CHRONIC HYDROCEPHALUS

A THESIS

BY

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During the time I enjoyed the great advantage of acting as House Physician to the late lamented Dr. Parishon, F.R.S. etc. and Dr. Bristow (Author of the Theory, Practice of Medicine) at St. Thomas' Hospital London. Three Cases of Chronic Hydrocephalus came under my care in the Out-Patient Department. These three cases formed the basis of the present paper.

Contrary to my expectations, the children made such good progress under the treatment adopted, that I originally determined simply to publish the cases in one of the Medical Journals, adding only a few remarks on the treatment which seemed to have benefited them so much; but as any hope from treatment in these cases can only be expected when it is planned with distinct reference to the cause of the disease, (this being a complaint in which a mere symptomatic course of treatment offers the sole hope to the patient, but the devoted hope of deriving any benefit from his Medical attendant.), it became necessary before expressing a decided preference for any one plan of treatment above others, to be sure that such was based upon, and supported by, the teaching of what is known of the Pathology of the disease. This led me to search more widely into the literature of the subject, and the paper soon began to grow to a size unaccustomed to the limited space of a periodical. It then occurred to me that I would still further extend and enlarge it, and present it to the above Medical Society as a Thesis, in the hope that the University might deem it worthy of their acceptance—

The first part of this paper is therefore devoted to an attempt to establish the inflammatory
Characteristry for the larger number of cases that are met with in practice — as I cannot but feel convinced, that the more firmly the idea becomes rooted in the minds of Practitioners, the greater will be the amount of success in the treatment of the distressing, and I fear too often fatal malady —

**Part II.** is devoted to some points of interest in the clinical history of the disease —

**Part III.** is concerned with discussing the treatment of the malady, and detailing the "Modified plan of Söleis" which I adopted in my cases —

**Part IV.** to Diagnosis, both of the disease itself, and also of its varieties —

**Part V.** to Prognosis, with special reference to the condition of the superficial veins as a help in this matter —

And lastly, I have appended the usual Table, I was able to take my cases, in the limited time at my disposal, in the Out-Patient Department of London Hospital —
Part 1.

Pathology

The assigned causes of this disease are not numerous. They are: tumor pressure, congénitale, malformation, inflammation of the lining membrane of the ventricles of the brain, occlusion of the cerebral arteries, and rachitis.

The cases arising from tumor pressure and occlusion of the cerebral arteries are rare. Congénitale malformation is also rarely met with. Usually, since the greater number of the cases perish during parturition, at the hands of the obstetrician, or die soon after birth.

The last state of rachitis has only in recent years been considered as one of the causes of this disease, being specially brought forward by Dr. Dickinson of St. George's Hospital, in his lectures on hygiene. He drew a paper in the Lancet of July 10, 1870, in which he states that it is "one of the most common cause of accumulation of fluid in the ventricles in early life." It is known to the third cause, "inflammation," that I wish to draw attention, as I believe if such an opinion were more generally held, very little and the disease is generally of inflammatory origin.

The course of treatment adopted under these have a definite aim, and the results would be different to what they now generally are.

The opinion of Rokitansky, (Pathologische Anatome, vol. ii. page 7574) and also of Vroli (Handbuch der Zirkulationsphysiologie, 2d ed., Amsterdam 1846, page 574-587)
That the disease is not merely a passive deposit, but simply a consequence of arrested brain development, but results from a slow inflammatory condition of the terms lining of the ventricles, is I believe, that which is in most cases accepted by Pathologists, both in this, and other countries, and all the recent writings upon the subject which I have consulted, (or exception excepted), are agreed upon the point. They fully admit that strong cases are doubtfully due to Tumours and Malformations, but assign to Chronic Inflammation the cause of by far the larger number of the cases. And I suspect, that even some of those cases reported to be the result of Malformations, might really be due to inflammation also; such as an "obstruction of the cerebrospinal opening" first noticed by the late W. Hilton in his most valuable "Lectures on Rest and Pain," page 33, in which he states it to be an experience, of not inadmissible cause of this disease. It seems difficult however to understand how a closed cerebrospinal opening, could of itself produce an accumulation of fluid within the lateral ventricles; as such an idea would limit the power of absorbing cerebrospinal fluid to the spinal chamber, and imply that although the terms lining of the ventricles had the power of secreting a fluid, yet it was powerless to absorb it; an implication to which Physiology would be entirely opposed. Hence, such a Theory, appears to my mind untenable; and I cannot regard a closed cerebrospinal opening as being of itself a cause of Ventricular Deposit. That such a condition however, does sometimes accompany Chronic Hydrocephalus cannot
be denied; but I suspect the opening is more often closed as the result of Chronic Inflammation -
metabolic changes, than as the cause; and that therefore it is only a concurrent circumstance.
In cases however where the opening is really wanting -
The position which it might to occupy is closed by
real nerve tissue, it would appear possible,
that a brain which is the subject of such
process of formation, could be more subject
than an ordinary or normal brain to errors
of nutrition, which are but the first stage
of inflammation - Hence indirect but infer.
That reason seems as strongly opposed to the Clos
Cerebrospinal opening being a cause of Chronic
Hydrocephalus, as it is in favour of its being a
Consequence of Chronic Inflammation

