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Subject:-

Cerebral Cysts.

by

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Cerebral Cysts.

Deeper knowledge of physiology and of the laws which determine the healing of wounds has in recent years justified increasing boldness in surgical practice.
This confidence is based largely on the foundations of anaesthesia and antisepsis, or asepsis, the two great factors in modern surgery.
The advance has been a general one; along the well beaten track much has been improved & simplified, while many untrodden paths have been entered upon.
In describing the nature of this fresh impulse it may be said that attention to detail characterises modern methods regard for biological truth the modern spirit: an attitude so full of promise that we cannot assign limits to future progress, though in certain directions we are apt to think

that finality has been reached.
The light of recent surgical knowledge, however, is only breaking on a region which now absorbs much interest, viz that of the Cranial Cavity.
This region is still shrouded in purely vanishing mists arising from the complexity of the brain itself, and from the difficulty of differentiating structural from functional and nutritive lesions.
The accurate diagnosis indeed of anatomical lesions is not a simple matter, and it is by no means infrequent to see conclusions based on experimental & clinico-pathological grounds refuted by post-mortem examination, and to observe after death gross cerebral changes which were attended by few or unexpected symptoms during life.
This is not surprising when we consider the functional relations of distant parts of the brain, and the

power of local lesions to excite remote disturbances.
It must also be remembered that authorities are not yet entirely agreed as to the exact delimitation of the functional areas.
Clinical surgery has much to observe and teach regarding these points, while practically its duty is to determine the tolerance of living tissues towards active interference, and the possibilities of operative measures.
Accurate observation & detailed records of more or less important work are necessary to give precision to surgery in this direction.
A case of considerable rarity brought under my notice cystic formations connected with the brain: these I propose briefly to review, to describe the special case with the treatment employed, and to enter into some points of interest suggested by it.

The varieties of cysts met with in this region are numerous, but from their nature & anatomical position all are not of equal surgical importance. The large & pathologically interesting group of "cysts of degeneration," the product of resolving tubercular, Cancerous and syphilitic infiltrations, and of degenerated glandulous, myxomatous, and other tumours, belongs to an advanced stage of these constitutional & local disorders. In the future, after therapeutic measures have been tried, surgery will probably anticipate cystic development, by interfering while these deposits are yet in the solid state, when operation seems admissible.

The dangers of delay make it imperative that surgery should endeavour to afford speedy relief, for while it is true that cystic involution may be attended by amelioration of symptoms, on the other hand haemorrhage into and around the cyst, in consequence of diminished

pressure often renders the symptoms more urgent. I recently saw an illustration of this — convulsions, paralysis & death following haemorrhage into and around a softening glioma tous tumour situated near the right fissure of Rolando and involving the prefrontal region, which for months had caused occipital headache, emaciation & signs of progressive mental disorder.

Such cysts then are the late manifestations of morbid changes, and a study of their etiology is chiefly valuable in so far as it enables us to control or modify the exciting causes.

All cerebral cysts, however, are not so amenable to preventive treatment. Analysis of reported cases shews, firstly, that a large number are congenital, and secondly that a considerable proportion is of traumatic origin. Many included in the latter group are in a manner

congenital, arising from injurious pressure on the skull during parturition, attended by laceration of cerebral vessels and occasionally by fracture of cranial bones. The remainder originate in falls or blows on the head in infancy & later life.

It is obvious that such causes can not be altogether avoided, while the remarkable latency of symptoms in many cases of cerebral traumatism renders impossible that early recognition of the lesion necessary for the prevention of secondary changes.

Thirdly we meet both cysts of the pituitary body and pineal gland, either congenital or cystic during their whole life history: and fourthly in some Countries from the nature of the environment parasites are a not infrequent cause of cystic growths.

Let us consider each group somewhat more in detail —.

I First- Congenital cysts.

We may dismiss in a word any further reference to their etiology:- they are abnormalities of evolution or development.

With certain exceptions to be afterwards mentioned these cysts form obvious tumours, not necessitating for recognition analysis of symptoms, but demanding for differential diagnosis careful attention to certain features appreciable by the senses of sight and touch.

Meningoceles and a variety of encephalocele will at once suggest themselves as belonging to this group, while we may further observe, that though usually presenting externally some dermoid cysts and a few metamorphosed naevoid growths may be only recognised by the symptoms of intra-cranial mischief which they give rise to.

