For example, if to obtain representative data no fewer than 2000 points have to be counted per macroscopic or microscopic section of an organ, and on the first application of the grid only 500 points corresponded to the particular component being studied, repeated random applications of the grid at different angles to the same section or to subsequent sections must be carried out at least four times. The results of the calculations are added separately for each structural component (vessels, glomeruli, and so on), and for the section as a whole. For instance, if the component studied corresponded to 200 of a total of 2000 points, it would be 0.1 (or 10%) of the whole volume of the organ.

The grids as described above have been tested in stereometric investigations of macroscopic and microscopic preparations and have given good results. They can be recommended for wide use in morphometric and stereometric investigations.

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A METHOD OF REPRODUCING VERTEBRAL ARTERY SYNDROME EXPERIMENTALLY

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A method of reproducing the vertebral artery syndrome in chronic experiments on dogs is suggested. Under general anesthesia two horseshoe-shaped electrodes are inserted into the vertebral canal at the selected level and fixed, and wires connected to them are brought out on the posterior surface of the neck. Rheographic and thermometric changes arising in response to stimulation by the electrodes and to measured electrical stimulation were investigated.

KEY WORDS: vertebral artery syndrome – experimental reproduction; horseshoe-shaped electrode.

The vertebral artery syndrome is frequently encountered in clinical neurology. A decisive role in its clinical manifestations is played by the action of pathologically changed surrounding structures on the artery and its sympathetic plexus. Its pathogenetic mechanisms can be studied by experimental reproduction of the syndrome.

No way of reproducing the vertebral artery syndrome could be found in the accessible literature. The only papers that were relevant dealt with the experimental study of the pathogenesis of its various symptoms in acute [1, 2, 5] and chronic [3] experiments. A method of reproducing vertebral artery syndrome has been developed by the writers in dogs. Under morphine–ether anesthesia an incision is made along the posterior border of the sternomastoid muscle. The tissues are separated and the neurovascular bundle retracted medially. The edges of the transverse processes of the vertebrae bounding the region of the vertebral artery

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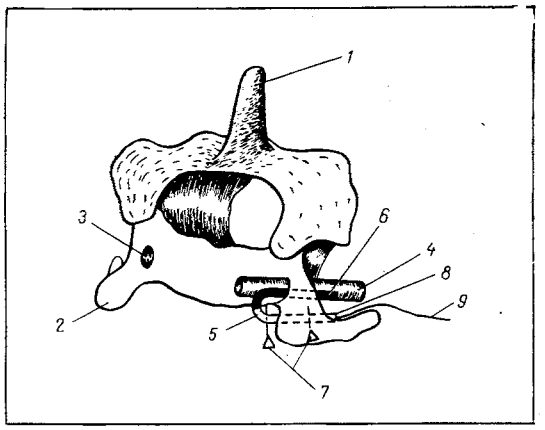

Fig. 1. Diagram showing position of horseshoe-shaped electrode in transverse foramen of cervical vertebra of a dog: 1) spinous process; 2) right transverse process; 3) transverse foramen; 4) left vertebral artery; 5) outer blade of electrode; 6) inner blade of electrode; 7) pointed screws of outer blade; 8) vinyl chloride insulation; 9) insulated wire.

chosen for stimulation caudally and cranially are then exposed. Parts of these processes are nibbled away and the blades of two horseshoe-shaped stainless steel electrodes are inserted into the bony canal of the vertebral artery in opposite directions. Each electrode is fixed to the anterior wall of the bony canal by two screws, held in the other (the one not inserted into the canal) blade of the horseshoe-shaped electrode. The whole electrode except that part of it which is introduced into the canal is insulated from the surrounding tissues by vinyl chloride tube (Fig. 1). After the electrodes have been inserted, their position is checked roentgenologically. The wires connected to the electrodes are brought out through the posterior surface of the neck. The operation wound is filled with penicillin and closed in layers without drainage, the wires are fixed to the skin by two or three silk sutures. The parts of the wires remaining outside are coiled and tied with silk thread. The animal is used for investigation 7-10 days after the operation (when the wound has healed).

The method of reproducing the vertebral artery syndrome described above can be used: 1) to limit the area of electrical stimulation to strictly defined parts of the vertebral artery with minimal leaking of currents to other tissues, 2) to vary both the size of the area stimulated and its position at different levels of the vertebral artery in the bony canal, 3) to introduce electrodes without difficulty because of their horseshoe shape, which also minimizes tissue trauma, and 4) to fix each electrode securely and independently to a particular vertebra, without infringing the biomechanical conditions in the zone of this bony canal, the only one in the body to be movable.

The method thus provides the closest possible approximation of the experimental conditions to the clinical conditions for production of the syndrome and enables it to be studied over a long period of time (3-10 months).

The writers investigated the rheographic [4] and dermatothermometric changes recorded at various times after implantation of the electrodes. A pulsed current from the ISE-01 apparatus (5-10 V, 100 Hz) was applied to the electrodes for 30 sec.

Immediately after stimulation the blood volume in the vertebro-basilar system in five experiments was reduced by 19.5-50%. The skin temperature in the limbs on the side of the implanted electrodes was always raised. The mean value of the temperature asymmetry was 0.9°C. During control measurements before the operation no asymmetry was detected in the same animals.

The animals were killed 5-8 months after the investigations and angiography of the vertebral arteries and postmortem verification of the position of the electrodes were carried out. In four animals the lumen of the arteries at the site of implantation of the electrodes was constricted, in conformity with the well-known morphological picture of the vertebrogenic vertebral artery syndrome. The position of the electrodes was unchanged. There was no inflammatory reaction around them.

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