A Technique for Surgical Exposure of the Cerebral Midline: Experimental Transcallosal Microdissection

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Dissection of the cerebral midline is usually difficult and occasionally hazardous. The area contains many vital centers, it is highly sensitive to surgical manipulation, and it encloses a rich blood supply including superficial venous sinuses, superficial and deep cerebral veins, and branching arteries from the anterior cerebral circulation. Unfortunately, it is also a common site of disease. Tumors of the 3rd ventricle, the pineal body, and subcortical structures comprising the diencephalon, are examples of problems for which a surgical remedy must be sought. In the best of hands, however, surgery in this area is associated with a high mortality. In 1922, Dandy developed a technique for transcallosal exposure of 3rd ventricular tumors. The procedure consisted of turning a right parietal bone flap, ligating the supracortical veins, retracting the paracentral lobule, and splitting the splenium of the corpus callosum. For lesions situated in the anterior portion of the 3rd ventricle, Dandy introduced an alternative approach in 1938. This involved construction of a right frontal bone flap, resection of enough frontal cortex to open the lateral ventricle, and exposure of the 3rd ventricle through the foramen of Monro. Both procedures became standard techniques and both have endured with relatively little modification. Of the two, the transcallosal approach provides better exposure and is more direct; it is generally more dangerous. The transcortical approach avoids direct confrontation with the midline blood supply but provides limited access to the surgical target, removes significant amounts of cortical tissue, and introduces the risk of postoperative epilepsy.

In experimental surgery, similar problems occur and opportunities to explore and study the vital structures in the midline have been limited. In general, standard techniques of gross midline dissection have proven too cumbersome and traumatic for refined neurophysiological studies. The surgical alternative of a transcortical exposure, on the other hand, renders the preparation unfit for the study of subcortical-cortical relationships. Consequently, many investigators have

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FIG. 1. Following routine parasagittal craniotomy, the exposed hemisphere is retracted away from the falk and the corpus callosum is identified at the base of the longitudinal fissure. Since the dissecting microscope permits the surgeon to work in narrow, deep cavities, it is not necessary to coagulate bridging supracortical veins for purposes of exposure.

Fig. 2. View of the corpus callosum: X10 magnification. A midline callosal incision is created by removing tissue through the capillary micropipette. Callosal blood supply is preserved by dissection beneath the vascular ramifications.
confined their examination of subcortical structures to data furnished by stereotaxic studies. In recent years, however, significant inroads have been made and these include the split-brain operation\(^1\) and the mesial cerebral incision procedure.\(^1\) In the former, the midline commissures and callosum are divided with microsurgical instruments; using the latter, a fiber-splitting technique has been devised to separate the two hemispheres.

The technique reported herein is presented as a means of increasing the surgical accessibility of structures lying deep in the cerebral midline. It was designed to complement, modify and extend older techniques of transcallosal dissection; to reduce to a minimum the inherent dangers of midline dissection; and to introduce the transcallosal approach as a technique for exposing a number of important and essentially inaccessible subcortical structures. The surgical steps were developed with microdissection tools in a series of 75 cats and 25 Rhesus monkeys. The immediate laboratory rewards of the technique, as well as the clinical applications that are envisioned, are enumerated below.

### Technique

All surgical lesions are made directly with microdissection tools and without resort to stereotaxic techniques. A parasagittal craniotomy is routinely employed to expose the midline (Fig. 1). The potential space of the longitudinal fissure is developed by gentle retraction and the corpus callosum is exposed at the base of the fissure. Care should be taken to preserve the numerous bridging veins which traverse the fissure and run to the superior sagittal sinus.

The corpus callosum is then viewed with the Zeis

![Image](image_url)

**Fig. 3.** Transcallosal exposure of the 3rd ventricle through a midline linear incision: X10 magnification. Gentle retraction causes the bridging vessels to undergo considerable elongation.