

THE INSERTION OF ELECTRODES INTO THE HYPOTHALAMIC REGION IN DOGS

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For tapping action potentials and electrical stimulation of the subcortical structures of the brain, a number of methods of insertion of electrodes has recently been suggested. The large number of such methods suggests that none is free from defects. For example, the insertion of electrodes from above [2, 3] is accompanied by trauma to the overlying divisions of the brain; the operation itself, moreover, is technically complicated, for it necessitates operating in the danger zone of the sagittal sinus.

The method suggested by P. G. Bogach and A. F. Kosenko [1] is unsatisfactory for, when the plexiglass shoe containing the electrodes is applied some stretching of the pedicle of the hypophysis is unavoidable, and the presence of a foreign body of considerable size cannot but affect the function of the hypothalamus. The possibilities of G. Ya. Khvoles's [4] method are limited, because only one electrode is inserted for a unipolar lead.

We have adopted a new method based on the use of the plastic AST-T, which possesses properties that make it a valuable material for various types of experimental work. Plastic AST-T solidifies at 30-35°, is durable, a good insulator, causes no particular reaction in surrounding tissues after insertion and, as bacteriological investigations have shown, in its recently prepared form it is sterile.

The operation is carried out under hexobarbital or intratracheal ether anesthesia. The dog is bound to the table lying on its back. A pillow is placed under its neck so that blood does not flow into the trachea. The upper jaw of the animal is bound to the table, and the lower jaw is drawn apart by the assistant; the latter also draws the tongue to one side by means of tongue-holding forceps. The soft palate is divided by a median incision 3-4 cm long; the wound edges are separated by retractors. The mucous membrane covering the palatine bone is incised crosswise and lifted together with the periosteum by means of a raspator; the suture between the palatine and the sphenoid bones. To approach the anterior hypothalamic region at the level of this suture, a hole 5-7 mm in diameter is bored vertically downward with a spherical drill. The hemorrhage developing during drilling may usually be easily controlled by firmly packing the hole for 30-60 sec. When approaching the dura mater care must be taken that it is not damaged by the drill. The hole itself should be slightly enlarged inwardly, making it barrel-shaped or the shape of an inverted cone. When a sufficiently large area of the dura mater is exposed, the orifice in the bone is irrigated with furacilin, after which it is ready for insertion of the electrodes. It is best to take the lead ends of the electrodes first through the nasal passages with a wire loop. The dura mater is punctured with the sterile ends of the electrodes, which are then at once introduced to the required depth. The cerebrospinal fluid which leaks out is mopped up with gauze strips. To obtain good fixation it is essential to dry out the hold and surrounding bone as well as possible.

The plastic is mixed in proportion of powder to monomer of 2:1 to 2:1.5. The mixture swells to the consistency of sour cream, and it is then poured from a small spoon into the hold (in slight excess). Further solidifi-

cation of the plastic takes place in the hole; when it is becoming solid firm pressure must be applied to it in some way or other and the pressure must not be relaxed until solidification is complete. By means of a trocar, the ends of the electrodes are brought out on the dorsum of the nose. The soft palate is repaired with 2-3 sutures. Insertion of the electrodes into the posterior hypothalamic region is carried out almost in the same way, the only difference being that the hole is drilled 6-10 mm posterior to the suture.

We used electrodes of nichrome wire (diameter 0.2 mm) covered with lacquer over their whole extent except the tip. The nichrome was soldered to a fine multicore copper wire with vinyl chloride insulation. The soldered junction was coated with insulating lacquer and the vinyl chloride insulation of the wire drawn over it. Coming up against the dura mater, the vinyl chloride restricted the penetration of the electrodes. Naturally electrodes of any other construction may be used.

The method described is comparatively simple and enables electrodes to be introduced into any part of the hypothalamic region with minimum trauma to the brain tissue. The fixation of the electrodes is so firm that 30-40 days later, when the dogs were sacrificed at the end of the experiment, the plastic seal with the electrodes could only be removed by breaking the surrounding bone.

SUMMARY

The author suggests a new method of implantation of electrodes through a trephine opening in the hard palate. Fixation of electrodes in the bone opening is effected with the aid of quick-setting plastic AST-T. The method permits the introduction of several pairs of electrodes to the required depth. The external ends of the electrodes are located on the bridge of the nose.

LITERATURE CITED

1. P. G. Bogach and A. F. Kosenko, *Fiziol. Zhur. SSSR* 42, 11, 989 (1956).
2. A. B. Kogan, *Technique of Chronic Insertion of Electrodes for Tapping Potentials and Stimulating the Brain* [in Russian] (Moscow, 1952).
3. N. N. Lyubimov and L. G. Trofimov, *Zhur. Vyssei Nerv. Deyatel.* 8, 4, 617 (1958).
4. G. Ya. Khvoles, *Byull. Eksp. Biol. Med.*, Suppl. to No. 1, 155 (1957).*

*Original Russian pagination. See C. B. translation.