The effect of pneumoperitoneum on optic nerve sheath diameter in paediatric patients undergoing laparoscopic appendectomy operation

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Background and Goal of Study: Variations in optic nerve sheath diameter (ONSD) measured by ultrasonography may be an indirect marker of intracranial pressure (ICP) alterations due to increased intraabdominal pressure. The primary aim of this study is to observe the effect of pneumoperitoneum on ONSD measured by ultrasonography, where the secondary goal is to investigate the changes of ONSD caused by perioperative body position in paediatric patients undergoing laparoscopic appendectomy.

Materials and Methods: This study is compromised of the observation over 28 patients (5-12 years in age). After premedication with midazolam 0.5 mg kg⁻¹ po, induction was achieved with propofol 3 mg kg⁻¹, rocuronium 0.6 mg kg⁻¹, remifentanil 0.3-0.5 mcg kg⁻¹ following the routine ASA monitoring. Anaesthesia maintenance was provided by 2-3% sevoflurane in a mixture of 40% O₂- 60% N₂O. Intraabdominal pressure was maintained as 12 mmHg during pneumoperitoneum. Both left and right ONSD measurements were performed as a transverse diameter of the sheath on 3 mm far from the exit of the optic nerve with the linear probe of 7-12 MHz frequency. The values were recorded as follows: 3 min after induction (t₀), 5 min after insufflation (t₁), 5 min after trendelenburg and 15 degrees to the left tilted position (t₂), 15 min after insufflation (t₃), 30 min after insufflation (t₄) and 5 min after desufflation (t₅). For statistical analysis, one way ANOVA, Paired t-test and Wilcoxon tests were applied.

Results and Discussion: ONSD was determined as t₀: 5,12 ± 0,49 mm, t₁: 5,41 ± 0,49 mm, t₂: 5,63 ± 0,58 mm on the right and t₀: 5,12 ± 0,46 mm, t₁: 5,42 ± 0,49 mm, t₂: 5,58 ± 0,46 mm on the left side.

There was no difference between t₀ and t₅ (t₀: 5,12 ± 0,49 mm, t₅: 5,28 ± 0,53 mm) on the right side. However, there was a statistically significant difference between t₀ and t₅ (t₀: 5,12 ± 0,46 mm, t₅: 5,30 ± 0,48 mm) on the left side. There are numerous studies showing that pneumoperitoneum increases the ONSD (1). However, the effect of the body position on ONSD is controversial (2, 3). The present study revealed that pneumoperitoneum and also body position changes might affect ONSD. Many studies use the measurement of one eye or the average of the both for ONSD measurement. We measured two eyes separately and observed differences. We argue that the body position has an effect on the left eye's inability to return to its initial value.

Conclusion(s): ONSD might be affected both by increased intraabdominal pressure and patient position, especially Trendelenburg and side tilt. Therefore, USG might be an outstanding method of monitoring the changes of ONSD during laparoscopic procedures in paediatric patients.

Table 1: ONSD changes during operation

	5 min after induction (t ₀) N:28	3 min after insufflation (t ₁) N:28	5 min after position changes (t ₂) N:28	15 min after insufflation (t ₃) N:22	30 min after insufflation (t ₄) N: 14	5 min after desufflation (t ₅) N:28
ONSD- right (mm)	5,12 ± 0,49*	5,41 ± 0,49 *	5,63 ± 0,58	5,72 ± 0,36	5,57 ± 0,43	5,28 ± 0,53***
ONSD- left (mm)	5,12 ± 0,46**	5,42 ± 0,49**	5,58 ± 0,46	5,73 ± 0,36	5,62 ± 0,38	5,30 ± 0,48****

*%95CI t₀ and t₁ for: p<0.001, t₁ and t₂ for p=0.001
** %95CI t₀ and t₁ for p<0.001, t₁ and t₂ for p=0.003
*** %95CI t₀ and t₅ for p=0.27
**** %95 CI t₀ and t₅ for p=0.019

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