THE SURGICAL TREATMENT OF INTRACRANIAL FLUID PRESSURE.

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On May 5th, 1889, Dr. Claud Muirhead drew my attention to the subject of the following case, who had been admitted the day before into Ward 39 of the Royal Edinburgh Infirmary. I am indebted to Dr. Muirhead for the clinical report, and for permission to publish it; and I give it *in extenso*, as the case presents the following points of interest: (1) the condition of the brain was ascertained during life; (2) the results of surgical operative procedure were somewhat remarkable; and (3) its collation with various suggestions for the treatment of "head cases."

R. S. W., male, aged 32, married, commercial traveller, admitted, at his wife's request, suffering from "strangeness of manner." Father died of heart disease; mother alive. No family history bearing on the case.

History given by Wife and Mother.—Previous to present illness patient had been bright, clever, active, and sober. About four months before marriage his hair began to fall out, he suffered from sore throat and headache; was treated with mercury till his teeth became loose. Four months after marriage his wife noticed her own hair becoming thin; she suffered from sore throat, and she became somewhat deaf; six months after marriage she aborted, and a second time at the sixth month. Two children were subsequently born, the eldest of which is barely seven. Patient's present illness commenced two months ago, when his mother noticed alternating conditions of depression and excitement. There was cause for depression, as he had lost his situation, and had made frequent unsuccessful attempts to get employment. His wife said he would sit for days in the house, and not notice any member of the family. If she gave him a paper, he would look at it carelessly, and then allow it to drop from his hands as from those of a man falling asleep. At meals he would take up his spoon and fork instead of his knife and fork. If he showed any desire to go out, she noticed that he would wander into the lobby, then back again to the sitting room, sit down, and forget his intention; this would happen several times a day. Memory failed in many ways; he would go out and stray about for hours, forgetting where he was. For three months previous to admission he had shown no sexual desire.

Report of Case taken Four Days after Admission.—When admitted, patient easily and readily reconciled himself to the hospital, and spoke of it as his own house. When questioned as to his occupation, he states he is a commercial traveller, working from Carlisle; that his method of business is to go to India every two years to purchase stock, which takes ten years to dispose of, when he returns to the East. His business affords large profits; for example, he sells a chair for £2,000, which cost him £70. He is consequently a very rich man. For all this there is no foundation. He is also very strong, and possesses great muscular power, and can perform very extraordinary feats. He is weakly, pliable, and is easy of management; his memory of recent events is very defective; he did not recognise his wife and children till his attention was specially directed to them, and then only in a vague manner. He sometimes knows he is in Edinburgh, but generally speaks of being in Carlisle. In almost the same minute he speaks of his great riches, and asks for twopence for a shave, or begs for "a fill" of tobacco. Appetite good; has a tendency to overeat himself. He frequently tries to strip off his clothes, and walk naked through the ward. He has slept well and quietly, except on the night of his admission, when, being somewhat restless, one seventy-fifth of a grain of hyoscine was administered. Temperature since admission has ranged between 98° in the morning to 101° and 102° at night. Pulse 74; first sound of heart accentuated. Patient complains of an intense burning pain in the crown of his head, which is constantly present; it is relieved by the icebag. His articulation is impaired; he stumbles over words, and makes mistakes when reading, which he does very slowly, pronouncing syllable by syllable. When tested, he read "excess" for "success," and pronounced "dilution" with difficulty. Words are slurred if not pronounced very slowly. Hearing not impaired. When tested as to smell, he says hypobromite of soda has no smell, sulphuretted hydrogen is disagreeable, ammonia is hot, but does not recognise it or the odour of lavender. As to taste, he recognises whisky as sweet, but cannot distinguish between it and wine; can distinguish