So far as the meningoceles are concerned their recognition is of greater negative than positive value, since,

should spontaneous cure not take place, treatment, though successful in one or two instances, has usually let up fatal meningites. This fact emphasises the feature in their nature of interest for us at present, which is that these abnormalities are cysts communicating with the subdural space by diverticula of greater or smaller dimensions. They sometimes cover a shell of brain substance, and when so complicated they closely resemble subcutaneous naevi. Should this complication lead to error in diagnosis, simple operative procedures might be followed by unfortunate consequences.

The angiomata indeed must be handled with some caution on account of their occasional connection with intracranial naevi or even with intracranial cysts formed from structurally altered naevi.

The rarity of this last condition as a rule allows the surgeon sufficient protection, but such cases do occur.

Several instances are recorded of confusion arising between meningoceles and <u>dermoid cysts</u>.
The developmental origin of these cysts is now fully established.
They are usually met with in the mesial line of the body, but in the skull they may occur at any point where lines of union take place between ossific centres, and where the bones are deficient in early life.
In the majority of cases the cyst firmly adheres to, & deeply excavates the cranial bones, in others it communicates with the cranial cavity, and in a few it lies entirely within the skull.
Although the greater number of these dermoids lie along a line drawn from the root of the nose to the external meatus, many examples of the intracranial variety with which we are chiefly concerned, are found in the region of the squama occipitalis.
Instances abound of the discovery

of such lesions after death, but so far as Dean discover, no truly intra-cranial cases have been diagnosed and successfully treated during life.
The published cases shew that these cystic tumours vary greatly in size & that they are not incompatible with prolonged life, unless some accidental circumstance, or intercurrent complication, should induce morbid action in a predisposed brain.
Though the occurrence of intra-cranial dermoids is comparatively rare, it is clear that this variety of cyst should always be kept in view when presented with obscure symptoms of cortical irritation in early life.
Professional opinion will no doubt soon sanction exploratory operations in obscure brain disease, but even if diagnosed & cut down upon, removal of such growths, owing to their occasional intimate connection with the cerebral sinuses, might be an operation attended by no little risk, or impossible of performance.

II Mixed forms, congenital, or cystic new growths.

We may at this stage draw attention to some rare forms of cyst- which are not necessarily though occasionally congenital, and which while pathologically distinct clinically may be conveniently grouped together.

I allude to a class of cases in which cystic growths, congenital or of new formation, may, if of sufficient size, produce a series of symptoms and appearances included under the term "Chronic hydrocephalus."

If small they are of little surgical interest, since they do not give rise to any characteristic symptoms.

I am aware that the term "chronic hydrocephalus" has a precise meaning, but it is capable of extremely loose application - perhaps necessarily so in the absence of post mortem examination - and is, I believe, often employed to denote not definite intra-cranial changes, but their remote effects of cranial

enlargement, dilatation of fontanelles, and separation of sutures.

Such changes are gross and are attended by symptoms of a general nature arising from abnormal intra-cranial pressure, viz pretpulness (in children) wasting, vomiting, convulsions, and sometimes such disturbance of special senses as enables one to locate the primary lesion.

Among the existing causes of this condition connected with our subject may be mentioned dropsy of the septum lucidum, dropsical effusion between the layers of the dura mater, cystic degeneration of the villi of the choroid plexus, cystic occlusion of the posterior cornu of the lateral ventricle, also cystic neoplasms of the pineal gland and pituitary body.

A remarkable case is described by Dr. Zenker in Virchow's Archiv of 1854 which illustrates my meaning.

Marasmus & convulsions ended in death in a child of six years old, the supposed

subject of hydrocephalus. Subsequent examination shewed that the cause of death was a cystic new growth of the pituitary body which had invaded the third & lateral ventricles through the anterior perforated space, greatly distended their cavities, thinned the brain substance, and produced enlargement of the skull.

III Parasitic Cysts.

The chief cerebral parasites in man are Echinococcus hominis, and cysticercus cellulosae.

They usually form cysts in highly vascular parts, such as the ventricles, the ganglia, pia mater and cortex of the brain, where they cause sensory, motory and mental disturbance according to their size and site.

