

**A probationary essay on injuries of the head : submitted, by authority of the President and his Council, to the examination of the Royal College of Surgeons of Edinburgh, when candidate for admission into their body, in conformity to their regulations respecting the admission of ordinary Fellows / by George Gill.**

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Gill, George, 1804?-1866.  
Royal College of Surgeons of England

**Publication/Creation**

Edinburgh : Printed by James Walker, 1830.

**Persistent URL**

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A

PROBATIONARY ESSAY,

ON

INJURIES OF THE HEAD,

SUBMITTED,

BY AUTHORITY OF THE PRESIDENT AND HIS COUNCIL,

TO THE EXAMINATION OF THE

**Royal College of Surgeons of Edinburgh,**

*WHEN CANDIDATE*

FOR ADMISSION INTO THEIR BODY,

IN CONFORMITY TO THEIR REGULATIONS RESPECTING THE

ADMISSION OF ORDINARY FELLOWS.

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BY

GEORGE GILL,

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OF EDINBURGH, &c. &c.

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NOVEMBER 1830.

EDINBURGH:

PRINTED BY JAMES WALKER.

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TO

ROBERT LISTON, Esq.

MEMBER OF THE ROYAL COLLEGES OF SURGEONS OF  
LONDON AND EDINBURGH, SURGEON TO THE  
ROYAL INFIRMARY OF EDINBURGH,

&c. &c. &c.

THIS PROBATIONARY ESSAY,

IN TESTIMONY

OF ADMIRATION OF HIS PROFESSIONAL SKILL AND ABILITY,

IS,

WITH MUCH RESPECT,

DEDICATED

BY

THE AUTHOR.





ON

## INJURIES OF THE HEAD.

As the narrow limits of a Probationary Essay prevent me from entering into a detail of the whole Injuries of the Head, I propose, instead of following out the common arrangement into Wounds of the Scalp, Fractures of the Skull, and Affections of the Brain and its Membranes, to proceed at once to Injuries of the Brain ; touching on Wounds of the Scalp, and Fractures of the Skull, in so far only as they derive importance from their connexion with lesions within the Cranium.

The effects of injuries on the contents of the skull are reducible to three heads : Concussion, Compression and Inflammatory Action. However imperfect this arrangement may appear, it is the best which our present knowledge enables us to form ; and although we are often disappointed in the application of it to practice, there is reason to hope that the use of it may lead to a more perfect acquaintance with the subject. The states of Concussion, Compression and Inflammation are so often mixed up in the ef-



fect of an injury, that some are apt to condemn all attempts at an arrangement as impossible ; yet surely, if there are certain simple states of lesion, which we can always conceive, and which we sometimes witness ; and if, out of these, all the mixed affections are compounded, we do not unfit ourselves either for the study or treatment of those mixed affections, by considering apart the elements out of which these result. The little progress hitherto made in this subject is readily accounted for by the complex constitution of the living body, and the complex offices, which the brain itself performs in the animal economy. But if nothing operates in the body by chance, but according to fixed laws, we have no reason to despair of the affections in question being finally reduced to a more definite and intelligible form.

I have been led to make these few remarks, in the fear that some part of this Essay may appear more theoretical than practical ; but as my opportunities of observation have not been extensive, I have found it impossible to make use of the works of surgical writers, without sometimes attempting, by theory, to reconcile their discrepancies.

The states of Concussion, Compression and Inflammatory Action may not only be mixed up, as has been already remarked, but each of them may vary much in degree. We may see Concussion vary from the slightest stun, which has scarcely occurred, before it is recovered from, up to the rapid sinking of the vital powers, which terminates life in a few moments after the injury. We may see Compression in every degree between a slight stupor, and total insensibili-



ty, with relaxation of the sphincters, paralysis and convulsions of the voluntary muscles. And we may see various shades of Inflammation, from that insidious and latent form, in which it discovers itself only by the mischiefs in which it terminates, up to the uncontrollable phrensy of brain fever.

When we consider, then, the frequent union of these three states of injury of the brain, in the same patient, and the different degrees in which they may arise, it does not appear surprising that there should be little agreement among surgical writers as to the signs by which they are characterised.

