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Publication/Creation

Dublin : Fannin and co., medical literary institution, 1831.

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A

PRACTICAL TREATISE

ON

INJURIES OF THE HEAD.

DUBLIN:

FANNIN AND CO.

MEDICAL LITERARY INSTITUTION.

MDCCCXXXI.

1
PRACTICAL TREATISE

OF

OF

OF

INJURIES OF THE HEAD.

BY

OF

DUBLIN:

PRINTED BY

PRINTED BY THOMAS I. WHITE,

149, ABBEY STREET.

MDCCCXXII.

TO
RAWDON M'NAMARA, ESQ.
PRESIDENT
OF THE ROYAL COLLEGE OF SURGEONS
IN IRELAND,
THIS LITTLE VOLUME
IS
MOST RESPECTFULLY
INSCRIBED.

PREFACE.

THE Injuries which form the subject of this Volume are of a nature deeply serious and important, whether considered as to their immediate effects, or their remote consequences ; and hence they have occupied the time, and engaged the particular observation, of several of the most distinguished ornaments of our profession.

The illustrious names of Pott and Dease stand preeminent in the list of authors who have written upon this branch of Surgery. In the works of these great men is found nearly all the information we possess, at the present day, on Injuries of the Head ; and although some of their opinions may now be esteemed erroneous, and some of their practice may have become obsolete, yet to them is mainly attributable the approach to perfection at which modern surgeons have

arrived in the treatment of those accidents.

In our own time, Mr. Colles of this city, and Mr. Abernethy of London, with a host of other surgeons, remarkable alike for talent and for industry, have contributed, by their writings and lectures, to the further extension of our knowledge, and the improvement of our practice in this class of injuries.

The following little Volume has been principally compiled from the works of the most eminent writers on Injuries of the Head. Thanks to the proverbial pugnacity of our warm-hearted and hot-headed countrymen, the hospitals of Dublin present ample opportunities of studying the subject in all its varieties. These opportunities, it will be found, have not been totally neglected.

A treatise of the kind, adapted to the capacity of students, and combining the latest improvements, *with the present practice of hospital surgeons*, must obviously be esteemed a desideratum. The quantity of useful information on this subject, with which the surgeon should be ac-

quainted, is distributed through a considerable number of volumes, some of which are inaccessible to the majority of students, either on account of their high price or their scarcity. Among the latter class may be mentioned Mr. Dease's "Observations on Wounds of the Head," and his "Practical Remarks."

The Publishers of this Volume at first purposed to present the Public with a reprint of the above valuable works ; but, on consideration, it appeared advisable that those portions more especially deserving of notice, as being applicable to the present state of practice, should be selected ; and, being incorporated with similar extracts from other approved works, the whole should be condensed into a small compass, so as to afford to students a cheap, concise, yet comprehensive manual on this important subject.

How this task has been executed is for the Public to decide. It has been a work of more labour than might be anticipated from the bulk of the volume ; and, if it cannot be ranked amongst the highly-embellished works of modern surgeons, it

should be recollected, that it is designed for a class of persons to whom simplicity of expression, and clearness of explanation, are of more importance than elegance of diction, or the decorations of art.

In the compilation of the work, it was found impossible to quote the respective authorities after each extract, without crowding the pages with references, and creating unavoidable confusion. In very many places, no more than the mere *ideas* of the writers will be recognised,—the Compiler being obliged to substitute his own language to preserve order in the arrangement, and to condense a quantity of useful matter into a few sentences. It is therefore hoped that a general acknowledgment of the authors who have been consulted will be sufficient.

At the end of each chapter, its substance will be found thrown into the form of aphorisms. The idea of this plan was taken from Dease's Aphorisms, and from Mr. Colles's valuable little work on Injuries of the Head; and it is expected that they will prove a useful addition.

THE FOLLOWING IS A LIST OF THE WORKS WHICH
HAVE BEEN CONSULTED :

LE DRAN'S "Operations in Surgery."

POTT'S "Chirurgical Works," Vol. 1.

DEASE'S "Observations on Wounds of the Head."

———"Practical Remarks," &c.

HEY'S "Practical Observations in Surgery."

DESAULT'S "Œuvres Chirurgicales."

———"Parisian Chirurgical Journal."

ABERNETHY'S "Surgical Works," Vol. 2.

SIR ASTLEY COOPER'S "Lectures on Surgery."

LARREY'S "Memoires de Chirurgie Militaire."

HENNEN'S "Military Surgery."

COLLES'S "Practical Precepts on Injuries of the
Head."

COOPER'S "Surgical Dictionary."

———"First Lines," &c.

BRODIE, in the 14th Volume of the Medico-Chirurgical
Transactions.

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THE CONSEQUENCES OF EXTERNAL
VIOLENCE ON
THE SUPERFICIAL PARTS
A PRACTICAL TREATISE
BY DEBAULT AND OTHER AUTHORS, VIZ.
INJURIES OF THE HEAD.

INCISED WOUNDS OF THE SCALP.

5. A simple incised wound of the scalp resembles, in all respects, a simple incised wound of similar structures in any other part, and is to be treated on precisely the same principles, even if the skull should be laid bare.

6. Union by the first intention should in all cases be attempted. The edges should be immediately brought together by adhesive straps, and bandage if necessary, and retained in close apposition till union has taken place.

7. An incised wound may sometimes be in the form of a flap, as when produced by an oblique cut of a sabre; and occasionally a portion of the external table of the skull may at the same time be detached, and adhere to the flap. A question here arises, whether we shall remove the detached piece of bone, or attempt its preservation. Our practice must be regulated by circumstances. If the portion of bone be of such a size as to induce us to suppose it will retain its vitality, we should replace it, and treat the whole wound as if this complication did not exist; and we will generally succeed in procuring its union. But if, on the other hand, the piece be small, a mere scale, we had better remove it (as its continuance would act as a foreign body), and lay the flap down, which very probably will adhere by the first intention.

8. Le Dran found, in a church-yard, the skull of a person who had had a part cut off in this manner, but in this case a portion of *both* tables had been separated. The piece had firmly united, and he could distinguish, both on the external and internal surfaces, the callus which had cemented it.*

* Le Dran's Surgery, translated by Gataker, p. 375. A similar case is mentioned in Sir Astley Cooper's Lectures, 2d edit. p. 128.

9. There is a case, however, in which it would not be good practice to lay down the flap, and attempt its union by the first intention. It is when the sabre has cut through both tables of the skull, and a part of the bone is driven in on the brain; but this will more properly come under our consideration in speaking of fractures.

LACERATED WOUNDS OF THE SCALP.

10. Lacerated Wounds admit of division into,

1. Those which may be produced by any *rough or uneven instrument*, as a *saw*, forcibly drawn across the scalp; 2. Those in the form of a *flap*; and, 3. Those complicated with *contusion*.

11. The first exactly resemble similar injuries of other parts, require the same treatment, and will heal more readily than if situated elsewhere, owing to the superior vascularity of the scalp, and the power we have of retaining the parts in close apposition, in consequence of the counter-resistance afforded by the cranium.

12. The second division, or those in which a *flap* is detached, *without contusion*, we are not often likely to meet with; yet such an accident is possible. A man, ascending a ladder, missed his footing, and slipped. His forehead came in contact with a sharp hook in the wall against which the ladder was placed: the hook entered his scalp, and detached a considerable portion of it in the form of a triangular flap. Such a case should be treated precisely as an *incised flap* wound, and, in general, it will heal as rapidly. In the case above alluded to, the flap was replaced, one point of suture placed in the angle, and a few strips of adhesive plaster applied. Every particle of the wound united by the first intention.*

* Modern surgeons are in the habit of discarding sutures

13. The third class shall be considered in treating of contused wounds, to the consideration of which I shall now proceed.

CONTUSED WOUNDS OF THE SCALP.

14. Contused wounds, like all wounds of the scalp, do not essentially differ from similar injuries situated in other parts of the body. A contused wound of the scalp has the same appearance, and requires the same local treatment, as a like wound of the integuments of the shin, or of any other part where the bone is covered only by skin and fascia. In the former case, however, as in other wounds of the head, a more rigid adherence to the antiphlogistic regimen will be required, than in the latter. The *principle* of treatment is precisely the same.

15. Contused wounds may be either perpendicular to the skull, or in the form of a flap, attended with laceration.

16. In the first case, as the edges are often much injured, and likely to slough, we must not bring them closely together, with a view to union by the first intention; as, confining the discharge, and making pressure on parts which must inevitably become considerably swollen, will very soon produce severe inflammation and symptomatic fever. Our local treatment, then, according to some practitioners, should be, after hav-

except where they are *absolutely required*. The presence of a suture often excites considerable irritation. Suppuration, and frequently ulceration, if long retained, almost as inevitably follow in its track, as in that of a seton. Mr. Colles, in his lectures at the College of Surgeons, relates, with a great deal of humour, an anecdote of one of our chancellors and his apothecary,—the former being furnished with a bill, in which the latter charged so much for thirteen stitches inflicted on the scalp of his lordship's coachman. The only case in which sutures are allowable is alluded to in par. 20.

ing cleared away as much dirt and extraneous matter as we can from the wound, without too much pain or inconvenience to the patient, and having ascertained that no farther injury has been done, to apply an emollient poultice, which should be repeated, or alternated with warm fomentations, till the violence of the inflammation has been subdued, and the sloughs have all separated. Others recommend a pledget of lint, wet with a little cold spirit and water, or any other evaporating lotion, to be laid loosely on the wound, and to be moistened with the lotion as often as it becomes dry, or gives uneasiness to the patient. We will find both of these methods of treatment useful, according to circumstances: we should be principally guided by the feelings of the patient. Whichever treatment we pursue, as soon as the sloughs have come away, and granulations begin to appear, we may gently approximate the edges of the wound with adhesive plaster, and heal it as a simple ulcer.

17. But if the wound be of the flap kind, where a considerable portion of the scalp is often detached, as by the passing of a coach-wheel over a man's head, or by nearly similar violence, the method of treatment is of the greatest importance; for on it depends not only the ease or difficulty with which a cure may be accomplished, but the future health and well-being of the patient are involved, together with the character of the surgeon. These considerations should make us weigh well the line of practice we intend to adopt, and the more especially, as two very different modes of treatment are at the present day, and in this city, followed by surgeons, and each has its advocates among the most talented and best informed practitioners.

18. The whole difference between the two

methods of treatment consists in the question, whether we shall attempt the union of such wounds by the first intention, or interpose a dressing between the separated scalp and the skull, and heal by granulation. The old practice of removing the flap, either wholly or in part, I look upon as entirely discarded from modern surgery.

19. The practice of Mr. Dease, and of many modern surgeons, is as follows: "If, on examining, we have no reason to suspect any farther mischief, after freeing the wound from all extraneous matter, as dirt, gravel, &c., we should interpose a thin pledget of lint or soft piece of old holland, spread with some mild digestive, between the flap and cranium, and sustain the former in situ, but by no means in close contact. After some days dressing in this manner, when all contused and ragged parts are flung off in sloughs by suppuration, and the wound becomes quite clean, the flap should be kept in its natural situation by means of compress and bandage, or one or two points of the interrupted suture may be made, if it be deemed a securer means of holding the divided parts in situ." The immediate return of the flap, *without* the interposed dressing, and retaining it in its situation by sutures, &c., as recommended by Pott, Mr. Dease says, "will, in all probability, cause inflammation, erysipelatous swellings of the whole scalp and face, and smart fevers, that generally end in collections of matter."*

20. On the other hand, the opponents of this practice maintain, that the union of the flap by the first intention is a measure which should always be attempted, even though a part of the

* Dease's "Observations on Wounds of the Head," p. 32.

cranium should be completely denuded. Pott is an advocate for this mode of proceeding, in which he is followed by most British surgeons of the present day. According to them, after removing the gravel and other foreign bodies from the flap, we should replace it immediately, and maintain it in its former situation by means of adhesive plaster, bandage, and suture if necessary. Some surgeons object strongly to the use of sutures in tendinous structures, lest they should produce erysipelas, but I believe the danger is much exaggerated. They are not, however, often necessary, as *good* adhesive plaster, judiciously applied, with a double-headed roller, will generally suffice, unless the flap be very large and pendulous, or the patient delirious.* If the flap be angular, one point of suture will be sufficient. Should any particles of gravel, &c., be so impacted in the flap, as to render it difficult to remove them, without putting the patient to considerable pain and inconvenience, or should the flap itself be much contused, it is recommended only to wash away as much extraneous matter as will readily admit of removal, and then lay down the flap loosely, so as to leave room for the discharge of the foreign substances by suppuration or sloughing, which will often occur in such cases. As soon as the process of sloughing has been finished, the parts should be brought into the closest apposition, and retained by adhesive plaster and bandage. "In some instances," says Pott, "the whole separated piece will unite perfectly, and give little or no trouble, especially in young and healthy persons; in some, the union will take place in some parts, and not in others; and consequently matter will be formed, and require to

* See note on par. 12.

be discharged, perhaps at several different points; and in some particular cases, circumstances, and habits, there will be no union at all: the torn cellular membrane, or the naked aponeurosis, will inflame and become sloughy, a considerable quantity of matter will be collected, and perhaps the cranium will be denuded; but even in this state of things, which does not very often happen where proper care has been taken, and is almost the worst that can happen in the case of mere simple laceration and detachment,—I say, even then, if the surgeon will not be too soon, nor too much alarmed, nor in a hurry to cut, he will often find the cure much more feasible than he may at first imagine. Let him take care to keep the inflammation under by proper means,—let him have patience till the matter is fairly and fully formed, and the sloughs perfectly separated,—and, when this is accomplished, let him make a proper number of dependent openings for the discharge of them, and let him, by bandage and other proper management, keep the parts in constant contact with each other,—and he will often find, that, although he was foiled in his first intention of procuring immediate union, yet he will frequently succeed in this his second: he will still save the scalp, shorten the cure, and prevent the great deformity arising (particularly to women), not only from the scar, but from the total loss of hair.”* This union may take place, even though the skull should have been stripped of its pericranium, or this membrane have been removed by sloughing. It does not on this account follow that the bone should exfoliate. If the skull itself has not been injured, but appears in a healthy state, granulations will spring from it, and unite the scalp to the bone underneath.

* Pott's Chirurgical Works, vol. i. p. 12.

21. I have now set before my readers a full statement of both modes of practice; and I must confess, that, from actual observation, and a comparison of the merits of each with the other, the latter appears to me the preferable plan, and that which should be adopted, no matter of what extent the wound may be. We shall constantly find, that, in those cases of flap wound which have been treated according to Mr. Dease's plan, the flap becomes shortened, thickened, and puckered; so that, when we wish (after the process of sloughing,) to draw the flap over the surface from which it had been raised, it will leave more than one third of that surface uncovered.

22. It is truly astonishing what frightful injuries have been converted into seemingly trivial ones, by Pott's mode of treatment. I recollect one case, in particular, which will serve to elucidate this remark. A young man, whilst imprudently running backwards down a hill before a mail-coach, suddenly fell, and, before he had time to raise himself from the ground, the coach arrived at the spot. One of the horses struck him on the forehead with his shoe, and dreadfully lacerated his scalp. Fully two-thirds of the integuments of his head were stripped off, and the laceration extended half-way down the neck. A very skilful surgeon in the neighbourhood, after cleaning the wound, immediately replaced the scalp, and retained it with a few points of suture, adhesive straps, and bandage. About twenty ounces of blood were taken from the arm, and a strict antiphlogistic regimen observed. The whole of this extensive wound healed, with the formation of scarcely a drop of matter, and the man recovered without a single bad symptom.

23. It must be distinctly recollected, that all that has been said relative to the treatment of

contused wounds of the scalp, has reference only to those *not complicated with fracture or any other injury*. Our attention *then* must be paid to the greater evil: it then becomes another kind of case, and all that need be said of it here is, that, although we should not attempt to unite the wound by the first intention, yet we should constantly bear in mind the propriety of saving as much of the scalp as possible, whether we consider it merely as skin, or as the seat of the hair.

24. Contused and lacerated wounds are more liable than simple incisions to be followed by erysipelas, which affection shall be considered in a future chapter.

PUNCTURED WOUNDS OF THE SCALP.

25. These wounds are more likely than any we have as yet considered, to inflame and produce troublesome symptoms. This is generally true of all parts of the body, but in the scalp, particularly, they are sometimes attended with such a high degree of inflammation, and such dangerous symptoms, as to give cause for well-grounded alarm to both patient and surgeon. These symptoms, it is true, bear a close resemblance to those that occur from inflammation of any other part under fascia or aponeurotic structure; but, on account of the proximity of the inflammation to the brain and its membranes, they are peculiarly modified, and merit particular attention.

26. In this description of wounds, the inflammation which inevitably follows does not produce the same degree of tumefaction as we observe in erysipelas of the scalp; neither does it pit on pressure, which we shall presently see is another symptom of erysipelas. The swelling is generally of the natural colour of the skin, except in the

immediate vicinity of the wound, where it is of a deep red colour, unmixed with the yellow hue which characterizes erysipelas. It is very tense, and extremely painful to the touch. In general, the ears and eye-lids are not comprehended in the tumour, although they may sometimes partake of the general inflammation of the skin, which occasionally attends those injuries.

27. The constitutional symptoms are usually extremely violent. Acute pain in the head, hot skin, parched tongue, excessive thirst, constipated bowels, high-coloured urine, restlessness, total want of sleep, very frequently delirium, with all the other symptoms of high inflammatory fever, are the almost constant attendants on punctured wounds penetrating the aponeurosis of the occipito-frontalis muscle. If the cause of those symptoms be not suspected, or the proper treatment not adopted, the patient's life is placed in the most imminent danger from the continuance of the fever; or, if he should fortunately escape a fatal termination of his sufferings, the injured aponeurosis and pericranium will become sloughy, abscesses will be produced, and the case rendered both tedious and troublesome.

28. How often do we see patients, under these formidable circumstances, ordered by their surgeons to have warm fomentations and emollient cataplasms applied to the wound, to the total neglect of the all-essential mode of practice! Do we not often see other surgeons, more considerate, prescribe the application of leeches to the tumor, or perhaps recommend a large quantity of blood to be taken from the arm, while the simplest and most efficient means of relieving the patient are entirely forgotten!

29. The mere enlargement of the wound, by a simple incision down to the bone, of an inch or

less in length, will most commonly remove all the bad symptoms, and, if it be done in time, will render every thing else almost unnecessary.* After having relieved the tension in this manner, if the inflammatory symptoms had previously run high, or if they should not be completely subdued by the operation, it will be proper to bleed from the arm, to an extent proportioned to the patient's age and strength, and to the violence of the symptoms; and afterwards make use of the other antiphlogistic remedies usually employed for the cure of inflammation, viz., purging, tartar-emetic in nauseating doses, strictly low diet, absolute rest, and the application of cold evaporating lotions to the head, or warm poultices, according to the sensations of the patient.†

30. Desault is of opinion that all those symptoms may generally be removed by the exhibition of tartar-emetic. This is a dangerous error, and may lead to a fatal neglect of the practice here inculcated, which, by the greater number of intelligent surgeons, is considered indispensable in inflammation under the aponeurosis.

