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THE OPERATIVE TREATMENT OF ABSCESS WHEN SITUATED IN THE BRAIN.¹

BY CHARLES A. BALLANCE, M.S. LOND., F.R.C.S. ENG.

MR. PRESIDENT AND GENTLEMEN,—None of us can have forgotten the beautiful story of "Rab and his Friends,"² wherein is painted by a master hand an operation by your great surgeon Syme in the pre-chloroform and pre-antiseptic days. The heartrending description of the operation would be true to this day but for the genius of Simpson, as chloroform—"one of God's best gifts to His suffering children"—might still be unknown; and the "Reaper, whose name is Death,"³ would still be reaping the "bearded grain" by means of the bacillary "sickle keen"—the dread and fatal septic illness that cut off the life of Ailie—had not Lister, the peerless knight of surgery, after long years of toil, vanquished the terror of the surgeon. Truly

"We hold him for another Herakles
Battling with custom, prejudice, disease,
As once the son of Zeus with Death and Hell."⁴

Indeed, we may detach some words from a sublime passage in which Macaulay immortalizes the genius of an illustrious statesman, and say of Lister: "History will deliberately pronounce that

¹ An address delivered at a special meeting of the Otological Society of the United Kingdom, held in Edinburgh on May 11, 1901.

² By John Brown, M.D.

³ Longfellow, "The Reaper and the Flowers."

⁴ W. E. Henley, "A Book of Verses: The Chief."

among eminent men no one has left a more stainless, and none a more splendid, name."¹

In the city where these greatest benefactors of humanity lived and taught, it is indeed a high honour to have been called upon to open a scientific discussion.

On looking over my paper on the journey North, I could not help being struck with the contrast between even a practical paper and the triumphant achievements of the Edinburgh school. The exclamation of Tony Lumpkin, when Diggory handed him a letter, came to my mind :

"A damned cramp piece of penmanship as ever I saw in my life."²

"The greatest trust between man and man," writes Lord Bacon in his essay on "Counsel," "is the trust of giving counsel." We have it on the authority of his greater contemporary that—

"Some men have greatness thrust upon them."³

This is my fate ; for to offer counsel on the subject of the treatment of abscess of the brain presents transcendent difficulty, and to be requested so to do implies a trust in my ability which I am only too conscious will fall short of the standard set before me. In fact, not to put too fine a point upon it, I somewhat fear my fate may be comparable to that of Metis,⁴ whose name, Bacon tells us, signifies "counsel." It was her fate to be married to Jupiter, who, as soon as she conceived, ate her up lest he might be deprived of any of her counsel. I do not imagine that the members present will appraise my counsel so highly that they will be anxious to follow the lead of Jupiter ; but should that consummation happen, it is my fervent prayer that they may partake of a spiritual rather than of a corporeal feast.

Macbeth tells us—

"The time has been
That when the brains were out the man would die,
And there an end."⁵

Though this dire calamity frequently dogs our footsteps, yet the times have changed, for now the Society's "great consult begins,"⁶ not as in Milton's Stygian Council, held at Pandemonium, by the passing of "resolutions in despair,"⁷ but having gained "reinforcement of hope" from past success, we—

"Meanwhile revive,
Abandon fear, to strength and counsel joined
Think nothing hard, much less to be despaired."⁸

¹ "Essay on the Earl of Chatham."

² Goldsmith, "She Stoops to Conquer," Act IV., line 388.

³ "Twelfth Night," Act III., Scene iv., line 43.

⁵ Act III., Scene iv., line 78.

⁷ *Ibid.*, Book I., line 190.

⁴ Essay on "Counsel."

⁶ "Paradise Lost," Book I., line 798.

⁸ *Ibid.*, Book VI., line 493.

"Things unattempted yet"¹ the advance of knowledge will make possible; the tide of Truth is ever flowing.