Mr Abernethy's\* division of Concussion into three stages, was a material step towards a better understanding of the distinctions between the symptoms of these several affections ; for nothing appears to have introduced greater confusion into this subject, than descriptions of Concussion drawn from different periods in its progress. Thus, one author lays down a natural state of the pulse and respiration as characteristic of Concussion ; another represents the pulse as slow and pausing, and the respiration stertorous. One makes complete insensibility the true indication of Concussion ; another considers the possibility of rousing the patient from his stupor, the distinctive mark of this affection. What can be more discouraging than such contradictions ? but if, with Abernethy, we regard the disease as progressive, we find place for almost every one of these apparently conflicting symptoms.

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\* Abernethy's Surgical Observations on Injuries of the Head, page 83.



In the first stage of every considerable Concussion, the pulse is weak and intermitting, the respiration defective, in general without stertor. If this state of sinking does not proceed to the speedy extinction of life, the second stage soon commences. In it, the pulse and respiration become more natural, the heat of the body returns, and the patient becomes capable of being roused, though often with difficulty : he is querulous and impatient of being disturbed, and soon sinks back into a state of stupor, or at least of inattention to what is passing around. Inflammation, when it supervenes on this state, constitutes the third stage of Concussion.

When we turn to the pathological differences between Concussion and Compression, we find authors pretty well agreed in one point of distinction ; which is, that Concussion is a general affection of the brain, and that Compression is a local affection, limited to the place where the compression is made. This important distinction seems to determine the difference, between the signs of the two affections. In Concussion, at its commencement at least, the vital energy of the brain is greatly impaired, and the functions, which depend on it, or particularly sympathize with it, suffer accordingly ; the respiration is defective, the circulation is languid, and the animal heat, so essentially dependent on both, fails on the surface and in the extremities. In a word, the vital functions are at a low ebb. In Compression, on the contrary, the pulse is full and slow ; the respiration is performed with less frequency, but with undiminished energy ; the heat of the body is not deficient ; the vital force



of the brain is unimpaired ; the animal actions alone are suspended.

This difference in the symptoms is just that, which we should anticipate, from the consideration of the difference, in the actual condition of the brain, in these affections.

A general disturbance of the brain impairs the heart's action ; because the heart, though not dependent on the nervous system for its ordinary action, is in strict sympathy with it \* ; and affects the respiration, because it affects the medulla oblongata, that part of the encephalon on which respiration depends.

A local affection, like Compression, should not interfere with the heart's action ; and with the respiration, only when it has its seat in the medulla oblongata ; and, if the whole of the brain itself is the common organ of sense and voluntary motion, we can readily conceive, that even local pressure should suspend these functions, as effectually as general disturbance.

What then is that general disturbance of the brain, which constitutes Concussion ? The term Concussion was evidently introduced into surgical language, from the occurrence of death after falls or blows on the head, where dissection discovered no signs of lesion within the cranium. It is impossible to deny that such cases do occur † ; but they are rarely met with. Concussion appears usually to destroy life by accom-

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\* Philip's Experimental Inquiry into the Laws of the Vital Functions.

† Pott's Works, vol. i. p. 266.



panying or subsequent extravasation of blood, or by the succeeding inflammation. When the insensibility arising from a blow or fall quickly disappears, and the person is restored to perfect health, there is no reason to believe that it depended, on any other cause, than a disturbance of the circulation, in the minute vessels of the brain \*. This may be regarded as the simplest form of Concussion. But when the first insensibility disappears in part only, and the patient continues, for a long time, in a state of stupor or delirium, before restoration to health, we must believe, that the minute vessels of the brain have suffered some greater change than simple interruption of their usual action. There is great reason to think, with Mr J. Bell †, that, in such cases, the minute vessels have suffered a general lesion,—that there has arisen, throughout the brain, the same state of suffusion, which is seen, in the other soft parts of the body, under the effects of external violence. This may be termed Aggravated Concussion.

The tediousness of recovery from Concussion is not always, however, attributable altogether to this general lesion of the minute vessels of the brain ; since it is evident, that local extravasation of blood, or laceration of the brain, may accompany Concussion ‡, which, even when they are not extensive enough to produce the symptoms of Compression, must tend to

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\* Abernethy's Surgical Observations, p. 72.