between tea and coffee. Patient suffers from a perceptible amount of anaesthesia combined with analgesia over the whole body. His muscular irritability is not diminished; knee reflex absent; plantar reflex absent, although the soles are sensitive. Tests of muscular sense fallacious. Muscular force very good. The pupils are unequal and variable, the left being generally larger than the right, though the opposite condition has been observed. The pupils are sluggish and almost insensible to light. The field of vision is not contracted. The ophthalmoscope shows a healthy fundus and disc, with slightly dilated veins, but no tortuosity. Motor functions: When lying down or sitting nothing is noticeable, but when standing up, with the feet close together, his body moves very perceptibly from side to side, and backwards and forwards; this movement is increased when the eyes are closed, though he has no tendency to fall. When asked to walk, he seems to brace himself up for the effort; the feet are planted somewhat apart, and the heels are jerked down, the toes being raised more than normally. He easily loses his balance, stumbles over small obstacles, and shows some hesitancy in turning round. When walking with his eyes closed he widens the basis of support still more, and, although he walks fairly straight, he staggers a good deal. When holding out his hand it is shaky, and the fingers are constantly moving, besides being affected by fine fibrillar tremors. He cannot raise a glass of water to his mouth steadily. When silent the face muscles are quiet, but twitch when he opens his mouth to speak, especially those of the lips, the upper one being the worst. He protrudes his tongue with a jerk, and when kept out it twitches in fine fibrillar waves. The tongue is large, white, and flabby, with well-marked furrows in the sides, and indented by the teeth.

During the fortnight after admission many of the symptoms became more marked; articulation became more difficult, and there was greater mental confusion. Greater difficulty was shown in answering simple questions, and he forgot what he had been speaking about almost immediately after the words were uttered. He did not recognise where he was. He was perfectly happy, the condition of *bien-être* being well marked; at times he would assume a business-like air, and count over large sums of money; at others he would pace the ward, and strike out at some imaginary object. He began to see some imaginary persons, but rarely spoke to them, generally using signs and gestures. During the two following days he had depressed turns, his happy condition suddenly turning to sadness and weeping; as suddenly the state of joyousness would return. On admission there was a slight cloud of albumen in the urine, which soon disappeared.

The congeries of symptoms above narrated pointed to what is generally termed "general paralysis of the insane," probably, almost certainly, of syphilitic origin. This condition is admittedly desperate, very few cases, and those somewhat doubtful, of recovery having been recorded. Intracranial pressure, produced by at least two morbid processes presently to be discussed, is known to exist in general paralysis. After very careful consideration of the case between Dr. Muirhead, Mr. John Duncan, and myself, it was determined to advise the friends to allow trephining to be performed. It was fully explained to them that the procedure would be experimental, but was warrantable on the following grounds: (1) the case was almost certainly sure to result in death in from twelve to twenty-four months; (2) that there was little likelihood of any harm following the operation; (3) that the case was in an early stage of the disease; and (4) that a hope of some improvement being effected might be entertained. Consent was given, and on May 17th the operation was performed by Mr. John Duncan. The patient having been placed under chloroform, of which he required a large quantity to procure complete anaesthesia, Mr. Duncan made a semilunar incision around the left parietal eminence and reflected the periosteum; several vessels required ligature. The trephine was applied a little above and in front of the parietal eminence; the bone was found to be five-sixteenths of an inch thick; the disc was removed, and the dura mater exposed. No signs of bulging of the brain into the hole were observed. An exactly similar procedure was followed at the identical spot on the right side. Here the bone was thicker, being six-sixteenths of an inch in thickness. On removing the disc the dura mater bulged markedly, almost filling the circular pit. The dura mater was not opened, as it was deemed of importance to see what would be the result of simply exposing it. The discs were not returned, the wounds were stitched up, dressed antiseptically, and were found practically healed twenty-four hours after the operation was completed. No systemic irritation was noticeable;

the pulse did not rise, nor was temperature increased beyond what had been noted previous to the operation. On recovery from the chloroform no change in the inequality of the pupils was noted, but on the following morning they were almost equal, and reacted better to light than previously; this continued for five days. The most obvious result was the change in the mental condition of the patient; his intellect was distinctly clearer; for the first time since admission he recognised the fact that he was in a hospital, his manner was calmer, and he was evidently more sane than he had previously been. He ceased to have hallucinations, asked for what he wanted in a rational manner, and the headache disappeared. This improvement, however, only lasted for five days, when the old symptoms returned, with the exception of headache. The rules of the infirmary forbidding the retention of insane persons, it became necessary to remove him, and he was accordingly sent to the Morningside Asylum. Unfortunately I was obliged to leave Edinburgh at this time on official duties, otherwise I would have endeavoured to take measures by which R. S. W. could have remained under my observation, when I certainly should have advised the removal of other discs in the neighbourhood of the longitudinal sinus, or another operative procedure on the manifestly affected side. I much regret not having communicated on the subject with Dr. Clouston, who, I know, would willingly have assented to any measures being taken likely to procure relief: but circumstances stood in the way of my doing so. Dr. Clouston thinks that the operation may possibly have modified symptoms, as the patient since coming under his care has been remarkably tranquil. I saw R. S. W. lately, found him much demented, with ataxic symptoms very well marked. He is showing progressive symptoms of a downward tendency. The scalp is drawn inwards in the trephine holes; pulsation is not to be felt on pressing the fingers into either of them.

