estimated. Under constant saline irrigation a corresponding graft was cut with the same trephine and scissors through the cornea of the enucleated eye, which was held in Tudor Thomas's apparatus during this manoeuvre. The graft was transferred to the bed in a lens spoon, and manoeuvred into position by an iris repositor. At the same time gradual tension was put on the purse-string suture, and eventually this was tied so that the graft was maintained in position and entirely covered by conjunctiva. No part of the suture touched the graft, and no corneal stitches were used. Eserine was instilled, a retention suture fixed the upper lid to the cheek, and ordinary cataract routine was instituted.

Diagram of operation. A-A', Corneal graft. B, Conjunctival flap (note eccentric position of suture). C, Miotic pupillary aperture. D, Iris. E, Lens.

Three days later the graft could be seen in position through the widening conjunctival aperture, and was completely opaque. There was intense conjunctival engorgement, but no pain. At the end of the first week the conjunctival aperture had increased, and the graft was seen to be clear and to have the brightness of normal corneal epithelium. On the tenth day the stitch was removed, and thereafter dressings were continued until the end of a fortnight. Three weeks after the operation the appearance of the grafted eye was as in Fig. 2 (Special Plate). The central black area is the gap through the posterior layers of the graft, surrounded by a shelf, which in this case was slightly too excessive, and which has resulted in some limitation of the field. By slit-lamp examination the iris details can now be seen, and the pupil is found to be fixed by posterior synechiae; there has been an improvement in the opacity of the cornea outside the graft. Unaided vision at this time was 2/60. One month after the operation the unaided vision was 6/60, and the patient was able to walk about the ward, although on account of her limited field she had to exercise great care.

On January 7th, 1935, unaided vision was 6/36, and with the telescopic glasses this is improved to 6/24 and J.6. Judged by the rate at which the graft has cleared there may yet be further improvement. The patient is now able to read ordinary correspondence, and spends most of her time watching traffic through the hospital windows. It is possible that she may be removed from the blind register.

Postscript: March, 1935.—The vision is 6/24 and J.6: the patient now walks abroad unaided.

Commentary

In our opinion the important features of this technique lie in the use of a complete conjunctival flap with constant saline irrigation. It would have been better in this case to have used a larger graft or to have made the shelving edge less, although the stenopaic nature of the aperture undoubtedly improves her vision; in future cases we propose to adopt this technique.

We should like to thank Dr. Rushton of the Royal Eye Hospital for the photographs.

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COLLOID CYST OF THIRD VENTRICLE OF THE BRAIN

REPORT OF A CASE OPERATED ON, WITH RECOVERY
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(With Special Plate)

In the literature will be found a considerable series of reports of a peculiar cystic tumour of the third ventricle of the brain, with notes reflecting the interest which the discovery of this rare type of intracranial new growth seems invariably to have aroused in its finders. Until the appearance in 1933 of Dandy's monograph on *Benign Tumours in the Third Ventricle of the Brain*¹ such references were to findings at necropsy, and the publication of his series of five cases operated on with four recoveries suggested that neuro-surgeons in general had perhaps not been sufficiently alive to the importance of being on the look out for this rare but eminently operable variety of tumour.

In the spring of last year we were fresh from the study of Dandy's book when a case of brain tumour presented itself, unlocalizable by ordinary clinical methods, and having as its most characteristic feature the pronounced intermittency of its symptomatology. In the circumstances it was inevitable that the possibility of this being a case of third ventricle tumour should occur at once, and, by one of those coincidences which do happen sometimes, our suspicions were confirmed by ventriculography; operation followed, and a colloid cyst was successfully removed from the patient's third ventricle. With the exception of Dandy's four cases noted above, a study of the literature has failed to discover any reference to the operative removal, with recovery, of a tumour of this type, and our case would seem to be the first successful operation of the kind to be recorded in this country.

Patient's Previous History

The patient, a moulder aged 34, was admitted to the Victoria Infirmary on April 25th, 1934, having been sent in by Dr. Bell of Falkirk Infirmary with a diagnosis of brain tumour. About two and a half years before admission he began to suffer attacks of pain; these were distributed generally over the cranium, but tended to be most severe in the right side of the head. During the height of an attack there was frequently marked pain in the occipital region. These attacks, the onset of which was not associated with any special time of day or with any very obvious exciting cause, had at first a duration of a few hours. At first, too, a period of months used to elapse between the paroxysms, but as time went on the free intervals gradually shortened, until finally, just before admission, there was only a week or two of freedom, while the attacks themselves were of longer duration and were more severe.