† J. Bell's Principles of Surgery, ed. by C. Bell, vol. ii. p. 330.

‡ Sir Astley Cooper's Lectures on Surgery by Tyrrell, vol. i. p. 263.



retard the progress of recovery. This state, were it distinguishable before dissection, might be termed *Complicated Concussion*.

With regard to the pathological state of the brain, in Abernethy's second stage of Concussion, little appears to be known for certain. In the simplest form of Concussion, where there is no lesion of the vessels, and where the reaction restores the patient immediately to health, no change can take place in the brain, beyond that slight excitement necessary to restore the interrupted circulation to its natural state. In the aggravated form of Concussion, there is actual lesion of the vessels; the healing process cannot take place without some degree of inflammation, as in every other case of contusion. It seems probable, therefore, that the second stage is of an inflammatory character from the commencement, however imperfect the reaction may appear, and that the difference between the second stage and third is, that, in the one, the inflammation is nothing more, than is essential to restore the contused parts to their healthy state, while, in the other, the inflammation is of such a character, as to threaten the destruction of the organs. But we shall deceive ourselves, if we expect always to see a distinct line of demarcation, between these two kinds of inflammation, so different in their result. In many cases, it is true, the commencement of the destructive inflammatory stage cannot be mistaken, the symptoms being those of acute phrenitis; but the diffused secondary inflammation of Concussion more frequently assumes a slower, insidious character, marked by no perceptible



acceleration of the pulse, or other febrile symptom ; and hence, dangerous inflammation may be going on, while we can discover nothing in the case, but the imperfect reaction of the second stage. This seems to be the cause of death, when the second stage, after many days, proves fatal. Pott's \* 39th case is an instance of Concussion, in which the patient became sensible, on the fourth day after the injury. He appeared to do well till the twelfth day ; after which, without symptoms indicative of inflammation, he became gradually comatose, and died on the 20th day after the injury. Nothing was discovered on dissection but serous effusion.

From the apoplectic attack we draw our idea of the signs of Compression of the brain after injuries ; and, like apoplexy, this affection varies in degree. Instead of attempting to detail the symptoms, in the different degrees of Compression, I quote the following case, which occurred, when I acted as House-Surgeon in the Royal Infirmary of this city :

William Crabb, æt. 30, was admitted in October 1829, in a state of insensibility, with complete relaxation of all the muscles. On the back part of the head there was a small wound, but no fracture was discoverable. Blood flowed from the left ear ; pupils were contracted, and sensible to light. Pulse 66, full and strong, skin warm, respiration slow, urine passed involuntarily. Reported to have received the injury, when in a state of intoxication, by falling on his head down a few steps of a stair. On

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\* Pott's Works, vol. i. p. 281.



the second day the pulse became quicker, with extreme restlessness ; which state continued on the third day, the insensibility being nothing diminished. On the fourth he had several severe convulsive attacks, and the pulse became small, with cold extremities and hurried respiration. The convulsions continued till his death, which took place on the sixth day.

On dissection, a considerable quantity of blood was found effused on the surface of the brain. There was no injury of the bone near the external wound ; but there was a fracture, extending from the left temporal bone, across the base of the skull, to the temporal bone of the opposite side.

The insensibility in this case was greater than in many cases of Compression, with the symptoms, in other respects, equally severe. It is often possible to rouse the patient for a moment or two, and even to obtain sensible answers from him ; but he soon sinks again into his former state of stupor. Restlessness is a very striking symptom in Compression ; it is seldom absent, except in that severest form of the affection, where there are convulsions from the first, with immediate sinking of the vital actions. The condition of the pupil does not appear to be of much service, in determining the extent of the injury. In slight cases of Compression, it is seldom dilated ; in this, though a severe case, it was contracted, and sensible to light. In the severest forms, however, it seems always to be dilated. The worst sign of all is convulsion \*. Convulsions usually come on, as in

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\* J. Bell's Principles of Surgery, by C. Bell, vol. ii. p. 339.



the case cited, on the third or fourth day, and appear in fits with short intermissions. When the case is to prove fatal, a general sinking of the powers of life takes place, the symptoms being much the same as attend the fatal event of other diseases of the brain. Inflammatory action also may come on, and give rise to a new train of symptoms.