The Richetly Theory of Dr. Richetly, which is detailed as
I have already mentioned in my lecture on
Chronic Hydrocephalus in the Lancet for 1870,
is based upon the fact, that out of twenty six
cases of Chronic Hydrocephalus which came
under his notice, as less than 15 per cent. of them
were suffering under Rachitis - in this respect
his experience seems to be unique, as so far as I
am aware, he is the first to draw attention to
this fact; and it seems difficult to believe that
had the concurrence of Chronic Hydrocephalus
and Richet been so nearly constant (as he would
lead us to infer), it would have been noticed or
overlooked, by the many careful research
observers who have studied the disease.
He argues that owing to the Richetly condition
of the skull bones, they insufficiently resist
what he terms the "Intra-cranial hydrostatic
pressure" of the cerebral fluid, and
Hydrocephalus is the result—We admit that Rickets are not known to occur till after birth; yet does not attempt to deny, or explain, the frequent occurrence of Hydrocephalus in utero.

According to this view, it is the ordinary cerebrospinal fluid which causes the head expansion; so Rickets prove themselves to be no exception to the ordinary cerebrospinal fluid, because each child, even in the womb, is exposed to it. And if the "external hydraulic pressure" has power to expand Rickets, shall there, a few months after birth, with its ability to expand the Fontanelles, and sutures bridges over with their membranes; and besides, we know that the fluid in the cerebrospinal fluid is constantly expanding and shrinking for the brain; a water bed, so to speak, increasing and decreasing in proportion to the amount of cerebrospinal fluid.

I think it is certain, that in every case the expanding agent is the cerebrospinal fluid, but a cerebrospinal fluid, the tension of "internal hydraulic pressure," which is greatly increased. How can that be the cause of this increased tension? Surely it cannot be due to the Rickets condition of the skull bones! Mechanical hindrances, such as tumor pressure, or other cerebrospinal fluid cannot account for it, and so would chronic inflammatory changes; and Pathologists agree that the latter is by far the more commonly found after death.

Dr. Price in his "Diocese of infancy childhood's CHILDREN.
6th Edition page 130 is very conclusive about this
matter, he says, "I cannot subscribe to the opinion for not only is hydrocephalus present in a very large proportion of cases independent of any sign whatever of Richet's, whilst the most extreme degrees of Richet's are not usually associated with hydrocephalus, but the evidence of Richet's when present are, comparatively slight, and do not precede, but follow the enlargement of the skull. Further, the most marked imperfectness in the constitution of the skull, as in the so-called Encephalitis, is observed independently of effusion of fluid into the ventricles; whilst lastly, the shape of the head associated with Richet's is peculiar, characteristic, and entirely different from that produced by Chronic Hydrocephalus."

Dr. Birchmore (Practice of Physic, p. 1048) seems to clear up the difficulty in this controversy by saying, "It is said to occur especially in Richet's children and in children of persons in unhealthy scenes; the immediate cause is probably some chronic inflammation, or some condition allied to inflammation, involving the lining membrane of the affected cavity."

The inflammatory nature of the disease is still further borne out by the examination of the effused fluid, which is described as thick, transparent, and yellowish, of a specific gravity slightly lower than that of the Plasma, free of the blood, containing a smaller amount of solid constituents. Here is an analysis by Dr. Bostock of the fluid from the head of the celebrated case of Cardinal, published by Dr. Bright, "Medical Reports," vol. 1, part 7, p. 42:

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1011.38</td>
</tr>
<tr>
<td>Albumen</td>
<td>982.6</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
</tr>
</tbody>
</table>
Chloride of sodium — 7.0
Soda — — — — 1.4
Urea + ammonia — — 3.0
Sulphuric acid tide
+ Potash — — a trace
1000.0

"The composition differs from that of normal cerebro-spinal fluid, in containing a larger proportion of solid constituents, viz. 1.8 per cent. instead of about 1.2 per cent., which is normal; in containing more albumen; and in containing acid, which has hitherto been found in cerebro-spinal fluid, in many different diseases, especially in diseases of the kidney."