31. In punctured wounds of the scalp, perhaps the best practice would be, in all cases, even before the occurrence of inflammation, to enlarge the wound by a simple incision, and thus leave a free space for the tumefaction of the integuments and aponeurosis which almost always succeeds.

* How striking the relief obtained by incision in deep-seated paronychia! an analogous case, the affection occurring in a similar structure, though the inflammation in the fibrous tissue of the finger is often idiopathic.

† Mr. Colles, in his lectures, states that, when fibrous structure is the seat of inflammation, and a sense of *tension* is complained of, warm applications are to be preferred. When matter is making its way through this structure, the temperature of these applications should be very considerable, in order to feel grateful.

32. APHORISMS.

Wounds of the scalp do not essentially differ from wounds of similar parts situated elsewhere, and are to be treated on precisely the same principles.

In the treatment of wounds of the scalp, you should have constantly in view its preservation.

Union by the first intention is always to be attempted in incised and lacerated flap wounds, not combined with fractures, &c.

If a scale of bone be cut off, and adhere to the flap, it makes no difference in the treatment. Proceed as if such complication did not exist.

In contused wounds, if small, approximate the parts, but by no means bring them into very close apposition.

Flap wounds which are much contused are to be treated by laying down the flap, after washing clean the surfaces. After the process of sloughing has taken place, bring the parts into the closest apposition.

Never interpose a dressing between the flap and skull.

Treat punctured wounds of the scalp as similar wounds in other parts, and like structures.

To remove the inflammatory tension of the aponeurosis produced by these wounds, and the consequent fever, dilate the puncture by incision.

Erysipelas, with fever, is not an unfrequent consequence of wounds of the scalp.

Always keep in mind the proximity of those wounds to the brain; the vascular connection between the pericranium and dura mater; and the necessity, on this account, of a strict attention to the antiphlogistic regimen in the treatment.

CHAP. II.

CONTUSIONS OF THE SCALP. BLOODY TUMOR.

33. WHEN the integuments of the cranium are struck with a blunt instrument perpendicularly to the skull, or when the head is forcibly driven against any resisting substance, in consequence of a fall, &c., the scalp is generally detached from the pericranium, to a greater or less extent, around the immediate seat of the injury. Into the receptacle thus formed, blood is poured from the ruptured vessels.* The extravasated blood is also injected into the cellular substance surrounding the cavity, and thus a considerable tumor is formed, easily distinguishable from all others, and, in general, very easily cured. This is called the *bloody tumor* of the scalp.

34. On examination of this tumor, we perceive in the centre a soft spot, into which the finger sinks, and produces to the touch a sensation so much resembling that caused by a depressed fracture of the skull, as to be easily mistaken by an inattentive or unadvised examiner. If, in consequence of this mistake, we were to act on the supposition that a fracture exists, we might expose our patient to much unnecessary pain and inconvenience. As the touch is so

* There is a difference of opinion as to the seat of the blood in this tumor. It is generally supposed to be situated, as I have said, between the pericranium and scalp; but there are some, who assert that the effusion takes place between the integuments and the aponeurosis of the occipito-frontalis.

deceptive, we should be particularly careful never to make a diagnosis of depressed fracture, unless other symptoms more unequivocally indicate such an accident.

35. Our liability to fall into this error is to be attributed to the manner in which the blood is impacted into the cellular substance, causing the border of such a tumor to be raised and hardened, so as to resemble the elevated circumference of a depressed fracture, while the central part, which is detached from the skull, being soft and yielding, allows the finger to sink apparently below the level of the skull.

36. The treatment of such accidents is, in general, very simple. Unless the extravasation be very considerable, and the integuments much bruised,* the use of discutient applications to the tumor, with the antiphlogistic regimen and quiet, will cause the effused blood to be absorbed, and the tumor to disappear in a short time (from ten to twenty days, according to Mr. Colles). The following lotion will perhaps be as good a one as we can apply to the tumor, with a view of procuring the absorption of the extravasated blood:

R.

Muriatis Ammoniae, \bar{z} iss.

Spiritus Vini Rectificati.

Aceti distillati, ana \bar{z} ij.

Aquæ distillatæ, lb. j.

Misce.

* In this case, the violence inflicted is sometimes followed by considerable inflammation. Should this be the case, the stimulating wash recommended in the text would not be so eligible as a saturnine lotion, with or without the application of leeches. This inflammatory action may, in very severe cases, notwithstanding this treatment, terminate in suppuration, and the contents of the tumor will présent a marbled appearance, owing to the mixture of blood and matter. When this takes place, the tumor must be opened as an ordinary abscess, and poultices and fomentations diligently applied,

It is seldom necessary to have recourse to considerable evacuations, unless symptoms of further mischief be present; but mild laxatives ought to be administered at proper intervals.

37. Mr. Colles remarks, in his "Practical Precepts," that, if we should open these tumors in an early stage, we shall induce a high degree of inflammation and fever, which will be followed by suppuration of a very bad character. I believe it is, in almost all cases, unnecessary to open them early; but the practice of making an incision into a bloody tumor is not an unfrequent one, even with experienced surgeons, and, as far as I have seen, has not been followed by those severe consequences which Mr. Colles seems so much to dread. However, as, from this gentleman's extensive practice, and habits of observation, his opinion is entitled to the highest respect, and as the operation is, in general, uncalled for, we shall not run much risk in implicitly following his advice, viz., to wait patiently for ten or twelve days, diligently making use of the remedies above specified; and at the end of that time if absorption of the extravasated fluids cannot be produced, and the tumor should continue undiminished, especially if the integuments begin to inflame and point, to make an incision of moderate size into the tumor, sufficient to give exit to the blood, and afterwards to keep the parts in apposition, by compress and bandage, till they unite.*

38. APHORISMS.

Contusions of the head are generally attended with detachment of the scalp from the pericranium, and a *bloody tumor* is the consequence.

* Practical Precepts on Injuries of the Head, p. 8.

The feel of this tumor so nearly resembles that of a depressed fracture, as often to be mistaken for it.

Never, on this account, make an incision in order to examine the state of the skull; but wait for the occurrence of those symptoms which render fracture more probable.

The application of cold lotions to the tumor, with the occasional use of laxative medicines, will, in general, be sufficient for the removal of the extravasated blood.

If these means should not be successful at the end of ten or twelve days, let out the blood by an incision.

CHAP. III.

ERYSIPELAS,

AS A CONSEQUENCE OF INJURIES OF THE SCALP.

39. ERYSIPELAS generally occurs in persons of a bilious habit, and is sometimes a very frequent consequence of wounds, especially in large hospitals, where bad air, crowded wards, and unwholesome diet, contribute not a little to its developement. There is no part of the body in which wounds are so likely to be followed by erysipelas, as in the integuments of the head. The greater number of punctured and contused wounds of the scalp, in the hospitals of a large city, are attended with more or less of this complication. But in some constitutions, even when placed under favourable circumstances, it will occur from the most trifling injury. Sir Astley Cooper mentions a fatal case of erysipelas, which followed the excision of a small encysted tumor from the forehead.*

40. Erysipelas commences, in general, from the third to the seventh day from the receipt of the wound. Its symptoms, and even its appearances, vary in almost every individual case. Sometimes the constitutional symptoms precede the local, as in idiopathic erysipelas; but generally, in the traumatic disease, we will find some difference in the appearance and sensation of the wound, or the surrounding integuments, to be the first indication of its approach. The follow-

* Lectures, 2d edit. 18mo. p. 112.

ing, in the majority of cases, is the order in which the symptoms are developed.

41. Pain, sometimes dull and obtuse, at other times acute and pungent, in the immediate situation of the wound, is generally the first symptom of the approach of erysipelas. A puffiness of the lips of the wound, at first slight, but very soon more marked, next attracts our attention, and, at the same time, the surrounding integuments are more or less red. If we now examine the tongue of the patient, we shall find it covered with a yellowish fur; he has a distaste for every species of food; he is distressed with nausea, and occasional vomitings of bilious matter; and sometimes he complains of uneasiness in the region of the liver.

42. As the disease advances, the swelling and redness extend, occupying the whole of the scalp, and are propagated even to the face. The ears and eye-lids are generally comprehended in the tumor,—the latter of these are sometimes so distended as to be completely closed. On pressure, the colour disappears, but immediately returns on removing the finger. The swelling is always attended with œdema. Scattered vesicles form on the face, but never on the hairy scalp.

43. In a still more advanced stage, the pain in the head and sleeplessness increase; delirium sets in, followed by coma; the thirst is excessive; the skin is dry, and is attended with that *calor mordax*, so remarkable in bilious affections; the pulse is hard, small, contracted, and frequent.* The appearance of the wound changes.

* The pulse seems to be subject to more variety than any of the other symptoms, owing, perhaps, to differences in the constitutions of the patients; and hence we may account for the difference of opinion which exists amongst authors on this subject. Occasionally we shall find it soft, compressible, and not much increased in frequency.

If it be recent, the edges are swollen and dry, not secreting any fluid, and the dressings adhere to the wound. If pus has been already secreted, it changes to a yellowish, thin sanies, often fœtid. The tension of the integuments is sometimes considerable, sometimes not so much marked. Occasionally, the disease terminates in desquamation; but, if our endeavours to procure resolution have failed, collections of matter are formed, which are discharged by openings behind the ears, or in the upper eye-lids; or death itself may ensue.

44. The *swelling* in erysipelas is flat,—not pointed, as in phlegmon: it is diffused, and has not the hardness of phlegmon. In erysipelas, the *pain* is *burning*; in phlegmon, *throbbing*. The *colour* of the former is circumscribed, and varies from a uniform light red to a brighter colour, often, after a few days, mixed with a yellowish tinge. The *phlegmonous redness* is diffused, not uniform, but deep and livid at the centre, light and shaded off at the circumference. Erysipelas has a strong disposition to spread by continuity, and is, at all periods of the disease, *erratic*; not so with phlegmon, which is, from the commencement, limited and stationary. If the erysipelatous inflammation is to end favourably, it does not spread so quickly as when it is likely to terminate in suppuration. Phlegmon is said to be a *healthy* inflammation; erysipelas, *unhealthy*: the fever in the former is of the *sthenic*; in the latter, of the *asthenic* type. The terminations of the one are generally favourable; those of the other are frequently the reverse.

45. The fever, in erysipelas, generally proceeds *pari passu* with the local disease, and both get better or worse together. In the course of the disease, the tongue becomes of a mahogany

colour, and there is often considerable tenderness in the epigastrium. If the patient is to die, he dies of the fever, comatose. Erysipelas is more dangerous when it affects the head, than any other part. Sometimes we will find the disease apparently epidemic, and more prevalent than at others: this occurs generally in damp and changeable weather.

46. The appearances, on dissection, of those who have died of erysipelas of the scalp, are very unsatisfactory. In the majority of cases, we will not be able to detect in the brain or its membranes the slightest trace of inflammation, thus disproving the assertion of some authors, that the patient dies in consequence of the *translocation* of the disease to the brain. A few cases are recorded, in which an increase of vascularity in the pia mater was observable, but I believe the general result of examinations has been what I have stated above, far from satisfactory.

47. When we reflect on the above account of the disease, we shall be disposed to admit that it is chiefly a constitutional affection, depending on disorder in the liver and primæ viæ; and that there is a real, though obscure relation, between the gastric organs, and the parts affected by erysipelas,—a relation which becomes more striking, when we consider that the local symptoms rarely become violent without the liver being affected—sometimes even to such a degree, as to have abscesses formed in it. But this circumstance will more naturally come before us in the consideration of suppuration of the brain from concussion, &c.

48. Occasionally, the erysipelas assumes the phlegmonoid character, more than the bilious. In such cases, the symptoms are more violent, and more nearly resemble those attending inflam-

mation under the aponeurosis, already described (27). It has been asserted by some authors, that the erysipelas attending wounds of the scalp is owing to injury of the aponeurosis; and, in consequence, incisions down to the bone have been recommended. There are cases of *phlegmonoid* erysipelas, where this treatment may be required, in order to give exit to sloughy cellular membrane; but in the *bilious* form, the affection is external to the aponeurosis.

49. From what has been said, it will be easy to conceive that the treatment of erysipelas of the scalp must be considered with reference to the local inflammation, and the constitutional symptoms. A strict attention to the constitutional treatment is, in general, of far greater consequence to the patient, than a like solicitude about the state of the wound or the surrounding inflammation; but still there are many cases, in which we shall find mere constitutional measures insufficient.

50. The local treatment recommended by Desault consisted merely in the use of emollient poultices and fomentations to the wound only, and discutient applications to the erysipelas.* But we shall meet with cases where these measures will not suffice, and we shall be obliged to have recourse to the local abstraction of blood by means of leeches. The application of leeches to erysipelas has been objected to, by some of the most experienced surgeons in this city, through fear of the bites being afterwards converted into ill-conditioned ulcers. This fear appears to arise more from pre-conceived opinion, and an attachment to a favourite system of practice, than from actual observation. Every one who has had an

* Œuvres Chirurgicales, vol. 2, p. 9.

opportunity of witnessing the good effects resulting from this mode of treatment, in the Meath Hospital, will have no hesitation in applying leeches to the erysipelatous tumor following wounds of the scalp. In every case where we are obliged to use general blood-letting for the cure of this affection, the local application of leeches will have a beneficial effect; and, in milder cases, it will be proper to apply them without previous venesection. The number we apply must, in general, be considerable,—regulated, however, by the age and strength of the patient,—the extent of the erysipelas,—the degree of tumefaction and tension of the scalp,—and the extent to which we have carried our other evacuations.

51. But, as we have already seen, it is upon the constitutional treatment we are to place our chief reliance. In some cases, particularly in young and plethoric subjects, the fever is so high, and the local symptoms so violent, that we must at once have recourse to venesection, without losing time in the adoption of any less decisive remedies. The bleeding should be in proportion to the urgency of the symptoms. Sixteen ounces may be considered as an average quantity to be taken at one operation, and this may be repeated, if necessary. The blood-letting is to be followed by the application of leeches, as directed above, and the other parts of the antiphlogistic system, hereafter to be spoken of. In milder cases, where bleeding has not been practised, we must keep in mind, that the peculiar appearance of the wound and surrounding integuments depends entirely on some disordered state of the chylopoietic viscera, and to correct this disorder must be our chief aim. As the bowels are generally more or less constipated, and often loaded with

ill-digested food, we should in the first place administer a smart purgative, and assist its action, if necessary, by an enema. Perhaps as good a formula as we can adopt, to fulfil this indication, is the following:

R.

Pil. Hydrarg.

Calomelanos, ana, gr. xv.

Pil. Colocynth. comp. ʒss.

M. et

divide in pilulas duodecim.

Two of those pills may be given to the patient, and followed, in about three hours, by two or three ounces of the following mixture (the ordinary *black-bottle*), which may be repeated every two hours till the bowels are well freed:

R.

Infusi Sennæ, ʒvij.

Tinct. Sennæ, ʒss.

Elect. Scammonii, ʒij.

Sulph. Magnesiae, ʒiss.

Antim. Tartarizat. gr. j.

M.

This end having been obtained, we may next proceed to administer tartar emetic, after the manner of Desault, dissolved in a large quantity of liquid. It may be dissolved in whey, in the proportion of a grain to a quart, and of this the patient may drink as much as he can bear in the course of the day. Or it may be given in the drink called *imperial*, according to the following formula:

R.

Potassæ Supertart. ʒj.

Aquæ ferventis, lb. ij.

Corticis Limonis, ʒij.

Sacchari Albi, ʒij.

Antim. Tartariz. gr. j.

M.

Some practioners recommend the tartar emetic to be given at the outset of the disease, in doses sufficient to produce vomiting. This has been objected to, as likely to cause determination of blood to the head, and coma. I believe there are no just grounds for this apprehension. Emetics are constantly prescribed in erysipelas of the scalp, with the best effects, and I have never known them followed by any bad consequences. If we shall have administered an emetic in the first instance, we may afterwards proceed to the purgative and nauseating plan, as directed above.

52. By the above local and constitutional treatment, judiciously followed, we shall, in most cases, be able to subdue the disease in young and previously healthy subjects; but old, debilitated persons, when attacked by erysipelas, often require a directly opposite mode of treatment. In them the disease seriously impairs the powers of life, and we must rather endeavour to support them, than to combat the local affection. A free use of bark and wine will, in such cases, be often necessary. When the bowels are confined in those cases, aperients may be given in combination with tonics, as follows:

R.

Sulph, Quininæ, gr. xij.

Pil. Hydrarg.

— Aloeticæ, āā, ʒj.

Pulv. Cinnam. comp. gr. xij.

M.

Divide in pilulas duodecim.—Sumat duas tertiis horis ad alvi solutionem.

We shall know whether we are likely to succeed in our endeavours to arrest the disease, by the following circumstances: the fever abates; perspiration appears on the surface of the whole

body; the tongue loses its yellow fur; the discharge from the wound recovers a healthy appearance; the inflamed surface becomes pale and wrinkled, and the cuticle begins to desquamate. After the free use of evacuations, even when the local inflammation is nearly removed, a white tongue, and other symptoms of disordered digestive organs, will sometimes remain. Under these circumstances, the use of calomel and James's Powder is very advantageous. They act copiously on the bowels, clean the tongue, and improve the state of the stomach. Two or three grains of calomel, with a like quantity of James's Powder, may be given every six hours, for one, two, or three days. The *hydrargyrum cum cretâ* might be used in the same way.

53. When the above means have arrested the inflammation, the patient is probably reduced in strength, and may require the aid of nutritive diet and tonic medicines. These should seldom be employed, till the pulse is quiet and the tongue clean, lest they should induce a relapse of the disease. In cases where we are in doubt whether stimulants should be administered or not, the carbonate of ammonia is the best medicine we can employ. From five to eight grains may be given in a draught, every six hours, without any risk of re-producing the inflammation, and in many cases with decided advantage. Bark comes next in order to the volatile alkali, and the sulphate of quinine is the most eligible form of the remedy. Wine is sometimes necessary, but should be used very sparingly, and discontinued as soon as the necessity for its exhibition has ceased.*

* See an excellent paper on erysipelas by Mr. Lawrence, in the 14th volume of the Medico-Chirurgical Transactions.

54. APHORISMS.

If, between the third and seventh day from the receipt of the wound, you perceive its lips to become puffy, and the surrounding integuments red and swollen, while at the same time symptoms of gastric disturbance make their appearance, you have reason to fear the occurrence of erysipelas.

The degree of danger of this disease is always proportioned to the violence of the fever, and recovery from the one is indicated by the cessation of the other.

In nine cases out of ten, the disease arises from disorder of the liver and other digestive organs, and to the removal of this disorder must your remedies be directed.

