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# ORIGINAL MEMOIRS

## AN APPROACH TO THE HYPOPHYSIS THROUGH THE ANTERIOR CRANIAL FOSSA.*

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THOUGH the real advent of surgery of the hypophysis dates back little more than a half a decade—it being the last of the cerebral structures to come within the scope of surgical therapy—nevertheless in this short space of time rhinologists and surgeons have given much attention to this small and until recently very inaccessible organ, and have developed various methods of approach on the cadaver and the living subject with varying degrees of success. The hypophysis, situated as it is deep in the sella turcica and hemmed in by such important structures as the cavernous sinus, the optic tracts and chiasm, and the internal carotid artery, has for a long time been considered a *noli me tangere* by the surgeon. Indeed, in 1882, Hyrtl described even the sphenoidal sinus as being entirely beyond the reach of hand or instrument.

The incentive to surgical intervention in this particular field must be attributed to Pierre Marie, who in 1886, in a monograph on acromegaly, first suggested the etiologic relation between acromegaly and perverted function of the hypophysis. The constantly increasing number of experiments demonstrating the vital importance of this organ, and the many observations, notably Fröhlich's, of the various symp-

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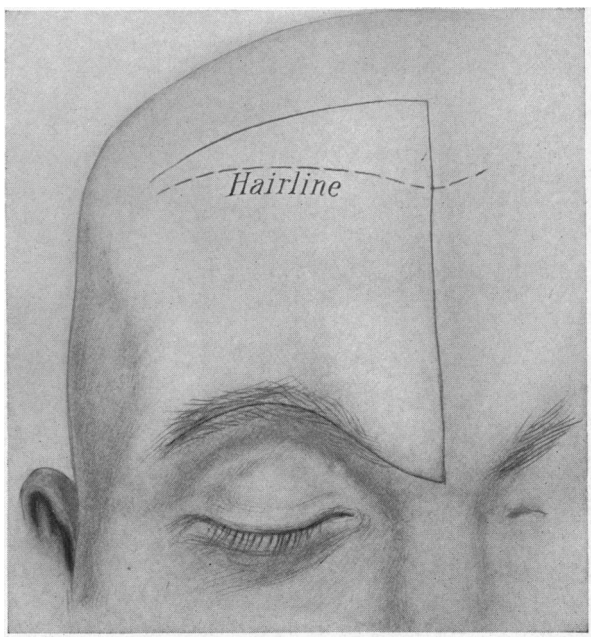
toms complex, caused by perverted function of the pituitary and amenable in only a transitory measure to internal remedies, including organotherapy, have added greatly to the impetus to surgical intervention. Like all other intricate procedures, the operation for exposure of the hypophysis is passing through various stages of evolution, becoming constantly less complex and at the same time less mutilating, until I think I may say with perfect accuracy that I found the operation, according to the technic which I am about to describe, as easy of performance and as devoid of difficulties, though somewhat more complicated, as that on the Gasserian ganglion.

There are two principal modes of attack: the intracranial and the extracranial, each having been modified to suit the needs and the convenience of the various operators. By means of the former, the hypophysis may be reached either through the middle or the anterior cranial fossa, and the operation may be performed extradurally or intradurally.

