

Can Pupillary Reflex Dilatation predict the response to skin incision?

Rational

There is currently no reliable monitoring assessing the intensity of analgesia for every patient before applying a noxious stimulus. As pupil diameter is known to increase in parallel with noxious stimulations, Pupillary Reflex Dilatation (PRD), which is the percentage of dilatation of the pupil in response to a calibrated tetanic stimulation, may be used to predict response to surgical stimulations. The aim of this study was to evaluate the place of the PRD to predict the response to skin incision in non paralyzed patients.

Patients and methods

This prospective and observational study was approved by the local ethics committee. Patients scheduled to undergo breast or skin surgery under general anaesthesia without neuromuscular blockade (sevoflurane or propofol and remifentanyl in Target Controlled Infusion) with a laryngeal mask were included. The PRD after a tetanos of 60mA during 5 seconds applied to cubital nerve was measured just before skin incision. Its correlation with the occurrence, within 10 minutes after incision, of a movement, an increase of systolic arterial blood pressure (SAP) $\geq 20\%$, a laryngospasm, an increase of airway pressure $\geq 20\%$, or a reaction of any type (movement, hemodynamic, laryngeal, or need for increase of target concentrations) was studied by comparing responders to non responders using a Mann & Whitney test. The results are expressed as median and [interquartile].

Results

Forty one patients, ASA status 1 or 2, were included. The PRD before skin incision was significantly higher in patients who then moved (41% [34 – 46] vs. 12% [7 – 20], $p = 0.008$), increased SAP (15% [11 – 29] vs. 9% [5 – 19], $p = 0.05$), increased airway pressure (18% [14 – 40] vs. 10% [6 – 20], $p = 0.02$) or a reaction of any type (18% [12 – 30] vs. 7% [5 – 17], $p = 0.004$), but did not differ significantly in patients who had a laryngospasm (30% [23 – 38] vs. 12% [7 – 21], $p = 0.09$). The receiver-operating characteristic curves were built. The AUC was 0.9 for the movement, 0.8 for laryngospasm, 0.7 for SAP increase and 0.8 for all responses. The threshold value corresponding to the highest ratio between sensitivity and sensibility was $\sim 15\%$. The PRD was a better predictive factor than target remifentanyl concentration which was significantly correlated only to the hemodynamic response.

Discussion

The PRD seems to be a relevant monitoring to predict the response to skin incision. It may then be useful to guide opioids titration according to the needs of each patient. However, the number of patients was low and the results need to be validated by a larger study. Moreover, the performances described here depend of the intensity of the calibrated tetanos and of the noxious stimulation (here, the skin incision), and results for other settings or in other surgical contexts remain to be studied.

Summary

In this study, the place of the PRD to predict the response to skin incision in patient under general anesthesia, is evaluated. It seems to be a relevant monitoring, better than Cet remi, to predict the movement, hemodynamic or laryngeal response.