"For while the tired waves, vainly breaking,
Seem here no painful inch to gain,
Far back, thro' creeks and inlets making,
Comes silent, flooding in, the main."²

So it has been in the advance of surgery. Only by slow degrees has problem after problem been grappled with and solved. One of the latest triumphs of the art of the surgeon is shown in the operative treatment of abscess of the brain. In a steadily increasing number of instances it can truly be said of the surgeon:

"Strangely visited people
All swoln and ulcerous, pitiful [in the brains],
The mere despair of surgery, he cures."³

Although in the surgical treatment of disease of the brain we are as yet only on the threshold of success, nevertheless, the near approach of a perfect understanding of these matters may be confidently predicted. Then will it be possible to enter into the thought of the Roman poet:

"No pleasure is comparable to the standing upon the vantage ground of truth [a hill not to be commanded, and where the air is always clear and serene], and to see the errors, and wanderings, and mists and tempests in the vale below."⁴

"The more I think of it," says Ruskin, "I find this conclusion more impressed upon me—that the greatest thing a human soul ever does in this world is to *see* something, and tell what it *saw* in a *plain* way." In this paper an attempt is made to tell in a *plain* way a few of the things which I see with regard to abscess of the brain. "Whether these seeings are there at all is another matter." The object in view is to induce my colleagues and fellow-workers to tell also what they have seen. "The practical bearings of our theme" are of incalculable interest to science and to man. Correct observation is the vital "thread which binds the facts" and widens the field of knowledge.

GENERAL CONSIDERATIONS.

Before describing the exact details which must be carried out in the operative treatment of abscess of the brain, certain general considerations demand attention. An abscess of the brain is situated in a tissue of "liquid texture."⁵ This tissue, containing

¹ "Paradise Lost," Book I., line 16.

² Poem by A. H. Clough, "Say not the struggle nought availeth."

³ "Macbeth," Act IV., Scene iii., line 150.

⁴ Lucretius: see Bacon's essay on "Truth."

⁵ "Paradise Lost," Book VI., line 348.

little less water than the blood and enclosed in an inextensible bony capsule, is subject to the laws of hydrostatics. The integrity of certain parts of it is essential to the continuance of life. Placed within the cranium, the abscess is, until exposed by operation, quite beyond the reach of physical examination. Important facts, therefore, readily ascertainable by this method with reference to an abscess in an accessible situation, are not at the command of the surgeon when he has to operate for the relief of brain abscess. Despite the dictum of the poet, that—

“ 'Tis the blot upon the brain
That *will* show itself without,”¹

the objective and subjective symptoms upon which the diagnosis is made point to a lesion of the cerebral substance, but do not indicate clearly its nature and extent. The surgeon has to operate without any certain knowledge as to the size of the abscess and the acuteness of the inflammation, nor can he often truly surmise whether he has to deal with circumscribed or diffuse suppuration, or both. Even when the history seems to point clearly to an acute condition, it may be found that the abscess is of old standing. Abscess in the brain may be latent, producing only general symptoms of ill-health, until excited to renewed activity by a febrile attack, by a blow on the head, or by some minor operation, such as the removal of a polypus. By a latent brain abscess, then, is meant one producing no symptoms directly referable to a lesion of the brain. Such an abscess is, in all parts of the body, enclosed in a capsule. An abscess producing slight symptoms over a considerable period of time may not be encapsuled. This is true of the brain as of the neck or any other region. This variety of abscess has a tendency to extend, causing local destruction of tissue. A history of long-continued cerebral symptoms does not necessarily point to the presence of a capsule around the area of suppuration, for in a case of cerebellar abscess with symptoms dating back at least eight months no capsule was found, but the whole cerebellar hemisphere was nothing but a shell of softened gray matter.² The two conditions of acute abscess and old encapsuled abscess may exist together, as in a case that occurred to one of my colleagues, now deceased, in which an acute cerebellar abscess was opened with relief to the symptoms, but at the necropsy an old encapsuled abscess was found internal to that

¹ Tennyson's "Maud," Part II., iv. 8.

