Aspects of intravenous anaesthesia

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Background

Remifentanil may offer advantages in terms of a more rapid recovery than the commonly used fentanyl but potency with regard to respiratory depression has not been studied.

Tracheal intubation of infants can be performed following anaesthesia with only propofol and remifentanil, thus avoiding muscle relaxant, but relatively large doses are needed. We hypothesised that addition of a small bolus of rocuronium would ensure good intubation conditions at lower doses of propofol and remifentanil.

Aims/methods

The aims of the studies were to:

1. Determine the remifentanil dose that gives the same maximum respiratory depression as 1 μg kg^{-1} of fentanyl.
2. Determine if addition of a low dose of rocuronium to a moderate dose of propofol and fentanyl improve intubation conditions.

Twelve healthy volunteers were allowed to rebreath in a system designed to dampen variations in end-tidal carbon dioxide tension (PET_{CO2}) so that measurements would be obtained at similar levels of CO_2 stimulation. The minute ventilation was measured before (V'preinj) and after injection (V'nadir) of fentanyl, 1 μg kg^{-1}, and remifentanil, 0.25, 0.5, or 1 μg kg^{-1}. The remifentanil doses were plotted against V'nadir/V'preinj in a log-probit diagram to determine what amount gave the same maximum ventilatory depression as the fentanyl dose.

Seventy infants were randomized to either rocuronium (0.2 mg/kg) or placebo after induction with IV propofol (3 mg) and remifentanil (2 μg/kg). Tracheal intubation was attempted 1 minute after the rocuronium/placebo injection and the "Copenhagen scoring system" was used to assess intubation conditions.

Results

V'nadir was 51 (38-64) % of V'preinj after fentanyl, and 70 (61-77), 50 (46-56) and 29 (24-38) %, respectively, after remifentanil 0.25, 0.5, and 1 μg kg^{-1} [median (interquartile range)]. A remifentanil dose of 0.47 (0.42-0.62) μg kg^{-1} was equidepressant to 1 μg kg^{-1} of fentanyl. Fifteen min after fentanyl injection, median minute ventilation was 30 to 40 % less than after injection of remifentanil, 0.25 and 0.5 μg kg^{-1} ($p<0.05$).

Intubation conditions were classified as "poor" in 10 of 36 (28%) patients given rocuronium and in 14 of 34 (41%) infants given placebo (p=0.32). There were four failed first attempts at intubation in the placebo group and none in the rocuronium group (p=0.051).

Conclusion

Fentanyl, 1 μg kg^{-1}, and remifentanil, 0.5 μg kg^{-1}, gave similar maximum ventilatory depression. Onset and recovery of ventilatory depression were faster with remifentanil.

Intubation conditions were poor in almost one third of the patients receiving only propofol-remifentanil and adding a low dose rocuronium did not improve intubating conditions.

Published papers

Intravenous boluses of fentanyl, 1 μg kg^{-1}, and remifentanil, 0.5 μg kg^{-1}, give similar maximum ventilatory depression in awake volunteers.

Gelberg J, Jonmarker C, Stenqvist O, Werner O.

Br J Anaesth. 2012 Jun;108(6):1028-34.

Intubation conditions in young infants after propofol and remifentanil induction with and without low dose rocuronium

Gelberg J, Kongstad L, Werner O

Acta Anaesth Scand. 2014 Aug;58(7):820-825