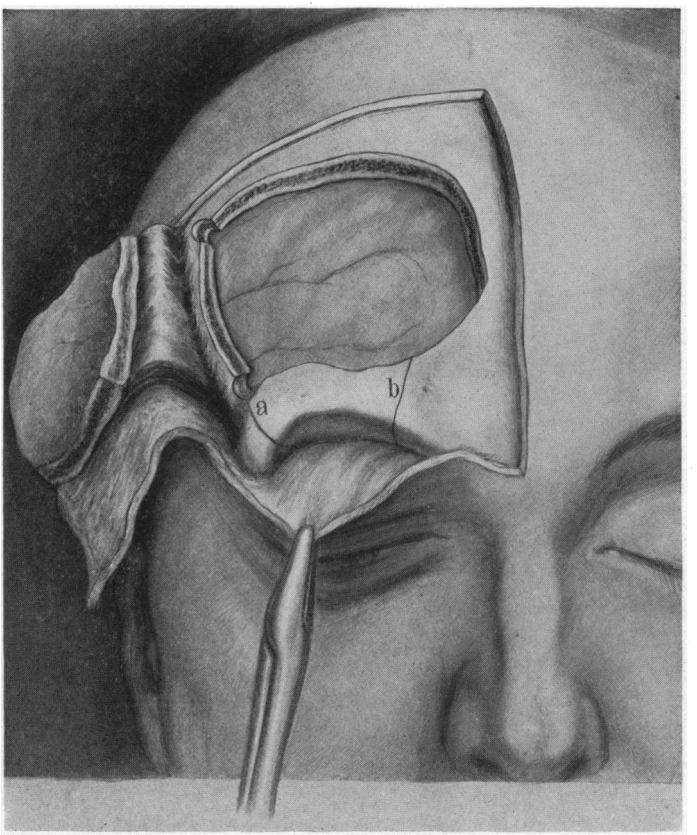
In 1893, Caton and Paul (*Brit. Med. Jour.*, 1893, p. 1421) conceived the idea of removing a hypophyseal growth through the middle cranial fossa by elevating the temporosphenoidal lobe, but as it happened the patient died before the operation was performed. Horsley (*Brit. Med. Jour.*, 1906, i, 323) later removed a cyst of the hypophysis by this method, and recommends early incision of the dura. Dahlgren is also reported to have operated successfully through the middle fossa, but no details of the operation are to be found. Paulesco, Cushing and Caselli have used a very similar method in their experimental work. In 1910, Silbermark (*Wien. klin. Wchnschr.*, 1910, xxiii, 467) developed a temporal intracranial method on the cadaver, consisting of a bilateral craniectomy—the counter-opening allowing dislocation of the temporal lobe without danger of compression. This operation, however, has never been performed on the living. While this method has proved very successful in canine and other experimental hypophysectomies, it seems scarcely adapted to man except in very rare instances, such, for example, as when a cyst or tumor of the pituitary extends into the infundibular region, and little attention has been given of late to this procedure.

FIG. 1.



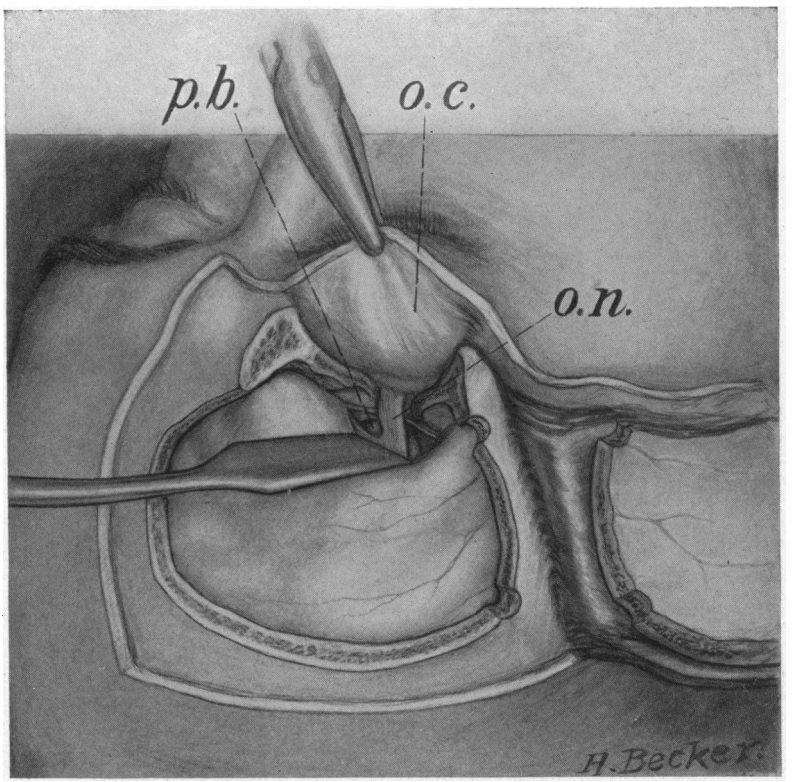

Drawing showing the relation of the incision to the eyebrow and the hair line.