The Compression, which supervenes immediately on an injury, can depend only on some considerable depression of bone, or extravasation of blood within the skull. From many cases on record, it appears, that both depression of bone and extravasation of blood may occur, to some extent, without producing insensibility \*. It is not easy to determine the circumstances, under which extravasation does not become a cause of insensibility. Something may possibly depend on the rapidity or slowness of the effusion; since it is a well established fact, that slow changes in an organ interfere much less with its function, than rapid changes even of a much smaller extent. Be this as it may, the most complete states of insensibility are commonly produced, by the rupture of some considerable blood-vessel traversing the course of a fracture †.

When the patient recovers from his first insensibility, and soon becomes again comatose, we have an instance of Concussion passing into Compression. When this occurs, some blood-vessel must have been ruptured, or a laceration of the brain must have taken

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\* Abernethy's Surgical Observations, p. 14.

† Abernethy's Surgical Works, p. 44.



place along with the Concussion; the bleeding having been prevented from arising at the commencement, in consequence of the depression of the circulation attendant on the first stage of Concussion. Compression may also follow Concussion, as a result of the effusion attendant on its inflammatory stage.

But by far the most important form of secondary Compression is that, which arises, as a consequence of suppuration within the cranium, after an injury of the Scalp, not accompanied with any immediate affection of the sensorium. The inflammation productive of this secondary compression may arise, either by extension of external inflammation, or may spring from some extravasation or lesion within, accompanying the external wound, but insufficient, at first, to affect the function of the brain. There are no signs, from which such a result can be predicted; but it is to be apprehended, and, as far as possible, guarded against, in every considerable injury of the scalp; more especially when it appears, that the degree of violence applied to the head has been great. When we consider the number of such cases recorded in surgical works, especially in the works of Pott and Dease \*, there seems reason to think that this consequence of wounds of the scalp was more frequent, in the last century, than it is in our times. To establish this point, a more extensive induction would be necessary, than I have been able to make; and it is worthy of inquiry at the same time, whether the treatment of external injuries, at present, is not

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\* Dease's Observations on Wounds of the Head.



better fitted to prevent serious inflammation, within the head, than that pursued by Pott, Dease and other surgeons of the last age. Their treatment did not fail in activity. They took blood with little reserve ; but general blood-letting, to whatsoever extent carried, appears to be much less adapted to control the low inflammation consequent on injuries of the scalp, than the free use of leeches and cold applications, as practised by most surgeons at present.

The seat of this suppuration is various: in the substance of the brain ; on its surface ; between the membranes ; and between the bone and dura mater ; and in this last situation alone can relief be afforded. Febrile symptoms frequently attend the inflammation, which terminates by such suppuration ; but they are by no means so constant as to furnish a sure indication ; and before the function of the brain itself becomes affected, it is in general too late to avert the mischief. Dease \*, and some other surgeons, trusted much to the occurrence of shiverings, as a sign that pus had actually been formed ; and, though it does not appear to be by any means a certain criterion, it is worthy of attention.

Mr Pott's † much celebrated indication of the formation of matter between the bone and dura mater,—the detachment of the pericranium opposite to the seat of the disease,—is now generally regarded as fallacious ; yet the number of cases, in which he found these two states combined, entitles it to be taken in-

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\* Dease's Observations on Wounds of the Head.

† Pott's Works, vol. i. p. 45 & 46.



to account, in forming our opinion in cases of difficulty.

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### TREATMENT.

The treatment of affections of the brain, after injuries, is beset with many difficulties. Certain general rules of practice are sufficiently established ; yet the complex character of the cases most frequently met with demands the greatest nicety of judgment, in the application of these rules ; and nothing, but the most watchful attention to the ever-varying state of the symptoms, can enable the surgeon to escape the most serious errors.