A typical severe attack was characterized by a gradually increasing headache, which reached at length an extreme degree of severity, and on four occasions—the first time early in January, 1934—a period of unconsciousness of a few minutes' duration occurred at the height of the paroxysm. For the past six weeks, too, there had been vomiting on several occasions without any relief to the pain, and the patient's wife was emphatic in her statement that after these severe seizures there was complete failure of memory of the past attack, so that the patient himself had no recollection whatever of its characters. For three weeks before admission it had been noted that giddiness was present during the paroxysms. Even during the early mild seizures there was

a very noticeable deterioration of vision, and this became aggravated later, so that the patient was sometimes almost blind; apart from these transient periods of defective vision, however, the eyesight had gradually failed during the past nine months.

Condition on Examination

Examination showed him to be a strong, healthy-looking individual, clear and intelligent mentally; during his fourteen days' stay in hospital prior to operation he had none of his severe attacks of pain, but complained of constant dull frontal headache. Apart from a questionable defect in the sense of smell (he appreciated, but could not recognize odours) investigation of the cranial nerves was, with the exception of the eye examination, entirely negative. Vision in either eye was 3.5/6, while ophthalmoscopic examination showed a papilloedema of 4 D in both eyes, with two small haemorrhages on the right optic disk. The visual fields were normal. A detailed investigation of the motor and sensory functions, and of reflexes, station, gait, and co-ordination, failed to elicit anything abnormal. The Wassermann reaction of the blood was negative; x-ray examination of the skull showed no abnormality.

Ventriculography and Operation

On May 9th, 1934, under avertin anaesthesia with local infiltration with novocain, ventriculography was carried out and was followed immediately by operation. Both lateral ventricles were tapped. There was a moderate increase in the cerebro-spinal fluid pressure, the fluid itself being clear. Phenylsulphonaphthalein solution, 1 c.cm., was injected into the right lateral ventricle; almost immediately the dye appeared in the fluid from the left ventricle. Then 120 c.cm. of cerebro-spinal fluid was withdrawn and replaced by a slightly smaller volume of oxygen. The aspiration of fluid was continued until no more could be obtained, in order to secure, as nearly as possible, a complete substitution of gas for cerebro-spinal fluid. (This, as is well known, is a most important point in the diagnosis of a case of this type. In an imperfectly filled ventricular system and with the standard positions of the head, an apparent filling defect of the third ventricle may be due entirely to the absence of gas within its cavity.)

The x-ray films showed a pronounced degree of hydrocephalic expansion of both lateral ventricles; no third ventricle was visible. An interesting finding was the definite bulging of the septum lucidum to the left of the midline in a well-centred antero-posterior film. The appearances suggested a tumour of the third ventricle, and it was thought that the entire absence of symptoms referable to involvement of the mid-brain suggested a lesion in its anterior portion rather than one more posteriorly.

At operation a right frontal bone flap was turned down, and this was followed by the reflection of a dural flap with its base to the longitudinal sinus. After pressure had been reduced by tapping the anterior horn of the ventricle, a portion of frontal lobe well forward of the motor area was excised with the diathermy knife. This gave a free opening into the widely dilated ventricle, within which could be seen the choroid plexus extending forward to the foramen of Monro. This latter was scarcely, if at all, dilated, but within its lumen could be seen a solid grey structure.

With a small knife an incision of the fornix was made from the edge of the foramen of Monro forwards; this opened up the anterior part of the third ventricle and showed the above-noted greyish structure to be the wall of a tumour. Puncture demonstrated its cystic character and allowed a small amount of stringy mucoid material to escape. The thin wall of the cyst was then seized with forceps and, after a good deal of difficulty owing to friability, was removed completely in one piece.

It was then possible to look through the widened foramen of Monro and inspect the clean, white, and apparently quite normal walls of the third ventricle. A small tag of tissue was adherent to the anterior extremity of the choroid plexus. This was removed after placing a silver clip on the plexus, a manoeuvre which started some bleeding from a small vein just lateral to this point; after a little difficulty this was controlled by electro-coagulation. The ventricular system was quite dry when finally the dura was replaced and closed

over the gap in the frontal lobe. The operation was completed by the usual closure of bone flap and scalp.

The specimen after removal agreed very closely in appearance with that of Case I in Dandy's series. The tumour was about the size of a hazel-nut, and showed a small area of choroid plexus tissue attached to the cyst wall.