On July 28th, 1889, Dr. Claye Shaw removed bone from the skull in a case of "general paralysis," trephining having been performed "on the right side of the skull over the central sulcus, and about two inches outside the longitudinal fissure.....The operation consisted of making two holes with a trephine, cutting away the intermediate bone so as to make an opening about an inch and a half long by three-quarters of an inch wide, cutting away the dura mater, and letting out a considerable quantity of sub-arachnoid fluid."¹ The patient's general condition was much improved by the operation, and he was, in Dr. Claye Shaw's opinion, at the date of his report, no longer insane.

In a letter addressed to the Editor of the BRITISH MEDICAL JOURNAL on November 23rd, Dr. Revington maintains that Dr. Claye Shaw has failed to satisfy, even partially, the following conditions, which are demanded for the performance of a new and serious operation: (1) the establishment, by an unassailable theory, of the pathological processes to be remedied; (2) the sufficiency of the mechanical means competent to produce the result intended; and (3) the absolute relation of cause and effect as regards the operation, and the subsequent improvement. It may be admitted that Dr. Claye Shaw is not very clear as to his reasons for believing that relief from pressure would be obtained by the operation, and his attempted analogy between it and nerve-stretching is somewhat bewildering; still, he is much nearer the mark than Dr. Revington when the latter says that "giving the brain more space to expand by making a hole an inch and a half by three-quarters of an inch is to talk mechanical nonsense;" that intracranial fluid of more than normal quantity is necessarily "compensatory;" and that "the only way to relieve pressure due directly to fluid in the convolutions would be to slice them as freely as we incise oedematous subcutaneous tissue." I am afraid Dr. Revington's propositions give expression to at least three errors; in dealing with them *seriatim* I hope to show that Dr. Claye Shaw and I were warranted, by theory at least, in taking the measures we severally adopted.

If we assume that the average compressibility of brain matter included in the dura mater is at all comparable with that of water, it is certain that a very small increase of the capacity of the retaining membrane would materially diminish the internal pressure. In his *Properties of Matter* (p. 190) Tait gives the following empirical expression for the average compressibility of water: $\frac{v_0 - v}{p v_0} = 0.0000489 - 0.00000025t - 0.000000067p$, where v is the volume at $t^\circ \text{C.}$ and p atmospheres, v_0 at $t^\circ \text{C.}$ and one atmo-

sphere. At this rate, taking our ordinary temperature (say 15°C.), we should find that the volume of water is altered by an atmosphere to the extent of 0.000045, that is, 0.0045 per cent. only. In other words, supposing a rigid chamber absolutely full of water, the addition of a $\frac{1}{220}$ part of its volume would produce a pressure of one atmosphere; and, conversely, the withdrawal of a $\frac{1}{220}$ part of its volume, under the circumstance of an additional atmosphere, would reduce the pressure to that of the external air. To emphasise the expression, supposing a fluid so situated was under the pressure of 100 atmospheres, the withdrawal of $\frac{1}{220}$ of its bulk would reduce the pressure to that of the atmosphere. If it is added that the pressure of an additional atmosphere would crush the convolutions into a shapeless mass, it is evident that the increase of the capacity of the dura mater need be very small in order to procure diminution of the pressure of its contents. If, therefore, the operation of trephining be followed by well-marked bulging of the dura mater, it is absolutely certain that there must be a corresponding increase in the capacity of that membrane, and, consequently, a diminution of the pressure of its contents, supposing any pressure to exist caused by their overgrowth. The actual amount of this diminution of pressure would be perhaps difficult to calculate *a priori*; but the difficulty should not be insuperable; imitative experiment should enable us to form a fair estimate of its amount.²

Up to this point I have been speaking of intracranial pressure as if it affected the contents of a closed sac. It is so generally stated in pathological works that the cranium is a "practically closed sac" that this expression has assumed the position of an axiom, and we have been taught that morbid processes going on in the brain are to be considered as acting under very different conditions from those occurring in other parts of the body. This is, to a certain extent, true, but only to a certain extent. The dura mater is not a closed sac; were it so we should have pressure diffused equally all over, which we know not to be the case. It has numerous and extensive extra skeletal relations. Through each foramen of the base of the skull, and of the vertebral column, lymphatic vessels pass out, the sectional area of which is very considerable. The immense activity of the contained organs demands free exit of the products of waste and unused material.