² Allbutt's "System of Medicine," vol. vii., p. 590.

which had been opened.¹ I have drawn attention to several such instances.²

The question must now be asked, How is an abscess of the brain to be treated? There can be no discussion as to the nature of the reply. Stäcke says: "Otology is an offshoot of surgery, and only in close adherence to it and in the true and conscientious observance of its principles is success to be sought for and to be found. The most important principle is the care for free, unhindered, spontaneous drainage."³ These significant words were written in reference to the treatment of middle-ear suppuration, and they apply with equal force to the treatment of abscess of the brain, which is the only too frequent result of failure to comply with them. Success can only be won by close attention to those fundamental surgical principles which guide us in the treatment of abscess elsewhere. In one of the most recent text-books on surgery⁴ we find these principles thus tersely stated: "In the treatment of an abscess there is one absolute rule which knows no exception—viz., that whenever and wherever pus is found the abscess should be evacuated at once, and after evacuating it, thorough drainage must be provided for." To which may be added, that when a purulent collection is encapsuled enucleation is the proper treatment. In the great majority of abscesses in the brain, as elsewhere, there is no capsule. The following is, however, an instance in which a capsule $\frac{1}{8}$ inch thick was present, but owing to a mistake in diagnosis the abscess was not removed.

A man, aged forty years, was admitted to hospital on September 14, 1895, with severe occipital pain, vomiting, and slow cerebration. He had paralysis of the right sixth nerve and double optic neuritis. He lay on his right side in bed. There were forced movements to the right and rotation to the right in walking. With the eyes shut, he fell backwards and to the right. In the beginning of May in the same year he had a severe illness, with shivering, sweating, and rigor, said to have been of influenzal origin. This had been followed by slight loss of power on the left side, from which he had recovered. About ten days before admission the headache and other symptoms returned. On the day following admission (September 15) a rigor occurred at 5.30 p.m.; at 6.30 coma was complete; at 7.30 artificial respiration was necessary, and was continued until I arrived. I was told that the case was thought by the physician to be one of cerebellar tumour.

¹ "St. Thomas's Hospital Reports," vol. xxiii, p. 208.

² *Ibid.*, "Cases of Cerebellar Abscess," by T. D. Acland and C. A. Ballance.

³ *Berliner Klinische Wochenschrift*, 1889. ⁴ Da Costa, "Modern Surgery."

Considering it almost impracticable to remove a cerebellar tumour during the performance of artificial respiration, and thinking that the left-sided paresis might be due to involvement of the right cerebral hemisphere, I removed a large area of bone over the right motor cortex. The brain bulged under great pressure, but natural respiration did not return. A trocar and cannula was plunged in up to the hilt, and impinged upon a hard mass into which it would not penetrate. As this was thought to be a solid basal tumour which could not be removed, the operation was abandoned. The necropsy revealed an encapsuled abscess containing an ounce of thick greenish pus, replacing the right optic thalamus. The capsule was very firm and quite $\frac{1}{8}$ inch thick. This abscess might have been enucleated had it been recognised.

When there is no capsule the treatment is free incision and drainage, but the provision of drainage is more difficult in the brain than in other more solid tissues, where, by free incision and counter-opening, it is easy to establish drainage and effect a cure. The difficulty is that in the "liquid texture" of the brain, as soon as the abscess is opened, the intracranial pressure causes the fluid brain-substance surrounding the abscess to flow towards the surface, so that a large portion of the cavity of an unencapsuled abscess is at once shut off from communication with the incision.

Since micro-organisms behave in the brain as they do elsewhere in the body, the question naturally arises, Should the bacteriology of the abscess modify the treatment? It has been already pointed out that until the brain has been entered it cannot be discovered whether the abscess is localized or is spreading. The virulence of manifest suppuration presents clinical features which indicate its bacteriology to the mind of the surgeon who has had some training in that subject. These clinical signs cannot be observed in the case of brain abscess, but it is nevertheless supremely important to determine the nature of the micro-organism at the earliest possible moment, as the use of a suitable antitoxin may prove to be a valuable weapon in the fight against death.

DETAILS OF OPERATION.