The constitutional treatment, in young and plethoric patients, consists in the use of blood-letting, emetics, purgatives, and other evacuants; followed, when the inflammation has subsided, and the tongue become clean, by tonics and nutritive diet.

In old, debilitated persons, the antiphlogistic treatment is contra-indicated, and recourse must be had to bark, &c. from the commencement.

The local treatment is always of less importance than the constitutional, and consists in the application of leeches, poultices, cold lotions, &c. to the wound and erysipelas.

On post-mortem examination of the brain of those who have died of erysipelas, no appearances indicative of disease of that organ can be detected.

SECOND DIVISION.

EFFECTS OF EXTERNAL VIOLENCE ON THE BONES OF THE SKULL.

55. These injuries may be divided into Wounds of the Skull, Fractures of the Skull, Separation of the Sutures, &c.—but this division is not a practical one; and, as it indicates no difference in the treatment, I shall class all these accidents under the general head of Fractures, and consider them in one chapter. The symptoms and treatment of Compression of the Brain, the most common consequence of Fractures of the Skull,—whether as the result of extravasation, depression of the bone, or suppuration,—will properly form a second chapter in this division of the work.

CHAP. IV.

FRACTURES OF THE SKULL.

56. Death often occurs after the receipt of an injury which has caused a fracture of the bones of the cranium; and hence has arisen the idea that fractures of the skull are among the most dangerous accidents to which the human frame is liable,—whereas it is to some injury which the parts within the skull may have suffered at the same time with the occurrence of the fracture,

or to the consequences resulting to the brain from some peculiar condition of the fracture, that we are to attribute the fatal event.

57. Fractures of the cranium are, in themselves, by no means dangerous. The simple breach of continuity in the bone is a matter of little consequence, and requires no peculiar care on the part of the surgeon. Thus, we have already seen (7), that, even when a portion of the bone is cut away by a sabre at the same time with a wound of the scalp, it is to the latter injury we are to direct our attention, and make no difference in its treatment on account of the former.

58. Fractures at the base of the skull are more dangerous than at any other part, because an extravasation of blood will more probably occur; and, from the violence of the injury received, inflammation always supervenes. These fractures are produced by falls on the head from a height, when the whole weight of the body is thrown on the foramen magnum and cuneiform process of the occipital bone; in which case, a transverse fracture through those parts is often the consequence, and generally terminates fatally. Fractures of the skull present every variety of form and complication, according to the size, shape, weight, force, direction, &c. of the instrument by means of which the injury has occurred.

59. A fracture generally takes place in that part of the cranium on which the blow has been inflicted; but it sometimes happens that, although the place struck will not be fractured, some remote part will suffer this injury. This is produced by what the French call a *contre-coup*, and by English surgeons is denominated a counter-fissure. It has been doubted by some surgeons

whether this fracture ever occurs, except in the case alluded to above (58), where the occiput is forcibly driven against the atlas; but there are numerous well-attested instances on record, which prove the possibility of this accident. Such a fracture is always unattended by depression. The manner in which it takes place is thus explained by Desault:* when a broad surface is forcibly struck against the head, the first effect is to alter the natural form of the osseous case—to render it flatter in one part, and more prominent in another. If, then, the part which has been struck makes a resistance equal to *ten*, while the point which has been rendered prominent makes a resistance equal only to *five*, it is manifest that the latter part must be fractured, as the bones are incapable of bearing distention. Other explanations of this curious occurrence have been offered; but cases are related, which cannot be accounted for on any principles, yet proposed in explanation of such casualties.

60. The consideration of fractures of the skull has been subjected, by old authors, to an infinite number of divisions and subdivisions. It is quite unnecessary to repeat them here, as they are never used. Perhaps the best division we can adopt, because it is the most simple, and at the same time the most practical, is that recommended by Pott, viz., into fractures with depression, and fractures without depression. The latter shall be first disposed of, as requiring little consideration, and no peculiar surgical treatment.

SIMPLE UNDEPRESSED FRACTURES.

61. The word *simple*, when applied to a fracture of the cranium, is not always to be under-

* Œuvres Chirurgicales, tom. 2. p. 16.

stood in the same sense in which it is used in speaking of fractures of other bones. In the latter case, it means that the fracture is not complicated with a wound; whereas, in the former, it seldom signifies more than the absence of depression of the fractured bone.

62. A simple fracture of the skull, or a *fissure*, as it is sometimes called, no matter of what extent it may be, affords no symptoms, so long as the integuments remain entire, by which we can ascertain even its existence. It is said, however, that bleeding from the nose, eyes, or ears, is a good cause for suspecting that the fracture has extended through the bones encompassing them; but it is easy to conceive, that a less force than would be sufficient to produce a fracture, might rupture some of the small vessels in the cavities of those organs. In most instances, however, Mr. Brodie thinks that a hæmorrhage from the ear arises from laceration of the lateral sinus, where it extends downwards behind the petrous process of the temporal bone and the external meatus. On dissection of a case, where the bleeding occurred both from the ear and nostrils, there was fracture of the base of the skull, with laceration of the cavernous sinus, from which the hæmorrhage had taken place.* This symptom, if it can be called one, does not indicate any particular line of practice, and is only an additional reason for a strict adherence to the antiphlogistic treatment.

63. When a simple fracture is attended with an incised or lacerated wound of the scalp, instead of this complication making any difference in the principle of treatment, it should make us even more solicitous to close the wound, and heal

* Medico-Chirurgical Transactions, vol. 14. p. 385.

it by the first intention, because we convert a fracture which is analogous to a compound fracture in other parts into one resembling a simple fracture, and thus run less risk of inflammation.

64. Having discovered an undepressed fracture of the skull, we are desired by Mr. Dease, and other authors, to bring the full extent of the fracture into view, and to enlarge the wound at both ends for this purpose; but this is wholly unnecessary: we can have no object in thus subjecting the patient to additional pain. The only occurrence we have to dread in those simple fractures is inflammation; and surely this is much less likely to happen, if the fracture be covered by the integuments, than if it be exposed to satisfy an idle curiosity. Besides, such fractures too often pass from the top or sides of the skull to the base, until stopped by the foramen magnum.

65. The practice of trepanning, in simple, undepressed fractures, was strongly recommended by Pott, with the view of preventing inflammation and suppuration of the dura mater, which, he thought, must generally follow the violence which caused the fracture, unless this precaution were used. This practice has now fallen entirely into disuse. No surgeon will now use the trephine, before the appearance of those symptoms which absolutely require its aid; and it is the opinion of the best modern practitioners, that the early application of this instrument to a simple fracture must tend rather to excite, than to avert, inflammation of the contents of the cranium. Mr. Dease's opinion is,* that the surgeon who applies the trephine in simple fractures, without a great probability of detachment of the dura

* On Wounds of the Head, p. 19.

mater, extravasation, &c., in order to obviate the consequences of future inflammation and suppuration, subjects his patient to a severe and dangerous operation, often productive of disagreeable effects through life, and by no means indicated.

66. We perceive, then, that our local treatment of such injuries in no wise differs from that which we should adopt, if a fracture did not exist. The constitutional treatment should consist in bleeding largely, and the most sedulous employment of the other means calculated to prevent inflammation of the brain and its membranes. The patient must be kept on a strict antiphlogistic regimen, and his bowels occasionally well freed by laxative medicines. "We should be particularly attentive to any changes that may happen, especially those that take place in the second week; for it is no unfrequent circumstance to meet with, in those cases, that, notwithstanding every thing went on to our wish the first week, yet death shall unexpectedly close the scene the second."* This subject shall be more fully considered in a future chapter.

67. The disjunction of the sutures is very rare. It is evident that this accident cannot happen, except in persons not much advanced in life, in whom the sutures are not consolidated. Such a case is to be looked upon as one of imminent danger, not so much because the separation of the sutures is likely to lead to bad consequences, but because the force necessary to produce it is so great, that it must produce extensive injury of other parts.

* Dease on Wounds of the Head, p. 158.

DEPRESSED FRACTURES.

68. We have hitherto spoken only of those fractures in which the bone is merely cracked, and the sides of the fracture lie in their original situation, or are very slightly separated, without any depression below the surface of the skull. We now come to consider a more important class of injuries, which require surgical interference much more than the former, in order to preserve life, or relieve the patient from some disagreeable consequences of the accident.

69. The causes of depressed fractures are too obvious to require enumeration here. The instruments with which depression of the bones of the skull is produced, are generally blunt and angular, possessing considerable weight, and a less extent of surface than those which cause an undepressed fracture.

70. The existence of a depressed fracture is, in general, very evident, when the integuments are wounded, as the depression may be distinctly felt with a probe or the point of the finger. But it is not so easily discovered, when not attended with an external wound. Sometimes, indeed, immediately after the receipt of the injury, the depression can be plainly felt; but, in general, we do not see the patient so soon; and, when we are called on, the tumefaction of the scalp, and the effusion of blood, totally prevent our ascertaining the presence of the fracture. However, it is a matter of no consequence to us whether the bone is broken or not, so long as no symptoms occur to indicate such an accident; for, in depressed fractures without a wound of the scalp, as well as in simple ones, we shall have to pursue such treatment only as we should

adopt if the injury were not complicated with fracture, unless symptoms indicative of further mischief manifest themselves.

71. The symptoms of a depressed fracture are the symptoms of compression of the brain, and shall be more minutely considered in the next chapter. These symptoms, in their severity, bear no proportion to the size of the fracture, or the degree of depression. This is a fact which has been long known. In some slight cases of depressed fracture, the symptoms of compression of the brain are alarming; while, in some severe injuries of the kind, the symptoms are comparatively slight, and of short duration. So irregular, and, as it were, so capricious is nature, that, while causes apparently the most trifling produce inflammation in its most violent and aggravated form,—extensive fractures, depression, and even permanent compression, from the lodgment of balls, &c., have been followed by no such consequence.*

72. The different varieties of depressed fractures, depending on the part struck, the instrument with which the injury has been inflicted, the violence of the blow, the age of the patient, &c., &c., are too numerous to allow all of them to be described, or even alluded to here. But there are remarkable modifications of the accident, which it would be unpardonable to pass over.

73. I. The most common form of depressed fracture is, when an angular portion of the skull is driven in, and both tables at the same time suffer depression. But it is important to observe, that the division of the inner does not correspond to that of the outer table of the skull,—the former

* Hennen's Military Surgery, 3d edit. p. 289.

being invariably broken to a greater extent than the latter. In consequence of this, the actual depression is greater than it would appear to be, from the mere inspection of the external fracture.

74. II. Sometimes the inner table is depressed, so as to wound the dura mater and brain, and cause perilous symptoms, while there is a mere fissure in the outer table, often scarcely perceptible, and without depression. Nay, cases are on record, where the outer table has even remained entire, while the inner has been broken into splinters. Dr. Hennen gives an account of a case, in which the internal table was splintered, and at one part driven more than half an inch into the membranes of the brain, although there was not even a fissure of the external table.* The greater elasticity of the outer table, and the greater brittleness of the inner or vitreous table, seem to afford the only reasonable solution of these phenomena.†

75. III. Sir Astley Cooper‡ mentions a fracture, which is of a nature directly opposed to the foregoing. He says, it very often happens, that considerable depression of the bone will take place, from the external table of the skull being driven into the diploe, without producing the slightest injury to the internal table. He states that these fractures can only occur to those of middle age; for, in the very young, and in very old age, the skull is thin, and without diploe. I believe this form of depressed fracture is rare, notwithstanding Sir A. Cooper has been so fortunate as to witness it frequently. The possibility of such an occurrence, however, is another

* Military Surgery, 2d edit. p. 323.

† Brodie—Medico-Chirurgical Transactions, vol. 14. p. 331.

‡ Lectures, 2d edit. p. 130.

reason why we should be cautious in the application of the trephine.

76. IV. Frequently the violence which occasions the fracture has been so great, as not only to cause the depression of an angular portion of bone to a considerable depth, but also to break the bone into a number of pieces, some of which are completely detached, and lie on the surface of the dura mater, and, if allowed to remain, will occasion irritation and inflammation of this membrane; while others press on the brain, or even wound this organ, by penetrating the dura mater.

77. V. One of the most troublesome, and indeed formidable, fractures we can meet with, on account of its great liability to cause inflammation of the brain, is that in which a small portion of the skull has, as it were, been *punched out* by a blunt penetrating instrument, and the depressed piece of bone has been sunk into the brain.

78. VI. There is a case, in which depression of the bones of the skull may take place without fracture. It occurs in young children, in whom we sometimes find the cranium depressed or indented after a blow on the head, and in the course of a few days restored to its natural level, without the assistance of a surgeon. Mr. Brodie supposes that, in those cases, the earthy part of the bone has given way, while the animal part has remained entire,—so that there has not been a complete fracture, or actual solution of continuity; and that the pulsations of the brain, constantly operating against the inner surface of the bone, have been the means of elevating the depression.

79. The above are a few of the most remarkable varieties we shall meet with, among depressed fractures of the skull. There are some which

are important, on account of some other injury accompanying them, viz., those complicated with wounds of the brain and its membranes,—those attended by laceration of the sinuses or middle meningeal artery,—those communicating with the frontal sinus, &c. These shall be again noticed, in speaking of the treatment of depressed fractures.

80. The treatment of these accidents consists essentially in taking measures to guard against inflammation of the brain and its membranes, and to obviate *existing* symptoms of compression. The first indication is to be fulfilled in the manner already laid down as proper in the treatment of simple fractures, namely, venesection, and a strict antiphlogistic regimen. The blood should be largely and repeatedly taken from the arm or temporal artery. Cold, evaporating lotions should be constantly kept to the head,—antimonials* and purgatives freely administered,—and low diet, with perfect rest, enjoined. The antiphlogistic regimen should be continued for at least a month; for it is by no means uncommon, for inflammation and abscesses of the brain to follow injuries of the head, a very considerable time after the patients have had reason to suppose themselves in perfect safety (155).

81. In cases of depression of the bones of the skull, it was the invariable practice of the older surgeons to trepan immediately. The impropriety of this practice has been since completely proved. It has been found that very many cases of fractures of the skull, some of them attended with considerable depression, have recovered without the aid of the trephine; and, at this day, the mere circumstance of depression is not suffi-

* See paragraphs 51 and 52.

cient to induce any well-informed surgeon to have recourse to this instrument. Mr. Abernethy* has published an account of several cases, in which there were not only no symptoms at the time, but none at any subsequent period, although no attempt was ever made to restore the bone to its natural situation; and many similar cases might be added to the catalogue, which have fallen under the observation of every practical surgeon. Here the condition of the patient does not indicate the necessity of an *immediate* operation; and a very important question arises, as to the course which a surgeon should pursue. Should he, or should he not, apply the trephine, and elevate or remove the depressed portion?

82. To this question, Mr. Colles or Mr. Abernethy would answer, "Postpone the attempt to elevate the depressed piece, until symptoms of compression or inflammation begin to shew themselves."† Others, and, amongst them, Sir Astley Cooper‡ and Mr. Brodie,§ are of opinion, that the circumstance of the existence or non-existence of a *wound*, along with the fracture, should make a material difference in our treatment. Sir Astley Cooper recommends, in cases of depressed fracture without wound, merely to deplete, and wait for further symptoms before trephining. But, if a wound be present, he says inflammation of the brain is the general consequence, and that it will be of little use to trephine when inflammation is once produced. He, therefore, when called to what he denominates a *compound* fracture of the skull with depression, which is exposed to view, elevates or removes the de-

* Surgical Works, vol. 2. p. 5.

† Colles's Practical Precepts, p. 19.

‡ Lectures, 2d edit. p. 132.

§ Medico-Chirurgical Transactions, vol. 14. p. 408.

pressed piece of bone, *whether symptoms of injury of the brain exist or not.* Strong arguments in favour of this practice are advanced by Mr. Brodie, who deserves great credit for the ability and candour with which he has discussed this subject. He states, as the result of his experience, that the cases of depressed fracture in which suppuration took place, where the scalp remained entire, bore a very small proportion to those in which suppuration followed a fracture complicated with a wound of the scalp; and hence, in the latter cases, he should be disposed, in order to prevent future inflammation and suppuration, to apply the trephine, and elevate the depressed bone.

83. In a matter of so much importance, it must be satisfactory to the reader, to be informed of the reasons which induce some of the above-mentioned eminent surgeons to adopt a method of treatment, different from that pursued by the others. Those, who advocate the early application of the trephine, do so, on the supposition, that if the depression be allowed to remain, while complicated with an external wound, inflammation and suppuration of the dura mater are much more likely to follow, than if such depression were elevated, or the fractured piece removed; and that if the abscess has no means of discharging itself externally, the inflammation extends to the parts below, and suppuration of the arachnoid and pia mater follow, leading inevitably to the patient's destruction.

84. Even supposing that the patient has escaped these immediate bad consequences of allowing the depression to remain, still, it is said, it sometimes happens, that when the depressed piece has not been elevated, symptoms arise after a considerable lapse of time, which may even

endanger the life of the patient, and which are to be attributed to the continuance of the depression, although it had occasioned no inconvenience in the first instance. A case, illustrative of this assertion, is given by Sir Everard Home, in the *Philosophical Transactions* for 1814, and is quoted by Mr. Brodie.* In this case, nervous symptoms, supposed to be caused by pressure on the brain, after having continued for three years, increasing, instead of diminishing in severity, were at the end of that time completely relieved by the removal of the depressed bone by the trephine. Here, however, "the fracture and depression were very extensive, and probably," continues Mr. Brodie, "these ultimate ill-consequences, or secondary effects of the injury, may be avoided, if we consider it as a general rule, that an extensive or deep depression should lead to the application of the trephine, although the same necessity does not exist where the depression is small. This rule, however, affords us no assistance with respect to the greater danger arising from the chance of suppuration between the bone and dura mater; this being as likely to occur where the depression is small, as where it is large."†

85. On the other hand, those who prefer waiting for the occurrence of symptoms before trephining, contend that it is by no means a necessary consequence that inflammation and suppuration of the dura mater shall follow a depressed fracture of the skull, with an external wound; neither do these bad consequences take place in the majority of such injuries if left to themselves. Numerous instances are on record, where extensively depressed fractures, complicated with

* *Medico-Chirurgical Transactions*, vol. 14, p. 398. † *Ib.* p. 399.

wounds of the scalp, have recovered perfectly, without the elevation of the depressed bone. I have already alluded to several cases in proof of this point related by Mr. Abernethy (81). Whether the depression may not produce disagreeable and dangerous effects at some remote period, is a point not so easily determined, since it cannot be ascertained without a continual acquaintance with the persons who had received the injuries. Mr. Abernethy* quotes two cases from Mr. Hill, in which no inconvenience arose in consequence of the depression, for many years, during which Mr. H. knew the patients. It deserves to be mentioned, too, that one of them was a sailor, and therefore, probably, led a life of irregularity, as well as of exertion. The result of cases of this kind which Mr. Abernethy has met with, does not lead him to apprehend future mischief, "nor is it easy," says he, "to conceive that the pressure, which caused no ill effects at a time, when the contents of the cranium filled its cavity completely, should afterwards prove injurious when they have adapted themselves to its altered size and shape."†

86. Such are the opinions and reasonings of the most eminent modern surgeons, on the mode of proceeding we should adopt in those cases. It would not become me to attempt to decide which is deserving of preference.—I may, however, mention, that the practice recommended so strongly by Mr. Colles and Mr. Abernethy, namely, *never to use the trephine, till compelled to do so by urgent symptoms*, is that which is almost universally followed by surgeons in Dublin.