FIG. 2.




Showing the reflection of the osteoplastic flap and between lines (*a*) and (*b*) the portions of the supra-orbital ridge to be resected.

FIG. 3.




With the head in the Rose position, after the supra-orbital ridge and what remains of the roof of the orbit have been removed, the frontal lobe is elevated with a retractor and the orbital contents are displaced downwards, exposing the optic nerve and immediately to the left of it, the pituitary body; *o.c.*, orbital contents; *p.b.*, pituitary body; *o.n.*, optic nerve.

Krause (*Deu. Klin.*, 1905, viii, 1004) was the first to suggest approaching the hypophysis through the anterior cranial fossa, by resecting the frontal bone and proceeding extradurally until the lesser wing of the sphenoid is reached, at which juncture the dura is incised and the hypophysis easily exposed. Borchard (*Centralbl. f. Chir.*, 1908, lxvi, 332) tried to remove a hypophyseal tumor by the above method, but was obliged to abandon the operation because of hemorrhage. Kiliani (ANN. SURG., 1904, xl, 35) elaborated Krause's technic somewhat and advocates immediate incision of the dura. In 1908, McArthur performed an operation somewhat similar to Krause's with an unsuccessful outcome. He has since modified his technic, but has not to my knowledge practised it on the living subject. Last year Bogoiavlensky (*Jour. de Chir.*, 1912, viii, No. 4) performed the first successful operation through the anterior cranial fossa by a method very much like Krause's.

Most of the operations thus far have been by extracranial methods, and the surgery of the hypophysis is usually said to have its advent in 1907, when Schloffer performed his first fairly successful operation, approaching the hypophysis by the extracranial and transphenoidal route, though the experimental work of König, Löwe, and especially Giordano had paved the way for the development of Schloffer's technic. The latter, however, was somewhat crude and mutilating in character, and it has remained for others to alter and refine it. Thus, in chronological order, we find Kanavel (*Journal A.M.A.*, Nov. 20, 1909) and his intranasal operation, in which the nose is reflected upwards; Halstead (*Surg., Gyn.*, and Obstet., May, 1910) and his oronasal operation, in which the incision is made in the mucous membrane beneath the upper lip; and Hirsch (*Jour. A. M. A.*, vol. lv, p. 9) with his endonasal method. The latter is the operation of choice of all the transphenoidal methods, the conspicuous feature of which is the submucous resection of the septum and vomer, thus minimizing the danger of infection. During the past year Chiari (*Wien. klin. Wchschr.*, 1912, xxv, 1) performed two operations by a slightly different technic. He makes an incision from the inner edge of the orbit along the outer margin

of the nasal bone down to the maxillary process. The eyeball is then drawn outward, the posterior part of the nasal septum and the sphenoidal septum are resected, and the hypophysis exposed. The disfigurement, Chiari claims, is slight, as only a small portion of the nasal framework is removed. Still a different method has very recently been devised by Biehl (*Zentralb. f. Chir.*, 1912, Jan. 6) in experimental work, consisting in a suprahyoid pharyngotomy. By drawing aside the soft palate with the tenaculum, the base of the skull covering the nasopharynx up to the bifurcation of the septum is bare. The soft parts are pushed aside, under wall of the sphenoidal sinus opened, floor removed, and hypophysis readily exposed. This gives a broader approach than most extracranial methods, and has been found by Biehl very successful on the cadaver.

With one and all of these transphenoidal operations, however, there are two serious injections: One, the inevitable risk of infection from the mucous membrane. This has proven the determining factor in almost all of the 30 fatal cases. The second objection is the rather contracted avenue through which one must work to reach the sella turcica, and difficulty in securing an adequate exposure of the sella turcica and contents. The variation in size of the sphenoidal cells is a disturbing factor. When of comparatively large dimensions exposure is not so difficult; quite as often one will find cells of small dimension, through which exposure is correspondingly contracted.