We now proceed to consider step by step how the surgical principles of the treatment of abscess are to be carried out in the case of the brain. It is taken for granted that the local source of infection has been thoroughly removed. The abscess must now be exposed by an appropriate operation, the steps of which are the following :

1. *Sterilization of the Skin*.—Shave the scalp, scrub it with ethereal soap and sterilized water, wash the soap away with sterilized water, rub firmly with turpentine on a sterile swab and then again with ether. If the operation is not to be done immediately, apply sterilized lint soaked in a glycerine solution of perchloride of mercury (1 in 1,000). If the operation is proceeded with at once, swab the skin with strong carbolic or perchloride lotion. The hands of the operator and his assistants must in like manner be cleansed and then immersed in an alcoholic solution of perchloride or biniodide, or the glycerine perchloride solution. The wearing of sterilized gloves is also recommended.

2. *Anæsthesia*.—The anæsthetic should be chloroform, and it should be given warily, for, especially in cases of cerebellar abscess, respiration is apt to cease. On two occasions it has happened in my experience that with the first few inhalations of chloroform respiration ceased, and the operation had to be completed during the performance of artificial respiration. Neither morphia nor strychnia should be administered before the dura has been opened.

3. *Incision of the Scalp*.—A flap is to be preferred to a crucial incision. It should be cut with its base downwards, and should be considerably larger than the opening designed to be made in the skull.

4. *Opening in the Bone*.—I am convinced that failure may result from neglect of the rule of surgery to make a free opening. How can a *free* opening into the abscess be effected through an inadequate opening in the bone?

“Wounds by wider wounds are healed,
And poisons by themselves expelled.”¹

The trephine employed should be $\frac{5}{8}$ inch in diameter, of slightly conical shape, and should have the teeth outside. (a) In temporo-sphenoidal abscess the site of application of the point of the trephine should be about $\frac{7}{8}$ inch above the suprameatal spine, the object being to expose the lowest part of the middle fossa just external to the tegmen antri and tegmen tympani. Immediately above these tegmina are the tissues in which, as a rule, the infective process first develops. When the disc of bone has been removed by the trephine, more bone should be cut away with small saws, forceps, or Cryer's drill until the opening in the skull is enlarged to a parallelogram measuring $1\frac{3}{4}$ inches antero-posteriorly and 1 inch vertically. The lower edge of the parallelogram

¹ Butler, “Hudibras.”

is marked by that of the trephine opening. Three-quarters of an inch of its antero-posterior extent should lie behind the centre of this aperture and 1 inch in front. The lowest part of any abscess in the temporo-sphenoidal lobe can be efficiently drained through this opening, and the bone disease (usually the tegmina) which is the source of infection can be directly observed and removed. I have known a case where a temporo-sphenoidal abscess was opened at its highest part, and where life was only saved by making a counter-opening in the situation here recommended, the man having been for some weeks in a condition of cerebral irritation. If the abscess is above and behind or above and in front of the opening more bone should be taken away, so as completely to expose the surface of brain which is external to it, or, if the surgeon so prefer, he can make a trephine opening higher up and utilize the lower aperture as a counter-opening. The former method is recommended. (b) In operating for cerebellar abscess the same trephine should be used. It should be placed on the bone so that its anterior edge touches the posterior border of the mastoid process. Its upper edge should be just below Reid's base line. In this way the horizontal and vertical portions of the sigmoid sinus are avoided. The opening should be enlarged backwards and downwards until it is quite $1\frac{1}{4}$ inches in antero-posterior and 1 inch in vertical extent. The opening may require enlargement, especially in cases where the abscess extends into the posterior part of the lateral lobe. It cannot be carried forwards with much advantage, as the vertical portion of the sinus is in the way of incision of the dura in this direction. It is to be especially remembered that the removal of bone, while comparatively easy before incision of the dura mater, is not so satisfactorily accomplished when that membrane has been incised and the brain is bulging under pressure.

