

## Does Deep Neuromuscular Block Facilitate Laparoscopic Surgery? The Picture is Not Clear

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This topic is still open to be debated since reported data are conflicting to each other. In our previous report we addressed the following questions:

1. Is low inflation pressure necessary for laparoscopic procedures?
2. Is there a close correlation between surgical space conditions and surgeons' satisfaction?
3. Is deep block necessary to provide, optimal surgical conditions”?
4. Is objective neuromuscular monitoring mandatory during laparoscopic surgery if deep NMB is administered?

No clear answers exist to these questions because clinical situations are too complex and influenced by unpredictable factors. The main goal of a clinical anesthesiologist is to provide safe and stable physiological circumstances to an *individual* patient, during a *specific* surgical intervention and under the *given* conditions. Referring to our previous report we reconsider the main points in the frame of this pro-con debate.

Ad 1. In fact, performing laparoscopic surgery under low versus standard pressure pneumoperitoneum could not prove differences with respect of perioperative morbidity or adverse hemodynamic effects (1). A recently published metaanalysis compared the effect of low versus standard pressure pneumoperitoneum and found that 90% of laparoscopic cholecystectomies can be performed under low pressure pneumoperitoneum without any problem (2). However, particular care should be taken of the remaining 10% of patients because many of them present elevated risk for surgical interventions. Unfortunately, there is not sufficient information available on the effect of laparoscopic surgery in patients with high cardiovascular risk (2), nevertheless potential hemodynamic side effects of pneumoperitoneum (3) may become manifest in patients with cardiovascular risk. Furthermore, there is no sufficient evidence suggesting that administration of lower intraabdominal pressure would reduce postoperative shoulder pain (4). Hence, our answer to the first question is the following: low intraperitoneal pressure is not a prerequisite for laparoscopic interventions, but can be used safely in the majority of the patients. From a pathophysiological perspective, low intraabdominal pressures may be indicated in selected patient populations, but this has to be tested in further studies.

Ad 2 and 3. The concept of using deep neuromuscular block during laparoscopic procedures is based on the assumption that it allows the administration of low intraabdominal pressure while surgical space visibility remains fair or optimal. This question is a complex one. There are reports suggesting

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**Cite this article as:** Fülesdi B, Asztalos L, Tassonyi E. Does Deep Neuromuscular Block Facilitate Laparoscopic Surgery? The Picture is Not Clear. *Turk J Anaesthesiol Reanim* 2018; 46: 86-7.

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*Turk J Anaesthesiol Reanim* 2018; 46: 86-7

DOI: 10.5152/TJAR.2018.060418

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Available online at [www.jtaics.org](http://www.jtaics.org)

that short gynaecologic laparoscopic procedures can be performed even without administration of neuromuscular blocking agents (5-7). A recent metaanalysis suggested that surgical space conditions were optimal or good in the majority of the cases where deep neuromuscular block was administered as compared to moderate and shallow block or no relaxant at all (4). However useful these studies may be, they do not reflect the complexity of real life. The scoring systems that are used in different studies are subjective, the experience of the surgeons varies on a large scale, and the characteristics of the patients are also different according to age, to morphology and to previous surgeries as well as to the site of the intervention. In line with this, deep neuromuscular block produced a slightly better score by 0.7 on a 1 to 5 scale compared to moderate block (i.e. 4.7 to 4.0, respectively) (8). Thus, the question whether a deep neuromuscular block should be administered for the sake of optimal surgical conditions is still open to be debated. The main indication for deep neuromuscular block during laparoscopic surgery is ensuring low intraperitoneal pressure. However, there is no proof that administration of low pressure results in better outcome than conventional intraperitoneal pressure in terms of surgical morbidity or conversion to open cholecystectomy (2).

Ad 4. The generally accepted definition of „adequate recovery” from neuromuscular block is the return of the train-of-four (TOF) ratio to  $\geq 0.9$ . This level of recovery restores the functional integrity of the muscles involved in airway protection. It is also clear that postoperative residual neuromuscular block is associated with increased risk of morbidity and patients’ complaints in the postoperative setting (9). It has been shown that the incidence of residual NMB after intermediate-acting neuromuscular relaxants still remains as high as 41% on average (10). Although routine reversal without monitoring may decrease the incidence of residual muscle paralysis, it is not an adequate solution to the problem (11, 12).

Whatever the upcoming studies will suggest about the use of deep neuromuscular block in laparoscopic procedures (most probably restricted use in high risk population), objective neuromuscular monitoring should be mandatory in all cases where neuromuscular blocking agents are administered. Anesthesia is on the way toward individualized, personalized patient care. A proper selection of neuromuscular relaxants and adequate monitoring of complete reversal should become a part of this strategy.

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