* Surgical Works, vol. 2, p. 15.

† Perhaps this reasoning may appear more ingenious than practical, when we consider that exostoses occasionally arise from the inside of the skull, underneath the part which has been struck, and produce dangerous pressure on the brain.

87. In comminuted fractures, however, (76) where pieces of bone are completely separated from their attachments, and lie loosely in the wound, there can be no doubt of the propriety of removing them; they are to be considered as foreign bodies, and their continuance must inevitably produce inflammation of the dura mater. If any portion of the bone be depressed at the same time, this is the most proper period for raising it, as we have, in general, sufficient room for the introduction of an elevator, without using the trephine.

88. In very small depressed fractures or punctures of the skull, (77) where the piece has been completely detached, and driven into the brain, we are recommended by Mr. Colles,* not to interfere for a few days; "for, if the operation be performed immediately after the receipt of the injury, and if we attempt to seize the depressed fragment, the first touch of the forceps sinks it more deeply into the brain; portions of the brain, from the softness of its texture, rise up, and conceal the bone both from our sight and touch; whereas, if we defer the operation for a few days, we give time for the adhesive inflammation to take place; this circumscribes the depressed piece, hardens this spot of the brain, and thus enables us more easily and certainly to lay hold of the fragment of bone."

89. It sometimes happens that a fracture of the orbital plate of the frontal bone, with depression of the fractured piece, is produced by a walking cane, the point of an umbrella, or some similar instrument being thrust into the eye. A preparation of fracture from such an accident is preserved in the Museum of the College of Sur-

* Practical Precepts, p. 20.

geons, and is sometimes exhibited by Mr. Colles at his lectures. In this case the injury was inflicted by the pike end of a watchman's pole. A few days after the occurrence of such a fracture, a tumor of a discoloured appearance takes place in the upper eyelid, attended with inflammation. At length an abscess forms, and healthy matter is discharged. But, in general, the symptoms, indicative of this accident, are so obscure, as scarcely to warrant our adopting the only treatment which could possibly have a chance of saving the life of the patient, namely, the extirpation of the contents of the orbit, and removal of the depressed piece of bone.

90. Fractures of the skull, met with in military practice, present to our view numerous cases which scarcely admit of being comprehended within the tenor of any general rules and principles. The majority of gunshot fractures of the skull are fatal, because they are almost universally of the compound kind, and are rarely unaccompanied with great depression. "The difficulties of elevating or extracting the depressed portions of bone beat in upon the brain by gunshot, or the extraneous matter carried into its substance, are often very embarrassing; the ball, from the projectile force communicated to it, not only fracturing the bone, but hurrying in with it the detached piece or pieces, and jamming them under or amongst the sound parts; frequently, also, it lodges among the fractured portions; frequently it imbeds itself between the more solid osseous plates, and forms a kind of nidus in the diploe; and sometimes it drives forward into the brain itself, eluding the search of the surgeon, and subverting the theories of the physiologist.

91. "In the majority of cases, a leaden ball is

either flattened against the bone, or, if it has struck obliquely, it is cut against the unshattered edge of the cranium; and is either simply jagged, or is divided into two or more distinct parts, forming with each other various angles, influenced in their acuteness by the projectile force, the distance, obliquity, &c. It not unfrequently happens, that a perfect division of the ball takes place, and the two distinct masses lodge; or one lodges, and the other flies off; or else it takes its course through a different set of parts, or imbeds itself in a different spot from that where it originally struck.

92. "In all these cases, the removal of extraneous matters, the extraction of the fractured portions, if they lie loosely, and the elevation of the depressions, where it can be done without the infliction of additional violence, are, of course, the first steps to be taken; but instances, (particularly in the field,) will occur, where this cannot be done. The grand and leading point to be kept in view, in all cases, is the great tendency of the brain and its membranes to inflammation; the uncertain period at which it may occur; and the very doubtful consequences which may succeed its occurrence."*

93. A ball sometimes lodges in the frontal sinus, with or without fracture of the inner wall of this cavity. In cases of this description, Baron Larrey recommends exposing the course of the fracture by a free incision, and the use of the trephine for removing the extraneous body. If the inner side of the sinus be depressed, he next perforates that part of the cavity, takes away the loose pieces of bone, and lets out the extravasated blood. In one of the cases of this accident, re-

* Hennen's Military Surgery, 3d edit. p. 288.

lated by Larrey, an iron ball, weighing seven French ounces, was extracted from the frontal sinus. A considerable quantity of coagulated blood was also removed, under which the brain was found, with a depression of three or four lines in depth. The patient recovered perfectly, although the treatment appears to have been far from judicious.* There is a curious circumstance attending fractures of the frontal sinus, mentioned by Sir Astley Cooper.† When the fracture is unattended by a wound, if the nose be blown, the air escapes through the opening in the bone; and getting into the cellular membrane under the skin, renders the forehead emphysematous. But if there be an external wound, the air rushes out through it; so that, in either case, the nature of the accident may be easily ascertained.

94. The practice of trephining for the removal of balls situated near a fracture of the skull within the bony cavity, or lodged amongst the fragments, or between the two tables forced asunder, is recommended by most military surgeons of eminence. The ball is, however, sometimes lodged at such a distance from the fracture, that it cannot be extracted through any perforation made in the vicinity of the original injury. In cases of this description, Larrey was the first to advise the bold practice of making a counter-opening in the skull, at the part where the ball is, from various circumstances, supposed to be lodged. He relates the case of a soldier‡ who was struck on the middle of the forehead with a ball, which penetrated the frontal bone, and then

* Mem. de Chir. Mil. tom. 4, p. 183.

† Lectures, 2d edit. p. 128.

‡ Mem. de Chir. Mil. tom. 2, p. 139.

passed obliquely backwards between the skull and the dura mater, in the course of the great longitudinal sinus, as far as the lambdoidal suture, where it stopped. Larrey traced the course, and ascertained the situation of the ball, by the introduction of a gum-elastic catheter, introduced into the opening; and measuring the distance between the fracture and the place where he felt the ball, he cut down upon that part of the skull, beneath which he concluded that the ball was lodged. The bone was then perforated with a large trepan, the ball was extracted, and the patient recovered. In another case of Larrey's,* the ball pierced the left parietal bone, and lodged near the lambdoidal suture. Its situation was detected in the same way as the foregoing, and partly in consequence of there being a slight ecchymosis over the part. As the patient laboured under symptoms of compression, the trepan was applied, and half the ball, with a large quantity of blood, extracted. The case, although it appeared to go on well for a fortnight, terminated fatally, in consequence of the patient's being seized with what Larrey terms "hospital fever,"—but what, more probably, was inflammation and suppuration of the brain or its membranes. It is laid down as a principle, by Larrey, that, *when a ball has entered the cranium, without quitting the roof of this cavity, the case is one requiring the application of the trephine.*

95. If the longitudinal or lateral sinuses should have been laid open by a fracture, or by the surgeon in trephining, the hæmorrhage often occasions considerable alarm. It may, in most cases, be suppressed by introducing a small portion of

* Op. cit. tom. 3, p. 82.

lint into the wound of the sinus, and applying a very gentle pressure.

96. The middle artery of the dura mater is also occasionally wounded in fractures of the skull, or in trephining. The hæmorrhage may be arrested by a small plug of lint, introduced into the bleeding mouth of the vessel, or by the application of a red-hot iron probe. The latter is the plan recommended by Baron Larrey, who states that he derived the knowledge of it from his uncle, M. Larrey, of Toulouse.*

97. The limited size of this work prevents my alluding to more examples of the great variety of fractures of the skull mentioned by authors, and chiefly to be encountered by the army surgeon. The reader will consult with advantage the valuable works of Hennen and Larrey on Military Surgery, for further information on this subject. These publications contain a vast quantity of useful matter on Injuries of the Head, and a number of curious and interesting cases.

98. APHORISMS.

A simple fracture or fissure of the skull, with or without a wound of the scalp, is an accident of no great importance, and requires no attention from the surgeon, beyond the usual treatment for an injury of the head unaccompanied by fracture, except, perhaps, that the antiphlogistic regimen and evacuations are more decidedly necessary.

The danger often attending simple fractures of the skull, is to be attributed to some injury which other parts, particularly the brain, have received at the same time.

* Op. cit. tom. 2. p. 138.

Fractures of the base of the skull are attended with more danger than those of other parts, because the violence necessary to produce them must prove highly injurious to the brain.

Never make an incision into the scalp, for the purpose of ascertaining the existence of a fracture, even if you should have reason to suspect depression of the bone. Such practice is wholly unnecessary, and may be productive of bad consequences.

No calculation of the bad effects which are likely to follow depressed fractures of the skull can be made from the extent of the fracture, or the depth to which the broken piece has been sunk.

The treatment of depressed, like that of simple fractures, consists merely in a rigid attention to those measures which are best calculated to prevent inflammation of the parts within the cranium.

The trepan should never be used in depressed fractures without a wound of the integuments, unless necessary to remove *existing* symptoms of compression or inflammation of the brain. If these be present, we should trepan, even though no fracture existed.

The complication of a wound of the scalp with a depressed fracture is considered by Sir Astley Cooper, as a reason why the trephine should be immediately applied, as a preventive of future bad consequences; but perhaps the maxim, *never to trepan, till compelled to do so by urgent symptoms*, is the best general rule that can be adopted.

In comminuted fractures, always remove the loose portions of bone, as their remaining in the wound must produce inflammation.

If a small piece of bone be detached, and com-

pletely buried in the substance of the brain, perhaps it is better to wait a few days till the brain is hardened around it, than to attempt its immediate extraction.

Gun-shot fractures present so great a variety of appearances, that no general rule of practice, applicable to each individual case, can be laid down.

CHAP. V.

COMPRESSION OF THE BRAIN.

99. THIS subject may appear to some to belong more properly to the consideration of Injuries of the Brain; but, as compression is so commonly a consequence of depressed fractures, and as it cannot be considered an *organic* injury of the brain, but only causing a temporary suspension of its functions, it has appeared better to introduce it here, rather than to allot a chapter to it in the next division of our subject. Besides, the consideration of its treatment is so closely connected with that of depressed fractures, that one subject seems naturally and justly to follow the other.

100. Pressure on the brain may be produced in a variety of ways. The skull may be struck with a blunt instrument; the violence of the blow may rupture some blood-vessels within the cranium; and the extravasated blood cause symptoms of compression. We have already seen, that depressed fractures have a like effect. Foreign bodies lodged in the cranium, also operate in the same manner; and the formation of matter, in consequence of inflammation, is not an unfrequent cause of pressure on the brain.

101. It might be expected that this variety in the causes of compression should produce a corresponding variety in the symptoms. It is true,

that considerable difference does exist in the symptoms of different cases; but this difference is not to be attributed to the cause of the pressure. Those variations in the symptoms will be found to exist, where the cause of the pressure has been the same. Two men shall receive depressed fractures of the skull, yet the symptoms in both shall differ materially. This variety in the signs, coupled with the difficulty, often experienced, of distinguishing it from concussion of the brain, has involved the diagnosis of compression in considerable obscurity. However, we shall presently see, that there are some cases where we shall have little difficulty in declaring that compression of the brain actually exists.

102. Blows on the head may cause extravasation of blood in different situations. The effused fluid may lie between the dura mater and cranium; between the dura mater and arachnoid membrane; between the latter membrane and the pia mater; or, on the surface, in the ventricles, or in the substance of the brain. In the first species of extravasation, the blood is circumscribed. It may arise from a rupture of the small blood-vessels connecting the dura mater with the bone, or from the trunk or branches of the middle meningeal artery. The latter is the only case in which any considerable quantity of blood can be extravasated in this situation. Mr. Brodie* has never seen this artery lacerated, except in combination with fracture running across the bony canal in which it is lodged. Mr. Abernethy,† however, quotes two cases,—one from Mr. Hill, and the other from Latta,—in which the artery was ruptured, although no fracture existed.

* Medico-Chirurgical Transactions, vol. 14. p. 333.

† Surgical Works, vol. 2, p. 43.

103. When the blood is extravasated within the dura mater, it is diffused over the surface of the hemispheres; and, unless the quantity be considerable, it does not cause any great degree of pressure. If the blood be situated between the convolutions, it is also widely diffused; but if it be within the substance of the brain, or in the ventricles, which rarely happens, it is circumscribed. Extravasation at the base of the brain is more common than on the superior surface, and is much more dangerous, partly on account of the impossibility of removing the pressure, and partly because it is, in most cases, a consequence of a rupture of the substance of the brain.

104. The symptoms usually mentioned by authors, as diagnostic of compression of the brain, whether from extravasation, depressed fracture, or any other cause, are, pain in the head; loss of sensation; slow, labouring pulse; stertorous breathing; dilatation of the pupils; paralysis; retention, and, after some time, incontinence of urine; involuntary discharge of the fæces; and sometimes sickness and vomiting. Every variety in degree of those symptoms may be present, from slight drowsiness and head-ache, from which the patient recovers in a few hours, to complete coma, terminating in death.

105. The resemblance between these symptoms and those of concussion, and the fact that considerable depression of the bones of the skull may exist without the occurrence of any one of them, have led some writers to affirm that the symptoms are to be attributed entirely to concussion of the brain, received at the time of the accident. But a little examination into the history of cases of compression will convince us that this opinion is erroneous. We shall find that a person may

receive a blow on the head, and be so little stunned by the violence, as to be able to walk a considerable distance immediately afterwards, complaining only of slight pain in the head. In some time, however, (say an hour,) drowsiness comes on, which increases gradually, till it terminates in total insensibility. On examination of this patient after death, extravasation of blood will be found to have taken place. The circumstance of there having been no loss of sense in the first instance, and the interval which elapsed between the period of the accident and that of the occurrence of the symptoms, sufficiently demonstrate that they were the consequence of the pressure produced by the hæmorrhage, and not of the concussion.

106. Here, then, is one circumstance by which we shall be enabled to distinguish between the effects of concussion and of compression. When a man receives a blow on the head, he is, in general, stunned by the shock. From this state he sometimes recovers in a short time, while, in other instances, he remains stupid and senseless. This difference in the effects may usually be attributed to the difference in the degree of concussion of the brain. But, if he recovers his senses soon after the first effects of the violence have subsided, and afterwards gradually relapses into a drowsy condition, and finally into a state of insensibility, considerable light is thrown upon the case by their having been *an interval of sense*. That the symptoms which follow cannot arise from the concussion, is proved by the patient having recovered his senses, which he at first lost by being stunned: that the symptoms cannot be imputed to a depression of any portion of the skull is clear, because the patient would have continued senseless from the first: that the same

symptoms cannot be attributed to matter beneath the skull is certain, because the time would not have been sufficient for the formation of matter, and there have been no symptoms of inflammation of the dura mater. Here, any reflecting man must know, that hæmorrhage beneath the skull must exist; and that, in proportion as it increased after the accident, it alone has induced the bad symptoms under which the patient labours.*

107. But sometimes, and indeed in the majority of cases, we will not have the assistance of this interval of sense to guide us in our diagnosis. The extravasation is occasionally large, and made immediately on the receipt of the injury, so that all sense and motion are instantaneously lost, and never again recovered. Or, the extravasation may follow so soon after the accident, that the symptoms of the concussion may imperceptibly glide into those of compression, without any interval of sensation. In either case, we shall not be able, from a return of sensibility, to say which is the cause of the symptoms. But, when the extravasation is between the dura mater and bone, Mr. Abernethy† informs us of a method by which he says we may ascertain its existence. He states that the bone, immediately over the seat of the extravasation, will not bleed, because it no longer receives blood from the dura mater, which is the source of its chief supply. If this be true, it is a circumstance of great importance to be taken into account, when considering the propriety of applying the trephine. But may not the vascularity derived from the adjoining vessels, in the cancellated structure, cause blood

* Cooper's "First Lines."

† Surgical Works, vol. 2. p. 47.

to flow, although there may be extensive separation of the dura mater from the bone?

108. It has been already said, that the symptoms of pressure on the brain are subject to considerable variety. The *insensibility* is sometimes complete, and at other times incomplete. The patient may lie for the most part unconscious of what passes around him, but capable of being roused by stronger impressions on his senses; while, at other times, the loss of sense is so perfect, that the skin may be pinched, the flame of a candle may be held close to the eye, and the loudest voice may assail the ear, without any evident effect being produced on the sensorium. This state may continue, or the patient may again shew some signs of consciousness, and then relapse into a state of perfect stupor. It may be observed, that there is especially an increase of sensibility after blood-letting, and that, as the effect which the loss of blood has produced on the circulation subsides, so the sensibility becomes again diminished.* The loss of sensibility is sometimes only partial. Cases are related, where only one particular sense, as that of sight, was impaired by pressure on the brain; and instances of recovery from compression are not uncommon, where part of the body, as the hand or foot, has remained numb or insensible for years.

109. *The circulation* is, generally, more or less affected in compression, as is shewn by the slowness of the pulse. This slowness, however, is not constant; and sometimes, even when the other symptoms of pressure exist, there is no alteration in the pulse. Mr. Abernethy states, that the pulse is less subject to intermission in

* Brodie—Op. cit. p. 346.

cases of compression, than in concussion. But, in general, the influence of compression of the brain on the action of the heart is apparent, particularly in cases of depression of the bones of the skull, in which the pulse often rises to its natural state, on the removal of the pressure by an operation. This affection of the circulation arises, according to Mr. Brodie,* not by the pressure producing actual interruption to the action of the heart, but by causing its contractions to be either less frequent or less forcible than natural.

110. *Dilatation of the Pupils* has been mentioned as another symptom of compression, but it also is subject to considerable variation. Although the pupils are generally dilated, we shall occasionally find them contracted, and sometimes, in the same patient, one contracted, and the other dilated. Mr. Brodie† has seen the pupil dilate with the absence, and contract with the presence of light, although the patient lay in a state of complete insensibility, and did not seem to be at all conscious of the impression made on the retina. But this is rare; and, for the most part, when the other symptoms of pressure are present, the pupils are insensible and motionless. It is not uncommon for the pupils to remain for a time in a state of dilatation; then to become suddenly contracted, and, after remaining so for a longer or shorter time, to become again dilated;—these changes taking place independently of light and darkness. When the pupils are dilated, we shall find that they sometimes contract on the abstraction of blood,—the dilatation returning as soon as the immediate effects of the venesection on the circulation have subsided. Mr. Brodie‡

* Op. cit. p. 355.

† Ibid. p. 352.

