be forced out of the brain, or cerebro-spinal fluid from the cavity, in order to make room for it; when blood is thus forced out of the capillaries of the brain the intra-cranial pressure becomes that of the arterioles or arteries.

"Cerebro-spinal fluid, when drawn off from the cranium, is very quickly re-excreted. A dog thus may yield 100 c.c. or more cerebro-spinal fluid in 24 hours, and thus, if an animal is trephined and cerebro-fluid drawn off and the hole closed, the fluid rapidly collects again and the blood-pressure becomes normal.

"I think some of these points must be brought into very careful consideration in discussing any physical alteration of brain-pressure by trephining."

It thus appears that the patient's pressure being zero in the upright position corresponds with that of the dog in the same position, and it would seem that in ordinary circumstances of health and rest the intra-cranial pressure is zero, rising when the blood pressure is increased, as by change of posture, or running, coughing, excitement, or inflammatory action.

No advantage is gained by leaving the hole open, whereas in syncope the proper position for the patient is either a horizontal one or with the head pointing downwards; in apoplectic effusion, etc., where it is desirable to lessen the blood pressure, the head should be raised.

I am much indebted to Dr. Bond for his kindness and skill in preparing the plaster and gelatine casts, and for reading this paper in my unavoidable absence.

On Cerebral Pressure. By John Macpherson, F.R.C.P.E., Medical Superintendent, District Asylum, Stirling.

The term cerebral pressure requires more exact definition, and ought, I think, to be entirely superseded by a more generic, comprehensive, and intelligible name. It should not be taken in the limited sense of only including fluid pressure, but should be extended so as to embrace a large variety of clinical and pathological conditions.

It may be either acute or chronic, but when acute it falls to be dealt with entirely by the surgeon and general physician. When chronic it more often comes under the notice of the psychiatric physician or the neurologist. Generally speaking, when, in addition to continued mental

disturbance, we in our specialty meet with a case *which presents persistently two or more* such symptoms as the following—headache, vomiting, vertigo, ataxia of cerebral origin, paralysis, local or general convulsions, unequal, contracted, or irregular pupils, suffused face, and, above all, optic neuritis—then we have to do with a state of what is now, for want of a better term, called cerebral pressure. I do not say that all cases which present these symptoms should be surgically interfered with, nor am I maintaining that surgical interference would be likely, even if timeously applied, to benefit all such cases; but I do unhesitatingly maintain that many cases manifesting such a combination of symptoms as I have enumerated have derived undoubted benefit from surgical operation both in the experience of others and to a very limited extent in my own experience.

It will be urged against this form of treatment that it is empirical, and that it has no rational or extenuating basis founded upon either physiology or pathology. It is true, perhaps, that in the present very imperfect state of our knowledge no proper explanation of the *modus operandi* of surgical operation in the relief of such cases can be put forward. We are, therefore, met with the taunt of illegitimately experimenting upon the human subject. There appeared an editorial in last week's "British Medical Journal" which is so *apropos* of the present argument that I qucte a sentence or two from it, as follows:—"To the best class of practitioners every operation done, every bath ordered, every pill or potion prescribed is an experiment to be watched and noted and to serve as a stepping-stone to greater knowledge, which shall render such experiments in the future more exact and their results less uncertain. . . . To limit operative or any other form of treatment to such as is thought sure to be successful would mean a death sentence to untold numbers of sick people who at present are able to obtain a cure at the expense of running some amount of risk. The mortality in cerebral surgery for the relief of pressure generally has been so slight, or so conspicuous by its absence, that even the anti-experimental argument falls to the ground."

host of other effectual procedures too numerous to mention.

It has always appeared to me that the attempt made to explain the good results obtained by trephining in general paralysis have not added to the recommendation of the operation or to its general acceptance by the profession. General paralysis is probably not an entity, but a variety of pathological conditions manifesting more or less a uniformity of clinical symptoms, and these symptoms may, I think (at any rate I put forth the suggestion for what it is worth), be dependent upon that undefined underlying condition which, for want of a better name, we call cerebral pressure. It is a mistake to suppose that all cerebral pressure means fluid pressure. No assertion on the part of the advocates of interference by the surgeon in this condition could be more baneful, and none more innocuous could be put forward against it by its opponents, than that this procedure is intended solely for the removal of intracranial fluid. Fluid-pressure undoubtedly has to be reckoned with, and in many early cases of general paralysis it undoubtedly exists, but in others, on the other hand, it is either not apparent or does not exist, or only in small quantity. Yet all cases benefit, temporarily or permanently, by operation.

It seems to me that cerebral pressure, so far as we, as a specialty, have to do with it, is associated with the following conditions:—

1. Fluid-pressure, either sero-lymphatic or hæmorrhagic.
2. Cortical erethism.
3. Limited epilepsies.
4. Mechanical pressure by tumours.
5. Conditions as yet unexplained, in which the clinical symptoms of pressure are manifest.