[Note: "Handbook Pathological Anatomy" 2nd Ed. p. 248]

Water — — 987.49
Albumen — — 1.62
Cell, + other
Extractive matters 10.52

999.63

On comparing these two analyses, it will be seen at once that the chief difference between the healthy and morbid fluid, exists in the relative amount of Albumen; 1.6 per cent, in health, but 6 per cent, in disease. So small is the amount of albumen in health, that Robin in his "Leçons sur les humeurs" Paris, 1867, p. 289, says, "Cerebro spinal fluid is not affected by heat, and contains but a trace of Albumen."

If, however, the "Albumin, Nouveau Element de Physiologie Humaine" 1876 says, "Le liquide cerebro-spinal est insensible, l'albumine est tres analogue a la caseine, en-sont
une matière ressemblant à l'alcool dite de
la glycine [E. Bernard] et une assez forte
proportion des phosphates et de l'eau de potasse.

The establishment of the inflammatory character
of the process, is far more than a mere
Pathological Curiosity. It throws a beam of
hope upon these cases, and indicates a definite
line of treatment. If inflammatory
effusions in other serous cavities, such as the
Pleura, Pericardium, Tunica vaginalis, or
even Peritonem are often so hopefully and
successfully treated, should it not stimulate
us to more active and persistent efforts in the
cure of this pitiable and generally fatal
disease?
Part II
Clinical History and Symptoms.

The inversion of the picture is not always, marked by the enlargement of the head; although such is generally the case. Epilepsy may be the only symptom of its commencement, and therefore the frequent occurrence of convulsions for some length of time, alone (according to Frere and Vol. 1. p. 476) cause a medical man to suspect the possible presence of hydrocephalus. West has collected 45 cases, in 12 of which "fit" had existed for some months, before any sign of head enlargement was noticeable.

Although as it will happen, by for the larger number of cases occur in infancy, still it must not be imagined that disease is entirely confined to that period of existence. A case is mentioned by Dr. Thomas Watson in his valuable lecture, of a young lawyer who was attacked with sudden loss of consciousness, in one of the New Courts, he became by degree dull, stupid, forgetful, and at last insensible, to the death, a large quantity of serum, liquid was found distending the ventricles of his brain, and no other alteration could be detected. Another case is also recorded, that of a gentleman, who had exhibited for many years, in a very remarkable degree, that grief, consti,
self balancing guilt, which children alway,
exhibit when the disease is not too far advanced
for them to walk about— he died at length
in middle life, after a short but obscure
illness; and after death, the lateral ventricles
of the brain were found to contain a very
large quantity of clear fluid, and formed
a great vacated cavity when the fluid
was forced, which bore evidently of old
standing—

D. Baillie in his work on Hydrocephalus,
mentions a case, which occurred in a man
fifty years of age, at the autopsie, six once
of fluid were drawn off from the
lateral ventricles—

The celebrated Dean of St. Patrick, Swift,
affords another instance of the disease
attacking those advanced in life. The
case is related by Sir Walter Scott in his
"Life of Dean Swift," who died in his
seventy eighth year—

Gölis mentions three instances, in two of
which the patients were over seventy years
of age, and the third a Physician at
Vienna, also in the decline of life—

The symptoms caused by Chronic Hydrocephalus
after the skull bone, here become consolidated,
are necessarily obscure; and more so, since
the dross is almost always superadded to
some grave lesion, which has already
produced cerebral symptoms. The symptoms
would be those which are given from pressure
on the ganglia situated on the floor of the
ventricles at the base of the brain— if the
lesion were acute, then they would resemble those
of intraventricular hemorrhage, with concomitant paresis.

An interesting clinical fact is, that in some rare instances, the closed future will actually produce under the influence of the fluid pressure, as Baillie has pointed out, in instance, in such the occurred in a lad of seven years; and Ceili in his work on Hydrocephalus, mentions a similar case, in a boy aged nine.