5. *Incision of the Dura Mater.*—Here, again, a flap is preferable to a crucial incision. A small aperture should be made with a knife, and the flap (having its base sideways or even upwards)¹ should then be cut with fine blunt-pointed scissors. Great care must be taken to avoid wounding the vessels of the cortex which are forced by the intracranial pressure into close contact with the membrane.

6. *Discovery and Incision of the Abscess.*—When there is a sufficient opening in the bone it may be possible to determine by palpation that the abscess is immediately subcortical. An incision should at once be made through the intervening portion of brain substance into the abscess cavity, care being taken to avoid wound-

¹ Suggested to me by Dr. C. D. Green.

ing the vessels, as in other parts of the body. The use of a trocar and cannula, a pus-seeker, or other special instrument, is unnecessary and contrary to surgical principles. If the site of abscess is not obvious, it must be sought for by exploratory puncture, and in so doing it should be remembered that the site of the abscess is almost certainly close to the bone disease which gave rise to it. The best instrument to use is a sharp-pointed, long and narrow knife. Our brains are not like Satan's

" Entrails, heart or head, liver or reins,"¹

which Milton tells us could

" Not in their liquid texture mortal wound
Receive, no more than can the fluid air ";

and a wound made by the surgeon's knife will not heal quite so readily as that inflicted by the sword of Michael ; yet in the brain, as elsewhere, clean-cut wounds heal more readily than any others, and there is certainly less risk of the abscess being missed when search is made for it with a sharp knife than when any other instrument is employed. There have been cases of (1) trocar and cannula missing the abscess ; of (2) trocar and cannula passing through the abscess without tapping it ; and of (3) trocar and cannula striking the abscess but failing to penetrate its capsule (as in case described on p. 335). The following is a striking example of trocar and cannula failing to evacuate a large abscess : " The brain was explored in various directions with a trocar and cannula " with a negative result. At the necropsy there was found " a large abscess with very thick walls containing over 4 ounces of green offensive pus. So thick was the wall that the abscess shelled out whole and could be rolled about the table. In fact, it needed a sharp plunge with the knife to open it."²

The use of the knife for the evacuation of an abscess of the brain is not a new operation, but was taught and practised more than a century ago. Dupuytren³ in one of his lectures says : " In certain cases of deeply-seated fluid collections we must incise the dura mater, the arachnoid, the brain itself if the focus is at the surface of this organ, and by this bold proceeding patients have been saved." A little further on in the same lecture he continues : " Relying also on the success of J. L. Petit, Boyer concurs in the advice of Quesnay, and does not fear to plunge the bistoury quite deeply (*assez profondement*) into the very substance of the brain in

¹ " Paradise Lost," Book VI., line 346.

² Abbott, " St. Thomas's Hospital Reports," vol. xxv., p. 205.

³ " Leçons Orales," second edition, vol. vi., pp. 183, 184 (published 1839 ; date of lecture not given).

order to evacuate traumatic effusions which may have formed there, and it has fallen to my lot to do so several times with success." Like many another step in the advance of knowledge, this advice, though justified by some brilliant successes, remained for a considerable time a dead letter, for we find a great English surgeon writing nearly half a century later: "There are few surgeons who would have the hardihood of Dupuytren, who plunged a bistoury into the substance of the brain, and thus luckily relieved the patient of an abscess in this situation."¹ And after yet another decade the famous case of Dupuytren is thus alluded to in a later edition of the same work: "This was doubtless a somewhat rash thing to do without previously ascertaining the presence of pus by milder means."² Dupuytren, in his account of this historical case, says simply: "I incised the dura mater, nothing came out; I thrust a bistoury cautiously" (?so as to avoid the vessels of the cortex) "into the brain, and there welled up immediately a flood of pus. That very night all the symptoms disappeared and the patient recovered."³ If careful exploratory puncture with the knife fail to find the abscess, the finger inserted into the brain-substance will almost infallibly detect the presence of a tense abnormal swelling. Mistakes, however, may still be made, as is illustrated by two cases related in my article on "Certain Affections of the Ear," in Clifford Allbutt's "System of Medicine." In one of these one cerebellar abscess and in the other two had been opened, yet both patients died from an unopened abscess, oyster-like in shape, lying immediately beneath the cortex of the upper surface of the cerebellar hemisphere. The examining finger felt the sensation of resistance, but this was attributed to the tentorium.