The phenomena of intrameningitic fluid pressure depend not so much on the rigidity of its bony covering as on the rapidity of the production of fluid, and the resistance offered to its exit by the extraskelatal tissues and fluids. In health, of course, the lymphatic system is patent, but under conditions of disease it becomes impaired, generally, perhaps, by the action of increased arterial pressure and venous obstruction, and, locally, by the products of inflammation. When inflammatory action affects the membranes themselves, or their contents, exudation of serum is greater than can be carried off by the lymphatic conduits; still, a large portion of it is removed, otherwise we should have the brain and spinal cord submitted to such an amount of pressure as would necessarily produce death. Thus, even in disease, the dura mater cannot be regarded as a closed sac, for although fluid pressure is being exerted within it a large proportion of the fluid must and does escape. Consequently, the amount of pressure produced by the accumulation of fluid can only be estimated by fractions of the pressure of an atmosphere, and the volume of fluid withdrawn need be proportionately small to procure modification of symptoms, as compared with what would need to be set free under the pressure of an atmosphere. Further, in the case described by me, the pressure was either confined to one side or it was unequal, as the dura mater bulged out on the right side only, the disc removed from which was thicker than that taken from the left. Sections of the bone showed thickening of both plates, especially the outer, with a corresponding thickening of the trabeculae of the diploë, in the spaces of which at some points were collections of small round cells resembling granulation tissue more closely than the ordinary red marrow. In some parts of the sections there was nothing but fatty tissue. The thickening of the inner table must have produced some diminution of the intracranial capacity; but the marked bulging indicative of fluid pressure is to be accounted for by inflammatory processes occurring in the membranes, and giving rise to increased fluid pressure in certain circumscribed areas which, in this case, may have been represented by the whole superior and lateral aspects of the right hemisphere, and may possibly have corresponded with the area of

¹ JOURNAL, November 16th, 1889, p. 1090.

² I am endeavouring to devise a method of experiment bearing on this subject and on the compressibility of brain matter.

inflamed bone. Thus the bulge of dura mater would only affect a limited area of confined fluid, and would give a relatively larger amount of relief from pressure. For these various reasons, therefore, I maintain that in my case relief was obtained directly from the operation, although the amount of bulge may have not held more than twenty or thirty minims of fluid. The investigations of Naunyn and Schreiber, and those of Adamkiewicz, show that definite series of phenomena accompany very slight variations of pressure, and we have a right to infer that even a very small diminution of morbid pressure is followed by at least temporary change in symptoms.

Dr. Revington speaks of excess of cerebro-spinal fluid being compensatory. It is no more compensatory under the conditions we are now discussing than any other form of dropsy; it is an effusion produced by morbid processes going on in the brain. In brain syphilis we have a well-marked arteritis, endarteritis diminishing the lumen of the vessels, and, what is of even greater importance in the production of dropsy, periarteritis, which thickens the adventitia, and occludes more or less thoroughly the perivascular lymphatics by deposits of leucocytes, and, in some cases, by what might be called granulation tissue, and in others by layers of coagulable fibrin. Thus obstructed lymph can make its way but imperfectly by the natural channels to the piamatral space (or, as it is generally, but improperly, called the subarachnoid space), and becomes diffused through the tissues, finding paths to the various lymphatic cisterns as best it may, injuring and displacing cell and fibre, and impairing their functional activity.

The cells are directly affected by this morbid process, for their lymphatic envelopes and conduits are more or less occluded; they cannot convey the products of waste to the perivascular spaces; they become dilated, and the cells are bathed in a poisonous acid fluid, which may act as a stimulant or a depressant. If we accept the views of Heynsius and Preyer, the variety of action depends on the chemical reaction of the fluid. At the same time, an inflammatory process is going on affecting the neuroglia.

