Pupillometry - future objective pain reaction measurement while unconsciuos?

Introduction: Endotracheal intubation remains at the forefront of anaesthetic procedures causing the most pain. By mechanical stimulation of the upper respiratory tract receptors, it causes the sympathetic discharge, affecting the haemodynamic stability of the patient. The catecholamines release results in hypertension, tachycardia and arrhythmia, important risk factors for cardiovascular complications.

In a patient under the influence of general anaesthetic drugs, determining the level of analgesia remains a major challenge. The essence of anaesthesia is to maintain a balance between the patient's pain sensations, analgesic supply and their adverse effects. Insufficient drug doses may cause haemodynamic instability and increase the likelihood of intraoperative awakening. Too high, on the other hand, may be responsible for general side effects mainly associated with opioid drugs.

Given the current state of knowledge, there is a need to develop an objective and measurable method of pain monitoring in unconscious patients under general anaesthesia. The anaesthetist usually relies on the analysis of cardiovascular parameters and autonomic reactions of the patient. Unfortunately, these may be non-specific, falsely indicating inappropriate levels of analgesia due to the patient's condition or the drugs taken. Few methods are able to determine objectively the level of patient anaesthesia, including the depth of analgesia. Among them, pupillometry seems to be one of the most promising. It is based on the physiological reflex associated with pupil dilation in response to a pain stimulus. The pupil diameter is correlated with the intensity of the pain stimulus and with the amount of analgesic medication administered. The measurement is inversely proportional to the amount of analgesics administered, which may indicate the dependence of pupillometry measurement on the analgesic component of anaesthesia.

On the other hand, lignocaine, a local anaesthetic, which, according to the studies, decreases pain impulsation and has a positive effect on cardiovascular stability; thus, it is often used during anaesthesia induction.

Subject: The aim of the study was to evaluate the usefulness of pupillometry for assessing the level of analgesia during endotracheal intubation and the appropriateness of using

lignocaine before intubation.

Material and method: 90 patients qualified for elective surgery under general anaesthesia were divided into 3 groups: the control group (induction of anaesthesia with drugs in standard doses), the study group (additional lignocaine 1.5 mg/kg infusion before intubation) and placebo group (0.9% NaCl infusion before intubation). Standard vital signs, TOF (Train of Four) and BIS (Bispectral Index) were recorded every minute from the time of general anaesthetic drugs administration. When TOF = 0 was achieved, BIS was recorded and endotracheal intubation was performed, PRD (Pupillary Reflex Dilation) during intubation and PPI (Pupillary Pain Index) at 5 minutes after were determed.

Results: The study population did not differ in demographics, risk of anaesthesia, intubation conditions and anaesthetic induction drug requirements. Patients in each group had adequate levels of anaesthesia achieved before and during intubation. There was a higher value of PRD amplitude in the placebo group compared with the study group and the control group. In each group, patients with a PRD reflex sensitivity of very high were the most numerous group. A correlation was observed between PRD reflex and BIS during intubation in the study group. There were no statistically significant differences in DBP, SBP and HR measurements at different time steps between the study groups.

Conclusions: Pupillometry is a useful method to determine the level of analgesia during endotracheal intubation in anaesthetised patients. At a constant level of the depth of anaesthesia, lignocaine administered as a bolus appears to reduce pain during intubation yet does not completely abolish it. Lignocaine administration does not affect haemodynamic stability during endotracheal intubation.

Key words: anaesthesia, endotracheal intubation, pupillometry, level of analgesia, lignocaine