

Electrical Anesthesia as a Tool for Dental Research

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A study presently is being done to determine whether gingival recession and periodontal destruction can be attributed to prolonged occlusal pressure, such as that created by the common habit of nocturnal tooth clenching. It is anticipated that experiments will be more than a year long, and it was found that anesthetic drugs could be used only as long as two weeks. The dogs used built up tolerances to the various drugs or became malnourished because they were not normally active during their waking hours. It therefore became of interest to investigate the use of electrical anesthesia for longer experiments.

Two young adult male beagles were used for this study. Adjustable-strap headgear was designed so that a strap crossed the center of each temporalis muscle, where a 1- to 1¼-inch-diameter electrode, made of a synthetic sponge, was held in place with a 2-inch bolt that projected outward from the strap. The hair was clipped over the temporalis muscles, just above the zygomatic arch and anterior to the ear, and a small amount of electrical conducting ointment was applied daily. The sponge electrodes were moistened with saline solution every 30 to 60 minutes during the procedure, to maintain good electrical conduction. The electrical leads were connected to the bolts with alligator clamps. A variable-frequency, constant-current electroanesthesia unit* was used to produce an akinetic state.

Induction was done by slow introduction of the electric current from 0 ma to 15 to 20 ma. Slow increase of the frequency, from 1,500 Hz to 5,000 Hz, was interdigitated with the current changes over a period of five to eight minutes for each induction. After three to five preliminary inductions, the dogs appeared to be conditioned to the procedure and could be anesthetized easily. No untoward reactions of the dogs were observed.

A thin, cold-cured acrylic bite plate was then fashioned for the right arch of each dog. Each day after the initial experimental induction, the

bite plate was inserted and the current was adjusted to cause the temporalis muscles to contract. This caused firm occlusal pressure to be exerted on teeth of the right arch, as these teeth made premature contact on the bite plate. Although the machines are capable of giving a level of anesthesia deep enough for general surgery by the proper placement of electrodes and the proper electrical adjustments, the level used for this work was at a low magnitude (the average resistance was 500 ohms). The dogs would lie quietly for hours, with only a small amount of attention necessary. Occasionally, they passed through a period referred to as "fading," in which they tended to move or partially awaken. This was easily controlled by changing the magnitude of the current or decreasing the frequency for a brief period.

Sudden, loud noise often made a dog jump to his feet, which made it necessary to stop and reapply the current. When the cause of awakening had been corrected, the dog was easily returned to sleep. To aid in the prevention of this problem, it was found helpful to drape the dog's head with a towel and to keep a radio playing music to give a constant level of background noise. So that he would not foul the electrical leads if he did awaken suddenly, each dog was loosely tied to the canvas pallet on which he lay.

After two months on this daily routine, the dogs appeared healthy, happy, and well adjusted in their behavior. They would run into the laboratory and, more often than not, lie down on their pallets in anticipation of the daily headgear placement. There was no evidence that the experience was unpleasant or frightening.

Initially, several dogs with implanted electrodes had been used. These electrodes were always potential sites of infection, and they were always subject to extraction by being caught on the sides of the runs while the dogs were exercising during their waking hours. The contraction of the temporalis muscles eliminated the need of the spring clamps that had been used with the anesthetic drugs. Because posterior teeth of dogs have a scissorlike relationship, any shift of the bite on the experimental side was of no real consequence in affecting the control side, as it would be in a primate.

It is anticipated that this technic will be a valuable tool in oral research on animals in which regularly repeated examinations or treatments, or both, are necessary.

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Additional information is available on request to the authors.

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