7. *The Further Treatment of the Abscess.*—When the cavity is not entirely closed by the waves of brain-substance, it may be gently irrigated with a weak antiseptic; but on no account should this be done unless two drainage-tubes are so arranged as to insure the free escape of the fluid. Sterilized normal saline solution is recommended, but I am not in favour of irrigation except in very exceptional and chronic cases. Unless the opening in the cortex is large, I am opposed to the tamponing or packing of the cavity with gauze, because the tampon tends to obstruct the free exit of septic material. In one case of abscess of the temporo-sphenoidal lobe in which I removed a large area of bone, I ligatured and removed the cortex corresponding to the outer boundary of the abscess. The inner wall of the abscess, which was at first treated by gauze

¹ Erichsen's "Surgery," seventh edition, 1877, vol. i., p. 532.

² *Ibid.*, ninth edition, 1888, vol. i., p. 78. ³ "Leçons Orales," *ibid.*, p. 146.

plugging, soon came to form part of the outer surface of the brain, and was thus directly accessible for dressing. Complete recovery ensued.

As to drainage-tubes, the rules for their use in abscess of the brain do not differ in any way from those which apply to their employment in the healing of suppurating areas elsewhere. When a tube has been successfully introduced, it should not be disturbed for some time. The most successful cases treated in this way are those in which the tube remains undisturbed for many days. Tubes are shortened or removed only as the cavity heals from the bottom. The nature of the tube is of little consequence. All tubes are liable to become blocked with brain debris.

In the case of a small abscess deeply placed in the anterior and inner portion of the cerebellar hemisphere, the surgeon may be unwilling to use the knife for evacuation. Recourse must then be had to the exploring trocar and cannula, the latter having rings of wire attached, by which, when it has penetrated the abscess, it may be immediately fixed to the scalp by silkworm gut. Many a case has been lost after the pus has been evacuated owing to failure to reintroduce the tube in the proper position. The trocar and cannula should be of platinized silver. In the event of a counter-opening being made or of drainage occurring in consequence of disease or of operative interference via the region of the tegmina, gentle irrigation through the diseased area of brain may be beneficial, just as it is in cases of abscess with a counter-opening elsewhere.

8. *Closure of the Wound and Dressing.*—An aperture is now made in the base of the flap of the size of the opening in the brain, and the edge of the flap is replaced in position and sutured with fine silkworm gut. In certain cases it is not advisable to replace the flap. A powder may be used for dusting around the wound, but it should be sterilized. The dressing may be of sterilized cyanide gauze, either used dry or wrung out of carbolic lotion (1 in 40). A dry sterilized cyanide dressing is recommended, and the bandage should, if possible, be so managed as not to cover the forehead.

9. *After-treatment.*—This is a matter demanding the close personal attention of the operator. The dressing may require to be changed daily or not at all, according to the nature of the disease and the condition of the wound. (1) The primæ viæ should be kept open by the administration of some preparation of mercury. I have found, too, in septic cases that the pill of colocynth and hyoseyamus is very efficient in clearing the intestine of foul-

smell ng fæces. (2) In regard to food, it may be noted that barley-water and beef-tea are often borne by the stomach when milk is rejected. (3) As to alcohol, in certain cases we can hardly do without it. When it must be given, I personally prefer to order old brandy, though in this city old Scotch whisky would no doubt be selected. Far be it from me to assent to the "startling question" of the gifted Calverley, that both the ancient Greeks and the Scotch ought to have invented and adhered to another beverage :

"The Greek mind must have had some vital fault,
That they should stick to liquors so injurious
(Wine, water, tempered p'raps with Attic salt),
And not at once invent that mild, luxurious,
And artful beverage, Beer. . . .
Then nectar—was that beer or whisky-toddy ?
Some say the Gaelic mixture, I the Saxon :
I think a strict adherence to the latter
Might make some Scots less pigheaded and fatter."¹

(4) *Hernia cerebri* is an evidence of sepsis. It is best treated by sterilized antiseptic dressings. To prevent the dressing from adhering to the hernia some form of protective should be used; perhaps gold-leaf is the best. Slight elastic pressure is useful in the later stages of the treatment.

