trial (FEDORA trial)

J. M. Calvo-Vecino[1,8], J. Ripollés-Melchor[1,*,8], M. G. Mythen[2], R. Casans-Francés[3,8], A. Balik[4], J. P. Artacho[5], E. Martínez-Hurtado[1,8], A. Serrano Romero[6], C. Fernández Pérez[7,8], S. Asuero de Lis[7], and FEDORA Trial Investigators Group

[1]Department of Anaesthesia, Complutense University of Madrid, Hospital Universitario Infanta Leonor, Madrid, Spain, [2]University College London Hospitals, National Institute of Health Research Biomedical Research Centre, London, UK, [3]Department of Anaesthesia, University of Zaragoza, Hospital Clínico Universitario Lozano Blesa, Zaragoza, Spain, [4]Department of Anaesthesia, Hospital de Torrevieja, Torrevieja, Spain, [5]Department of Anaesthesia, Hospital de Vinalopó, Vinalopó, Spain, [6]Department of Anaesthesia, Hospital Universitario Ramón y Cajal, Madrid, Spain and [7]Department of Public Health, Complutense University of Madrid, Hospital Clínico San Carlos, Madrid, Spain

*Corresponding author. E-mail: ripo542@gmail.com.

[8] Evidence Anaesthesia Review (EAR) Group.

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Abstract

Background: The aim of this study was to evaluate postoperative complications in patients having major elective surgery using oesophageal Doppler monitor-guided goal-directed haemodynamic therapy (GDHT), in which administration of fluids, inotropes, and vasopressors was guided by stroke volume, mean arterial pressure, and cardiac index.
Methods: The FEDORA trial was a prospective, multicentre, randomised, parallel-group, controlled patient- and observer-blind trial conducted in adults scheduled for major elective surgery. Randomization and allocation were carried out by a central computer system. In the control group, intraoperative fluids were given based on traditional principles. In the GDHT group, the intraoperative goals were to maintain a maximal stroke volume, with mean arterial pressure >70 mm Hg, and cardiac index ≥2.5 litres min^{-1} m^{-2}. The primary outcome was percentage of patients with moderate or severe postoperative complications during the first 180 days after surgery.
Results: In total, 450 patients were randomized to the GDHT group (n=224) or control group (n=226). Data from 420 subjects were analysed. There were significantly fewer with complications in the GDHT group (8.6% *vs* 16.6%, P=0.018).

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There were also fewer complications (acute kidney disease, pulmonary oedema, respiratory distress syndrome, wound infections, etc.), and length of hospital stay was shorter in the GDHT group. There was no significant difference in mortality between groups.
Conclusions: Oesophageal Doppler monitor-guided GDHT reduced postoperative complications and hospital length of stay in low–moderate risk patients undergoing intermediate risk surgery, with no difference in mortality at 180 days.
Clinical trial registration: ISRCTN93543537.

Keywords: Elective Surgical Procedures/adverse effects; Hemodynamics/physiology; Intraoperative/methods; Postoperative Complications/prevention & control; Prospective Studies

Editor's key points

- Whether goal-directed haemodynamic therapy improves postoperative outcome is unclear.
- The effect of oesophageal Doppler cardiac output monitor guided haemodynamic therapy was compared with standard care in a multicentre randomised trial.
- Haemodynamic optimization reduced complications and hospital length of stay in low–moderate risk patients having major abdominal surgery, with no effect on mortality.
- Goal-directed haemodynamic therapy can be beneficial even in low–moderate risk patients.

Approximately 240 million anaesthesia procedures are performed annually worldwide.[1] Of these, approximately 10% are in high-risk patients. Although there is no consensus on the definition of 'high-risk' patients,[2] this group probably accounts for >80% of perioperative deaths.[3] Moderate-risk surgery is much more common and constitutes about 40% of total surgical procedures. Nearly 30% of moderate-risk surgical patients experience minor postoperative complications, most often gastrointestinal, including delayed enteral feeding, paralytic ileus, nausea or vomiting, and wound complications.[4] Even minor complications prolong hospital stay[5] and increase healthcare costs,[6] and, more importantly, can reduce long-term survival.[7] The European Surgical Outcomes Study in patients having non-cardiac surgery concluded that in-hospital mortality rate was high (4%) and varies substantially among European countries.[8] There were also large differences in postsurgery mortality among hospitals within each country, suggesting that there is a potential to improve survival after surgery.[9,10]

Many postoperative complications are thought to be related to tissue hypoperfusion and an imbalance between oxygen delivery and consumption.[11] Perioperative fluid management strongly influences patient outcomes.[12–14] Despite national guidelines[15,16] and international recommendations,[17–20] there remains wide variability in haemodynamic monitoring,[21] and type and volume of administered fluids.[22,23]

Goal-directed hemodynamic therapy (GDHT) is a method aiming at optimal dosing and timing of fluids, inotropes, and vasopressors through monitoring of cardiac output (CO) and other haemodynamic parameters. Studies suggest that GDHT helps prevent organ hypoperfusion and fluid overload, thereby reducing postoperative complications.[24] However, the OPTIMISE trial[12] and other recent studies[25–27] suggest that the benefits associated with GDHT are less than previously reported, and that GDHT can even worsen patient outcomes if combined with a liberal fluid maintenance regimen.[28] In particular, the usefulness of oesophageal Doppler monitoring (ODM) to guide GDHT has recently been questioned.[29,30]

We carried out a controlled randomized clinical trial to study the effect of ODM-guided administration of i.v. fluids and vasopressor and inotropic drugs on postoperative complications after major surgery. Specifically, we tested the hypothesis that ODM-guided management reduces postoperative complications.

Methods

This was a randomised controlled clinical trial performed at five centres in Spain between 2011 and 2014. Patients were recruited at Hospital Universitario Infanta Leonor, Madrid; Hospital Universitario Ramón y Cajal, Madrid; Hospital Clínico Universitario Lozano Blesa, Zaragoza; Hospital de Vinalopó, Alicante; and Hospital de Torrevieja, Alicante. Unidad Española de Evaluaciones Sanitarias (Agencia Laín Entralgo, Madrid, Spain) supported this study, approved by the Ethics Committee of the Hospital Universitario Gregorio Marañón, Madrid (HUIL 2011-02-22), and registered by the principal investigator (J.M.C.V.) in the clinical trial registry ISRCTN (ISRCTN93543537). The Ethics Committee at each centre approved the study protocol; the trial was conducted according to the original protocol, which remained unchanged throughout the duration of the trial. The full study protocol (in Spanish) is available upon request, and the summarized English version can be accessed at http://www.eargroup.es/. Written informed consent was obtained from all patients before surgery. The principal investigators (J.M.C.V. and S.A.L.) performed site visits for source data verification.

Study population

Eligible patients were aged 18 yr or older and scheduled for major abdominal, urological, gynaecological, or orthopaedic surgery under general anaesthesia using laparoscopic or open approaches. Surgery was considered major if it fulfilled at least one of the following criteria: expected duration ≥2 h, estimated blood loss >15% of blood volume, or transfusion requirements of at least two packs of red blood cells. Exclusion criteria were emergency surgery, ASA physical status[31] >3, contraindications for ODM, or aortic pathology that could lead to misinterpretation of haemodynamic variables (e.g. intra-aortic balloon pump, thoracic aorta aneurysm). The principal investigator at each site evaluated eligibility, obtained informed consent, and enrolled participants.

Study design

This was a randomised, controlled, multicentre, parallel-arm, patient- and observer-blind superiority trial. Randomization