This is a class of cases of considerable importance in certain parts of the world, notably in Australia where the possibility of hydatids must be considered and excluded in every

tumours or collection of fluid occurring in any of the cavities of the body. Diagnosis is based largely on the previous health and mode of life of the patient.
Evacuation by tapping, free drainage or in some situations extirpation seem helpful methods of treatment.

It may be asked is it possible to distinguish during life a cystic from a solid growth, and is the distinction of any practical importance?
When we lose the aid which age, traumatism and exposure to parasitic infection afford us we pass into a region in which the constitutional condition and the selective affinity of special structures for certain morbid growths mainly guide us in diagnosis. In other words, given certain cerebral symptoms we must by an analysis of these locate the lesion and then predict its probable nature from the

known pathology of the region affected. Such a study renders it evident that, compared with vascular lesions and solid growths, cysts need hardly – with the exceptions already mentioned – enter into our calculations.

Practically I should say that the differentiation of a cyst from a tumour was of little moment. Extirpation is the only thorough method of cure for either, while tapping and drainage, palliative measures applicable to cysts only, are apt to prove futile from refilling of the cyst and from the haemorrhage which may follow their employment.

This outline, which leaves many points untouched brings us to the last and most important division of our subject.

IV Traumatic Cysts.

It has been abundantly proved that structural diseases may owe their origin to long antecedent injuries, and that a local lesion may progress

unobserved till, at a late period after the date of accident, it gives rise to symptoms or appearances of a striking character.

The conditions which commonly give rise to late symptoms in cases of head injury are 1 Depression of inner table of skull. 2 Cicatrix of cortex of brain or of the cerebral membranes. 3 Osteophytic growths, 4. Cysts, with which we are at present concerned.

These manifest their presence by symptoms pointing to local compression or irritation, while the history of injury the tender percussion area and the occasional deficiency of the cranial bones in their neighborhood indicate the probable nature of the morbid condition.

The following cases illustrates these various points.

The patient was a woman aet 24 single, the subject of epileptic attacks since the age of thirteen.

Her family history was excellent and in infancy she enjoyed perfect health.

When two years old she fell out of a high bed on to a stone floor, and sustained a severe injury of the right-side of the head, the full-nature of which is unknown. After this accident the shape of the head changed, the right-side becoming prominent - and it is certain that this deformity was on the increase at the age of six years. Health and intelligence remained unimpaired till the fits began at the age of thirteen, if we except a certain nervousness and excitability unusual in her family. Some hallucinations, it is true, gave evidence of cerebral disturbance at a still earlier period, as she frequently imagined she was being chased by visible animals. The onset of this symptom cannot be dated and no attention was paid to it, till later it was observed to precede an epileptic seizure.

The onset of unmistakeable convulsions dates from puberty. They occurred at irregular intervals, sometimes three

or four daily & sometimes weeks passed of immunity from attacks. These early seizures were said to begin in the left-leg - but this statement cannot be implicitly relied on - and to be confined to the left-side unless the attack was of unusual violence.

Since under observation the convulsions have been bilateral and general, and of a character pointing to focal irritation. The patient soon discovered, & others observed, that the head and eyes turned towards the left-side immediately before a fit: these movements were attended by a feeling of giddiness & by flashes of light.

As she advanced in years the convulsions became more violent, till ultimately the frequency of the attacks, combined with occasional outbursts of temper & impertinent & indecent language which characterised the pre-epileptic period, rendered her incapable to be self-maintaining.

I saw her in August 1888 when the

the condition was as follows.
Patient well nourished, muscularly strong, organic functions normal. highly self-conscious, excitable, & at times maniacal when disposed.
The fits were of almost-daily occurrence, though sometimes represented by transient giddiness & mental confusion only. No definite aura preceded the convulsive seizures, but she was conscious of the conjugate-deviation of head & eyes to the left side which invariably ushered in an attack. The spasms at once became general, the muscular phenomena being rather more marked on the left side & they lasted about two minutes. Micturition occasionally occurred during a fit; tongue never bitten, consciousness entirely abolished, but she was usually up & active immediately after a fit.
Nervous System. Subjective phenomena.
She complained much of the annoyance the fits caused her & occipital headache, and of a sense of weight,

cold, & throbbing in the right-parietal region.

Objective phenomena. Reflexes, coordination, sensation, temperature sense, and special senses normal.

