DETERMINATION OF THE PROJECTION OF THE CLAUSTRUM ON THE LATERAL SURFACE OF THE CAT'S SKULL

L. D. Savenko

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The projection of the claustrum on the lateral surface of the cat's skull was studied. By estimating the position of the projection of the claustrum on the lateral surface of the skull relative to specified bony points and knowing the depth of a nucleus (allowing for the thickness of the bone in the particular region), it is possible to destroy the claustrum through an approach from the lateral surface of the brain which, at the same time, avoids the risk of considerable destruction of brain substance by the electrode.

With a direct vertical insertion of an electrode into the claustrum, the method most widely used with work on stereotaxic apparatuses, considerable damage is inflicted on the higher levels of the brain, resulting in massive degenerative changes. It is more satisfactory to insert electrodes through various points on the brain surface so as to minimize the risk of damage to structures connected with the formation being studied [1]. The most convenient method of destroying the claustrum is by inserting an electrode through the lateral surface of the hemisphere. However, no information could be found in the literature for the projection of the claustrum on the lateral surface of the skull [2].

If an electrode is to be inserted obliquely, a graphic or mathematical method of calculating the coordinates is required, or alternatively the stereotaxic apparatus used must have two coordinated heads with electrode holders (for oblique insertion by Meshcherskii's method [3]).

For the reasons given above the projection of the claustrum on the lateral surface of the skull was studied.

After the brain had been well fixed and hardened in situ with 10% formalin solution in physiological saline, the skull was sawed open in the sagittal plane and the cerebral hemispheres removed without the dura.

The outlines of the claustrum, corresponding to data obtained previously for the projection of the claustrum in the cat on the surface of the pallium were traced with a barium suspension placed on the dorsal-lateral surface of each hemisphere taken from the skull. The hemisphere was then accurately replaced in the skull and roentgenograms taken of the lateral surface of the skull.

To determine the thickness of the cranial bone in the region of projection of the claustrum, the barium suspension was washed from the surface of the hemisphere and dye (water paint or ink) applied to the same region of projection of the claustrum. The hemisphere was then accurately replaced in the sagittally divided skull. By the impression method, an image of the projection of the claustrum was thus obtained on the inner surface of the skull. A hole corresponding to the projection of the claustrum on the lateral surface of the skull was then drilled at the edges of this impression by means of thin bits. The thickness of the bone in this area was 1-1.5 mm.

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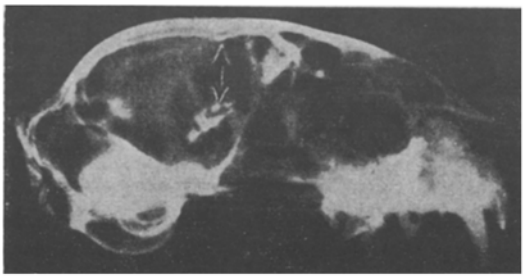

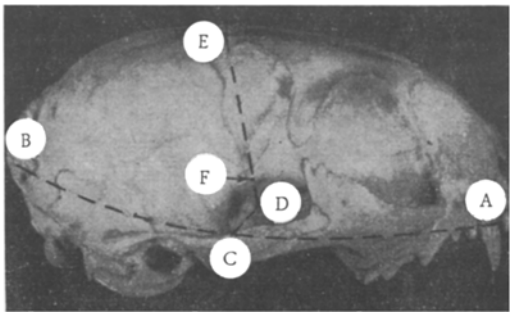

Fig. 1 Fig. 2

Fig. 1. Projection of the claustrum (I) on the lateral surface of the cat's skull.

Fig. 2. Determination of the center of projection of the claustrum on the lateral surface of the cat's skull. F) Point where a burr-hole is drilled in the skull (center of projection of the claustrum on the lateral surface of the skull); AB, CD, DE) conventional lines connecting various elements of the bony skeleton of the skull (explanation in text).

The projection zone of the claustrum on the lateral surface of the skull at the boundary between the anterior and middle cranial foci, contrasted with the barium suspension paste (Fig. 1), was determined on the lateral roentgenogram of the skull.

To determine the projection of the center of this nucleus in the region of its middle third, where it reaches it greatest extent (vertical diameter 3.05 ± 0.07 mm) the conventional straight line AB, connecting the antero-inferior border (where it projects furthest forward) of the upper jaw and the occipital tuberosity was drawn. The point of intersection of the line AB with the upper border of the zygomatic arch (often lying at the middle of the arch) was described as the point C. The point C on the zygomatic arch was then projected on the lateral surface of the skull and designated D. This last point was connected by a conventional line DE with the point of intersection of the sagittal and coronary sutures (the point E). The place where the burr-hole is drilled in the skull is then marked 4-5 mm above the point D along the line DE (Fig. 2, point F). The projection of the center of the claustrum on the lateral surface of the skull is thus situated in fact 4-5 mm above the center of the zygomatic arch. Since the coronoid process of the mandible may interfere with the drilling of a burr-hole in this region, it must be partially removed with bone-nibbling forceps or the cat's mandible must be lowered as much as possible.

During the study of the roentgenograms and calculations it was considered that the x-ray picture of the skull obtained by a divergent beam of x rays is always enlarged by approximately 20%, and also that during long fixation and histological treatment of the brain it shrinks as it hardens.

During operations on animals in which an electrode is inserted horizontally, information concerning the depth of the claustrum in the cat relative to the lateral surface of the hemisphere is also used (for this region of the nucleus this depth is 5 ± 0.5 mm).

LITERATURE CITED

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3. R. M. Meshcherskii, Stereotaxic Methods [in Russian], Moscow (1961).