‡ Ibid. p. 354.

mentions an instance, where a dilatation of one pupil continued for a year after recovery from compression of the brain. In this case, the affected eye was accompanied by a ptosis.

111. *Paralysis* is another very constant symptom of hurtful pressure on the brain; but the circumstances which determine its degree, extent, or situation, are not well understood. In most cases, it manifests itself on the opposite side of the body from that which has been injured. Desault*, however, states that, in the Hotel Dieu, extravasation has been as often known to produce paralysis of the same side as of the opposite, and that sometimes the blood was diffused generally, while the paralysis was local. The degree of the paralysis corresponds to that of the insensibility. When the latter is complete, the voluntary muscles are completely paralysed. It is to this paralysis of the muscles that we are to attribute some other symptoms of compression, viz., the *stertorous breathing*, *involuntary discharge of fæces and urine*, &c. The bladder, being incapable of contraction, becomes preternaturally distended, and the urine, continuing to be secreted, flows out. In like manner, the relaxation of the sphincter ani allows the discharge of the fæces from the rectum. Afterwards the muscles of respiration become affected also; the patient breathes with stertor, as in a most profound sleep; and the diaphragm contracts at longer and longer intervals, until respiration altogether ceases.

112. *Convulsive twitchings of the muscles* are sometimes mentioned as symptomatic of compression of the brain, but it may be doubted

* Œuvres Chirurgicales, tom. 2. p. 27.

whether we are justified in referring them to the pressure. It certainly occasionally happens, that, when paralysis occurs on one side of the body from injury of the head, those twitchings have been observed in the muscles of the opposite side; but we find the same convulsive actions take place in cases of punctured and wounded brain; and, when we have an opportunity of examining the bodies of those who have died with depression of the skull, or extravasation of blood, accompanied by those symptoms, we will always find that the injury has been complicated with a wound or laceration of the brain.

113. *Sickness and vomiting*, which are laid down by some authors as symptoms of compression, may more properly be said to be indicative of concussion. A disposition to vomit is scarcely ever present, when the pressure on the brain and the general insensibility are considerable. The correctness of this assertion is forcibly shewn by an observation of Mr. Brodie's, viz., that when he had occasion to apply the trephine, on account of a fracture and depression, and no sickness existed previously, he has sometimes known the patient become sick and vomit, immediately on the depression being elevated.*

114. We have now considered, in detail, the symptoms said to be indicative of compression. When all, or the greater part of them, are present, we may very reasonably conclude that compression exists; but the mere presence of the symptoms gives us no insight into the immediate cause of the compression (whether it be blood, a depressed fracture, or matter); into its situation; its extent; or how far it may be complicated

* Op. cit. p. 356.

with concussion. In the discovery of these circumstances, we must be principally guided by the history of the case, the part of the head which has been struck, &c. If there has been an interval of sense after the receipt of the injury, it has already been shewn, that we may conclude *extravasation* is the cause of the pressure (105). If, on examination, we find a depressed fracture, and that the symptoms have continued from the commencement, we may justly suppose, that either *depression of the bone*, or *concussion*, is the cause of those symptoms. But, if the fracture be situated about the anterior inferior angle of the parietal bone, we are not to attribute the symptoms to the pressure of the broken bone, or concussion alone, but also to *extravasation*, which is more likely to take place here, than at any other part of the skull. In fact, we can very rarely form any judgment of what proportion of the bad symptoms we are to attribute to the pressure of the bone, &c., or how far we are likely to benefit the patient by an operation. Again, if the symptoms of pressure supervene after inflammation of the dura mater or brain, their cause is to be imputed to the formation of matter.

115. Supposing that the symptoms and history of the case incline us to suspect extravasation to be present, how are we to know *where* such extravasation is situated? We have already seen (102), that blood may be effused in a variety of situations, and yet produce the same symptoms. The case in which the blood lies only on the dura mater, is almost the only one in which the application of the trephine can be useful. Mr. Abernethy's method of ascertaining the existence of blood in this situation has been alluded to above (107); but this criterion will be of no service, unless there be an external wound. The com-

mon rule in these cases is, to apply the trephine to the place where any traces of external violence appear,—the extravasation being often situated under that part of the skull which has received the blow; but if, after shaving and carefully examining the head, we find no trace of injury, the only means we have of guessing at the situation of the extravasation is from the paralysis, which is usually present. If one side of the body be more paralysed than the other, and the pupil of that side be more dilated than the opposite, we have reason to suspect that the extravasation is on that side on which there is least paralysis, and least dilatation of the pupil. But to this rule there are many exceptions (111); and few surgeons of the present day would conceive themselves justified in trephining under those circumstances.

116. As the symptoms of pressure on the brain vary in different cases, both in degree, and as they are combined with each other, so they also differ materially as to the period of their duration. Of two individuals, in whom the early symptoms appear to be equally urgent, one may die in the course of three or four hours, and the other may survive for several days: and, among those who recover, we may find some in whom the symptoms wholly subside in a few days, and others in whom some remains of them exist after the lapse of several months, or even of years.* Sir Astley Cooper† relates a very curious case of a man, who, having fallen from the yard-arm of a ship, received a slight depressed fracture of the skull. He was taken up insensible, and, during a period of *thirteen months*, he remained deprived

* Brodie, Op. cit. p. 357.

† Lectures, 2d. edit. p. 134.

of all powers of mind, volition, or sensation. At the end of this time he was trephined, and the depression elevated. The operation was the means of restoring all the functions of his mind, and almost all the powers of his body.

117. From what has been said it will be perceived, that in the treatment of compression, when the symptoms are urgent, the only hopes we can have of preserving the life of the patient rest on the possibility of our being able to remove the cause of the pressure,—to prevent its giving rise to inflammation of the brain or its membranes,—or to obviate further extravasation. When the symptoms arise from a depressed fracture, and antiphlogistic measures have failed in removing them, the treatment is simple, and has been fully considered in the last chapter. We must elevate the depression, and give exit to extravasated blood, if it should be present. But if there be no fracture, and we have reason to suspect that it is extravasation which is the cause of the symptoms, the case is to be considered as one of greater danger, in proportion to the difficulty of ascertaining the seat of the extravasation, and of removing the effused blood. Our treatment, then, in the first instance, will consist in little more than free depletion, the application of cold lotions to the head, and a strict antiphlogistic regimen. Irritation must be lessened, the bowels well opened by purgative glysters, and perfect rest enjoined. By these means, we shall often succeed in preventing further extravasation, and in removing symptoms which at first produced considerable alarm.

118. But when the patient lies in a state of stupor, with stertorous breathing, this treatment will not be sufficient. Our only resource, then, is the trephine, and even this will seldom be of

service, unless the cause of the pressure be external to the dura mater; and of this we cannot often have any certainty. In applying the trephine on account of a fracture with depression, the removal of a small piece of bone is generally sufficient; and there is, indeed, no good reason for removing any considerable portion of the cranium. But, in resorting to the application of the instrument, with a view to removing an extravasation of blood on the surface of the dura mater, our practice should be different. The bone should be removed extensively, so as to expose at all events a large portion of the surface of the dura mater, in which the extravasation has taken place. Mr. Brodie was led to make this remark, by a case in which this rule was neglected, and in which the patient died; and he is of opinion, that, if a larger opening had been made in the cranium in the first instance, the patient's life might have been saved.* The peculiar circumstances of each individual case must regulate the practitioner as to the size of the opening. At all events, such an opening must be made as will provide for the free discharge of the blood at present, and of matter in future, should suppuration of the dura mater afterwards take place.

119. But by far the most common cause of compression is extravasation *within* the cavity of the dura mater. Here, if there be any collection of blood into one mass, which is seldom the case, it is generally at the base of the brain, or in its substance. In either case, an operation is of no use. We may, indeed, regard it as a general rule, that *an operation is not applicable to cases of compression of the brain from internal extravasa-*

* Op. cit. p. 387.

tion. But it is barely possible that the extravasation may exist on the superior surface of the brain, immediately under the dura mater; and it is said that such extravasation may be suspected, if, when the dura mater has been exposed by the trephine, it appears of a blue colour, lifted up and bulging into the opening of the cranium. This test, however, is considered by Mr. Colles and other eminent surgeons, to be very fallacious. According to them, the protrusion of the dura mater into the trepan-hole is no indication whatever that extravasation exists underneath. Nay, Mr. Colles goes so far as to assert, that he has seen cases in which the dura mater appeared *depressed*, on removing a portion of the cranium, and in those cases considerable extravasation was found beneath this membrane. Mr. Brodie* relates two cases in which the dura mater was cautiously opened with a lancet, in consequence of its presenting the appearance mentioned above. The incisions gave exit to a quantity of fluid blood, and both patients recovered. But cases such as these are extremely rare, and are to be regarded as out of the common course of events. In general, an incision into the dura mater, when blood is effused underneath, will only give vent to a small quantity of serum,—as an effectual discharge of the blood can hardly be expected in this situation, being always widely diffused, and in the great majority of instances coagulated.

120. APHORISMS.

Compression of the brain may be produced in different ways,—by depressed fracture, extrava-

* Op. cit. p. 389.

sation, &c.,—but the nature or degree of the symptoms gives us no insight into the cause of the compression.

The symptoms of compression very nearly resemble those of most cases of concussion, and we have then no means of distinguishing the two affections, but by the history of the case.

Those symptoms are—loss of sense and voluntary motion, stertorous breathing, slow, labouring pulse, involuntary discharge of fæces and urine, &c.

The intensity or duration of the symptoms is by no means proportioned to the violence of the blow, or the severity of the injury.

When extravasation takes place, the blood is generally situated *within* the cavity of the dura mater, and consequently out of the reach of the trephine.

The recollection of this fact should make us very cautious in the application of the trephine, *till all other means of relieving the patient have failed.*

The antiphlogistic treatment is decidedly indicated, and must be rigorously followed. Blood must be freely taken, the bowels emptied by purgative injections, and perfect rest enjoined.

If these means should fail, and the symptoms continue or increase, we may, as the last chance which the patient has for his life, apply the trephine, with the faint hope of finding blood extravasated between the dura mater and bone.

THIRD DIVISION.

EFFECTS OF EXTERNAL VIOLENCE ON THE BRAIN AND ITS MEMBRANES.

Under this head we shall consider, Concussion of the Brain,—Wounds of the Brain and its Membranes,—Inflammation and Suppuration beneath the Cranium, &c.

CHAP. VI.

CONCUSSION OF THE BRAIN.

121. It will not be necessary to detain the reader very long on this subject, as the symptoms in general very nearly resemble those of compression, already considered in the last chapter. However, as we shall meet with some few cases of concussion in which the symptoms are remarkably different from the symptoms of compression, and in which the nature of the injury done to the brain is more manifest, it will be proper to devote some attention to this part of our subject.

122. In the first place, let us inquire what is meant by a *concussion or commotion of the brain*; and how far we are acquainted with the actual state of the organ which gives rise to the symptoms. Many persons, meeting with a case of in-

jury of the head, in which no signs of fracture or external wound appear, content themselves with setting it down at once as a case of concussion of the brain, without ever dreaming of what the nature of the injury is, which they thus designate. The opinions of authors on this point are, for the most part, vague and unsatisfactory. Le Dran ascribes the symptoms to the vessels of the brain being deprived of their elasticity by the shock which the organ has sustained, and thrown into a state of torpor, which suspends in them the progress of the circulation: Dease is also of opinion, that the delicate vessels of the pia mater suffer so much by the shock, as to be rendered incapable of continuing the circulation, and that of course obstruction takes place: Sir Astley Cooper says that the shock produces a change in the circulation of the brain, and, in the more severe instances, laceration of its substance: and Desault attributes the symptoms to a general contusion and irritation of the brain, and consequent increased determination of blood, giving rise to inflammation.

123. Dissection of those who have died of concussion has not satisfactorily shewn what is the proximate cause of the symptoms. The brain, in general, does not present any visible marks of disorganization. "We are not, however, justified," says Mr. Brodie, "in the conclusion, that there is therefore, in reality, no organic injury; and, if we consider that the ultimate structure of the brain is on so minute a scale that our senses are incapable of detecting it, it is evident that there may be changes and alterations of structure which our senses are incapable of detecting also." Mr. Colles states, as the result of his dissections, that the only remarkable appearance of the brain which presents itself is, that the organ seems not

to fill the cranium completely. We must trust to future dissections and observations for the further elucidation of this subject.

124. I have already said, that the symptoms of most cases of concussion closely resemble those of compression. The chief circumstances in which they will be found on close attention to differ, are the following. In concussion, unless the injury be very severe, the insensibility is not so complete as in compression. The patient is capable of being roused,—will give incoherent or peevish answers to questions proposed to him, as if awakened from a sound sleep, and will again relapse into a state of stupor. Sickness and vomiting, which are rare in cases of compression, are among the most constant early symptoms of concussion. The pupils are not so constantly dilated in the latter affection: they are sometimes contracted, sometimes perfectly natural, and occasionally they contract on exposure to light. The respiration is generally tranquil and natural, but sometimes stertorous as in compression. The pulse is not so slow as in compression: in some cases, it is at first intermitting, irregular, feeble, and scarcely perceptible, and the patient is in a condition approaching that of syncope. When some degree of re-action takes place, it becomes slower, fuller, harder, and more regular. But this condition of the pulse continues only while the patient is at rest; for, on his making the slightest exertion, it immediately becomes very quick, sometimes beating as much as 130 in a minute. This is regarded by Sir Astley Cooper as a never-failing symptom, and a sure characteristic of concussion. The same author also remarks, that in concussion there is generally violent pulsation of the carotids, and this too he

looks on as a good diagnostic symptom.* Complete paralysis is a rare attendant on concussion, and is never so well marked as in compression. In some cases, we will find the muscles even more rigid than natural.

125. But, in some instances of concussion, few or none of the above symptoms are present, and the patient is affected in a manner very different from what has been described. He is not insensible; is constantly watchful, and gets no sleep: he has a wild look; talks much, and very inconsistently: his pulse is hard, and more than ordinarily quick: he has a slight degree of fever, and sometimes an inclination to vomit: his eye very much resembles that of a person who has long watched through apprehension and anxiety: if not restrained, he will frequently get out of bed, and act with a kind of frantic absurdity, appearing in general much hurt by a strong light. "A debility of understanding,—an idiot look,—a failure of memory,—a paralytic affection of some one part or limb,—the loss of sense,—spasm,—resolution of some one part or muscle,—are often the consequence of it."† These are the cases in which we shall be in no danger of confounding this affection of the brain with compression.

126. Mr. Abernethy has done much towards removing the difficulty and perplexity of this subject, by dividing concussion into three stages, viz.: 1. The stage of depression; 2. That of re-action; and, 3. Inflammation of the brain. "The *first* is that state of insensibility and derangement of the bodily powers which immediately succeed the accident. While it lasts, the patient scarcely feels any injury that may be inflicted on him. His breathing is difficult, but in

* Lectures, 2d. edit, p. 116.

† Pott.

general without stertor; his pulse intermitting, and his extremities cold. But such a state cannot last long; it goes off gradually, and is succeeded by another, which I consider as the *second* stage of concussion. In this, the pulse and respiration become better, and, though not regularly performed, are sufficient to maintain life, and to diffuse warmth over the extreme parts of the body. The feeling of the patient is now so far restored, that he is sensible if his skin be pinched; but he lies stupid, and inattentive to slight external impressions. As the effects of concussion diminish, he becomes capable of replying to questions put to him in a loud tone of voice, especially when they refer to his chief suffering at the time, as pain in the head, &c.; otherwise, he answers incoherently, and as if his attention could not be excited, or was occupied by something else: he is, in short, like a man in a heavy sleep. The concussion of the brain, lastly, produces a state of inflammation of the organ, and this constitutes the *third* stage, which is the most important of the series of effects proceeding from this cause. These several stages vary considerably in their degree and duration; but more or less of each will be found to take place, in every instance where the brain has been violently shaken. Whether they bear any certain proportion to each other or not, I do not know. Indeed, this will depend upon such a variety of circumstances in the constitution, the injury, and the after-treatment, that it must be difficult to determine.”*

127. A man, labouring under concussion or compression, very often nearly resembles one in a state of intoxication; and this resemblance is

* Abernethy's Surgical Works, vol. 2. p. 83.

sometimes so close, as to render it extremely difficult to distinguish between the two affections. We may be required to see a patient, who, we are told, has received a severe injury of the head. We may find him with an extensive laceration of the scalp, together with stupor, and sometimes even stertorous breathing. Not knowing that the individual was intoxicated at the time of receiving the injury, we would be inclined to attribute those symptoms to concussion or compression; when, after a few hours, the man, to our surprise, recovers from his drunken fit, and it becomes apparent that he received no other mischief than a wound of the scalp.* We should, therefore, particularly inquire into every circumstance connected with the accident at the time of its occurrence, before we venture to pronounce our diagnosis.

128. Memory, and the other faculties of the mind, as well as the senses, often remain considerably impaired after recovery from concussion. It is not uncommon for a patient to lose all recollection of recent events, while the scenes of his infancy still remain vividly impressed on his memory. The contrary, likewise, sometimes obtains: early recollections are effaced for ever, and impressions made on the mind immediately preceding the injury only remain. Numerous instances are on record, in which some patients have lost all knowledge of foreign languages, that they may have recently learned; others, all recollection of persons; others, of places, &c. The sight and hearing of persons who have suffered concussion of the brain, are sometimes much injured, and occasionally irrecoverably lost. Various

* Sir A. Cooper.

other equally curious consequences of concussion are related by authors, but it is unnecessary to introduce them here.*

129. The prognosis, in cases of violent concussion, must be always unfavourable. Death is not unusually the unavoidable consequence of such a severe injury, and we know of no means of re-establishing the functions of the brain. When the shock has been very considerable, the patient sometimes dies in the first stage. There is no reaction; the pulse becomes more and more feeble, more irregular, and intermittent; the extremities grow colder; and, at last, the action of the heart having altogether ceased, the patient expires. In some cases, even after reaction has commenced, it seems as if the constitution was unequal to the effort; and this is manifested by another failure of the circulation, the result of which is the same as if the patient had never rallied from the beginning.† Mr. Brodie thinks, in those cases in which concussion proves fatal, that disturbance of the heart's action is the immediate cause of death.

130. The treatment of concussion must be regulated according to the length of time which has elapsed since the receipt of the injury, and the state in which we find the patient. In the first stage, it would appear that very little could be done. It would be highly improper to bleed in this stage, while the patient is labouring under depression of all his vital powers. The practice of giving the more powerful stimulants,—such as brandy, wine, ammonia, &c.,—is also very objectionable, as they will have a tendency to increase the inflammation which is likely, sooner

* See Desault's *Œuvres Chirurgicales*, tom. 2. pp. 60, 61.

† Mr. Brodie.

or later, to ensue. The application of warmth to the extremities and surface of the body will, in most cases, be found sufficient, and its operation may be assisted by friction with woollen cloths. If these measures should not be successful, and the insensibility and appearance of syncope continue, a terebinthinate or foetid enema is probably the best stimulant we can have recourse to.