As the disease advances, and the skull enlarges, the actual growth of bone is even less, than it appears to be. The weight of a hydrocephalic skull according to Paget (Surgical Pathology, p. 57) is not much greater if at all than that of a healthy one, for example, a large hydrocephalic Parietal bone, measuring nine inches diagonally, weighed only four ounces; the weight of an ordinary one being about three.

As the head enlarges, and the bones of the skull, unable to cover the required surface, are therefore left behind, so to speak; much is done by the Wormian bones to fill up the large tracts of Fontanelles and sutures; and it is noteworthy that this effect of nature is most marked at the posterior part of the sagittal suture, as is limitation of the interparietal bones of Rodents, and Monkeys, especially those of the genus Cebus and Jacchus. In the actual definition of the Wormian bones themselves, a certain amount of symmetry can often be traced, both in their growth and development.
Part III
Treatment

...
...as no good; in Francean going still further, saying that Medicine is always powerless to cure, or even to alleviate the sufferer. It will be interesting to know, whether these statements resulted from careful trial of any of the advised methods; or whether upon such presumptive notions they founded, & carried out, their so-called treatment.

It has often been stated, that the popular means for the care of any disease, are generally numerous, in a directly inverse proportion to its incurability, and chronic Hydrocephalus forms no exception to the rule. Forbes says, "its remedies have been derived from all the kingdom of nature, and include almost every kind of surgical contrivance, pharmaceutical compound."

The care of any case of Chronic Hydrocephalus may be attempted in one of the three following ways:

1. By Internal remedies  
2. By External remedies  
3. By a combination of the two

Referring to the first section, Internal remedies, I wish to call particular attention to the method I adopted in the three cases which came under my care, as that of a modified plan of the system originally proposed by Sélès of Vienna; a plan which is certainly consistent with the Inflammatory nature of the particular number of cases...  

The gentle administration of smallish doses of Mercury, extending over a long drawn period—Saardt, in his "Therapia Medicina", says of Mercury, "Mercurials cause abortion..."
of orbital fluid, either from increasing the activity of the absorbent system, or preventing further deflection. — Ringer says, in his "Handbook of Therapeutics," 2nd Edition, p. 253.

"20." Mercury "is of use in inflammation, especially of the serous membranes, in checking the inflammation, and promoting the absorption of the effused products." — There are really very few, if any, Practitioners, who could not bear testimony to these statements. We almost see such results in chronic inflammations of the skin and extremities; we can actually see such a late place on the face, in cases of Syphilis, unite, as day by day the little spots of Syphilis can be seen to melt away under the influence of Mercury.

The original method of folic was the following — Half a grain of Colocynth, to be taken twice a day, with a draught of Mercury, to be rubbed into the scalp, each night; and a warm cloth to be constantly worn for the head. Plenty of fresh air in all cases, and infants to be supplied with good breast milk. — He prefers to have had marvellous success, stating, that of the cases which began after birth, which he saw and treated early, he was fortunate enough to save the majority. The circumference of the head diminishing, from half an inch, to an inch, in from six to twelve weeks — he further states, that perseverance in this medicine was frequently followed by perfect recovery, both in regard to mind and body.

After a man or left lengthened trial, this method, for which so much was claimed, has entirely disappeared from British Practice.
The plan I adopted differs not in kind but in degree. Mercury being the agent, and Hydroxyline came next (the method of administration being the only preparation used, of which I generally gave two grains, (purified one), twice a day—no neglective effect followed, and its results which so frequently in these cases are confined, were efficiently corrected. Indeed, as soon as the children were put upon the very powder, the strength and force of their alimentary system began to improve, enabling them in a short time to take their Wine and a little Oil, which added much to their general health & appearance. The results were very satisfactory, so far as my trial of the medicine went; and although from the limited number I had the cases under my care, it would be unsafe to assert, to claim any specific effect from the treatment; yet it is perfectly clear to me that the administration of the Mercury, was in each case followed by what appeared to be a cure, not out of the offensive, and a steady progress of improvement.