We have thus two morbid processes in action, one consisting in increase of connective tissue, which surely does not call for compensation, and one productive of exudation, which is poured out more quickly than the occluded channels are competent to remove. Intracranial, or rather be it said intrameningitic, pressure is a necessary result. In those cases in which we have that typical congeries of symptoms which we term "general paralysis of the insane," similar processes are going on, differing mainly in their rapidity of action, and in their less well-marked tendency to formation of new perivascular tissue. Alongside of, or probably as an immediate consequence of, these morbid processes, we have occurring that series of progressive meningitic changes so characteristic of the condition, and as a result we have further interference with the passage outwards of fluid from the brain substance in the first instance, and from the meningitic channels and spaces downwards in the second, in consequence of the obliteration of conduits leading to the cisterns at the base to the wide piamatral (subarachnoid) space in the spinal canal, and to the ventricles.

Dr. Claye Shaw does not report bulging in his case on removal of the bone; but, even supposing it did not occur (or only to the small extent which is observable in all cases), its absence does not preclude the existence of abnormal pressure within the dura mater. It might be, indeed certainly was, present, although not to the extent of being able to exercise sufficient force to stretch the tough unyielding membrane when the restraining bone was removed, but still possessing sufficient power to have an evil influence on the brain tissues. But Dr. Claye Shaw did to his patient what I should certainly have done to mine had he remained under my care—he opened the dura mater, and allowed the escape of cerebro-spinal fluid from the *subdural* space, not, as he states, the subarachnoid space. In so doing he performed a thoroughly scientific physical experiment, and took the most effectual means of relieving pressure by withdrawing from a circumscribed area fluid which was being produced more rapidly than the impaired conduit system was capable of withdrawing. In this class of cases the inflammatory processes are mostly, and particularly in the early stage of the condition, confined to an area of the superior and lateral aspects of the convolutions, roughly indicated by placing the two open hands on the top of the head, palms downwards, inner aspects touching each other, and the hypothenar elevations resting on the temporal protuberances. Outside this area the evidences of disease on the surface of the convolutions, milkiness and opacity of the pia mater, are usually faint or absent; in fact, they fade as they recede from the focus of

disease, much as the blush of inflammation fades as it recedes from the centre of an implicated patch. In a word, the products of inflammation become diffused in the connective tissue more thoroughly as they leave the focus, and become less apparent. Thus we have evidence of inflammatory pressure circumscribed, as most inflammations are, by resistance of connective tissue, tension being produced slightly by arterial pressure agency, considerably by venous congestion, mainly by the general lymphatic changes.

When the dura mater was opened, the fluid pressure in the subdural space was reduced to that of the atmosphere, and gradually that affecting the subjacent tissues was relieved by the action of the Pacchionian villi. Under the previously existing pressure, these important organs could not act in withdrawing the fluid from the lymph spaces of the pia mater (the subarachnoid spaces), but as they exercised their function, the oedema of the brain substance was relieved, and with it tension. Thus "the mechanical means were adopted which were competent to produce the result intended."

Whether the good results are merely temporary or are to be permanent, the operation is fully justified, whether tested by theoretical principles or by consequences. The dropsical sacs were tapped, and we have a right to presume that, as in all such sacs, absorption of fluid by natural channels became feasible. The operation was presumably followed by the same results as follow on diminution of tension in a pleura or peritoneum, and a reasonable hope may be entertained that, as a consequence of healthy action of the lymphatics and blood vessels being now possible, the process of sclerosis has been stayed. It is a pity Dr. Claye Shaw could not give a more accurate estimate of the amount of fluid that escaped than "a considerable quantity," and did not state whether any oozing was encouraged during the days following the operation. Dr. Revington's statement that the only method of relieving an oedematous brain is "to slice the convolutions freely" is (to paraphrase an expression of his already quoted) anatomical and pathological nonsense.

To my mind the two cases taken together are most important; the first was only temporarily relieved by an imperfect operation, the second was benefited for a much longer period, if not permanently, by a much more thorough surgical proceeding. The collation of results warrants, in my opinion, repetitions of the operation in cases in which the symptoms have not advanced too far to preclude a reasonable hope of good being done. I shall certainly have no hesitation in recommending it in the early stage of "general paralysis." In the first place, the condition is, practically speaking, hopeless if left to itself; secondly, the operation is not dangerous to life, in point of fact, it is extremely simple; thirdly, it is a strictly scientific proceeding, and bears analogies to those undertaken in other dropsical regions; and, fourthly, the results obtained by the two operations already performed warrant the measure. I would suggest that such a large aperture as was made in Dr. Claye Shaw's case (an inch and a half by three-quarters of an inch) is unnecessary, as the withdrawal of fluid from the subdural space can be easily procured by a smaller opening. It might be found desirable to keep the aperture in the dura mater open for some length of time, so as to procure a slow constant drain, which might add some danger to the operation, but with carefully adjusted antiseptic dressings this source of danger should be slight.

