SUPERFICIAL VEINS OF THE BRAIN FROM
A SURGICAL POINT OF VIEW

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The excellent recent reviews on the embryonic development\textsuperscript{4-6} and on the pattern of distribution\textsuperscript{1,3,6} of the venous system of the human brain lack the information most needed by the surgeon. This study of the superficial veins of the human brain was undertaken to gather information that would be of practical use in the operating room.

MATERIALS AND METHODS

The problem of the distribution, points of drainage, and anastomosis between the surface vessels of the brain was investigated in the autopsy material. The brains of 100 patients aged 15 to 78, with no involvement of the central nervous system, were used in this study.

The venous system of the brain was injected through catheters in the superior longitudinal and straight sinuses, and in both jugular veins. Neoprene latex* solution containing a suspension of ordinary painter’s lead served as the injection material. Three to 4 hours later, the brains were roentgenographed in the cranium, then removed by the author, and the communicating veins between the brain, dura mater, and bone were carefully recorded. Each brain was removed with the dura mater intact over the entire cerebrum and most of the cerebellum. The brains were suspended in 10 per cent aqueous formalin by sutures placed in the frontal and occipital dura mater, and roentgenograms were made again after complete fixation.

Technique of injection: A burr hole was made at the inion and enlarged to an opening 3 cm. long and 2 cm. wide. A small opening large enough to admit four \#8 French catheters was made in the torcula and the straight, lateral, and superior longitudinal sinuses were cannulated. The dura mater was packed with cotton soaked in saturated alum sulfate solution. At this time the chest was opened and either the heart and lungs were removed or the large veins of the heart were incised to permit the irrigating fluid to escape. Each catheter at the torcula was irrigated with 1 liter or more of normal saline until clear fluid returned. Then a solution of 5 per cent acetic acid and 5 per cent tenth-normal hydrochloric acid was injected into each catheter in 5 to 10 cc. amounts to dissolve postmortem clots. This solution produced a dark brown fluid return from the catheters. The catheters were irrigated again with normal saline solution until the return became clear. Then a soft rubber tourniquet was wrapped around the neck to prevent the escape of dye through jugular and scalp veins and the brain was injected with the Neoprene latex solution as follows: 10 cc. into the straight sinus, then 35 cc. into each lateral sinus, and finally another 35 cc. into the superior sagittal sinus. This large amount of dye

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Fig. 1 (left). Drainage areas of frontoparietal (superior drainage area), temporo-occipital (inferior drainage area), and middle cerebral groups of veins (Sylvian vein area).

Fig. 2 (right). Drainage area of medial superior communicating veins (superior drainage area) which empty into superior longitudinal sinus, inferior drainage area which empties into lateral sinus, and basal vein area which empties into vena magna posteriorly and middle cerebral veins anteriorly. (Compare with Fig. 12.)

was necessary to fill the veins of the brain because some dye escaped through the cut in the scalp and the emissary veins of the cranium.

RESULTS

This study disclosed the topographic pattern of the veins of the lateral surface of the cerebrum (Fig. 1); the medial surface of the cerebrum (Fig. 2); the inferior surface of the cerebrum (Fig. 3); and the cerebellum, pons and medulla.

The veins on the lateral surface of the cerebrum consisted of frontal and parietal veins draining into the superior longitudinal sinus, and temporal and occipital veins draining into the lateral sinus. In addition, a third

Fig. 3 (left). Superior drainage area (frontopolar vein) empties into superior longitudinal sinus; inferior drainage area (inferior temporal and occipital veins) empties into lateral sinus. Basal vein communicates with vena magna and middle cerebral veins. Sylvian vein area drains into longitudinal as well as lateral sinuses. (Compare with Fig. 10.)

Fig. 4 (right). Diagrammatic representation of groups of veins draining lateral surface of cerebrum, shown with their free course in the subdural space outlined with semicircular lines.