10. *Recurrence of Symptoms*.—It is by no means uncommon to have a return of symptoms a few days after the evacuation of the abscess, due either to the refilling of the abscess cavity from faulty drainage, or to the formation of a new abscess in another part of the same lobe. In the cerebellum, it is by no means infrequent to have a second, or even a third, abscess. Instead of concentrating the attention on the original site of abscess, the new symptoms, such as high temperature, rapid, irregular pulse, screaming fits, retraction of head, general twitchings, vomiting, drowsiness, etc., may suggest conditions such as meningitis or acute distension of the ventricles, which are not present. The surgeon,

"Vext with waste dreams,"²

and led astray by these speculations, may fail to act wisely. We may perhaps apply the words of Goethe :

"I tell you what : your speculative wretch
Is like a beast upon a barren waste,
Round, ever round, by an evil spirit chased
Whilst all about him fair green pastures stretch."³

Your great countryman, Carlyle, has said : "Genius is the transcendent capacity for taking trouble first of all." And Joubert

¹ "Verses and Translations : Beer." By C. S. C.

² Tennyson, "Idylls of the King": "The Coming of Arthur."

³ "Faust," Act II., Scene iv. (Sir T. Martin's translation).

has written: "Genius begins great works, labour alone finishes them." Both of these maxims are eminently true of the treatment of abscess of the brain. In order to succeed, the surgeon must "take trouble first of all" in weighing well every point in the history and symptoms of the case, and in planning and executing the operation with minute attention to every detail. And in order to finish his great work, he must spare neither labour nor time in watching the progress of the case, and in personally carrying out all the minutiae of the after-treatment. Many are the vicissitudes of the days and weeks that follow the operation. To be able to choose with certainty and to carry out with precision the various measures which make for success and oppose a disastrous termination, the surgeon must have at his command an exact knowledge of the significance of the various symptoms that arise, and of the resources and methods available for their systematic treatment. The surgeon cannot here delegate his duties or shift his responsibility; and amid the difficulties that beset him in combating the disease, he may well utter the prayer which the veterans of Frederick the Great sang as they marched to meet the foe at the Battle of Leuthen:

"Grant that with zeal and skill this day I do
What me to do behoves, what Thou command'st me to;
Grant that I do it sharp, at point of moment fit,
And when I do it grant me good success in it."¹

And when the case has been brought safely through all difficulties and dangers into the smooth water of convalescence, we may well say of the surgeon who saves his patient as Bunyan did of his victorious pilgrim:

"Hob-goblin nor foul fiend
Can daunt his spirit;
He knows he at the end
Shall life inherit!
Then fancies fly away,
He'll fear not what men say;
He'll labour night and day"
[To save his patient].²

In conclusion, allow me to say how well I know the toughness of the problem which the surgeon has to face in coming to a decision to operate in certain cases suspected of harbouring an abscess of the brain. The advice given to Richard Plantagenet is much to the point:

"But yet be wary in thy studious care."³

Delay, as the result of consultation, may be disastrous, "for

¹ Carlyle's translation; see "History of Frederick the Great," Book XVIII., chap. x.

² "The Pilgrim's Progress," Part II.