It has been suggested by Dr. James Adam³ that Dr. Claye Shaw's case might have been one of those rare instances in which a condition causing the group of symptoms called general paralysis of the insane has been recovered from. As during thirty years of a large experience he has met with only two such cases, the odds (to use common parlance) are against the suggestion that Dr. Claye Shaw dropped on such a rarity. It may have been so, but even if such an extraordinary fortuitous collocation of events did occur, the measures adopted seem to have assisted recovery; but this theory may, for all practical purposes, be set aside. Certainly, before recommending such an operation, the utmost care should be exercised in excluding cases of alcoholism, which not infrequently simulate general paralysis. In fact, the whole question as to how far "general paralysis of the insane" can be considered a pathological entity must be undertaken; and I venture to suggest that the case I have narrated may have some bearing on it.

The consideration of these two cases has led me to the conclusion that there are other brain conditions which might be relieved

³ JOURNAL, November 23rd, 1889, p. 1189.

or cured by surgical interference. I cannot but believe that certain cases characterised by coma, delirium, and acute mania, produced by a congested and dropsical condition of the brain, or by meningitis, and in which there is a distinct tendency towards death, might be benefited by relief of pressure by puncture of the dura mater. It must be borne in mind that congestion and dilatation of the cerebral arteries and veins produces obstruction of the perivascular lymphatics in the same manner as the conditions already spoken of act. The mere dilatation occludes them partially, and the rapid accumulation of leucocytes outside the vessels helps to maintain and increase the obstruction. In the large majority of such cases death ensues from accumulation of fluid, and we are compelled to sit helpless and hopeless in their presence. One is warranted in asking, Are our resources of treatment exhausted? Death, we believe, results from intracranial pressure, which lowers and destroys the functional activity of the brain. If we relieve this pressure there would certainly be hope, founded on the reasons already advanced, that reparative processes might ensue on removing, by gradual draining, cerebro-spinal fluid from the vertex. I am not at present prepared to say whether it would be possible to tap the cerebello-medullary cistern in cases of basilar meningitis; but it really matters not whence the relief is obtained so long as the fluid is removed, for in such cases, inflammation not having existed for such a length of time as to cause blocking of the conduits in the meninges by organised material, and these remaining patent, free communication exists between all parts of the encephale. When we produce the analogies of the immediate good results of lifting bone which has been depressed for even long periods, and of the removal of tumours from the brain, why should we shun the displacement of a material which we know to be almost, if not quite, as potential in the production of death, or, of what is worse, hopeless insanity, simply because it is water? The procedure is simpler in the case of the diffused watery tumour than in that of the solid growth, and can be adopted without complicating existing conditions.

I cannot conclude this paper without insisting on the following points: (1) The necessity of keeping in view the vast influence exercised by the lymphatic system of the encephale in morbid processes. The implication of the lymphatics is a great and immediate cause of many cerebral symptoms, is easily produced, and is easily relieved. If not the prime, it is a very early, factor in the production of the phenomena of many forms of insanity, being the immediate sequence of vascular changes. It is curious to remark how traditional mistakes as to the anatomy of the cerebral lymphatic system have been handed down from one textbook to another; for example, in Quain's *Anatomy* we find the arachnoid described as a separate membrane, and the pia mater as a double membrane dipping as such into all the sulci. The simple fact is that the pia mater is a double membrane, the outer or parietal layer of which (the so-called arachnoid) bridges the sulci, and the inner only dipping into them, sending off lymph channels round each vessel, through which it receives the lymph into its spaces on the surface of the brain, transmitting it to the cisterns at the base, and by the Pacchionian villi to the subdural space, and the superior longitudinal sinus. It bears close analogies to the pleura and peritoneum. The whole subject is simplified if we speak of two membranes only, the dura and the pia mater; and of two lymph spaces, the subdural and the piamatral. Nomenclature would be simplified, and the general appreciation of the lymphatic system of the encephale made easy.⁴ (2) I would deprecate the theory that morbid processes going on in the brain are to be regarded as being conducted under materially different conditions from those acting in other parts of the body; and (3) I would ask, that being the case, Why not apply the same systems of treatment?