131. But when re-action has commenced, which may be known by the return of heat to the surface of the body, and by an increase in the strength of the pulse, the only treatment which it would be proper to pursue is that which has already been so strongly insisted on as applicable to compression; namely, copious bleeding, and other antiphlogistic measures. The free use of the lancet, as almost the only means of preventing inflammation, is recommended by all good surgeons. The local abstraction of blood, by leeches or cupping, must not be neglected; and very cold water, or evaporating lotions, must be constantly kept to the head. As the stomach is generally in a very irritable state, the patient will seldom bear the exhibition of purgative medicines. However, in those cases in which the stomach will retain them, it will be proper to administer them; and, in general, they must be of the most active description, on account of the torpor of the intestinal canal. A bolus of calomel and jalap, in the proportion of four or five grains of the former to fifteen or twenty of the latter, may be given; or the calomel may be administered alone, and followed in three hours by a draught, containing two ounces of infusion of senna, and three drachms of Epsom Salt. This draught may be repeated every second or third

hour, till the bowels are well freed. If the medicines should be rejected by the stomach, we must keep the bowels well opened with cathartic enemata. After local and general bleeding have been freely practised, and the bowels emptied, blisters to the scalp and nape of the neck are frequently very useful in preventing or lessening the tendency to inflammation of the brain and its membranes. In very young children, it often happens that bleeding from the arm cannot be practised. In such cases, Sir Astley Cooper recommends opening the jugular vein,—the application of leeches to the head,—and the exhibition of calomel, with ascendent drinks, so as to procure evacuations from the bowels. Bromfield was of opinion, that obstruction in the capillaries, or extravasation of the circulating fluids, is to be suspected in concussion; and that bleeding *ad deliquium* (so much recommended by those who thought that inflammation proceeded from obstruction kept up by plethora,) was not attended with success. He recommends strongly, large quantities of diaphoretics in which *opium* is a principal ingredient, so as to keep up a gentle action on the skin until the patient is out of danger. He says he has experienced the happy effects of this mode of treatment, even in *fracture*, without the operation of the trepan. He adopts this method on the supposition, that inflammations are often caused by spasm. It is hardly necessary to state that this practice is never followed by modern surgeons.

132. For the relief of certain symptoms frequently remaining after concussion,—as pain in the head, vertigo, dimness of sight, deafness, &c.,—Sir Astley Cooper directs the head to be washed with spirit of wine and water, or he recommends

the use of the shower-bath. Sometimes he orders the ointment of cantharides to be rubbed on the head, and the blue pill with extract of colocynth to be given. In case of nervous debility of an organ, *electricity* is sometimes useful; and occasionally, in long-continued pains in the head, he forms an issue in the scalp, as benefit sometimes results even from slight exfoliations.

133. APHORISMS.

A concussion of the brain means merely an injury in which the brain is violently shaken, and in which the organ is sometimes lacerated, but in general affected in such a manner as to afford, on dissection, no satisfactory information respecting the nature of the injury.

The symptoms of concussion are, for the most part, the same as those of compression, and differ from them only in degree. There are a few cases, however, in which the symptoms are very different, and in these the diagnosis is easy.

In such cases, the patient is not comatose; he has a wild look; is very talkative; has some fever; his pulse is hard and quick; he has intolerance of light, and some inclination to vomit.

Be always careful not to mistake intoxication for concussion or compression of the brain, lest you should be led to adopt a practice unnecessary or injurious.

The faculties of the mind are more or less injured by severe concussion of the brain; so that, in the most favourable cases, you are not too confidently to reckon on complete recovery.

Concussion is divided by Mr. Abernethy into three stages: 1. The stage of *depression* of the vital powers, immediately following the receipt

of the injury; 2. The stage of *re-action*; and,
3. The stage of inflammation or *phrenitis*.

The treatment of concussion will be different, according to the stage in which you find the patient. In the first stage, perhaps, the less that is done, the better; in the second, bleed and purge, to *prevent* inflammation; in the third, deplete, to *subdue* inflammation.

CHAP. VII.

WOUNDS OF THE BRAIN AND ITS MEMBRANES. FUNGUS OF THE BRAIN.

134. ALTHOUGH wounds of the brain and its membranes very much increase the danger to be apprehended from injuries of the head, yet they do not materially add to the symptoms which immediately follow the accident. It is only when the period of inflammation has arrived, that the marks of wounded brain, or punctured or lacerated dura mater, shew themselves. The latter membrane is the only one of the membranes of the brain which can be said to afford any symptoms of injury. The pia mater and arachnoid membrane are so thin and delicate, and so intimately connected with each other, and with the brain itself, that we cannot conceive them to be wounded without the brain being wounded also. We have, therefore, no symptoms by which we can distinguish wounds of those membranes from similar injuries of the brain,—nor, indeed, would our being able to do so be a matter of any consequence.

135. Wounds of the brain will often happen, without producing any interruption to the operations either of body or mind. But, should the wound be accompanied by either concussion or

compression, then the particular symptoms which characterize these injuries will be present. If, however, the wound be a simple incision or laceration, it will often prove quite harmless. Epileptic fits and herniplegia certainly sometimes follow, as effects of such injuries; but, on the other hand, considerable portions of the brain have been lost, apparently without having been succeeded by disturbance of either the mental or bodily functions. Numerous cases of this description are already before the public, and similar ones have fallen under the observation of almost every surgeon.

136. This fact may seem extraordinary to some who have been in the habit of considering the brain as the centre of life and motion,—the grand organ of sensation and volition; and to whom the destruction of the smallest portion of this all-important part would seem to involve the consequent necessary destruction of life, or at least of some particular function. It is true, that the researches of modern science have demonstrated that the brain is composed of various organs, intended to exercise very different functions; and the division of the substance of the brain, made by the hand of the physiologist, produces very different effects, according as it detaches one or another of these organs from the rest of the nervous system. But those distinct results, which are obtained with difficulty in *experimental physiology*, are not met with in *accidental wounds*. The symptoms produced by the latter are always liable to be complicated with those of concussion, and, in a great number of instances, are also complicated with those of compression of the brain. *Accidental* wounds rarely affect the cerebellum and medulla oblongata, or even the more deep-seated and important parts of the cerebrum;

and, with respect to wounds of the cerebrum, such as are commonly met with, even without the complications produced by concussion, depression of bone, or extravasated blood, we find their effects to be so different in different cases, that they do not admit of being reduced to any general rule; and no data, which we have hitherto obtained, will enable us to predict the exact consequences to be produced by a wound of a given extent, or occurring in a given situation.*

137. Perhaps the most striking illustration of the truth of this remark may be had from contrasting two cases, related, one by Morgagni,† the other by Dr. Hennen.‡ In the first of these cases, a man received a punctured wound from a sharp instrument, which passed between the eye and the roof of the orbit, penetrating through the latter into the substance of the cerebrum, to within a finger's breadth of the lateral ventricle. In the second case, the extremity of a ramrod entered the cranium, immediately below the nasal process of the frontal bone, and penetrated one inch into the anterior lobe of the left hemisphere of the brain. In each of these cases, the wound was of the same kind, and very nearly in the same situation; but in one of them it was considerably deeper than in the other. It might well be supposed that there would have been some correspondence in the effects produced; but what were the actual results? In Dr. Hennen's case, where the injury was the slighter, the patient was instantaneously deprived of life; while in Morgagni's case, where the injury was greater, there were no immediate symptoms

* Brodie—*Medico-Chir. Trans.* vol. 14. p. 359.

† Letter 51. a. 57.

‡ *Military Surgery*, 3d edit. p. 289.

whatever, and the patient seemed as if nothing unusual had occurred, until the end of the third day, when suppuration was established. Larrey relates a very extraordinary case, in which a ramrod had actually passed through the frontal bone, between the hemispheres of the brain, through the thick part of the sphenoid bone, and through the condyloid foramen of the occipital bone, without injuring any important organ! The patient survived till the second day.*

138. The records of military surgery afford numerous instances of balls, and other foreign bodies, remaining lodged in the brain for a considerable length of time without producing death, and sometimes without any symptoms by which we might suspect their presence. Several very curious cases of this description are contained in Dr. Hennen's Military Surgery, which the reader will do well to consult. In other cases, where foreign bodies remain lodged in the brain, the patient, although he may recover from the immediate effects of the accident, yet imperfection of one or more senses,—paralytic affections of one or more limbs,—convulsive twitchings of the muscles,—epilepsy, &c.,—may supervene, and continue for life.

139. The danger attending wounds of the brain (if death should not immediately follow the receipt of the injury,) arises principally from two causes; viz., inflammation, and the formation of fungus; but both of these may be often prevented or subdued, by prompt and scientific treatment. When the brain receives a wound, we must commence our curative measures by abstracting as large a quantity of blood from the system, as the constitution of the patient will

* Memoires de Chirurgie Militaire, tom. 3. p. 314.

bear; not, however, to such an extent as to prevent the restorative operations of nature. This must be followed by the other active means of preventing inflammation, already so often detailed.

140. The wound of the brain or its membranes may have been caused by splinters of bone which have penetrated into its substance. If these splinters can be extracted with perfect facility, and without the smallest additional disturbance to the injured organ, there can be no doubt as to the propriety of removing them. Such removal cannot be improper, and may probably be useful. But are we authorized in removing such splinters in all cases, even though there should be an obstacle to their easy extraction? I have already given Mr. Colles's opinion on this subject, when speaking of depressed fractures (88). The fact that splinters of bone, balls, and other foreign bodies, have remained for months, nay, years, lodged in the substance of the brain, has convinced other surgeons, and, amongst them, Mr. Brodie,* that it is better to leave the patient to take his chance with the splinters, &c., lodged in his brain, than to commit the least additional violence in an endeavour to remove them. Nevertheless, there are not wanting surgeons of acknowledged skill and experience, who espouse a different opinion, and contend that, where splinters of bone are lodged, we should in all cases attempt their extraction.† Perhaps, after

* Medico-Chir. Trans. vol. 14. p. 414.

† A gentleman, remarkable for professional talent and industry, and of considerable experience, to whom I applied for an opinion relative to Mr. Colles's practice in these cases, of allowing the foreign body to remain in the brain till the adhesive inflammation has circumscribed it, replies:

"In Mr. Colles's 'Precepts,' it is implied that the '*bit of bone*' may be *seen* previously to the attempt at removal; for he

all, no rule, applicable to every case, can be safely laid down. Mr. Brodie's observations on this subject are so much to the point, that I shall transcribe them in his own words. "If the foreign body be of such a figure and dimensions, and so situated, that, while one extremity of it is enclosed within the cavity of the cranium, the other extremity projects externally, it may, of course, be extracted, and probably ought to be extracted, at all risks. But, with respect to a musket ball or pistol bullet lodged in the brain, it may be observed, first, that it rarely happens that it can be discovered and extracted, even by the lightest and most practised hand, without such a degree of violence as must be in itself sufficient to produce a train of evils, which, in all probability, would terminate in death; and, secondly, that there are numerous instances of per-

says (p. 20), 'If we attempt to seize the depressed fragment, the first touch of the forceps sinks it more deeply into the brain; portions of the brain, from the softness of its texture, rise up, and conceal the bone, both from our *sight* and touch.'

"Mr. Colles appears to argue upon the certainty of failure, and not on the probability of success of the operation. Surely the surgeon should seize and remove the portion of bone with the forceps, if seen, and not sink it more deeply into the brain. If concealed by the brain, we should recollect that the bit of bone is not of such an innocent character as a leaden bullet, the extraction of which, Mr. Brodie suggests as a general rule, should not be attempted, if its removal add, in any degree, to the mischief already done.

"If we allow a fragment of wood, or splinter of bone, to remain in the soft parts '*for a few days*,' will we not have, as the necessary consequence of such practice, irritation, inflammation, and suppuration? Can we say of the wounded membranes of the brain, and of this organ itself, that the presence of a most irritating foreign body, which excites even in common structures the suppurative process, shall not produce in those highly vascular parts considerable, diffuse, and *suppurative* inflammation?"

The same opinions are supported by Mr. Hargrave, in his valuable little work on Operative Surgery, p. 506.

sons who have recovered, although the ball was allowed to remain in the brain; some of whom have suffered no more than they would have suffered from its being lodged in a less important part of the body. Taking all these things into consideration, ought we not to regard it as the general rule, that the extraction of a ball should not be attempted,—an exception to the rule being made only in those cases in which, from its more superficial situation and other circumstances, the extraction can be easily accomplished without the employment of force, and without adding, in any degree, to the mischief already done?"

141. But, although we should succeed in preventing inflammation, *fungus* or *hernia cerebri* may still spring up. The fungus generally begins to make its appearance some days after the receipt of the wound, and after the divided parts have begun to unite by means of the adhesive inflammation. What is called *fungus* sometimes consists of portions of the brain itself, unchanged in appearance; sometimes it occurs in consequence of a morbid alteration of the brain, which protrudes like a bloody coagulum, arising from a ruptured vessel, or else pushes forth a new product, easily separable by the knife, and quickly renewed, like fungous growth in other parts; sometimes it proceeds from a gradual but extensive breaking down of the brain into a bloody, pulpy mass, which appears to issue forth by its own fluidity; and often it may be considered as nothing more than the formation of granulations, which grow in a very exuberant manner,—protrude through the opening in the skull, whether it has been made by accident or the trephine,—and sometimes attain considerable magnitude. Mr. Abernethy considers it to be almost always no more than coagulated blood. Whatever be

the nature of this fungus, if its growth be not prevented or restrained, there will be violent irritation of the constitution, and the life of the patient will be in considerable danger. Various means have been suggested by authors of repressing fungus of the brain, and preventing its increase. Some recommend the application of escharotics; others, including the tumor in a ligature, and allowing it to slough away; others, removing it by the knife, &c., &c. Sir Astley Cooper strongly recommends the following plan of treatment: "You are to apply to the fungus a piece of lint wetted with *liquor calcis*, and, over this, strapping of adhesive plaster: when you examine the part on the following day, you will find the fungus considerably diminished: you are then to use a thicker piece of lint, and the strapping as before: pursuing this plan, you at length get the fungus to the level of the scalp; but this is not sufficiently low for your purpose; therefore, you must still thicken the lint, until you have succeeded in getting it even with the edges of the dura mater, in which position it must be cautiously preserved; when, at last, the dura mater heals over it, and your object is accomplished. Formerly it was the practice, in the treatment of these diseases, to remove the bone contiguous to the fungus: immense quantities of bone in this manner were taken away, thereby affording every facility to the growth of the fungus, and which, of course, rapidly increased, until the patient was destroyed. *By such treatment as this, no person could possibly recover: the method was a most injurious and stupid one*; therefore, let me caution you against adopting it. The plan of treatment which I have just recommended to you is, unquestionably, the

best, viz., that of repressing the growth of the fungus until the dura mater heals over it.”*
 142. Mr. Abernethy,† in slight cases, recommends the tumor to be covered with some mild dressing, *carefully avoiding all pressure*, which, he says, both reason and experience shew, is likely to be attended with bad consequences. Should the bulk of the tumor, however, become inconvenient, or render pressure from the dressings unavoidable, the practice which he thinks would be most successful, consists in occasionally paring off the tumor with a knife. In still worse cases, where bad symptoms apparently arise from irritation and pressure made on the brain, he says that the obvious mode of relief appears to be, *to enlarge the opening in the bone*, in proportion to the extent and increase of the tumor; and thus leave room for the escape of fluid collected within the cranium, to the pressure of which he attributes the unfavourable symptoms. This method of treatment, it will be seen, is diametrically opposed to that of Sir Astley Cooper, already detailed.

143. Dr. Hennen‡ steers a middle course. “The mildest dressings,” says he; “the cautious employment of pressure; supporting the parts as much as possible, by the approximation of the edges of the scalp; and avoiding every species of stimulus,—are the means that I would recommend in these cases, in which, independent of the protrusion, there is often a serious injury of the entire mass of the cerebrum. Some surgeons have ventured on the use of escharotics; but I have generally seen their employment succeeded

* Lectures, 2d edit. p. 137.

† Surgical Works, vol. 2. p. 60.

‡ Military Surgery, 3d edit. p. 319.

by a great aggravation of the symptoms." Mr. Colles, with Dease, seems disposed to hold all the different methods of treatment which have been recommended for this affection, in pretty equal estimation. He disposes of the subject in one short, pithy sentence: "When fungus of the brain shoots up, pressure will not restrain it; removing it by ligature is ineffectual; by incision is mortal."* This opinion, however, may be looked on as a little too sweeping; for it is notorious that several cases, which have been subjected to each of the above plans of treatment, have, nevertheless, not terminated fatally.

144. The majority of the cases of fungus of the brain, however, may be considered as likely to end unfavourably; and perhaps it is not very material which of the above modes of treatment we pursue. Nevertheless, as it is an object of the greatest importance with us to prevent all irritation and danger of inflammation of the brain, which might be excited or increased by the more violent practice recommended by Sir Astley Cooper or Mr. Abernethy, we may look upon Dr. Hennen's treatment as worthy of being followed in most instances, being the mildest and least likely to be productive of bad consequences. If it should not be found to succeed,—the fungus continuing to increase in size, while the constitutional symptoms are aggravated,—the surgeon will, under the circumstances, be justified in adopting whichever of the other modes of treatment above described he may deem most applicable to each individual case.

145. APHORISMS.

Wounds of the brain and its membranes produce no immediate constitutional symptoms, by

* Practical Precepts, p. 17.

which we could recognize their existence, unless complicated with concussion or compression.

Incised and lacerated wounds of the brain may be inflicted, without producing any derangement of the faculties of either body or mind.

The chief danger to be apprehended from such wounds of the brain is from the occurrence of inflammation, which must inevitably ensue to a greater or lesser degree.

In the treatment, therefore, our object is to prevent the inflammation from running too high; and, with this view, wounds of the brain must be treated on the same principles that regulate our practice in the treatment of other injuries of the head.

There is another formidable consequence of wounds of the brain or its membranes, namely, protrusion of the substance of the brain,—either alone, or mixed with coagulated blood,—called by authors *hernia cerebri*, *fungus cerebri*, &c.

For the removal of this dangerous complication, various remedies have been proposed and tried; viz., escharotics, ligature, pressure, the knife, &c., which, however, will seldom be effectual in restraining the growth of the tumor.

The danger, in cases of wounded brain, is generally in proportion to the degree of concussion with which the wound is complicated, and the part of the brain injured. Wounds of the cerebellum, and of the posterior lobes of the cerebrum, are, *cæteris paribus*, more dangerous than wounds of the anterior lobes.

The prognosis, in all cases of wounded brain, must be unfavourable, both on account of the shock which the organ generally receives on the occurrence of the injury, and also because we can never say to what height the subsequent inflammation may rise.

CHAP. VIII.

INFLAMMATION AND SUPPURATION WITHIN THE CRANIUM.