Ocular movements, peripheral as well as central vision, perfect: no optic neuritis, nor hemiopia for light, form, or colour.

Inspection of the head shewed that it was distorted towards the right side, the forehead sloping slightly forwards, & the occipital region bulging outwards. On further examination it was found that a considerable area of pulsation, visible & palpable, existed on the right side & that round this area of depression could be traced an elevated bony outline. This hollow measured 4¾ inches in length by 1¾ in width at its widest part, it lay with its long axis forwards, was irregularly rounded posteriorly, and anteriorly tapered to an acute angle.

Its superior margin was 2½ inches from the mesial plane of the body & almost parallel to it throughout its entire length, while the inferior joined the superior at a point a short distance behind the position of the coronal suture & 4½ inches above the level of the external auditory meatus. It sloped obliquely downwards & backwards from this point passing two inches above the external auditory meatus & terminating at the posterior inferior angle of the parietal bone. One inch behind the apex of this hollow a firm transverse ridge divided it into an anterior triangular, and a posterior roughly quadrilateral space. The floor of this hollow pulsated synchronously with the heart-beat, but on deep pressure resistance as of bone was encountered, and pulsation ceased to be felt. The question then arose was this hollow due to a depression or to a deficiency of a portion of the parietal bone: the pulsation pointed to a deficiency but the extraordinary resistance on pressure, and the presence of the anterior bridge left the matter undecided.

the convulsions, headache, giddiness all pointed to intra-cranial tumour, but the duration of the symptoms, the absence of any paralysis and of optic neuritis made it unlikely that such was the case.
This peculiar condition of the skull therefore was believed to be the result of injury in early life, and to afford an explanation of the epileptic seizures.
To aid diagnosis and to decide the presence or absence of bone, aspiration with proper antiseptic precautions was tried in the posterior space. A fine needle was used which soon passed into a ~~space~~ cavity in which it was freely movable: one ounce of clear fluid was drawn off, which was followed by a falling in of the scalp over the space, while pulsation became much more obvious shewing the greatness of the previously existing tension.
The presence of a superficial encysted collection of serous fluid was thus established.

This fluid was neutral in reaction, contained no albumin and under the microscope only a few leucocytes & cells resembling squamous epithelium were seen. In four days time, the floor of the hollow space had again become tense, and the patient complained of increased tenderness on pressure: it was therefore decided to make an exploratory incision.

Operation Aug. 29th 1888.

During the administration of the anaesthetic in the stage of violent excitement the centre depression became a protrusion, divided into deep furrows by numerous transverse bands. This proved the absence of a solid roof & shewed that in similar cases chloroform might prove of service in diagnosis.

A superficial incision two inches in length was made along the middle of the hollow in the direction of its long axis, and the scalp was divided layer by layer on a hernia director till a smooth strong membrane supposed to be cyst wall was reached. On making a small opening into this tense bulging membrane, a large quantity

of clear fluid welled rapidly up. The opening was enlarged, the fore-finger inserted, & the incision prolonged with a probe pointed bistoury throughout the entire length of the osseous space.

There was then exposed a large somewhat-wedge shaped cavity with a broader base than the osseous space, since it arched on either side beneath the parietal & temporal bones, supported by stout trabeculae which divided the cavity into deep but imperfect loculi. (To avoid confusion we may note that the base corresponds to roof, floor to apex, sides to surfaces of the wedge.) The cavity measured 2¼ inches in width, 2 inches in depth nearly five in length. The cerebral convolutions were flattened and pushed inwards, while the brain substance forming the floor of the cavity or apex of the wedge, seemed at points to be covered by a thin membrane, and at others perfectly bare. The antero-posterior axis of the cavity corresponded with that of the osseous space, while its vertical axis was directed towards the middle line at an angle of about 45°.

Its base arched boldly on to the parietal & temporal bones on to the strong upper vaulted surfaces, which merged gradually on to the bare floor.

The walls shewed no tendency to bleed & by sponges the cavity was quite emptied of fluid.

It was then apparent that he had to deal with a variety of subdural cyst, but the proper course of treatment was not so easily decided. Even assuming that a complete capsule existed the connection between the dura mater & cyst-wall was so & tenuous & vascular, & the deeper parts so difficult of access, that it was decided not to attempt a prolonged dissection, but to rely on free drainage. Accordingly no portion of the cyst-wall was removed, a large drainage tube was inserted, & the scalp accurately stitched, the sutures being carried through the entire thickness of the scalp.