1. With regard to fluid-pressure, it is not at all necessary that I should here proceed to thrash out all the old arguments for and against its relief surgically. Mainly I adhere to the position taken up by Mr. Wallace and myself in our article upon the surgical treatment of general paralysis in the "British Medical Journal," Vol. ii., 1893, p. 167, where

wherein I venture to assert that they overshoot the mark in their attempt to overthrow an argument that is obnoxious to their preconceived opinions. Granting that general paralysis is primarily of nervous origin, the results are identical. The dispute is not about results, but about causes, and first causes are as difficult to attain to as first principles. If any one chooses to assert that general paralysis is of primary nervous origin he is welcome to his assertion—it cannot be gainsaid; but it no more affects the question of the resultant symptoms, or the form of treatment, than if it were to be asserted that it was of atmospheric origin. There is in any case a pathological condition analogous to, or parallel to, inflammation, and the operation of trephining in some cases cures, in others arrests, this condition. It is admitted that in some cases it does neither. With regard to origin, however, I should like to propound to the advocates of the nervous theory of the origin a solution of the difficulty—Why it is that, if there is always such cortical degeneration, there should frequently be met with such marvellous intermissions and periods of mental lucidity in the course of the disease. But accepting the nervous theory again for the sake of argument, we find it quite fits in with the condition.

According to Meynert, Heubner, Duret, and other authorities, each functionating part of the cortex is a vasomotor centre, and may act as such to the extent of congesting and inflaming its environment, and of producing the pathological and clinical symptoms in question. How, then, does surgical interference affect such a state of matters? I reply, in two ways:—1. In the same way as depletion relieves any other local inflammatory condition: and 2. In the same way as iridectomy or, as in some cases, puncture of the sclerotic relieves glaucoma. We are not concerned with the *modus operandi* in the one case more than in the other two instances. No doubt iridectomy has been a great advance upon the old system of tapping through the sclerotic in the ocular disease, and we hope to see a surgical advance upon the present methods of operative interference in general paralysis. Dr. Alexander Robertson, of Glasgow, has published a case in which secondary incision of the scalp has been

2. The temporary relief given in cases of growing tumour and the permanent relief in stationary tumours is too well known for me to do more than mention here, but in the successful treatment of fracture of the base by trephining I think we have a most useful hint as to the course we ought to pursue in cases of cerebral tumours with mental symptoms, the localization of which is obscure.

3 and 4. Cortical erethism and limited epilepsies. Erethism of limited areas is something more than a theory, and it may be said to stand to modern cortical neurology in the same relation as the Darwinian theory does to natural science. If we can localize an erethismal area it ought to be as distinct a duty to cut down and trephine over it as it is to perform the same operation in Jacksonian spasm. Indeed, it need hardly be doubted that Jacksonian epilepsy is accompanied by an erethism of a motor-cortical area. The exposure of the area has in many instances cured, and in others relieved, the fits. Therefore, if the removal of local pressure relieves a limited epilepsy, it is not too much to infer that a unilateral hallucination (say auditory) might be cured by trephining over the superior temporo-sphenoidal convolute, where at least one terminal associated area might be expected to be found in a state of functional erethism.

The following case of limited epilepsy was successfully treated in the Stirling Asylum:—A. N., aged 35, was admitted two years ago with epileptic insanity. The fits were generally limited to the ring and little finger of the left hand, sometimes extending to the arm, and occasionally the left leg became implicated. The centre of the fingers of the left hand was exposed and the localization verified by electrical stimulation, which unfortunately was a little strong, and produced a convulsion. The convulsion caused so much local congestion that, although it was intended to remove the portion of the cortex involved, only a very minute speck was cut away, as the part bled profusely. The patient made a most satisfactory recovery from the effects of the operation. He had numerous fits for the first fortnight after operation, as is generally experienced. He was discharged recovered in three months, and has for 18 months been earning his

extraordinary. The patients often die comatose. They may actually be or simulate congestion, serous apoplexy, cortical apoplexies, or uræmic poisoning. They demand an attempt at surgical interference. Recently there have been recorded cases in which that most fatal of all cerebral diseases—tubercular meningitis—has been cured by trephining. Tubercular meningitis presents generally a very meagre pathology, and frequently very little fluid, yet it is one of the most specific examples of a cerebral pressure disease. It singularly exemplifies what I have already said upon the obscure nature of the cause of what is known as pressure. Now, if this disease can be shown to respond to surgical treatment, why not many others—why not, for instance, katatonia.

The table on the opposite page is a *résumé* of the cases operated on at Stirling. All the operations were kindly performed by Mr. Wallace, Assistant Surgeon Edinburgh Royal Infirmary. Five were cases of general paralysis, one of epilepsy, and one of automatic rhythmical movement of the right arm, accompanied by chronic mania.