Microscopical Examination of Tumour

Microscopical examination of the choroid plexus structure reveals a core of loose fibrous tissue in which are numerous congested and dilated vessels—some showing thickening and hyaline degeneration of their walls, while others are thin-walled and resembling sinusoids. Several concentric bodies are present. The cyst, where it is attached to the choroid plexus, has a covering of epithelium, which differs from that of the normal choroid in that instead of a single layer of flattened cells there is an irregular multi-layering of cells, having the appearance of actively secreting cells, almost goblet-cell in type. In places where the heaping up is marked, distended cells can be seen being thrown off into the cystic cavity. This is lined by a single layer of these cells set directly in a thin fibrous wall without basement membrane. The content of the cyst is a colloidal structureless material staining with the acid dye. An occasional cell is seen in the colloid—a polymorphonuclear leucocyte and a mononuclear leucocyte. In no part of the section could the presence of cilia be determined in the cells. In Dandy's cases the presence of cilia has been recorded.

As to the nature of the origin of such cysts one may consider that they may arise from the ordinary choroid plexus of the third ventricle, but at the same time the possibility of their origin from a vestigial structure, known as the paraphysis, and which is seen in the early embryo, especially that of the lower vertebrates, has to be considered. This structure arises from the roof of the telencephalon, and presents itself as a median irregular pouching originally communicating with the third ventricle, but in its later development through vascularization becoming very similar to the choroid plexus formation. The absence of lesions at necropsy which could be associated with such a structure in the third ventricle is sufficient grounds for questioning this interpretation.

Post-operative Progress

The post-operative course, though devoid of serious complications, showed several abrupt elevations of temperature, the highest of which (102.4°) took place on the fourth day. With this temperature the pulse rate was 90 per minute, and the patient complained of severe headache; pressure from hypersecretion or defective circulation of cerebro-spinal fluid was suggested, and the question of tapping the ventricles was considered, but the condition subsided quickly before this was carried out. After the sixth day the temperature remained normal.

For the two weeks following operation there was a marked disturbance of the patient's mental state; he was confused, and showed an entire loss of memory for events taking place after operation. This cleared abruptly about the fourteenth day, and thereafter his mental state appeared normal. He was discharged from hospital in excellent condition on June 2nd, and started work again as a moulder in October. He returned for examination on February 9th, and reported the occurrence of two epileptiform seizures, the first in December, the second on January 21st. These would seem to have been generalized, and were associated with complete loss of consciousness; there was no aura. The patient was otherwise in excellent mental and physical health, without any headache or other sign of increased intracranial pressure; his optic disks showed post-neuritic atrophy.

Some Interesting Features

It is not our purpose in this short paper to give a detailed description of the clinical manifestations of the type of lesion under discussion. Dandy's account is indeed so complete as to make this quite superfluous. In the remarks which follow we have discussed a few

only of the more interesting features which our case presents. A perusal of the literature makes one regard it as very typical in its symptomatology.

The characteristic intermittency of the symptoms is well exemplified. To quote Dandy¹: "Intermittent headaches are unquestionably of mechanical origin. They indicate a ball-valve obstruction to the outflow of fluid from some part of the ventricular system. The fluid increases until the pressure reaches a stage when the ventricular channel, wherever it may be, is again opened, thus permitting the excess of fluid to pass the obstruction. Such periodicity continues, usually with gradually shortening intervals, until eventually the obstruction becomes complete." In three out of Dandy's five cases there were present, in addition, curious attacks, mentioned also by some other writers, in which headache, dimness of vision, or giddiness was brought on by certain changes in the position of the head. These, however, were entirely absent in our patient.

It should be noted that the fatal ending in this condition occurs in coma during one of the attacks of severe headache. Rinder and Cannon² thus describe the terminal stage:

"The fatal ending began on the afternoon of November 27th, 1929. The patient stopped work because of a severe headache. At home she began to have attacks of vomiting, which increased until they became projectile. There was excruciating pain over the right eye and in the temporal region, and she complained of dimness of vision. She refused to call a physician, as she believed the attack would stop as had the previous ones. At 3 a.m. on November 28th she was found lying on the floor in a coma; she was cyanotic, and breathed with difficulty. Death ensued shortly thereafter."

From the history and neurological examination the diagnosis of these lesions can at best be but surmised. Ventriculography is required. Our case exemplifies very well the fallacy of relying on ventricular estimation and dye injection. It will be noted that the dye passed readily across from one lateral ventricle to the other in the presence of what was apparently a complete obstruction of both foramina of Monro. At operation the reason for this was obvious, in the finding of a large perforation of the septum lucidum, easily visible on inspection of the interior of the right lateral ventricle. The occurrence of this secondary perforation of the septum lucidum in cases of chronic hydrocephalus, with the fallacious diagnosis of an obstruction in the cerebro-spinal fluid pathways below the third ventricle to which it may give rise, should be emphasized. It is by no means uncommon, and several instances of the kind have lately presented themselves.

