

## The influence of anaesthetic chemical structure on reducing tourniquet induced ischemia-reperfusion injuries during extremity surgery at children's age

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**Introduction:** The aim of this study was to determine the relationship between the antioxidant profile of anaesthetics and its relation to total antioxidant capacity (TAC) of plasma in children who underwent tourniquet induced ischemia-reperfusion (IR) injury during extremity operations.

**Methods:** After obtaining the ethical committee approval and written informed consent from the parents we studied 45 patients ASA I or II, 8 to 17 years of age, undergoing orthopedic procedures that required bloodless limb surgery. Children were randomized into three groups of 15 patients each: general inhalational anesthesia with sevoflurane (group S), total intravenous anesthesia (TIVA) with propofol (group T) and regional anesthesia (group R). All patients were premedicated with midazolam. In the group S general anesthesia was induced with thiopental (5 mg/kg) and maintained with inhalation of sevoflurane (3-4 vol%). In the group T, anaesthesia was induced with propofol followed by continuous infusion of propofol at a rate of 10 mg/kg/h, reducing to 8 and 6 mg/kg/h, respectively. Atracurium was given to facilitate tracheal intubation in groups S and T and the lungs were ventilated with 65% nitrogen in oxygen. Rescue analgesia was provided by single bolus doses of alfentanil. In the group R, patients received peripheral nerve blocks using bupivacaine 0.25%. Venous blood samples for determination of the plasma TAC were obtained at four time points: before peripheral nerve block and induction of general anesthesia (baseline), 1 min before tourniquet release (BTR), 5 and 20 min after tourniquet release (ATR). Plasma TAC as well as antioxidant potential of propofol, thiopental and bupivacaine *in vitro* was measured by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. Antioxidant activity of plasma and anaesthetics was expressed as % of inhibition after the 30 min of the reaction with DPPH.

**Results and discussion:** Plasma TAC in group T was significantly higher at 20 min ATR (63.44±17.04%) in comparison with basal (44.94±14.69%) and BTR value (43.90±13.03%) as well as in comparison with plasma TAC in groups S (39.65±20.59%) and R (41.96±12.78%) measured at the same time point. The radical scavenging activity of anaesthetics *in vitro*, in investigated concentrations that are in the range of plasma anaesthetic concentrations, indicated that only propofol (2,6-diisopropylphenol) possessed significant antioxidative activity in the reaction with DPPH radical (mean value 70.09%, SD 21.53%) in comparison with thiopental (mean value 6.50%, SD 5.25%) and bupivacaine that didn't exert any antioxidative activity. These data confirm that TIVA with propofol attenuates oxidative stress related to tourniquet-induced ischaemia-reperfusion injury in children.