146. UNDER this head have been classed two separate and distinct affections, viz., 1. The inflammation of the brain and its membranes which follows immediately or very soon after the receipt of the injury, and from the commencement is manifested by symptoms, which are nearly the same as those of idiopathic phrenitis; and, 2. That slow suppuration which sometimes takes place between the dura mater and skull; sometimes between the latter membrane and the pia mater; sometimes between the brain and pia mater; and sometimes in the substance of the brain itself; and which affords no symptoms by which we can ascertain its existence, till the pressure on the brain, produced by the formation of matter, leaves us no room to doubt of its occurrence. The first of these affections is considered by some as depending on inflammation of the *pia mater*; while the latter is ascribed, by Pott and other surgeons, to inflammation of the *dura mater*.

147. Phrenitis from injury of the head is divided by Desault* into two kinds, the phlegmonous

* Œuvres Chirurgicales, tom. 2. p. 69.

and the bilious. The first is described as being attended with hardness, frequency, and strength of the pulse; slow, full respiration; little or no sleep; redness of the tongue; animation of the countenance; excessive sensibility of the retina to the impression of the light; contraction of the pupils; a full and wild appearance of the eyes; an acute throbbing pain in the head; general heat of the body; absence of all marks of gastric disorder; and, after a time, vertigo, loss of sense, delirium, coma, and convulsions.

148. In the bilious phrenitis, on the contrary, Desault represents the pulse as being contracted, frequent, and small; the fever characterized by a dull pain in the head; dryness and burning heat of the skin; yellowness of the face and eyes; bitterness in the mouth; nausea; bilious vomitings; clammy, furred tongue; heaviness, pain, and tension in the region of the liver; deep yellow stools; frothy, greasy, saffron-coloured urine; a variety of gastric complaints; and (as in the preceding case,) delirium, loss of sense, &c., though in a less remarkable degree.

149. According to Mr. Abernethy,* the inflammation will vary in degree, according as it is confined to the surface, or extends to the internal parts; as it produces a greater or smaller secretion of fluid which compresses the brain; or as it is more or less blended with the effects of concussion. The state of the patient will vary considerably under these different circumstances. If the inflammation be violent and general, the patient will be irrational and disturbed, having his mind strongly affected by wrong ideas, and endeavouring to act in conformity with them. If the inflammation be moderate, and affect the

* Surgical Works, vol. 2. p. 98.

surface only, he will be irrational, uneasy, restless, and perhaps endeavour to get out of bed, but without the violence of mania. Should a moderate inflammation be blended with the effects of concussion, he will have less appearance of irrationality, will be pretty quiet, and inattentive to slight impressions.

150. Inflammation of the brain and its membranes is a case that generally requires a very free use of the lancet; and the operation is to be more or less frequently repeated, according to the patient's strength, and the state of the symptoms. There is an advantage in taking blood from the temporal artery; or, in conjunction with venesection, blood may be drawn from the scalp by means of leeches, or cupping-glasses. Unless vomiting be a prominent symptom, the skin ought to be kept moist with antimonials, which should be given in nauseating doses, so as to have the effect of suddenly lessening the impetus of the circulation. Counter-irritation should be excited, by the application of blisters to the scalp and nape of the neck. Laxative glysters, and saline purgatives should be administered. Acidulated drinks may be given; the diet must be strictly antiphlogistic; and perfect rest must be observed. In the bilious form of the disease, Desault trusted chiefly to the efficacy of procuring evacuations, by exhibiting tartar-emetic in repeated doses; and he thought bleeding improper.

151. The above will be sufficient to give the reader a proper idea of the manner in which acute inflammation of the brain is to be treated. It is a disease in which the symptoms are generally so marked, and the principles of treatment so obvious, that no more need be said on the subject. But the other affection to which I have

alluded (146) is of more importance, and one in which the constant and watchful care of the surgeon is more requisite, inasmuch as it is more insidious in its advances, and is sometimes not even suspected till the life of the patient is placed in the most imminent danger, either from the pressure produced by the matter, or from its irritating the adjoining portions of the brain, and giving rise to diffuse inflammation along its surface. Hence, we should be particularly careful to use every means in our power to guard against, or ward off, this most dangerous and often fatal disease.

152. To give rise to this slow inflammation and suppuration of the parts within the skull, it is by no means necessary that the patient shall have received a fracture of the bones, or even a *wound* of the integuments of the cranium; for suppuration has followed injuries of the head in which no such accident has occurred, and where the symptoms, even of concussion, have been very trifling and transitory. A slight blow, or fall on the head, is, in some instances, sufficient to produce this consequence.

153. Many authors, particularly Pott and Le Dran, have believed that the alarming symptoms which sometimes follow wounds of the scalp, where the cranium suffers contusion or division of its external table, proceed, in all cases, from the injury sustained by the vessels connecting the pericranium and dura mater, by which the latter membrane is detached from the skull; and that into the receptacle thus formed, matter is secreted. But this opinion does not appear to be well grounded; for it has been the practice of surgeons, for many ages, to form issues over the sutures with the actual cautery in many diseases of the head, and yet we do not find in their

works, that those issues have, in a single instance, caused this inflammation and suppuration of the dura mater which Pott and others seem so much to dread, although there must have been a total destruction of those communicating vessels. In venereal patients, too, where the bones of the head are affected with nodes, or corroded by caries, do we find the death of the patient to be caused by detachment and putrefaction of the dura mater? On the contrary, we often find that the caries extends to both tables, laying bare the dura mater; and yet, by attention to diet, good air, &c., the patient will perfectly recover. Therefore, we cannot properly consider the putrefaction or inflammation of the dura mater as the sole cause of death, and we must have recourse to some more likely one.

154. Mr. Dease, whose work contains much valuable information on this branch of our subject, is of opinion that those injuries of the head "are to be considered more or less dangerous, in proportion to the degree of concussion the brain or its meninges are supposed to receive. The dura mater, being a strong, ligamentous membrane, and firmly attached to the skull, seems not to be so easily affected, being a fitter medium to transmit any shock it receives to the brain, than to oppose it."* The pia mater and brain, in the judgment of this author, appear to be the parts that suffer most. The latter may be affected, according to the violence of the shock, from a temporary suspension of its functions to a total destruction of them, as in death. The greater number, however, of these cases, are unattended by any immediate alarming symptoms; but, at the same time, the delicate vessels of the

* Observations on Wounds of the Head, p. 56

pia mater sometimes suffer so much by the shock, as to be rendered incapable of continuing the circulation; of course (according to Mr. Dease), obstruction takes place, and this, after some time, if not remedied, will lay the ground for future inflammation. Here, then, is an inflammation formed, without the heart or larger arteries being at all affected; and we have no means of judging of the occurrence of such an event, till the inflammation is advanced, or, in other words, till matter is formed; for this inflammation of the brain (if, indeed, it can be called such,) is, in general, not accompanied by those early symptoms that denote inflammation of parts of much less importance. As the disease is under the cranium, we can perceive no tumor; there is little pain, as the brain is almost insensible; the tension is not perceptible, either to us or to the patient, perhaps because the brain is a very soft part; and the pulsation of the arteries is so often perceived in the head, where no matter is forming in the brain, that throbbing is far from being a certain sign of suppuration here. "How, then," asks Le Dran,* "are we to know when matter is forming in the substance of the brain? Observation alone can inform us."

155. The period at which the symptoms which denote suppuration within the cranium first make their appearance, may be said to vary from the eighth to the twenty-first day from the receipt of the injury. It is sometimes even postponed to the end of the fourth week, and even then, we can scarcely say that our patient is out of danger. A case of this kind is related by Sir Astley Cooper, in his Lectures.† It is an unfortunate circumstance, that often attends those injuries of

* Observat. 35. p. 167. † Second edition, p. 140.

the head, that, before the patient is attacked with such symptoms as would excite particular attention, the inflammation within the skull has already made such a rapid progress, that the parts are in a state of suppuration.

156 "The progress of those wounds of the head," says Mr. Dease,* "in by far the greater number of cases I have seen, where the cranium was laid bare, contused, or its tables simply divided, was as follows: if the instrument, with which the blow was given, was not heavy, nor the force very great, the patient, after a few minutes, perceives no complaint, more than might be expected from a simple wound. If he be attended, it is seldom the surgeon will be able to determine, the first days, whether any farther injury has taken place or not. The wound digests as kindly, and the patient performs all the functions necessary to health as well as before he received it."

157. "I have seldom or never seen the symptoms that characterize a suppuration formed on or under the dura mater, appear before the seventh or eighth day, or later than the sixteenth; between the eighth and sixteenth being, in general, the period most to be dreaded. In order to take a more comprehensive view of those symptoms, let us consider those which affect the general system, and such as are only particular to the parts affected. Transitory, irregular shiverings first appear, seeming to the patient rather chilliness; a nausea, or inclination to vomit; a dull, heavy look, and lassitude; an acute or dull pain in the head. The shiverings are always succeeded by a feverish paroxysm, more or less acute; the shiverings increase, and the fever becomes con-

* Observations on Wounds of the Head, p. 62.

tinned; the pulse is, in general, rather light and quick; the patient complains of an increase of the pain of his head; his cheeks are flushed, and the pulsation of the carotids attracts the notice of the attendants; his sleep is short, broken, and disturbed, attended, for the most part, with a delirium; his skin is hot and dry, or bedewed with a clammy sweat; his tongue furred, dry, and parched. As those symptoms advance, the shiverings become less distinct; but to them, tremors, spasms, and convulsions succeed: the opposite side to the injury, at the latter period, generally becomes paralytic, but retains its sensibility; and the eye of the same side is affected with a gutta serena; the pupil is widely dilated, the conjunctiva puffed into a sort of yellow fungus; and the whole globe protruded: the patient becomes insensible, alternately convulsed, and dies generally comatose." The latter symptoms, perhaps, are to be attributed to the pressure made on the brain by the matter, and closely resemble those already described as being indicative of compression (104).

158. Of the general or constitutional symptoms, Mr. Dease states that there is none so constantly present, or so immediately points out the formation of matter under the cranium, as *irregular rigors*; and they are generally the first that alarm the patient. These rigors are to be carefully distinguished from those which precede every inflammation or fever of any importance. In the latter case, a fever succeeds, which is, in general, proportioned to the degree and duration of the rigor; quick, hard pulse; hot skin, &c.: and the rigors do not recur at intervals, as in the cases where they indicate the formation of matter. From a consideration of these circumstances, coupled with the history of the case, we may

safely infer, that the shiverings which come on between the eighth and twenty-first day from the receipt of an injury of the head, are attributable to the formation of matter.

159. Let us now inquire how far the local appearances—viz., of the wound and surrounding parts—will enable us to judge whether the injury has extended to the dura mater and brain, or not. Le Dran considered the spontaneous detachment of the pericranium from the bone as a certain indication of a similar separation of the dura mater, and a sufficient reason for the application of the trepan, which he used in those cases, with the view of applying such remedies to the dura mater as he thought would prevent its subsequent putrefaction. Pott, who adopts Le Dran's sentiments, says that "the inflammation of the dura mater, and the formation of matter between it and the skull, in consequence of contusion, are generally indicated and preceded by a symptom which I have hardly ever known to fail; I mean, *a puffy, circumscribed, indolent tumor* of the scalp, and a spontaneous separation of the pericranium from the skull under such tumor. These appearances, therefore, following a smart blow on the head, and attended with languor, pain, restlessness, watching, quick pulse, head-ache, and slight, irregular shiverings, *do almost infallibly indicate an inflamed dura mater, and pus either forming or formed between it and the cranium.*"*

160. This puffy tumor does not rise to any considerable height, or spread to any great extent. The sensation communicated by it to the finger is that of an obscure fluctuation, or as if the contents of the tumor were partly of a fluid, and

* Pott's Chirurgical Works, Earle's Edition, vol. i. p. 41.

partly an aëriform nature; and, on examination, we shall find that this is really sometimes the case; for, if the tumid part of the scalp be divided, the pericranium will be found of a darkish hue, and either quite detached, or very easily separable from the skull, and between them will be perceived a small quantity of a dark-coloured ichorous fluid, containing some bubbles of a foetid gas.

161. Beside the *puffy tumor*, there are other local symptoms, which will lead us to suspect the formation of matter within the cranium. In cases accompanied with wound, the sore will lose its florid appearance, and healthy, granulating surface, which will become pale, glassy, and flabby; instead of good matter, it will discharge only a thin, discoloured sanies; the dressings, instead of coming off easily (as in a kindly suppurating sore) will stick closely to all parts of it; and the pericranium, instead of adhering firmly to the bone, will separate from it, all round, to some distance from the edges of the wound.*

162. The opinion of the majority of surgeons of the present day, however, is, I believe, adverse to the doctrine of Pott. The puffy tumor, though it may lead us to suspect detachment of the dura mater from the skull, is not, nevertheless, a certain indication of such an occurrence. It is also true, that, even before the occurrence of the rigors, we may sometimes perceive the discharge from the wound to diminish, and become thin and unhealthy,—the lips of the wound to look pale and flabby,—and, after the shiverings have taken place, the pericranium to be separated from the skull around the sore to a considerable extent; but these are common occur-

* Pott, Op. cit. p. 36.

rences, and by no means infallible signs that the dura mater underneath is detached, and in a state of suppuration; for we may often trephine in such cases, and, contrary to our expectation, find the dura mater attached, and in a healthy state. Again, on the other hand, when the wound or surrounding parts shew *none* of the above-mentioned appearances, we may find the dura mater detached, and matter formed on it. So that the most we can say is, that the puffy tumor of Pott, with the accompanying unhealthy appearances of the wound, afford a *probability* that the dura mater underneath is separated from the cranium, and in a state of suppuration. In general, too, we do not notice the existence of those local symptoms, till the constitutional symptoms are pretty far advanced; and, moreover, there are few instances where the local appearances are not changed for the worse, if the patient, at the time, labour under *any* feverish symptoms.

163. Mr. Dease (from whose valuable work I have already quoted so much) says: "If the trepan was applied at any time after those symptoms took place, the appearance of the dura mater was invariably this: either it was detached, and in a state of suppuration and sloughy, or sound in every respect. If the injury was confined to it, *which was rarely the case*, the operation, as far as I have seen, proved successful. And, if the patient died, I have ever found the cause of his death in an uncircumscribed suppuration of the pia mater, which generally extended to the brain."*

164. In this account of the appearances to be met with on dissection, Mr. Colles and other

* On Wounds of the Head, p. 74.

surgeons concur. "On examination after death, we generally find a small quantity of purulent matter lying (at the site of the blow) on the surface of the dura mater. When we raise this membrane, we find nearly the entire surface of the hemisphere covered over by a yellow purulent fluid, which adheres so tenaciously to the pia mater, that very little of it will flow off; indeed, the colour and consistence of this fluid would lead us to suppose that it was formed of a commixture of pus and coagulated lymph."* When the matter lies between the skull and dura mater, this membrane generally appears discoloured and in a sloughy state. The matter is usually of a highly foetid odour, and dirty sanious appearance. We sometimes find portions of the surface of the brain and pia mater as it were melted into matter, resembling ulcerations of various degrees of magnitude. The internal lamina of the dura mater, or arachnoid membrane, is occasionally smeared with purulent matter, or speckled with red spots like *vibices*. At other times, the dura mater shews no signs of inflammation, while the brain and pia mater are in many places gangrened and quite putrid, having such an offensive smell, as to render it scarcely possible to remain in the same room with it. The dura mater sometimes, for a considerable distance from the seat of the injury, appears thickened, and of a yellowish hue. The whole brain, itself, is sometimes remarkably softened.

165. The treatment of this affection may be divided into the *preventive*, or that which we should adopt on the receipt of the injury; and the *curative*, or that which should take place on the occurrence of those symptoms which afford a

* Colles's Practical Precepts, p. 14.

presumption that suppuration has been established in the substance of the brain or its membranes.

166. When we are first called to a patient who has received a wound of the scalp which lays bare the skull, or perhaps has punctured through the outer table, while the patient makes no particular complaint, we are often at a loss how to proceed with the constitutional treatment, not having any means of judging whether he has suffered any further injury, than simply the wound. Whatever we prescribe, it may be superfluous; and how far our medicines have been useful, we can never know. But, if the means recommended to prevent the danger be such as cannot materially injure the patient, we are undoubtedly justified in using them, especially if, on inquiring into the circumstances attending the injury, we discover them to be such as might injure the contained parts. To guard against future bad consequences, Pott recommends copious bleeding, as long as the pulse requires, or strength permits; and he speaks of a certain mysterious something in the pulse and countenance, difficult to describe (and he might have added, as difficult to perceive), which points out the necessity of venesection. Bromfield's reasons for preferring the exhibition of Dover's Powder have been already mentioned. (131) The observations of Mr. Dease on this subject are so apposite, and so much in accordance with the sentiments of the most eminent modern surgeons, that I cannot do better than quote them here: "That a man who has received a wound in the head, which lays the skull bare, and is perhaps attended with other circumstances, may from this cause, (independent of any injury the vessels of the meninges or brain received,) have a quickness in his pulse, &c., which will indicate bleed-

ing, is often the case. But that such an injury, as makes at present the subject of our inquiry, is attended, the first days, with these symptoms, is, I believe, very seldom. For, were we here to consider the pulse as our direction in making use of evacuations, it would rarely, for some days, indicate any. And, even after the symptoms of matter under the cranium appear, we sometimes find the pulse very little quickened." "But, as we have already shewn that the bad effects of such injuries are not confined to the dura mater, but are generally propagated to the small vessels involved in the pia mater, an inflammation, after some days, will, in all probability, succeed. To prevent those consequences that in general prove fatal, we have recourse to bleeding, purging, sedatives, the application of blisters, &c."*

167. How far the success, often attributed to bleeding, after the receipt of such wounds, as a preventive of inflammation and suppuration, is to be justly ascribed to this remedy, must, after all, remain involved in uncertainty; as it is not uncommon to see some recover without having undergone any evacuation, and with very little surgical attention; while others, after undergoing profuse bleeding, purging, &c., will, notwithstanding, be seized, at the end of ten or fifteen days, with all the symptoms of suppuration of the brain. It is probable, that, when the vessels of the pia mater have suffered to a certain degree, which the event alone can shew, it is not in our power to prevent suppuration from succeeding.