I am quite aware that it is not uncommon for the head to attain a great circumference during the first two or three months of life, to vary but little subsequently should the child survive, and that most cases bear pain in their course, during which the head comes to enlarge, the child appears to improve, and are convinced of the truth of Dr. Willian's remarks, (Deane, of Boston, 6th edition) that almost every case of Chronic Hydrocephalus has pain, in its...
course, during which the child seems to enjoy a comparative immunity from suffering, &
gains flesh; whilst its head seems for a time
to enlarge—but I think it would be unfair
to argue, that in each of my cases, the
commencement of the treatment was coincident
with one of these phases—although few
things are more difficult, than rightly to
estimate the precise value of a drug in any
given case—yet my own inexpressible ones.
The improvement in my cases can, due to the
steady use of the Mercury; and therefore I
would recommend others to make a careful
continued trial of this simple & convenient
method, in the hope of proving, or dispelling,
its capability to cure or alleviate the disease—

With regards to Mercury apart from its
deobsturant properties—my experience
quite coincides with that of Ligeris (Edg.
der Rop. 1869), in which he states that
small doses of Mercury increase the weight
of healthy mice & animals—I have observed
how patients, who are labouring under Secondary
Syphilis, and who are in good health, (the
Hard Chancres excepted) frequently begin
toInterior when they are placed upon Mercury.
I have at the present time a case under
my care of a delicate, trimmer young man
who is being treated for Secondary Syphilis;
he has been taking very moderate doses of
Mercury for the past three months, during
which he has wonderfully improved in
appearance, and gained in flesh; and he
 told me only yesterday he had never felt so
well in his life— Dr. Heyes of American
Journal of Medical Science, Jan. 1876) says, "After a thorough & philosophical investigation of this subject I am of opinion that Mercury in small doses, i.e., for a time at least, a tonic; it increases the number of red corpuscles."

Any discussion of the treatment of this affection would be very imperfect, were it to be without considering the surgical method, which has been, and probably still will be resorted to, from time to time, in the future, & embraced under Section II. "External Mechanical Treatment," which includes Paracentesis and Pressure.

**Paracentesis.** In considering this subject, it will be interesting to notice some of the cases in which it has been performed, which have been placed upon record. The most remarkable perhaps of them is the case of Mr. Greenwood, mentioned in Watson's Physic, vol. i. p. 430. "A child fifteen months old, affected with chronic hydrocephalus, fell down & struck the back part of its head against a wall, which penetrated the skull; about three feet of water gradually flowed out at the orifice that was made, and the child was cured."

In the Philosophical Transactions for the year 1757, there is an account of the performance of this operation by Lelong. (This date is owing to the time when the Rev. Mr. Bennet suggested removing Denis Swift's cranium.) In 1778 Dr. Renanot of Plymouth, punctured a hydrocephalic head five times, taking away all the water.
Eighty ounces of fluid, but the child died seven days after the last tapping —
A very interesting case of the same kind is related by Dr. Sloss of Liverpool, the patient was an infant of seven months. Great improvement followed the operation, and the case was published as a success; but one, but unfortunately upon the closure of the nature, by ossification (the period which M. Menou says is so particularly full of danger, and which was so in this case) the complaint returned, and the child died. Mr. Ligers of Edinburgh relates a similar case with like result — Another striking case is recorded by Mr. Russell of Edinburgh (Medical Register, vol. 1, p. 431). The patient was an infant of three months old, with an enormous head: twenty-three inches in circumference. The usual rational measures, compression among the rest, had been employed without any success. By four operations, performed at intervals of about ten days, the size of the head was considerably reduced; but the fluid continuing to collect, Colonel was given in small and frequent doses; the fever became more, the child got well. At eight months, all the dimensions of the head were less, by five inches, in circumference, and the sutures had entirely closed —

It is known to the late Dr. Ligoncourt more than to any other, that the credit is due of giving authority to these operations: In a paper published in the Medical Gazette in March 1838 he states he had performed the operation on 19 different children, and in ten cases the children had survived;
but the cases are, like my own, not followed through, and very little is known of their subsequent history — of the condition of three only at a later period is there any record, and one of these three was in a very unsatisfactory state.

Saffing is supposed to be successful in Variocellular Tumors in Arachnoid — droopy, and Mr. Prinsep Hewett in his lectures on the subject delivered before the College of Surgeons of England, tells us how the two forms may be recognized, which will be alluded to under the head of Diagnosis — although however these forms can be separated for clinical purposes, there can be little, if any doubt, that the disease, though originally internal, and that External, so-called Arachnoid Hydrocele, is merely a consequence of the intracranial fluid, leaking to the Arachnoid by rupture of the cerebral substance; still apart from Pathology, the Clinical fact is important, that Saffing is more successful in the External than in the True, or Internal variety — which is easily explained, as in the former there would be no interfering with, or piercing, the cerebral substance —

I think it may be generally stated that withstanding isolated cases of success, experience is opposed to the sudden withdrawal of any large quantity of fluid, and that most is to be hoped for in this direction from slow and continuous drainage — I have unfortunately returned two cases in which the latter was affected,
by carefully pouring fine horse hair (in the first case two, and in the second only one hair) through the anterior fontanella, into expanded brain substance. Both cases died shortly after the operation, simple in itself though it was, and performed under the strictest aseptic precautions, by no less a surgeon than Dr. Lister, in the Edinburgh Royal Infirmary. The first died from acute meningitis, the second from collapse; so that judging from these cases in any future patient who might come under my care, I should only resort to this measure, after I had tried the modified system of folie a careful & continued trial.