No bad symptoms followed the operation, nor any special features marked convalescence. Serous fluid simply poured from the cavity, saturating large dressings.

* This was a mistake. a flap operation presents many advantages

The rod remained collapsed & pulseless till the fourth day when pulsation reappeared though the drain was acting freely. But- for the difficulty of maintaining antiseptesis owing to the patients unmanageable ways. I should have at this stage again laid the cavity freely open.

From this date onwards the serous discharge decreased in quantity, and on the 14th day the tube & the stitches were removed when the patients condition was satisfactory general health excellent, no headache and no pits. On the 20th day all dressings were removed, & for a month after this improvement continued, when suddenly the epileptic attacks occurred as before. After some weeks of observation & one or two mild outbreaks (Fragmental excitement) it was decided to attempt complete removal of the cyst.

Second Operation Nov. 19th 1888 almost twelve weeks after the first.

An incision was made along the line of the cicatrix, & instead of finding the cavity empty, obliterated, or filled with clear serous fluid as before, I was startled

to see that it had undergone considerable changes.
At first it seemed as though the brain had repleted the space since, when the scalp, pericranium & dura mater were divided a thin vascular membrane was exposed with greyish material beneath it. The wound was carefully enlarged on a director & the thin membrane preserved intact.
Having come to the conclusion that this was a fresh blood cyst I endeavoured to remove it entire by dissecting up the old cyst wall. In this I was only partially successful for on passing from the roof on to the inner surface of the temporal bone, I found that I was stripping the new cyst from its outer attachments. This separation was attended by free oozing by the bleeding down of what appeared to be brain tissue. Slight traction then ruptured the fresh cyst & caused profuse haemorrhage.
After this collapse a mesial septum was seen dividing ~~dividing~~ the cavity into two distinct portions enclosing an

the mesial side, either another portion of the newly formed cyst; or brain substance which had pressed outwards on the relief of tension following the first operation. Uncertainty on this point and the free haemorrhage caused the radical operation to be abandoned. The collapsed portion was cut away all bleeding arrested & a drainage tube inserted. Owing to the patients maniacal violence on recovering from the anaesthetic restraint was necessary which had to be continued till the wound healed. Free serous discharge occurred as before but blood stained & less plentiful. Drainage tube removed on 8th day & by the 16th the wound was soundly healed. Three weeks after the operation the patient had a slight attack of giddiness, but the local pain & headache were completely gone & she expressed herself better than she had felt for years. She continued in capital health & free from all symptoms till Jan 12th 1889 when the irritability of temper & epileptic attacks again returned.

April 25th 1889. Pts still frequent but rather less violent.
Unfortunately this result leaves it undecided whether the pts are due to confirmed habit or to want of thoroughness in the operation.
Such is the summary of the main facts let us now consider some aspects of the case capable of general application.
measurements do not convey a clear idea of the shape of the head, nor of the abrupt bulging which began immediately above the mastoid eminence, but they enabled me to determine with some precision the main area compressed by this cpt.
The convolutions compressed & flattened included, I believe, a small portion of the ascending frontal, a large part of the ascending parietal, the angular gyrus, a small portion of the supra marginal, & also the posterior portions of the superior & middle temporo-sphenoidal convolutions.
Notwithstanding this extensive interference with the motor area there was

no impairment of muscular power, neither of the facial nor brachial muscles. Similar cases might be multiplied. In the Journal of Anatomy & Physiology Professor Cunningham reported a case, which so far as the area implicated is concerned, presented some striking resemblances to the one under consideration. In his case the cyst had pressed the convolutions into their laminae in which neither nerve cells nor nerve fibres could be detected. Dr. Bryson Bramwell has also recorded a case of sarcoma of the dura mater in which so far as one could judge with the naked eye the whole of the motor centres for the face upper extremity were destroyed, yet microscopical examination the grey matter in this region seemed to have completely disappeared. And yet there was absolutely no trace of paralysis." (Br. Med. Journal June 1888) These two cases satisfy the demand of Dr. Ferrier that destruction of the grey matter should be proved in the

absence of paralytic phenomena "since we know that tumours may press aside without destroying the tissue in which they rest." (Ferrier Localisation of Cerebral Disease.)

