Deep Neuromuscular Block Facilitates Laparoscopic Surgery- or Probably Does Not?

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During the past couple of years several authors reported on favourable effects of deep neuromuscular block (NMB) during laparoscopic surgery, suggesting that deep NMB provides suitable surgical space at a reduced inflation pressure, which in turn decreases postoperative pain perception and finally improves outcome of surgery. No matter how promising this suggestion would appear, the issue is still open to be debated (1).

What we know about this topic is that the inflation of the abdominal cavity may result in hemodynamic changes and that early postoperative pain increases along with incrementally augmented pressure (2). We know that low intraabdominal pressure may compromise the visibility in surgical space and thus may increase the risk of conversion to laparotomy.

To get clear indications for the use of deep NMB during laparoscopic procedures, the following questions have to be answered.

Firstly, is low inflation pressure really necessary for laparoscopic surgeries? A Cochrane review compared the effect of low (12 mmHg) and standard (16 mmHg) pressure pneumoperitoneum on the outcome of laparoscopic cholecystectomies. No difference was found between the two groups in surgical morbidity, in conversion rate to open surgery and in patient satisfaction (3). The haemodynamic differences were insignificant and may also have been attributed to differences in inflation techniques or in patients’ positioning. Thus low pressure pneumoperitoneum does not appear to offer significant advantage.

Secondly, is there a close correlation between surgical space conditions and surgeons’ satisfaction? Surely every anaestitist experienced the typical bad mood of surgeons about poor surgical space conditions like “the patient is pressing, I cannot see properly” sometimes justified, but more often not, irrespective of the depth of NMB. Although several investigators reported better rating score by surgeons when deep NMB was administered, the quality of data leaves something to be desired (e.g. better assessor blinding, less subjectivity).

For example Martini et al. (4) compared the effect of moderate vs. deep block on operation conditions using a rating score of 1 to 5, the difference being 4.0±0.4 vs. 4.7±0.7, respectively, showing that operating conditions were fairly acceptable under moderate block. Adequate definition and accurate measurement of the depth of NMB is indispensable for comparison of operating conditions. The stability of the block during the study period is a key point. Deep block defined as posttetanic count 1 (PTC-1) may recover...
to moderate block (TOF count 1 or 2) during the study period. Many investigators used a single dose muscle relaxant or gave top-up dose late, at TOFC-1 or 2 (moderate block) (5-7). This means that evaluation of the surgical space did not happen at deep, but at moderate NMB. In other studies the effect of deep block was compared with shallow or minimal block (8). The duration of the majority of laparoscopic procedures is between 60-90 minutes. It is not clear whether the deep block should extend to the entire period of surgery, including also the closure of the fascia, or is it enough to cover the intraabdominal phase. Although the closure of abdominal wall may be easier under deep relaxation, reversal of deep block takes time and prolongs the time to tracheal extubation.

The third question is whether objective neuromuscular monitoring is a must during laparoscopic surgery? Actually, the majority of anesthetist rely on clinical evaluation of the relaxant effect instead of objective monitoring (9). Under these circumstances the wide use of deep NMB increases the risk of postoperative muscle paralysis, thus cannot be recommended. Kotake et al. (10) assessed patients who received sugammadex for reversal before extubation of the trachea based on clinical signs of residual paralysis. They found that in 4.3% of patients the reversal of the block was insufficient (TOFR <0.9). Recently Nemes et al. (11) demonstrated that pharmacological reversal based on clinical signs of muscle paralysis was superior to spontaneous recovery, but it did not preclude postoperative residual block, irrespective of the reversal agent. Therefore, we recommend the routine use of objective neuromuscular monitoring during laparoscopic surgery in order to verify the depth of block as well as adequate recovery. This is in line with a recently published international Consensus Statement about the use of neuromuscular monitors (12).

Last but not least the costs generated by using deep NMB should also be taken into account. When intermediate acting relaxants are given, deep block is maintained by administration of repeated bolus or IV infusion creating cost increase. The recommended dose of sugammadex is minimum 4 mg kg⁻¹ for the reversal of a deep rocuronium. A recent clinical study proved that sugammadex 2 mg kg⁻¹ promptly and safely reverses deep NMB from pipecuronium (13). Therefore, the combination of pipecuronium block with sugammadex reversal can be regarded a new paradigm for deep NMB. In summary, there is no convincing evidence for the routine use of deep NMB during laparoscopic surgery. Further studies specifically designed and based on appropriate electrophysiological measurements are needed to prove the benefit of deep NMB during laparoscopic surgery.

References