

Commentary

Goal directed therapy: how long can we wait?

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Abstract

Intensive monitoring and aggressive management of perioperative haemodynamics (goal directed therapy) have repeatedly been reported to reduce the significant morbidity and mortality associated with high risk surgery. It may not matter what particular monitor is used to assess cardiac output but it is essential to ensure adequate oxygen delivery. If this management cannot begin preoperatively, it is still worth beginning goal directed therapy in the immediate postoperative period.

Haemodynamic monitoring and manipulation are cornerstones of critical care management. In this issue of *Critical Care*, Pearse *et al.* report two interesting related studies in this area, examining the effectiveness of postoperative goal directed therapy following major surgery [1] and the use of central venous saturation (ScvO₂) monitoring in these patients [2].

As the authors at St George's Hospital, London, point out, despite their own work [3] and that of others [4,5] demonstrating the benefit of preoperative goal directed therapy (GDT) for high risk surgery patients, GDT has not become routine practice. One can speculate why this might be. A lack of intensive care beds to allow preoperative admission may be responsible for not instituting GDT; however, a study from York, UK, found that preoperative GDT did not increase overall intensive care use [5]. GDT is a bundle of care that includes intensive care unit (ICU) monitoring, fluids, blood transfusion and inotropes, and it is difficult to know if the benefits of GDT are due to all or just some of these components. Of note for practitioners, the safety of the pulmonary artery (PA) catheter has been questioned [6] and this was a core technology to measure cardiac output in earlier GDT studies.

Pearse and colleagues have taken the pragmatic view that if the intensive care community will not take up preoperative

GDT, then perhaps postoperative GDT is more palatable, and so they studied the efficacy of the latter. They demonstrated that even when only applied postoperatively for the first eight hours, GDT (as defined by their protocol) significantly reduced complication rates and hospital length of stay [1]. The two groups received similar volumes of crystalloid and blood but the GDT group received on average an extra 700 ml of colloid and, as dictated by the protocol, more patients in the GDT group achieved the oxygen delivery goal of 600 ml min⁻¹ m⁻². Mortality rates were similar in both groups.

This was a well conducted randomised controlled study that importantly had an appropriately managed control group. It is, however, subject to some limitations. Although it is difficult to blind GDT interventions, attempts were made to blind treatment allocation from the clinical team. Fluid management could have been subject to intentional or unintentional bias, however, because decisions about fluid treatment were made by the unblinded research team. Although there were predefined protocols for fluid administration, these protocols did include subjective criteria: "clinical suspicion of persistent hypovolaemia". This potential source of bias could be important because the treatment group has consistently received more fluid in prior studies and this may well be the major contributor to success of GDT.

The significant reduction of complications and hospital stay should be sufficient to convince most clinicians, patients and hospital administrators of the benefits of GDT. The study was powered to detect a reduction in complication rates from 50% to 34%. This goal was met at the first interim analysis and so the study was appropriately terminated with only 122 patients recruited. It is, therefore, difficult to interpret mortality data in such an under-powered sample size. The interpretation of mortality rates is also confounded by the

higher predicted mortality from the P-POSSUM score in the GDT group than the control group.

As the use of PA catheters has decreased in clinical practice [7], it is important to assess whether alternative indicators of inadequate cardiac output are good markers in GDT. In the first paper [1], cardiac output was not determined using PA catheters but by lithium indicator dilution and pulse contour analysis. The second paper by Pearse *et al.* [2] pursues the issue of alternative indicators of an adequate oxygen delivery further. They report that a low ScvO₂ was associated with an increased complication rate [2]. Further studies are required to determine whether ScvO₂ can be used as an alternative to the PA catheter to direct GDT in high risk surgical patients.

A couple of other findings in this second study are worth noting. The authors found that ScvO₂ and cardiac index were both independently associated with complication rates but that GDT was not. As they point out, this suggests that ensuring an adequate oxygen delivery is achieved is more important than the specific protocol of GDT. It is another explanation for the clinical equipoise about the use of GDT in high risk surgical patients.

Pearse and colleagues [2] also found that ScvO₂ levels dropped quite markedly in the first hour postoperatively without changes in other parameters such as blood pressure, heart rate, base deficit or lactate measurement. This finding and the correlation of ScvO₂ with complications illustrate why it may be important that these high risk patients receive GDT for some time before transfer to the general ward. This has important resource implications, especially in the UK where this study was conducted, as historically there has been a relative lack of both intensive care and high dependency beds [8,9].

Taken together, these two studies [1,2] and previous studies of preoperative optimization [3-5] show that it is possible to reduce the high morbidity and mortality of high risk surgery [10]. It may not matter what particular blood flow monitoring method is used [1,4,11] as long as an adequate oxygen delivery is achieved. It makes sense that this aggressive resuscitation with fluid and inotropes, if necessary, occurs as soon as possible in the operating theatre [11], if not pre-operatively, and that it should continue into the postoperative period. Even if it has not occurred pre- or intra-operatively, however, these and other studies suggest that GDT is still worth starting immediately postoperatively [1,2,12,13]. Premature transfer of patients to general wards misses the GDT opportunity and may be harmful based on studies showing that patients who require ICU admission from the general ward postoperatively have a very poor prognosis [14]. Studies in sepsis of goal directed therapy show substantial efficacy when started early [15] but not once organ failure is established [16].

Competing interests

The author(s) declare that they have no competing interests.

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