The recent occurrence in our patient of two epileptiform fits is to be regarded as a sequel to the transcortical incision into his lateral ventricle. Such seizures may occur after any brain operation in which the integrity of the leptomeninges is impaired, and come under the heading of traumatic epilepsy. According to Dandy they are seldom frequent, and tend to become less so over a period of time.³

We have to acknowledge our indebtedness to a number of individuals for their co-operation in the investigation of this case. Our thanks are due to Dr. Bell of Falkirk for his records of the patient while in Falkirk Infirmary, and to Dr. Conway and Dr. Walker for their ophthalmological and radiological examination while in the Victoria Infirmary. Lastly, on the pathological side, we owe a debt of gratitude to Dr. John Anderson, director of the clinical laboratory of the Victoria Infirmary, for a great deal of assistance and advice.

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FUNNEL-CHEST AND PULMONARY TUBERCULOSIS

BY

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(With Special Plate)

Funnel-chest ("Trichterbrust") is a depression of the lower part of the sternum, which is usually due to a congenital anomaly. The chief clinical symptoms are disturbances in the functions of the heart, which have been described in detail by Ebstein, Barié, Groedel, von Pohl, and Carr. Less attention has been paid to the fact that funnel-chest can be combined with pulmonary tuberculosis, as seen, for example, in the cases of Ebstein, Curschmann, Versé, and R. von Pohl. The question arises whether a pathogenic part is played by the funnel-chest in the development of pulmonary tuberculosis. The following case seems to be a contribution to the solution of this problem.

Case Record

Male, aged 30 years. Increasing cyanosis during the last eight years (1926-34); occasional small pulmonary haemorrhages since 1926. Father known to have suffered from tuberculosis forty years before the patient's admission to hospital (1926). Patient died on April 1st, 1934, with increased symptoms of cardiac insufficiency, especially dyspnoea and cyanosis. Tubercle bacilli were not found in the sputum until 1931, and never again until 1934.

POST-MORTEM EXAMINATION

Corpus sterni 10 cm. in length, with a depression 7 × 7 cm. from the third rib downwards (Fig. 1 on Plate). The area of depression included the cartilages of the ribs on the right side, the departure from the normal contour (the depth of the depression) being 3 cm. The manubrium of the sternum was 5 cm. long, the length of the whole sternum being 18 cm.

The heart was enlarged, particularly in its right section. The anterior surface of the enlarged right ventricle showed a depression of 5 × 2.5 cm. in size, corresponding to the depression of the sternum (Fig. 2). The pericardiac surface of the margins of the depression was thickened by scarring. When opened the right ventricle was seen to be bipartite, the inlet part comprising the right venous ostium being the larger, whereas the outlet part, with the right arterial ostium, was narrow, with smooth valves and vessels (Fig. 3). Beneath the right posterior semilunar valve of the pulmonary artery was a deep pocket in the muscular substance. The descending anterior branch of the left coronary artery diverged from the trunk of the aorta 2 cm. above the semilunar valves. The cardiac muscle in the region of the depression was to a great extent replaced by fibrotic tissue (histological examination).

Lungs.—Left upper lobe showed a notch like a lobus azygos. Three tuberculous foci were observed in the right upper lobe; the first, in the region of the ramus apicalis, and the second, in that of the ramus subapicalis of the dorsal bronchus, were the size of a hazel-nut, while the third, in the region of the ramus horizontalis, was the size of a walnut. All were liquefied. There were some smaller nodules due to aspiration in the lower lobes, and extreme blood stasis in all organs.

Discussion

The depth of the depression of the sternum, typical of funnel-chest, in the present instance did not reach the extreme figures of some of the cases described. The depression, which included the cartilages of the right ribs, was neither symmetrical nor confined to the body of the sternum. The heart was not displaced towards the left side to the extreme degree that has sometimes been observed, but it showed a peculiarity which seems to me of greatest importance, and which hitherto has not been noted as occurring in such a definite and marked manner—

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FIG. 1.—Low-power photomicrograph of area of cyst attached to choroid plexus, showing (i) lining epithelium which at this place closely resembles the epithelium of the plexus; (ii) an aggregation of cells which suggests an epithelial origin.

FIG. 2.—Low-power photomicrograph of wall of cyst, showing multi-layered epithelial cells with desquamation of a few into the cystic cavity.

FIG. 3.—High-power photomicrograph of lining epithelium of cyst wall with area of colloid content.

FIG. 4.—Ventriculogram. Antero-posterior view, showing dilatation of both lateral ventricles: no third ventricle visible: bulging of septum lucidum to left of midline.