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Changes in intradental sensory nerve excitability after pretreatment of exposed dentine

An effective desensitizing agent should suppress intradental sensory nerve activity generated by noxious stimulation of exposed dentine. The aim of this investigation was to examine whether the excitability of intradental nerves was modified after treatment of acutely exposed dentine with solutions of 2 and 30% sodium fluoride (NaF) and 5 and 30% potassium nitrate (KNO_3) in saline. Nerve activity was recorded by placing electrodes in two dentinal cavities prepared in canine teeth of anaesthetized cats. Changes in nerve excitability were evaluated by comparing the nerve response to a hyperosmotic solution of 6 M calcium chloride applied on exposed dentine at various intervals before and after treatment of dentine for 30 min with the test solution. With untreated dentine, consecutive applications of the hyperosmotic solution with 30-min intervals induced nerve activity of similar magnitude. The nerve response to hyperosmotic stimulation was severely reduced after treatment of dentine with 2% NaF (mean reduction 40%, $n=5$) or 5% KNO_3 (mean reduction 97%, $n=5$) and was completely abolished after pretreatment with 30% NaF or 30% KNO_3 ($n=5$). When the treated dentine was slightly deepened and acid-treated, the nerve response to hyperosmotic stimulation was restored to control levels in the cases where 2% NaF or 5% KNO_3 had been used, but remained considerably reduced when the dentine was treated with either 30% NaF (mean reduction 48%, $n=5$) or 30% KNO_3 (mean reduction=50%, $n=5$). When applied in deep cavities close to the pulp, NaF solutions excited the nerves ($n=5$), whereas KNO_3 solutions anaesthetized them. In conclusion, the results indicate that NaF and KNO_3 can be useful in treating dentine hypersensitivity, providing that the concentration and treatment duration are adequate. Furthermore, it appears that their desensitizing effect does not depend on their direct effect on intradental nerves.