It is but right to add, that many of the present authorities, on this disease are entirely opposed to the operation—such are Dr. Erichsen in the Continent, denounced the operation as useless, cruel; and Dr. Dickenson in his lectures on the insane for July 7, August 1870, on this disease from which I have already quoted, says, "my own experience of the proceeding which has been confined to two cases, has not been such as to make one wish it more extensive." Dr. Web in his lectures on Diseases of the Nervous & Children, 1874, p. 134 takes a more favorable view of the matter, as out of fifty cases collected & published in the Medical Gazette of April 1842, he says, four were cured, and therefore he would feel disposed to try it, if other remedies had failed. 
and the child was fairly strong & well nourished —

Dr. Schöpf—Mercier has also published cases of its successful performance in his "Klinik der Allgemeinen Krankenhaus," vol. 27, 1871, p. 27.

In the whole three, where every other plan has failed, and the case seems going steadily down hill, I cannot but feel that the remonstrances of Dr. Durand-Fardel in the "Bulletin General de Thérapeutique," vol. 12, 1870, ought to have great weight; he observes, that the operation may do good, (a fact that cannot be denied), and that should it fail, its failure might be due to causes (Malformation, &c.) which no remedy could remove — he seems to rest on these two facts. Firstly, that it has sometimes done good; and secondly, that there are many recorded cases in which if it has done no good, its frequent repetition proves it has done no harm.

**External Pressure** (originally introduced by the late Sir Gilbert Blane but more fully worked out & elaborated by W. Bernard & Ball), is another of the surgical remedies, which has been practiced far carried to great lengths, with varied success. It is a plan which for many years was adopted by F. Roux, &c., till in one unfortunate case the Ethmoid bone was actually distroyt by the pressure exerted, the empty sinus fluid flowing through the nose and deafness resulting as a consequence — for ever after he abandoned the practice.

Those also have advocated Pressure here gradually substituted Bandages for Plaster (which was the original material used), and
doubtfully, the India rubber bandages now in use, are much better adapted to the purpose than the ordinary calico ones.

Pressure ought never to be tried whilst any active brain symptoms are present, neither of the head is still enlarging. Should the disease appear to be stationary, the unconnected bones of the skull lose to fluctuating, and the child pale & languid, some benefit may be expected from moderate & well regulated support, but great secrecy is needed in the use of this remedy, as a slight excess of pressure may cause the brain to alternating dilate & shrivel.

I would certainly advise that all cases in which the disease is advanced, should wear a carefully made funnel cape, it is a protection to the brain & fragile skull case of which the child ought not to be deprived.
Part IV. Diagnosis

With regard to diagnosing the exact cause of the disease in any given case, there should be as a rule not much difficulty. The point to be determined is, whether the case is due to Malformation, Tumour pressure, or Inflammation. The majority of the cases due to Malformation are simple, finish during parturition at the hands of the Obstetrician, or are born Hydrocephalic, and often exhibit other Malformed conditions. Any child born Hydrocephalic, or born with a large head and manifesting unmistakable symptoms of the disease, will almost certainly be a case of Malformation. Should the head appear normal at birth, and the disease attack the patient soon after, there will be good reason for considering Malformation to be the probable cause.

Cases due to Tumour pressure would give evidence of the local character of the mischief, e.g., Palsy, Paralytic, Paralysis, of Cerebral Vessels. Here, The Ophthalmoscope will render much help by probably revealing Papillitis or Ophthalmitis, in a very large proportion of all cases of Cerebral Tumour (D. Towers' Thrice, four fifths). Hermitis occurs at some period. There is nothing however in Hermitis, with regard to its character or course, to help us to localise the growth. Tumours also sometimes cause simple Ophthalmitis by pressing upon, or invading some portion of the optic fibres, but this would be
distinguished from the atrophy found in ordinary (or inflammatory) cases, by
only one eye being affected, or affected to a much greater degree than the others; In
inflammatory hydrophthalmos, the atrophy results from pressure of the distended third
ventricle on the chiasma, and therefore both eyes suffer to an equal degree —

Recently Dr. Barlow & Mr. Hallett have observed 4 recorded cases of immense patches
of choroidial atrophy in the ordinary variety
(Hallett on Disease of the Eye).