I am unfortunately unable to demonstrate absence of brain cells, but appearances & analogy indicated at least greatly altered structure. My present aim however is not to question in the slightest the delimitation or importance of the motor areas, but to draw attention to a lesion which in my opinion throws some light on the functional connection of the opposite sides of the brain.

With regard to the special senses it is now held that, in either hemisphere of the brain both sides of the body are functionally represented the opposite side to the greater extent respectively & that should one centre fail from injury or disease the other can wholly or in part supply the deficiency. Recent investigation has also shewn that muscles which habitually act together may be thrown into activity from either hemisphere.

The fact of non-impairment of motor power in this, and other like instances, remains, and at first sight it seems to indicate that compensation by the opposite hemisphere can maintain specialised & independently executed movements.

All the conditions essential for the establishment of compensation were present in this instance, but proof is wanting & the case only adds one more to those exceptions which suggest three possible well known explanations — (1) probable compensation (2) non-complete destruction of grey matter (3) overlapping of cortical centres or existence of reserve of embryonic tissue which is gradually educated so as to replace the part injured or diseased.

This most interesting question of motor compensation can only be settled by elaborate experimental investigation, or by a remarkable series of clinico-pathological cases.

Etiology. In 1834 M. Baillarger pointed out the connection between blood extravasations & certain cerebral cystic formations, loosely described as subdural, subarachnoid, and inter arachnoid. Regarding the mode of origin of these cysts, however, opinions differed. Some holding that meningitis with lymph effusion and organisation as in pleurisy & pericarditis, sealed together the dura mater & arachnoid thus forming a cyst: others that lymph was poured out & became organised round an already effused blood clot: others that organisation took place in the extravasated blood without the intervention of any inflammatory action.

Sir Prescott Hewett (Trans. Med & Chirurg. Soc. (V. 28) strongly advocated & propounded the last view, and enforced his opinions from analogy, & by post mortem demonstration of various stages of membranous formation in recent haemorrhages.

He describes four conditions in which the extravasations may be found

1 Effused blood, liquid or coagulated.
2 Formed into a false membrane red

in colour, or reduced to plum & therefore yellow.
3. Maintained on free surface of arachnoid by a membrane.
4. Enclosed in a complete cyst - which may be removed entire from the cavity of the serous membrane.

The progress of the case which I have described led me independently to the belief in the haemorrhagic origin of these cerebral cysts, in which there is a distinct history of Cranial injury, & this is my apology for writing on the subject:
The result of the case consists in the enormous cranial deficiency the sharp anterior angle of which, - probably continued into an imperceptible fissure, - confirmed the view that Cranial fracture, with sub-dural haemorrhage was the primary lesion.
These traumatic Cranial deficiencies have not received much attention, though they are probably of more frequent occurrence than is sometimes imagined.
They seem to be invariably associated with fracture of the skull - usually in the right-

[parietal region -

arising from injury received during par-
turition, or from falls & blows in infancy.
The fissures so formed have increased in
size from the protrusion through them of
"spurious meningoceles", which occur when
the fracture is attended by such rupture
of cerebral membranes & brain substance,
that cerebro-spinal fluid escapes from
the cranial cavity, becomes diffused above
the bone & elevates the scalp. Such con-
stant pressure from within without favours
absorption of bone.

It may be that the pressure of the brain
interferes with callus formation, but it
seems that the injury itself is sufficient
to interfere with the nutrition of the part,
& to prevent that deposition of lime salts
necessary to keep pace with the growth
of the skull.

According to this view the deficiency means
arrested development relatively to the other
parts of the head, it must be increased
by absorptive or atrophic changes when com-
plicated by the presence of an intra-cranial cyst,
without which the deficiency might remain trivial.

Pursuing the same line of thought, it seems reasonable that the abnormal bulging of the head should be regarded as a perpetuation, by continued growth, of a distortion acquired at the time of injury. Though believing that the osseous deficiency afforded sufficient relief to intra-cranial tension, I was unable to satisfy myself that interference with the vis-à-tergo through the right lateral sinus, by pressure of the cyst was not a factor in producing the distortion.

