Pupillary Pain Index predicts postoperative pain in orthopedic patients with peripheral blocks

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Background:

Pupillary Pain Index (PPI) has showed its effectiveness to assess intraoperative analgesia (1). With a scale from 1 to 10, the index reflects nociception via pupillary reaction to a defined electrical stimulus delivered by the device. It was the intention of our study to show that PPI can evaluate effectiveness of Adductor Canal Block (ACB) or Fascia Iliaca Block (FIB) in orthopedic patients undergoing hip (THR) and knee replacement (TKR) and predict postoperative pain levels as measured by Numeric Rating Scale (NRS).

Methods:

Prospective observational study with measurement of PPI with videopupillometry in orthopedic patients undergoing THR and TKR. Electrodes were applied at the skin area of block activity. PPI was measured before performing of neuraxial block after intubation (PPI1) and at the end of surgery in anesthetized patient at the time of skin closure (PPI2). NRS was used to evaluate pain at 24 (NRS24) and 48 hours (NRS48) at rest and with activity.

Results:

Thirty-seven patients enrolled to the study. Nineteen patients underwent THR and 18 – TKR. Median (quartiles) PPI scores significantly decreased at time of skin closure from 2 (2,6) to 1 (1,2) ($p < 0.001$) (fig. 1). There were positive correlations (Spearman) between PPI2 and NRS24 at rest ($r = 0.375$; $p = 0.034$) and NRS48 with activity ($r = 0.458$; $p = 0.008$). Patients with PPI2 more than 1 had bigger NRS scores after 24hour at rest ($p = 0.03$) and NRS scores after 48hours with activity ($p = 0.006$) (fig. 2).

Conclusion:

PPI index can be used as predictor of postoperative pain in orthopedic patients with ACB and FIB. Videopupillometry is a promising tool for evaluation of effectiveness of peripheral nerve blocks.

Fig. 1. Pupillary Pain Index before performing of neuraxial block after intubation (PPI1) and at the end of surgery in anesthetized patient after stopping of pain stimulus (PPI2). Data presented as mean with 95% Confidence Intervals.

Fig. 2. Numeric Rating Scales (NRS24 at rest and NRS48 with activity) with PPI2 cutoff value >1. Data presented as mean with 95% Confidence Intervals.

References:

1. Sabourdin N, Diarra C, Wolk R, Piat V, Louvet N, Constant I: Pupillary Pain Index Changes After a Standardized Bolus of Alfentanil Under Sevoflurane Anesthesia: First Evaluation of a New Pupillometric Index to Assess the Level of Analgesia During General Anesthesia. *Anesth Analg* 2019; 128:467–74.