In every case of this disease, which seems itself incurable, I consider it important that
the secondary atrophy, that of the organs of vision itself, be treated, as although
inflammation of a chronic type is the cause of it in the larger number of the cases, yet
it is not so of all, wherefore it is well to
bear in mind the possibility of a child with
a malformed brain being treated with
mercury, to its own detriment, and that
of the remedial value of the drug. I consider
this caution necessary, but at the same
point believe inflammation to largely
predominate, over all other known causes,
that one is practically safe in considering
the treatment from that stand point; for even luminae may be of inflammatory
origin, as may result from cerebral hematomy
(which was enumerated as one of the causes
by the doctor by my late dearly respected
teacher Dr. Marchion in his lectures
at St. Thomas Hospital) — in both of
which cases mercury will be the most
right treatment —
The only two other diseases with which chronic Hydrocephalus is likely to be confounded, in its early stages, (for it is only at that period that any difficulty would be likely to arise) are: Normal Thickening of the Bones of the Skull, and Hydrocephalus of the Brain. In the former, the head will be large & square, and the surface of the bones will be uneven & irregular, similar change, will, perhaps, be able to be detected in other bones of the body; the pictures will not be separable, & there will be no cerebral symptoms.

In Hydrocephalus of the Brain, the enlargement commences at, & continues most prominently in the Occiput; the Eye, remains deeply sunken in their sockets, and exhibit no change in the direction of their axes; and the Anterior Fontanelle is depressed, instead of being tense & convex as in Hydrocephalus.

Just why can the disease itself be diagnosed with ease, and its course, with a moderate amount of certainty, but according to Mr. Perret of the New College of Surgeons of Great Britain (already quoted some in this paper) the situation of the fluid itself can also be ascertained — he states that in the ordinary or Ventricular variety, the Eyes are more or less thrust out of their socket, & have a downward direction, so that a great part of the pupil is hidden behind the lower lid — these symptoms being produced by the flattening or pouching outwards of the orbital plate of the Frontal bone; this does not always happen, but
when it does, is to be regarded as proof of the
meta-macular situation of the fluid. This
diagnosis is only confirmative in cases in which
the operation of tapping is under consideration,
as according to Mr. Hewett it is more likely
to be successful when the fluid has
cramped into the arachnoid —

Part V.
Prognosis

This will depend upon the case; if Mal-
formation were the reason, of course the decision
admits of no cases. The treatment will be
simply palliative, limited to securing
euthanasia, since we cannot hope to avert
dearth. We should suspect the disease to be
viable, if the head were large but its
ossification imperfect, the protuberance
thickening, if much paralysis were present;
if convulsions occurred daily and without
any evident cause, or especially if there had
existed from birth —

But in other cases, I would caution anyone
against giving a too gloomy immediate
prognosis, especially in inflammatory cases.
The disease is not necessarily & invariably
fatal. A few proportion of children cut
their milk teeth, some few (Cardinal
for example, Dr. Bright's Report) reach
adult life, and even some attain to
old age. wires seen quoting from Field
(British Medicine) mentions two who died
at twenty-two and eighty years respectively. It is doubtful if a disease is really even cured; but it is certain that it not infrequently becomes permanently arrested.

It is important to bear in mind that the state of the cerebral functions must influence the prognosis as much as the actual size of the head itself.

It is important to remember that many of the symptoms of this disease are similar to the various aetiological conditions which may give rise to functional cases, or various conditions which so frequently arise from pathological causes, but more especially from Fevers, in which the child should always be taken to consult the doctor, or any person of medical knowledge in any given case.

It is possible that a child with chronic hydrocephalus may be cured by means of a special treatment in a given case. It should be borne in mind that even under proper medical treatment, there is not much diminution in the actual head measurements; the head may, as in all my cases, appear to grow smaller, but it will be found on measurement, the diminution in the circumference is but slight. The apparent diminution being due to the growth of the brain while the child's body, by which the relative proportions of body and head are more nearly attained.
Distension of the subdural sacs of the head is a physical sign of much value, as by it we can estimate the increase or decrease of the tension of the effusion. I found in each case that diminution of their distension was one of the earliest signs of amendment. I call attention to this fact, because so far as I am aware, it is not mentioned in any works on the subject.

