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Effect of local anesthetics on pulpal blood flow in mechanically stimulated teeth

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1. Objectives

The purpose of this study were to evaluate the effect of epinephrine-containing local anesthetics on pulpal blood flow (PBF) and to compare the change of pulpal blood flow after cavity preparation between in non-anesthetized teeth and in anesthetized ones in cats.

II. Materials and Methods

Nine cats were initially anesthetized with intra-muscular injection of ketamine (75 mg/kg) and acepromazine (2.5 mg/kg). Periapical radiographs of canine teeth were taken, followed by intra-venous injection of alpha-chloralose (40 mg/kg) and urethane (500 mg/kg) through the femoral vein for the general anesthesia. To monitor systemic blood pressure (SBP) continuously, a femoral artery was cannulated and air way was maintained through the tracheostomy. The mandible was immobilized by an intermaxillary splinting with dental plaster and steel rod that was anchored to the base by a magnetic stand.

The laser Doppler flowmeter probe (PF416, Perimed Co., Stockholm, Sweden) was positioned on the exposed dentin for recording PBF. The PBF was monitored with a laser Doppler flowmetry (Periflux 4001, Perimed Co., Stockholm, Sweden). SBP and PBF were monitored continuously and simultaneously throughout the experiments.

PBF and SBP were recorded for 30 minutes to monitor baseline value. 2% lidocaine hydrochloride with 1:100,000 epinephrine was administered by local infiltration given apical to the mandibular canine at the vestibular area of the experimental tooth and the same volume of isotonic saline was given on the controlateral tooth as a control. PBF was recorded for before and after injection 10 minutes on both teeth.

~~Slow-speed-round carbide burs were used to make class V cavities with~~ increasing depth through the enamel into the dentin under ~~isotonic saline flushing on both the experimental and the control teeth.~~ The data were statistically analysed by one-way ANOVA, ~~student t-test and Duncan's multiple range test.~~

III. Results

1. PBF was decreased significantly by the injection of local anesthetics of 2% lidocaine with 1:100,000 epinephrine ($p<0.05$). However, there was no significant change by the injection of saline ($p>0.05$).
2. Cavity preparation induced a significant increase of PBF in non-anesthetized teeth compared to in anesthetized teeth with 2% lidocaine with 1:100,000 epinephrine ($p<0.05$).

IV. Conclusions

Local anesthesia with 2% lidocaine with 1:100,000 epinephrine caused a significant decrease of pulpal blood flow. Tooth cavity preparation under local anesthesia induced less amount of pulpal blood flow increase compared to in non-anesthetized teeth.