

## **“LAP-MAP”: A New Blood Pressure Target During Laparoscopic Surgery**

A. Deasy, E. Corcoran, M. Moore, M. Power

Beaumont Hospital, Dublin.

Dear Editor –

Prolonged laparoscopic surgery with steep Trendelenberg position is frequently requested in high risk surgical patients. The combination of prolonged laparoscopy with steep Trendelenberg positioning may alter cerebral haemodynamic parameters<sup>1</sup>. Possible decreases in cerebral perfusion pressure (CPP) and cerebral blood flow across anterior and posterior cerebral circulations, where high central venous pressure (CVP) creates a ‘back-pressure’, may expose ‘watershed’ areas to hypo-perfusion despite autoregulation<sup>1</sup>. An increase in intracranial pressure may also occur during prolonged steep Trendelenberg leading to temporary cerebral oedema. An increase in intra-ocular pressure has also been described<sup>2</sup>. Nevertheless, it is difficult to predict how a patient’s unique physiologic and haemodynamic changes and reflexes during laparoscopy will affect cerebral perfusion.

The relationship between intra-operative mean arterial pressure (MAP) and clinical outcomes in non-cardiac surgery is well known<sup>3</sup>. While neither hypotension nor hypertension is desirable, a target net MAP has not been proposed for patients in steep Trendelenburg position during laparoscopic surgery.

Close attention to MAP is necessary to ensure adequate CPP. Our practise to target a higher MAP, also known as ‘driving pressure’, in these circumstances. A clinical estimate is derived from the formula  $CPP = MAP - CVP$ . We call this estimate LAP-MAP.

We increase MAP with a titrated vasopressor infusion, e.g. phenylephrine infusion, guided by invasive arterial blood pressure monitoring (the transducer should be zeroed at level of the external auditory meatus<sup>4</sup> so that LAP-MAP is greater than 65 mmHg when the patient is in steep Trendelenburg position.

The use of cardiac output (CO) monitoring to guide intravenous fluid therapy and vasopressor support is now recommended in recent guidelines<sup>4</sup>. Dynamic indices of fluid responsiveness, such as pulse pressure variation (PPV) or stroke volume variation (SVV), or changes in CO have excellent predictive capacities for fluid responsiveness.

We realise that CVP can be an unreliable measurement of intravascular volume status. However certain high-risk patients undergoing prolonged steep Trendelenburg positioning may also benefit from CVP monitoring in order to ensure adequate CPP and allow the calculation of LAP-MAP.

We propose 'LAP-MAP' as a clinically identifiable target which is easy to implement and titratable to patient needs. We suggest a 'LAP-MAP' target greater than 65 mmHg, during prolonged laparoscopy with steep Trendelenburg, that counteracts possible adverse effects on cerebrovascular perfusion. We suggest that LAP-MAP is added to anaesthesia practice for prolonged laparoscopic surgery, in high risk patients, requiring steep Trendelenburg positioning.

**Corresponding Author:**

A. Deasy,  
Specialist Registrar in Anaesthesia,  
Beaumont Hospital,  
Dublin.  
E-Mail: [alisondeasy@rcsi.ie](mailto:alisondeasy@rcsi.ie)

**References:**

1. Lestar M, Gunnarsson L, Lagerstrand L, Wiklund P, Odeberg-Werner S. Hemodynamic perturbations during robot-assisted laparoscopic radical prostatectomy in 45 degrees Trendelenburg position. *Anesth Analg.* 2011;113(5):1069-75.
2. Hayden P, Cowman S. Anaesthesia for laparoscopic surgery. *Continuing Education in Anaesthesia Critical Care & Pain.* 2011;11(5):177-80.
3. Walsh M, Devereaux PJ, Garg AX, Kurz A, Turan A, Rodseth RN, et al. Relationship between intraoperative mean arterial pressure and clinical outcomes after noncardiac surgery: toward an empirical definition of hypotension. *Anesthesiology.* 2013;119(3):507-15.
4. Rhodes A, Evans LE, Alhazzani W, Levy MM, Antonelli M, Ferrer R, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Med.* 2017;43(3):304-77.