All the cases recovered satisfactorily from the operation, except the last one, which developed a softening in the white matter, which ultimately proved fatal.

Of the five cases of general paralysis one, that of a female, who manifested very slight symptoms from the first, which misled us into thinking it was an early case, whereas it was well advanced when operated upon, ran the ordinary course of the disease unaffected by the operation. Another male case so advanced at the time of the operation that the escape of compensatory fluid left a space between the pia and the skull-cap equal to half-an-inch. The patient lived for 18 months after operation, and the course of the disease was evidently checked. The other three cases are still living, and the disease has been arrested at the stage it was in when operation was performed more than $2\frac{1}{2}$ years ago. That is to say they are still insane.

I cannot pretend to deduce any valuable clinical facts from the experience of so few cases, but on the other hand the results are strikingly significant, and suggest the possi-

TABLE SHOWING CASES OPERATED ON AT THE STIRLING ASYLUM, AND THE RESULTS OF OPERATION.

ADMISSION TO ASYLUM.	DISEASE.	OPERATION.	PHYSICAL CONDITION AFTER OPERATION.	MENTAL CONDITION AFTER OPERATION.	REMARKS.
12th July, 1891	General paralysis.	2nd Oct., 1891. Opening on left side. Membranes incised.	No change.	No change.	Died of progressive paralysis, 6th Jan., 1892.
25th April, 1891	General paralysis.	20th Oct., 1891. Opening on left side. Membranes incised.	Arrest of paralysis. Distinct improvement in nutrition and nervous tone.	Arrest of excitement. Delusions persist.	In the same condition at this date (Aug., 1894).
26th Feb., 1891	General paralysis.	14th Nov., 1891. Opening on left side. Membranes incised.	Arrest of paralytic progress. Nervous and muscular improvement.	Delusions persist. Subject to periodic attacks of excitement.	In the same condition at this date (Aug., 1894).
22nd Sept., 1891	General paralysis.	11th Oct., 1891. Openings on both sides. Membranes incised.	Temporary arrest of nervous symptoms.	Temporary mental improvement. Remained facile.	Died of progressive paralysis, 29th May, 1893.
27th July, 1885	General paralysis.	23rd Jan., 1892. Openings on both sides. Membranes incised.	Arrest of paralysis. Physical improvement.	Subject to periodical attacks of excitement of short duration.	In the same condition at this date (Aug., 1894).
2nd Sept., 1892	Jacksonian epilepsy	13th Nov., 1892. Removal of centre.	Complete arrest of fits after first fortnight.	Disappearance of symptoms of mental aberration.	Discharged six months afterwards completely recovered, and is earning livelihood at this date (Aug., 1894).
10th July, 1893	Mania, with automatic movement of right arm.	13th Dec., 1893. Removal of centre.	Paralysis of motion of right arm set in five days after operation.	No change.	Died 3rd Jan., 1894, of cerebral softening. The portion of cortex removed at operation, as well as the rest of motor cortex of left side, examined after death showed advanced degeneration.

known as cerebral pressure, as well as the facts of general experience, seem to indicate that it is capable of relief by surgical interference.

2. That further and more extensive experience of the results of operations for the relief of cerebral pressure is desirable in the present state of our knowledge.

3. That such operations are quite justifiable on the ground that they are eminently safe, and practically unattended with any mortality if carefully performed.

Trephining in Meningitis, with Notes of a Case. By JOHN KEAY, M.D., F.R.C.P.E., Medical Superintendent, District Asylum, Inverness.

The patient was admitted into Mavisbank Asylum on the 5th of October, 1891, suffering from monomania of suspicion of probably about a year's duration. He was a well-nourished man, 50 years of age, 66 inches in height, weighing 160lbs.

Physical examination, against which he strongly protested, did not reveal any disease of the bodily organs, but it was noted that he had auditory hallucinations, and that his pupils were equally contracted. The special senses were moderately acute. Mentally he was an excitable, irritable monomaniac, full of delusions of suspicion. He charged people with hatching plots to do him injury, was extremely angry, and answered the most civil remark with a torrent of abuse, and threats of legal action, or physical violence.

In this excitable, delusional condition of mind, and in moderately robust bodily health, the patient continued until the middle of February of this year, when it was observed that his appetite was failing, and his weight diminishing. He also became more restless at night. Physical examination, with the object of discovering if possible the cause of this deterioration, was attempted, but the patient resisted with determination, and declared that there was nothing the matter with him. A week later it was observed that he frequently placed his hand on the right temporal region, and at the same time it was noticed that there was a slight purulent discharge from the right ear. Attempts were thereupon made to examine the ear, and to apply appropriate cleansing treatment, but, as before, all interference was