Let us consider shortly the changes in the interior of the skull.
The case illustrates on the living subject all the changes enumerated by Dr Prescott Hewett as occurring in intra-arachnoid or subdural haemorrhages.
On the first exploration the difficulty lay in determining the nature of the trabeculae & the relations of the walls which bounded the collection of fluid. I now think that we had to deal with an imperfect cyst or rudimentary Class 3. This difficulty otherwise

to explain why the floor of the cavity should have been covered only by a thin membrane no thicker than the pia mater, which at points was greatly thinned or altogether absent. The extravasated blood had of course undergone disintegrative changes. The trabeculae can be accounted for in two ways. Either the so called cyst was multilocular from the first - and the septa became ruptured by its increasing size: or the trabeculae represented attachments of the membrane to the brain (or rather pia mater) which became stretched & finally separated as the cyst-enlarged from transludation of fluid or renewed haemorrhage.

The second operation afforded samples of the remaining forms: a complete newly formed cyst was found, while the excised portion both naked eye & microscopically illustrated different stages of membranous organisation.

The excised portion was composed of strata of different consistency and age.

External was a dense white layer, within

it - a thick red layer, internally there was a delicate membrane with filamentous processes extending into what had been the cavity of the cyst. The yellow colour shining through this thin membrane was no doubt due to the formation of fibrin organisation proceeding in the contained blood.
Microscopically the separation of inner cyst-wall from the dura mater could not be distinguished, several sections only shewed different stages in the organisation of fibrous tissue, with at points a clearly defined line separating the old cyst-wall from the new. There was also in the recently formed fibrous tissue an enormous development of vessels shewing how readily fresh haemorrhage into the cavity of the cyst could occur
The points of greatest interest to determine are - when did the cavity become filled with blood, what caused the haemorrhage. It is not credible that bleeding could have occurred shortly after the first operation and have escaped through a large & patent drainage tube, without staining the pus serous discharge.

One did not anticipate haemorrhage from the decidedly non-vascular walls of the old cavity & at the most repelling with serous fluid was expected.

The explanation of the phenomena most in accord with the changes observed is as follows. The irritation of the sponging of the interference generally caused inflammatory changes & formation of embryonic vessels in the old cyst-wall & among the recesses of the cavity. A layer of vascular tissue was thus formed which easily bled from cerebral congestion due either to exertion or agitation. The early tension of the roof which followed operation is also in favour of this view. Haemorrhage probably occurred more than once during the patients violent struggles, but I am unable to assign reliable dates.

The mesial septum was probably due to special formative activity along the line of the cicatrix.

Conclusion. Such changes give rise to certain questions regarding the nature of the operation.

It is now an axiom in cerebral surgery that an operation must not be of such extent as to give rise per se to formidable symptoms; but further caution is necessary, for the period of danger includes the healing process, and we must be able to foresee all possible structural changes in order to avoid them.

The irritative effects of large cicatrices, & of adhesions between brain & skull, have been fully pointed out, as they have been frequently observed to cause such dragging & displacement of convolutions, & cerebral vibrations, as to produce disordered function or neuralgic pain.

Surgeons not aware that the risks attending the production of unoccupied spaces in the cranial cavity have received much attention.

I may be presumptious to base conclusions upon an isolated case, but I think it's teaching indicates that without apposition between the walls of artificially produced cavities, liability to haemorrhage & septic formation is less present.

Its influence on treatment is to suggest that in similar cases the cyst should be exposed, left open well drained till relief of tension & the slight irritation of antiseptics produced arrest of all transudative or secretive activity from sclerosis of its walls.
It is true that free division of all resisting structures & excision of a thin layer of cerebral cortex were not tried, because not deemed applicable, but before concluding that want of operative thoroughness accounts for failure, an alternative must be considered & that is the suitability of the case for operation at all.
Many now hold that too much has been expected of cranial surgery & that its range after all is limited.
In this view I cannot concur, but believe with von Bergmann that wisdom consists in never lightly undertaking exploratory operations on account of their comparative safety.
We strongly advocate careful selection of cases & maintain that operation for relief of traumatic epilepsy

is only applicable to those cases in which spasms invariably commence in the same group of muscles, & spread to others in an ordered sequence, & in which temporary or permanent paralysis remains in muscles previously implicated in the convulsion.

According to this standard Operation in the present case was a mistake & the result may be looked upon as strengthening & confirming this view of its real futility.