³ "Henry VI.," Part I., Act II., Scene vi., line 97.

occasion turneth a bald noddle after she hath presented her locks in front and no hold taken";¹ and "the ripeness or unripeness of the occasion must ever be well weighed."² On the one hand, boldness alone is "ill in counsel, good in execution";³ on the other hand, "it is a dangerous thing to trace the thread of knowledge a little way, and fancy we have found the end."⁴ What is required in consultation is knowledge, experience, a grave sense of responsibility, and the strength to accept the consequences arising therefrom—indeed, to fulfil the Pauline exhortation, "Be strong; quit yourselves like men."⁵ When the decision to operate is made, it should be acted upon at once; hesitation or delay may be fatal. A patient suffering from cerebellar abscess has died in the night, the operation having been arranged for the following day. "True despatch is a rich thing."⁶ "Yet and but," said the Templar, "are words for fools; wise men neither hesitate nor retract; they resolve and they execute."⁷

But still, in spite of all our care and pains, success may be wooed in vain. There may be no abscess, or, if present, it may not be found.

"The best-laid schemes o' mice an' men
Gang aft agley,
An' lea'e us nought but grief an' pain
For promis'd joy."⁸

"The smallest actual good," says Macaulay, "is better than the most magnificent promises of impossibilities"; and the stay of the surgeon in the midst of depression, discouragement, and defeat is the consciousness that he has "faithfully rendered an unrewarded obedience to the command"⁹ of the Preacher.¹⁰

"The man who, though his fights be all defeats,
Still fights,
Enters at last
The heavenly Jerusalem's rejoicing streets."¹¹

"In earthly races,
To victors only do the heralds call;
But, oh! in yonder high and heavenly places
Success is nothing, *and the work is all.*"¹²

Yet, kindled by the past, the surgeon may surely say, "I shall arrive." "The succession cannot break. The further evolution

¹ Bacon's Essays: "Of Delays."

² *Ibid.*

³ *Ibid.*: "Of Boldness."

⁴ A. W. Holmes-Forbes, "The Science of Beauty," p. 195.

⁵ 1 Cor. xvi. 13; 1 Sam. iv. 9.

⁶ Bacon's Essays: "Of Despatch."

⁷ "The Talisman," chap. xix.

⁸ Burns, "To a Mouse," verse 7.

⁹ Ruskin, "Sesame and Lilies," Lecture III.

¹⁰ Eccles. ix. 10.

¹¹ C. Patmore, "The Unknown Eros": "Victory in Defeat."

¹² Quoted from a biographical sketch of Sir William Gull.

must go on . . . first the blade, where we are to-day; then the ear, where we shall be to-morrow; then the full corn in the ear, which awaits our children's children, and which we live to hasten."¹

SOME OBSERVATIONS AND REMARKS ON THE AIR-CURRENTS IN NASAL RESPIRATION.

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SINCE the respiratory functions of the nose have been fully investigated and understood, and the peculiar vascular structure of the inferior turbinates has been demonstrated, it has been assumed that the air during nasal inspiration comes into contact with these bodies, the structural peculiarities of which seem especially suited to yield both warmth and moisture. It is said² that the function of the inferior turbinated bodies appears to be that of increasing the area of mucous membrane *over which the air passes* when either more heat or more moisture is demanded; that after exposure to cold these bodies are found to assume their greatest proportions, whilst in an atmosphere supersaturated with moisture they are frequently found to be collapsed. Again, it is said that in hot dry rooms these bodies swell so as to saturate the air with moisture as it passes over their surface. Such statements as these are quite common, and while not wishing to deny that the inferior turbinates vary in size in response to the varying conditions of the atmosphere, I do not think that the air comes to any great extent into direct contact with these bodies.

There has always seemed to me considerable difficulty in accepting the idea that the inspired air travels through the lower part of the nasal cavities, and on the following grounds:

1. Patients with an absolutely free inferior meatus and post-nasal space will often complain of stuffiness and inability to breathe through the nose.
2. Hyperplastic or cedematous enlargement of the middle turbinates, especially of their anterior ends, or muco-purulent catarrh affecting the middle meatus, may cause difficulty of nasal respiration, although the lower passages may be unusually patent.
3. Polypi will cause marked nasal obstruction even in slight cases, where the inferior meatus is quite free.

¹ "The Ascent of Man," chap. x., by H. Drummond.

² MacDonald, "The Respiratory Functions of the Nose," London, 1889, p. 51.