It is, however, unwise to lay too much stress on any one symptom, and there can be no doubt that the most important evidence of success or failure of any plan of treatment is the mental and bodily condition of the patient. It was the great and persistent mental improvement, accompanied by the increase of flesh and amendment of the general health, that constituted the best criterion of the success of my treatment.

What may be the ultimate fate of my patients, I cannot presume to say, but I am agreeably surprised to find, that contrary to my original expectations, their chances seemed to improve with time.
Cases

William B., aged 7 months — first seen on Dec. 13th.

His mother stated his head "had never been right at birth," since which it had gradually been increasing in size up to the present time — he had always been in the habit of rolling his head from side to side — a fortnight previously (Nov. 27th) he had his first and only fit —

The head presented the usual appearance of well marked case of Chronic Hydrocephalus, the superficial veins being much enlarged, and the circumference around frontal & occipital bones being 18¾ inches — Ordered Hyd. E. Crêta q.s. ½ every night — Dec. 18th. Has had two fits and has squinted several times —

The child continued to take the Phæg powder, and improved so much in general health, being quite lively, that I gave no more of it until the following March, on the 18th of which he took cold, began to cough, became very fretful, took febrile, three or four times a day after food — he has a croup — March 19th. Has cut some teeth, and is much better, the superficial veins of the head are not prominent, and notwithstanding the marked growth of the child in three months, the frontal occipital circumference is only 18 inches — Ordered Hyd. E. Crêta q.s. ½ twice a day, and ½.

March 31st. Three times a day after food — April 2nd. He has greatly improved, & eats well, frontal occipital diameter 17¾ inches — After this, I gave him at intervals of a fortnight
During which time he continued the treatment improved. His teeth continued to give him some trouble, but the frontal circumference remained the same 17 3/4 inches. Thus in five months, during three of which he had taken Mercury, the head which at the commencement measured 18 1/4 inches diminished to 17 1/4 inches, in spite of the rapid growth of the child.

Emily S., aged sixteen months, a six months' child. Mother had had no other children but two miscarriages. Father is said to have died of congestion of the brain.

At birth, the head "fit" for three days, but excepting there, the remained free from any head symptom, till she was a year old, when she began to get fretful, irritable, & irritable, but had no fits or sickness.

She came under observation on Jan. 5th, her head presenting in a marked degree the usual appearance of hydrocephalus. The face also exhibiting the triangular condition, the hair forming the apex, & of course, the base of circumference. Frontal circumference 17 inches, and other fontanel very large. The superficial veins were much distended, and eyelids not drawn up to puffed equal.

Ordered: daily 6 oz. castor oil twice a day, with chloroform bid.

Jan. 26: She improved in every way, having gained much flesh & strength. The superficial veins are not now visibly distended. Father-
March 23rd.地方, a portion more. 面积 cir-

occipital 17 1/2 inches —

was 17 1/2 inches, but the anterior fontanelle

is almost closed — had gained much flesh —

Medicine to be continued —

April 10th. Still improving — Mercury to be

stayed, but col lin oil to be continued to

be continued —

I saw her at frequent intervals, till May

25th., during which time no sign of an attack

of fever, & Cutting become better. She

steadily continued to improve, the head

maintaining the same circumference of 17 1/2 in.

but the child had grown so rapidly, exposing

the lower part of the face that the triangular

appearance of the head until now passing almost

attention. She is fairly intelligent, able

to talk moderately; the anterior fontanelle

remains almost closed —

Mr. 13, aged five months. Three days after

first saw child with convulsions, and the

head had been enlarging ever since. It now

presents the appearance of the head marked

case of Chronic Hydrocephalus — the plane of

scalp is very tense. Plastic Fontanelle

diameter 18 inches. Mother says the child

frequented.

Ordered: U. & c. & c. 11, every night, &

col lin oil —

At the end of six weeks, the head greatly enlarged,

having gained flesh, & grown very fast, in which

respect the head circumference was only 17 1/4

inches. Her mother saying "her head is not.
half the size. In fact today I saw no
more of the child after that time, and can
only hope that no news is good news.

I hereby certify that this thesis is my
own composition.

John Rudd Leonor
28th April 1882.