ON A READY METHOD OF PREPARING LARGE SECTIONS OF THE BRAIN.

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THE position and extent of tumours and other lesions situated in the interior of the brain are perhaps most accurately determined by cutting the organ into a series of transverse-vertical or longitudinal-vertical sections, after the parts have been fixed in position by some hardening agency.

The preliminary hardening is best effected by injecting the brain, as a whole, with Müller's fluid—a method which was, I believe, first recommended by Professor D. J. Hamilton, of Aberdeen.

With the object of facilitating the process of injection and allowing the fluid to distribute itself equally and evenly throughout the whole brain tissue, I am in the habit of using an ordinary stomach-pump syringe, and a "distributor" (see Figs. 1 & 2, pp. 436, 437), from which tubes pass to the four great nutrient arteries (vertebrals and common carotids).

Each of these tubes is attached to a canula (see Fig. 2, A), which is firmly tied into the artery. In order that this attachment may be easily made, it is necessary, in removing the brain, to see that the vessels are cut as long as possible. The canula should be attached to its tube before being tied into the vessel; and all four tubes should be tied into the arteries before they are attached to the distributor.

Before proceeding with the injection, I find it advisable to place the brain in a large wide-mouthed jar filled with Müller's fluid. The fluid in which the brain is immersed should be changed (by means of the syringe-syphon arrangement described below) and the brain reinjected on the following day. After an interval of two days the process should be repeated; and a

further injection may be made later, if it is thought desirable. The fluid in which the brain is immersed should be changed at least four times.

At the end of a month or six weeks, the organ is sufficiently hard to be cut into sections.

In those cases in which it is necessary or desirable to cut into and examine the brain in the fresh condition, the organ should be cut into a series of thick transverse-vertical sections,

FIG. 1.—INJECTION APPARATUS DESCRIBED IN THE TEXT.

The letter *I* points to the syringe; *L*, to the supply tube of the syringe; *K* to the discharge tube, by which the fluid is conveyed to the distributor *M*, and thence to the four great vessels (vertebrals and common carotid arteries).

The jar shown in the figure is not, of course, that described in the text for holding the brain during the process of hardening.

each section measuring from two to two and a half inches in thickness.

After the sections have been carefully examined, and any morbid appearances described and noted, each section is placed in a flat shallow jar (large enough and deep enough to hold it easily) which is then filled up with Müller's fluid; the jar (the edge of which is ground flat for the purpose) is then covered with a glass plate, and the preparation set aside until the following day.

The Müller's fluid should be changed, and the section turned daily, for at least ten days.

In order to prevent any destruction of the section in the process of emptying and turning, I find it advisable to withdraw the fluid by syphon action. After drawing off one syringeful of fluid, the tube (L, Fig. 1) is disconnected from the syringe (care, of course, being taken that while this is being done the end of the tube (L) connected with the syringe is below the level of the jar), and the remainder of the fluid allowed to flow off by syphon action.

FIG. 2.—CANULA (A), AND DISTRIBUTER (B), NATURAL SIZE.

The brain section is best turned by reversing the empty flat jar, which has, after it is emptied, been covered with a glass plate; the jar is then lifted off the cover, and filled with fresh Müller's fluid, into which the brain section is allowed to glide off the glass plate.

These may seem trifling details, but they are important, inasmuch as they do away with the necessity of fingering the brain tissue, and thereby prevent any possibility of tearing it, while still in the soft, unhardened condition.

At the end of a month or six weeks, these thick portions of brain are sufficiently hard to permit of being cut into thinner sections. The outer surface of sections prepared in this way is considerably shrunk, and any morbid appearances which were present in the fresh state will, in it, be unrecognisable; but the interior of thick portions of brain prepared in this manner is splendidly hardened, permitting of perfectly clean section, and displaying many morbid conditions, such as tumours, softenings, etc., in a very beautiful manner.

I have found this method of hardening in thick sections very convenient and useful; for it allows one to examine the organ while in the fresh condition, and therefore to note changes in vascularity and colour which are destroyed by the process of hardening, while it at the same time enables one to make perfect sections of the whole again.

Professor Hamilton's method of preparing the brain and of cutting entire sections by his large freezing microtome is so complicated and laborious, and requires so much time, as to be entirely unfitted for ordinary every-day use. It is, too, unnecessary for most practical purposes, for which very thin sections are not required; all one wants for most practical purposes is a series of sections which display the naked-eye appearances; the minute changes in any portion of these sections may, if necessary, be subsequently determined in the ordinary (microscopical) manner.

For cutting a series of thin naked-eye sections of the entire brain, the very simple apparatus shown in Figure 3 is all that is required.

It consists of an L-shaped piece of hard wood (A); the horizontal portion of the L (that on which the letter A is placed) measures 11 inches in length, 8 inches in breadth, and 1 inch in thickness; the vertical, short portion of the L measures 7 × 8 × 1 inches.

The piece of brain which is to be cut into sections is placed in the position shown in the figure (see B, Fig. 3), and is firmly pressed against the upright part of the stand by means of a glass plate (c).

The section is then cut by means of a long thin knife, similar to the brain-knife used by pathologists, only con-

siderably longer in the blade. The knife is of course held in the right hand, while the left hand presses the glass plate firmly and evenly against the brain tissue. After the section is made, the stand is tilted up, so that the vertical side becomes horizontal; the glass plate is then removed, and the two portions of brain are floated off by immersing the end of the wooden stand, and the brain sections which are lying

FIG. 3.—APPARATUS DESCRIBED IN THE TEXT FOR CUTTING NAKED-EYE SECTIONS OF THE ENTIRE BRAIN.

The letter A is placed on the horizontal portion of the L-shaped wooden stand; B on the portion of brain tissue; and C above the glass plate by means of which the slice of brain is held in position.

upon it, in water; in this manner all risk of tearing or lacerating the section is avoided.

With a little practice, it is not difficult by means of this simple appliance to cut beautiful, even, sections of a quarter of an inch in thickness.

Sections prepared in this manner can be pinned to a wooden board, and then photographed, should it be thought desirable to preserve their exact appearances.

A series of representations of sections of the entire brain may easily be prepared in this manner; and I have in my

possession a large collection of photographs of naked-eye sections of the entire brain, which it is no exaggeration to say are at least equal to any representations of the normal and pathological brain which have yet been published.

Any portion of these sections may, of course, be cut out, placed in any microtome, cut into thin sections, and examined by any of the ordinary microscopical methods. In this way, a whole transverse vertical section of the brain may, if it is required, be submitted to microscopical examination; with the great advantage, that it is possible to piece as it were the individual microscopical sections together, or at all events to be quite sure of the relative position of any given microscopical section to the entire (transverse-vertical, longitudinal-vertical, or horizontal) section of brain from which it was removed.

Or should it be desired to make thin sections of the entire brain, the naked-eye sections, obtained in the manner described above, may be prepared, frozen, and cut, in the manner recommended by Professor Hamilton. Indeed, my "ready method" is a useful preliminary to Professor Hamilton's method, for the thinness of the sections greatly facilitates and shortens the freezing process.¹

¹ The apparatus was made for me by Gardner, Forrest Road, Edinburgh.