I am very much in doubt whether eventually the transphenoidal route will be the operation of choice, and although there are some conditions in which this method will have to be resorted to, I believe in the future preference will be given to the intracranial route through the anterior cranial fossa. With this in mind, I have endeavored to elaborate a technic which will make the exposure of the hypophysis as feasible as the exposure of other basal structures, such as the Gasserian ganglion. The procedure, which I resorted to lately, seems to me the safest and most rational that has come to my notice. The operation consists essentially in the reflection of an osteoplastic flap from the right frontal region, in the removal *en bloc* of the supra-orbital ridge as suggested by McArthur with a

portion of the roof of the orbit, later to be replaced, and in rongeuring away what remains of the roof of the orbit down to the optic foramen. With the elevation of the frontal lobe and the depression of the orbital contents, a free and adequate exposure is secured, and there remains only to make a short incision in the dura to lay bare the cavity of the sella turcica.

In a case referred to me recently by Dr. Franklin E. Murphy, of Kansas City, the patient, a young man of twenty-three, had been a normal child up to the age of fourteen, when he was struck with a rock over the right temporal region. Two years later, he grew perceptibly weaker, his weight began constantly to increase, and he was gradually losing the sight of his right eye. When he first came under my observation in July, 1912, his appearance was that of a thickset boy of fifteen or sixteen, with very marked panniculus adiposis. The genitalia—infantile in type—suggested a child of ten or twelve. He had an enormous appetite, and was suffering from severe headaches and occasional nausea. The ocular disturbances had advanced to a state of complete right temporal hemianopsia. Aside from these marked glandular symptoms, the X-ray findings were very suggestive of pituitary trouble. As the latter showed no material deepening of the sella turcica, I felt that the lesion would be readily exposed from above. Under intratracheal anæsthesia, the operation was carried out in the manner above described. As soon as the anterior clinoid process was reached, a transverse incision, two centimetres long, was made in the dura across from one anterior clinoid process to the other and about a centimetre above the base of the skull, and with a retractor suitably placed there was seen projecting upward between the optic tracts what proved afterward to be a pituitary cyst. The cyst was opened and evacuated. The operation was devoid of any serious difficulty, and afforded a splendid exposure of the region of the sella turcica.

This method,[1] which is a modification of McArthur's, has certain advantages over the latter's; chiefly, in that the reflection of the osteoplastic flap from the frontal region admits of greater elevation of the frontal lobe and a correspondingly freer exposure of the deep-seated structures. This is a point

[1] Since the reading of this paper this operation was repeated in a second case with equally gratifying results.

of considerable importance. Secondly the portion of bone to be resected, including the supra-orbital ridge and a portion of the orbital roof, is of smaller dimensions. As this bone must be replaced for cosmetic reasons, its nutrition will be more readily supplied than the larger fragment of McArthur's operation, and necrosis is less likely to occur. This infrafrontal route deserves careful consideration in the selection of methods for hypophyseal operations. The presence or absence of a scar in the median line of the forehead is a matter of little consequence compared with the importance of selecting a method which ensures a minimum of risk to life with a maximum of exposure.

While it is still a matter of speculation which of the two methods, the extracranial or the intracranial, will become the conventional procedure, for the time being at least the operator should be influenced by the contour and conformation of the sella turcica. Ever since Oppenheim in 1899 discovered that enlargements of the sella could be reproduced by the X-ray and correlated with an increase in size in the gland itself, the radiograph has held an important place in the diagnosis and later in the mode of removal of tumors in the uncinate region. Thus, when the radiograph shows the sella deepened and encroaching upon the sphenoidal cells with a narrow orifice, access to the hypophysis from above, that is by one of the intracranial routes, is difficult and preference should be given to the transphenoidal method, in which the approach is made from below. When, however, the sella, whether deepened or shallow, has an enlarged orifice, showing its contents have encroached on the brain and not the sphenoidal cells, the transphenoidal method is practically impossible and one of the intracranial routes is indicated. In eleven out of fourteen deaths following a transphenoidal intervention (*Toupet, Revue de Chir.*, 1912, vol. xxxii, No. 6) autopsy showed that the tumor had encroached upon the intracranial space. It is very likely that the outcome in these cases might have been quite different had the intracranial method been applied.

Thus, we see there are cases in which the intracranial method is positively indicated and should be given preference. It gives a broader avenue of approach and lessens danger of infection.