In the first stage of Concussion, there is little room for practice. The first oppression of the vital actions, which threatens the extinction of life, usually disappears spontaneously, and most commonly before the surgeon has an opportunity of seeing the patient. He should be put to bed and left to repose, free air being admitted into the chamber ; at the same time some external means may be used to restore the natural heat of the body. Stimulants, which have been recommended in this stage, are usually hurtful. If, however, the sinking of the vital actions, immediately on the receipt of an injury, appears likely to end in speedy dissolution, stimulant and cordial remedies ought to be had recourse to ; care being taken to intermit the use of them, as soon as the first signs of reaction show themselves. Blood-letting, at this period of the disease, is altogether inadmissible.



When the second stage sets in with strong reaction, indicated by increased heat, full and frequent pulse, and other febrile symptoms, blood should be drawn freely from the arm or temporal artery, at the same time that leeches and cold are applied to the head. To this treatment is to be added the use of saline purgatives, and of antimonial diaphoretics. The same treatment may be continued with safety, so long as the pulse continues hard and frequent, with increased heat of surface.

But it oftener happens that the reaction is imperfect ; the pulse being weak, and the heat of surface scarcely natural, with a general deficiency of vigour in the actions of the body. In such cases, blood-letting seems often hurtful ; and the repetition of it appears to retard, or altogether to prevent the patient's recovery. Sir Astley Cooper \* recites a case, where the frequent use of the lancet appears to have prevented the powers of nature from effecting a cure. Under this treatment, he says, " the patient " became perfectly pale, was in a state of consider- " able dejection, not of the mind, but of the powers " of the body, and died without any symptoms of " inflammation of the brain, ten days after the in- " jury. On examination of the head, it was found " that there was a slight laceration of the brain, with " some degree of extravasation of blood ; but that " not the slightest attempt had been made by nature " to heal the wound." And Mr Liston, whose successful treatment of injuries of the head I had many

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\* Sir A. Cooper's Lectures by Tyrrell, vol. i. p. 270.



opportunities of witnessing in the Royal Infirmary, has remarked the tediousness of the recovery, in those cases of Concussion, where blood-letting had been freely practised, under the imperfect reaction of the second stage. In doubtful cases, it will be the safer plan to take blood moderately at first ; and to be guided in the after-employment of it, by the state of the pulse. But since inflammation of a low character may go on to a fatal extent without any excitement of the pulse, we ought rarely to neglect the use of leeches and cold applications, followed up by blistering ; or the frequent inunction of tartar-emetic ointment, to produce a crop of pustules on the head or neck. Nor is this practice incompatible with another plan of treatment, which I have seen Mr Liston adopt with much advantage : I mean the use of stimulants. It must be admitted that the indiscriminate use of stimulants would be productive of much mischief ; but I am convinced I have seen much benefit from the practice in some cases. Nor does it seem difficult to account, on principle, for their occasional utility. We know of no mode, by which nature heals lesions of the body, except by inflammatory action. A certain degree of inflammation is essential to the cure of every considerable Concussion. The excess of this action alone is dangerous. Now, if a deficiency of this sanative action should exist in the brain, as often happens elsewhere in the body, why may not stimulants be useful sometimes in Concussion, just as they are sometimes useful in assisting the cure of contusions, in other soft parts more open to inspec-



tion? Such reasoning, I am well aware, would not justify the use of them independently of experience; but when experience appears to show that they are sometimes useful, the reasoning is not misplaced, if it assists to prove that there is no fallacy in that experience.

When acute inflammation supervenes on Concussion, our treatment cannot be too active: we must watch with jealousy every case, whatsoever may be the character of the early symptoms, to detect the first signs of dangerous inflammation, and adapt our remedies to the urgency of the disease. Full blood-letting is indispensable, wherever the heart's action is much excited. This is to be followed up by leeches, cold applications, saline purgatives, and especially by the judicious use of tartar-emetic.

When Compression of the brain occurs, as the immediate effect of an injury, blood is to be taken from the arm, a saline purgative administered, and cold applications put on the head. In many cases, the symptoms soon undergo great amelioration; and it becomes evident that a continuance of the same treatment, proportioned to the nature of the case, will restore the patient to health without any operation. If Compression supervenes on Concussion, in consequence of extravasation taking place, when the reaction commences, the same kind of treatment is requisite, provided the state of the pulse does not contra-indicate it. When, however, Compression occurs, as the result of suppuration within the skull, there is no hope except from the use of the Trephine,