THE SURGICAL TREATMENT OF GENERAL PARALYSIS.

By R. PERCY SMITH, M.D.,

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It has been a matter of surprise to me that no superintendent of an asylum or physician in lunacy practice of sufficiently long

experience, and whose opinions would have great weight, should have ventured to criticise Dr. Claye Shaw's report of a case of general paralysis treated by trephining, published in the *JOURNAL* of November 16th. I feel certain that there must be very few men in such posts who have read Dr. Claye Shaw's report of his case but must have felt that the whole bearing of the case was not stated with sufficient completeness.

In the minds of those unfamiliar with the disease, it seems to me that, from the report of the case, the impression might be produced that it was rather a new thing for a case of general paralysis to be discharged "recovered" from an asylum or hospital; but surely it is well recognised that such cases frequently show marked improvement, for a time at least, and that they may have to be discharged "recovered" because there are not sufficient symptoms to warrant their legal detention, though the physician under whose care they have been may have the strongest feeling in his own mind that they will eventually relapse and end fatally. This course has had not infrequently to be resorted to at Bethlem, and I give here, very briefly, a few instances.

CASE I.—A. K., aged 41, was admitted July 5th, 1884. For two months he had had pain in the head, and had become extravagant and intemperate. On admission he was full of exalted delusions of strength, wealth, and powers of all sorts; he wrote misspelt, untidy letters with tremulous hand, his knee-jerks were absent, his gait somewhat ataxic, his pupils minute and not acting to light, his speech and tongue tremulous. He was considered to be an ataxic general paralytic. During the next twelve months his mental symptoms improved so much that he was discharged "recovered" in September, 1885. There remained, however, tremor of lips and tongue, the pupils and knee-jerks were as before, and, of course, the case was not for a moment looked upon as a cure of general paralysis. Nothing has, however, been heard of him since, and he may have died.

CASE II.—W. H. S. M., aged 34, captain of a telegraph ship, admitted July 6th, 1885. History of syphilis. Depression for five months, then, on admission, extravagant, exalted, excited, with unequal pupils, exaggerated knee-jerks, tremor of lips, tongue and cheeks, and speech trouble; but in March, 1886, having lost his excitement and delusions, and in great part his abnormal physical signs, he was sent on leave of absence, and eventually discharged "recovered." This case was thought to be one of general paralysis, but he was able to resume work, and for nearly eighteen months he acted as chief mate of a steamer in the East Indies, remaining apparently in good health, but, from being an irritable man, he had become easy-going, and he was noticed to sleep too much. He, however, was able to perform the complicated and important duties of chief officer without any accident. In June, 1888, his wife brought him up to the hospital; he was then losing power, was thin, and had marked tremor of the lips and tongue, bladder weakness, and commencing dementia. He was readmitted, and died in the hospital.

CASE III.—G. S. R., aged 34, a clergyman, admitted October 16th, 1886. Had suffered from syphilis in youth. Had had an unusually brilliant university and athletic career. From July, 1885, he had been sleepless, and had had two or three attacks of what was described as "coma." He had lost memory and nerve power, and had occasional excitement. On admission he had tremor of tongue and lips, unequal pupils, blurred and difficult speech, exaggerated knee-jerks, loss of memory, and much mental confusion and delusion that he was watched. There was considered to be no doubt as to his having early general paralysis. By the end of December, however, there was great mental and some physical improvement, and in March, 1887, he was discharged "recovered." Subsequently a letter from his father announced his "complete recovery," that his "delusions have entirely left him." He resumed clerical duty, and went on a continental tour, doing chaplain's work, and during this period his relations considered him perfectly well. In July of the same year, however, he suddenly became furiously maniacal, with intense exaltation, eroticism, and obscenity, and with marked physical signs again. He was brought over to England with great difficulty, was readmitted to Bethlem, and, after some weeks of great excitement, he died in a series of convulsive seizures.

CASE IV.—J. S., aged 46, a post-office official, admitted November 14th, 1884. For some time he had been restless, "odd," sleepless, had become intemperate, and then violent and threatening. On admission he was the "world's provider," a great orator, thought he had unlimited wealth, wrote to the Queen and Prince of Wales, and was constantly writing letters. His speech was

⁴ The existence of a third, the epicerebral lymph space of His, is more than doubtful.