168. Nevertheless, the practice of the best surgeons in those cases is, to draw blood as soon as the patient has recovered from the first shock

* Dease, Op. cit. pp. 77, 78,

of the accident, and to repeat the evacuation, if the symptoms appear to require it. Smart purging, at regular intervals, should certainly, in every case, be prescribed; and a low diet, with perfect rest, observed; till the time at which the dreaded symptoms usually appear has passed by. But on no account should we follow the exploded practice of applying the trephine, as a prophylactic. It cannot possibly be of the slightest benefit, and it subjects the patient to a severe and dangerous operation without the least necessity, and, in fact, is one of the most likely means of producing the very consequences we wish to avoid.*

169. But, should all our exertions to prevent inflammation and suppuration of the brain and its membranes fail; and should the symptoms already described, as usually attending such a state, be present; the fever hourly increases the irregular rigors become more frequent, while the patient is affected with inquietude and delirium; then, indeed, we have good reason to suspect that matter is formed underneath the cranium, and then, and not till then, we are justified in applying the trephine; although, I fear, we cannot expect, with Mr. Dease, that "it will *in general* prove successful in relieving the patient under the circumstances already mentioned." For, as we have before seen, the suppuration is seldom confined to the dura mater, in which place alone

* Though, perhaps, not strictly a case in point, a forcible illustration of the impropriety of trephining, in the absence of those symptoms which imperatively call for the operation, is given, as well as I recollect, by Mr. Colles, in his lectures at the College of Surgeons. I allude to four cases of lunatics, who were trepanned, in the hope of curing them of their madness. Three of them died purely of the operation, which was performed at the suggestion of a physician, of the state of whose head this speculation affords a lamentable picture.

we could expect to find the matter on perforating the skull; but extends to the pia mater and brain itself.

170. When, on removing a portion of the cranium by the trephine, the matter is not found on the dura mater, it has been proposed to open this membrane with a lancet, in the expectation that suppuration may have taken place between it and the brain. The desperate condition of the patient may sometimes urge us to adopt this practice, but in the great majority of cases it will be of no service, because the matter is generally diffused over the entire surface of the hemisphere, and adheres tenaciously to the pia mater. So that, if we actually come down on the matter, we place the patient, if possible, in a worse condition than he previously was; for the brain will protrude in large masses, and, in all probability, a speedy end will be put to the patient's life.

171. Unpropitious as this case may be, it is yet possible that the patient may recover, notwithstanding that we have unequivocal proofs that matter is formed in the pia mater or brain. We have numerous instances of matter formed in the most important viscera, which has been absorbed and removed from the body. Mr. Dease says, that, from his experience, he has been induced to believe, that some part even of the substance of the brain may suppurate, and yet the patient recover. For this reason, we should not now neglect our patient. We should still endeavour, as far as we are able, to obviate the effects of suppuration in so important a part, and procure the absorption of the matter. To effect this purpose, Mr. Dease recommends bark to be given in such quantities as the patient will bear, his drink to be acidulated with sulphuric

acid, and blisters to be applied to his legs or back.*

172. In a few instances, the matter is formed in a circumscribed spot on the surface of the brain, with adhesion between the dura mater and pia mater, and occasionally with a splinter of bone forced through these two membranes into the substance of the brain. The early application of the trephine may probably save such patients; but, if it be delayed too long, this operation will, even in such cases, prove ineffectual.†

173. It is confidently asserted by some authors, that abscesses in the liver are occasional consequences of wounds of the head. Mr. Dease‡ mentions a case of this kind, where the abscess contained half a pint of matter. The patient was a healthy young man, and had had no previous indisposition. Various and absurd are the theories which have been invented to explain this circumstance, but the real cause of such a consequence, (for it cannot be denied that abscesses in the liver do sometimes follow injuries of the head,) has never been satisfactorily accounted for. We frequently see patients who are affected with suppuration in the head, in consequence of a wound, turn yellow, or apparently jaundiced, some days before they die.

174. APHORISMS.

Acute inflammation of the brain, as a consequence of wounds or other injuries, resembles in its symptoms idiopathic phrenitis, and requires precisely the same treatment.

If, between the seventh and twenty-first day,

* Observations on Wounds of the Head, p. 92.

† Colles's Practical Precepts, p. 16.

‡ Op. cit. p. 124.

irregular rigors, frequently recurring, and attended with fever, make their appearance, we have reason to dread the formation of matter within the cranium.

Suppuration within the cranium is sometimes caused by apparently trivial injuries of the head. The probability of its occurrence cannot be estimated by the extent of the injury.

The matter is much oftener situated within the dura mater, than between this membrane and the bone. It is generally smeared over the whole surface of the pia mater of one hemisphere.

If the matter be situated between the dura mater and skull, the patient will often recover by the timely application of the trephine; but, if the brain or pia mater be affected with suppuration, he will most probably die.

It will be time enough to use the trephine, when by irregular shiverings, &c. we have every reason to apprehend matter to be formed under the cranium.

Never apply the trephine as a means of *preventing* inflammation and suppuration of the brain or its membranes.

After every wound of the head, vigorous antiphlogistic treatment should at once be had recourse to, with a view to prevent suppuration within the cranium.

Abscesses in the liver occasionally follow wounds of the head. No satisfactory explanation of this fact has been given.

CHAP. IX.

ON THE OPERATION OF TREPHINING, &c.

175.—THE cases demanding the removal of a part of the skull by the trephine, have been already alluded to in various places. This instrument, it must be remembered, is only to be used for the relief of *existing* symptoms, and is never to be employed as a mere preventive of inflammation or other bad consequences, in the absence of those symptoms which denote compression of the brain. The operation of trephining may be required, to relieve the brain from pressure: 1. By enabling us to elevate a depressed piece of bone, or remove a foreign body; 2. By giving exit to extravasated blood; and, 3. By allowing us to evacuate matter. These form, generally speaking, the only true and vindicable reasons for employing the trephine, or sawing away any portion of the skull.

176. To this remark, there are very few, if any exceptions. Perhaps it may be, now and then, advisable to saw away the bony edges around some fungous excrescences, which grow from the dura mater, and make their way outward by occasioning an absorption of the part of the skull immediately over them. It may be also, some-

times proper to saw out diseased portions of the skull, though it must be confessed, that in general, their separation should be left to time and nature. But these are cases which are hardly applicable to the consideration of *injuries* of the head, and belong more to that of *chronic disease*. Loose splinters should always be removed, (139) and perhaps, if the depressed portion of bone be denuded in a wound of the scalp, a trial to raise it with the elevator will be proper, even though urgent symptoms of pressure may not exist.* In such a case, we have already seen, (82) that Sir Astley Cooper sanctions this application of the trephine; but it is contrary to the principles which ought generally to be our guide.

177. It is truly wonderful, what beneficial effects have sometimes followed the judicious and timely application of the trephine. But for it, many lives must have been inevitably lost. The relief which occasionally results from the employment of this instrument, is sometimes so sudden and unexpected, as to strike us with astonishment, and in no instance does the interposition of the surgical art display itself to better advantage. "The immediate restoration of sight by the depression, or extraction of an opaque substance from the eye, is not more beautiful and striking, than the instantaneous communication of the intellectual faculties, and of the powers of speech, of feeling, &c. together with voluntary motion, to a person lying in an apparently lifeless state from an injury of the head. The utility of the trepan is occasionally manifested even in this degree."† Numerous instances are recorded, in which patients, who had been in a

* Cooper's Surgical Dictionary, sixth Edition, p. 1107.

† Cooper, op. cit. p. 1107.—See Sir Astley Cooper's case, alluded to in par. 116 of this work.

condition almost bereft of animation, rose up and spoke, the instant the pressure of the bone or the extravasated blood was removed. But these dazzling examples of success are to be regarded as very rare, and should never induce the surgeon to forget the rule already so often and so strongly insisted on, viz. not to undertake the operation except in the most pressing circumstances, and when the symptoms unequivocally demand it. Besides, the operation itself is a dangerous one. It creates considerable risk of subsequent ulceration and sloughing of the dura mater, and consequent protrusion of the brain. "*Gravis tamen satis est operatio, et nunquam, nisi indicationes sufficientes adsint, institui debet.*"*

178. The trephine, now commonly preferred for perforating the cranium, consists of a simple cylindrical saw, with a shaft proceeding from the centre of the instrument on the side opposite to that which contains the teeth. On this shaft a handle is placed transversely, like that of a gimlet. From the centre of the serrated edge of the circle a sharp little perforator projects, named the *centre-pin*. Its use is to fix the trephine when it is first applied, that is, before the teeth of the instrument have made a sufficient circular groove, in which they can steadily work. When this has been accomplished, the centre-pin must always be removed from its situation. In the older trephines the pin was made to screw in a corresponding hole at the inside of the top of the saw, from which it could be taken out by means of a little key for the purpose. Those now in use, however, have their centre-pins contrived to slide up and down in the shaft, and they can be retained in either situation by turning a little

* Callisen, Syst. Chir. Hodiern. tom. 1. p. 658.

thumb-screw. The cylindrical part of the trephine is called the *crown* of the instrument. The surgeon should always have two or three of those crowns, of different sizes; for it is always a commendable rule, never to saw away more of the cranium than is absolutely requisite for the accomplishment of our object. There is no occasion, however, for more than one handle, which may be made to screw on any of the crowns.

179. The instrument formerly employed for removing a circular portion of the skull was the *trepan*. The crown of the instrument differed from that of the trephine in being sometimes conical and grooved on the outside. The trepan, with the handle by which it was worked, bore a very close resemblance to the carpenter's tool, known under the name of a *wimble*, or *brace and bit*. In this country, the instrument is now wholly superseded by the trephine.

180. It is not always desirable to remove a complete circular portion of the cranium; the taking away a piece of smaller size, and of a different shape, being frequently much more advantageous. Some surgeons, who object to removing any unnecessary quantity of the cranium, occasionally employ a trephine, terminating only in a semi-circular, instead of a circular saw, by which means they can often cut across the base of a depressed portion of the skull, and take it away, without any occasion for removing also a circular piece of bone. The saws which Mr. Hey describes* will answer the same purpose, and should be kept in every case of trephining instruments. These saws are very short ones, fixed at the end of a long straight handle. Their edges are either straight or curved. The latter

* Hey's Surgery, 3d. edit. p. 8.

construction qualifies them for cutting in a curvilinear direction, which is often required. The edge of the saw should be made a little thicker than the rest of the blade, by which means it will work in the groove which is cut, with more facility. Mr. Colles, in his lectures, recommends that the saw and the handle should be made in one piece, because they are apt to become loosened by frequent use, when they are riveted or screwed together. This is a useful suggestion.

181. Besides trephines of various sizes, and the saws just now noticed, the surgeon should take care to have in his case of trephining instruments, a little *brush* for occasionally cleaning away the particles of bone from the teeth of the saw, in the progress of the operation; a pair of *forceps*, for extracting the round piece of bone after it has been detached by the saw; a *lenticular* for removing any inequalities, which may present themselves, round the sawed edge of the cranium, after the circular piece is taken out; a *raspatory* for the same purpose, and also for scraping the bone, in order to see whether it will bleed, (107) which is a circumstance in some cases very important to be attended to; a common *scalpel*, of pretty large size, for dividing the scalp, &c.; and *elevators*, for raising depressed pieces of bone. The common elevator, which is no more than a simple lever, is that which is now generally preferred by surgeons in these countries. Various others have from time to time been proposed, for a description of which, as well as of other curious antiquated instruments, the reader is referred to Pott's Surgical Works, and Bell's Principles of Surgery.

182. Previously to entering on a description of the operation, it will be well to consider the parts in which we are directed by surgical authors not

to perform it. Sir Astley Cooper says* that we should never trephine in the line which extends from just above the nose along the top of the head to the tuberosity of the occiput; for in this line the longitudinal sinus is situated. But this sinus is often wounded in fractures of the skull by spiculæ of bone, and it has been more than once purposely punctured with a lancet; yet the hæmorrhage was never known to be troublesome, after placing a bit of lint over the opening.

183. The majority of writers also forbid the application of the trephine to the frontal sinuses, in consequence of the indeterminate depth of these cavities, and the apprehension of incurable fistulæ.—However, Larrey has deviated from this principle in several instances; and he states that by opening the frontal sinus with a large trephine, and then using a small one for the inner table of the skull, placed, according to Mr. C. Bell's directions,† evenly and perpendicularly on the posterior surface of the sinus, the internal parietes of this cavity may be trephined with perfect safety, and no risk of injuring the dura mater with the saw.‡

184. "Writers also caution us not to apply the trephine to the anterior inferior angle of the parietal bone, in consequence of the middle artery of the dura mater lying under it, generally in a groove in the bone, and occasionally in a canal in its very substance. In the latter circumstance, this portion of the parietal bone could not possibly be removed without wounding the vessel. We ought, undoubtedly, to avoid trephining this part of the cranium, when we can prudently do so. But the causes demanding this operation are

* Lectures, 2d. edit. p. 142.

† Operative Surgery, vol. 1. p. 439.

‡ Mem. de Chir. Mil. tom. 2, p. 136—138.

always so urgent, that the patient's sole chance of existence depends on their quick removal. Hence, were there pressure on the brain, either from a depressed portion of bone, from blood, or matter, and such pressure could not be removed without trephining the anterior inferior angle of the parietal bone, what operator would be afraid of doing so? Besides, the fear of the hæmorrhage has been very unfounded; for the lodgment of the artery in a bony furrow or canal, which authors have pointed out as rendering the suppression of the hæmorrhage more difficult, is a mere visionary idea, as it is well known, that a little plug of lint, pushed into the orifice of a vessel, so situated, will always stop the bleeding with as much certainty and ease, as can possibly be imagined.* The safety of the practice is confirmed by Larrey:† “I have also,” says he, “applied the trepan over the track of the sphenospinous artery, at the inferior anterior angle of the parietal bone. The artery was divided; but I stopped the bleeding almost immediately by applying an iron probe red hot.” These two methods of restraining the hæmorrhage have been already alluded to in the chapter on Fractures of the Skull(96).

185. We are told that the trephine should never be applied below the transverse ridge of the occipital bone.‡ Though seldom necessary, we may be called on to perform the operation even here, and we ought not, in urgent circumstances, to be afraid of dividing the trapezius and complexus muscles, in order to be enabled to apply the trephine to the bone.§

* Cooper's Surg. Dict. p. 1112. 6th edit.

† Mem. de Chir. Mil. tom. 2. p. 138.

‡ Bertrandi, Traité des Operations, p. 267.

§ See Mr. Hutchinson's case in the second volume of the Medico-Chirurgical Transactions, p. 104.

186. If possible, we should avoid trephining any part, from which a complete circle of bone cannot be sawn, without hurting the dura mater. The inequalities of the inner table of the skull are, in several places, such as to make attention to this rule necessary. Thus the centre of the forehead is rather an inconvenient part for the trephine, because, when the spine of the frontal bone is prominent, it could not be sawn without the dura mater being wounded. If we should be obliged to apply the trephine to this place, we must be careful not to saw too deeply; but prefer separating the circle of bone with the elevator, to making any dangerous attempt to cut completely through the projecting spine.

187. The trephine cannot safely be applied lower down on the forehead, than half an inch above the superciliary ridge of the frontal bone, without risk of injuring the orbit. Behind the ears, on the posterior inferior angle of the parietal bone is another dangerous place to perform the operation, because here the lateral sinus is situated, and hæmorrhage from this sinus would probably prove serious. It would also be dangerous to apply the crown of the trephine on depressed portions of the skull for obvious reasons.

188. The operation being determined on, the patient's head should be shaved, in order that the surgeon may have a better opportunity of seeing what parts of the scalp have been struck; for it is in such situations, that he has most reason to apprehend fractures of the bone, or extravasations beneath it. If, however, the violence has occasioned a large wound, or laceration of the scalp, the practitioner, knowing where the force has been applied, is frequently contented with having a little hair removed from the parts immediately surrounding the injury. But as the

loss of the hair is of very little consequence, while the concealment of the seat of a depressed fracture or extravasation, might lead to fatal results, we can never err in causing the whole of the scalp to be shaved in every instance; more especially, as in every such serious injury the local treatment, either before or after the operation, will require removal of the hair.

189. When the propriety and necessity of trephining are fully indicated, provided the wound or laceration of the scalp should not have exposed a sufficient surface of the bone for the application of the crown of the trephine, an adequate dilatation of such wound ought immediately to be made. If, in the situation of the blow, there should only be a tumor, the consequence of a contusion, unattended with any wound; a division of this part of the scalp is to be made by carrying the knife quite down to the bone. In those cases in which the swelling, occasioned by the violence, is considerable, and attended with crepitus, as well as in other instances, in which there is only a contusion, under which a fracture and displaced pieces of bone may be felt; the scalp must be divided in the same manner, only with greater caution, lest the point of the knife should insinuate itself through the fracture, and do mischief to the dura mater and brain.

190. Authors recommend the shape of the incision to be different according to the kind of fracture, and the parts of the head on which the violence has operated. When the whole extent of the injury can be brought into view, by means of an incision, having the form of the letter T, the surgeon should be content with such a division; but if this be not sufficient, he may give it a crucial shape. In general, however, if it can be avoided, the latter form of incision is not ad-

visible, as the angles of the flaps are apt to fall into the trepan-hole, and prove troublesome. When the trephine is to be applied to the squamous portion of the temporal bone, we are recommended to make the incision as nearly as possible in the shape of the letter V, the branches of which are to be upward, in the direction of the fibres of the temporal muscle, in order that the division of those fibres may be avoided as much as possible.

191. Having divided the scalp, the next object is to reflect it; but no man would be warranted in cutting any part of it away, although such practice is advised by Pott, and sanctioned by Dease. The purposes of the operation do not require any removal of this kind; and the method would leave a wound which would be long in healing, and, when healed, always attended with deformity. In short, the reflected flaps of the scalp are capable of adhering to the parts on which they are laid after the operation, and consequently, ought never to be wantonly cut away.

192. The scalp being reflected, authors next advise us to scrape away the pericranium, either with the knife or the raspatory. Perhaps this measure may be considered as one, which does neither much harm or good. The design is to facilitate the application of the trephine to the bone. However, the teeth of a proper instrument, in good order, will not be impeded by the delicate periosteum; and scraping this membrane away from parts of the skull, which are not to be removed, may possibly occasion exfoliations.

193. Sometimes the bleeding from branches of the temporal, or occipital artery, is so copious, that the bone cannot be conveniently perforated before the hæmorrhage is suppressed. If it be

prudent to wait a little, and the case should be likely to be benefited by the evacuation of blood, it is as well to allow the bleeding to continue for a certain time. The surgeon may then just direct an assistant to put the end of his finger on the mouth of the vessel, and proceed in the operation. In some cases, the bleeding might be so troublesome, that it would be better to tie the artery at once.

194. The next thing the surgeon has to attend to, is the application of the trephine. He is first to make a little impression with the point of the centre-pin, for the purpose of marking the place where it will work, when the crown of the trephine is applied in the proper situation; for where such impression is made, the operator must make a small hole with a perforator, in order to fix the point of the centre-pin, on which the crown of the instrument turns backward and forward, as on an axis, during the first stage of the operation. Trephines are made with centre-pins, which do not require the aid of any particular instrument to make a previous perforation, and in this respect they are advantageous.

195. The point of the centre-pin having been fixed, the trephine is to be turned by regular semicircular motions, alternately to the right and left, which object is effected by steady pronation and supination of the operator's hand. The teeth of the saw having made a tolerable circular groove, in which they can steadily work, the centre-pin becomes useless, and must be removed, or drawn up into the shaft of the instrument, as the case may be. Sir Astley Cooper* mentions a case in which this precaution was forgotten; the centre-pin penetrated the skull and dura mater, and entered the brain.

* Lectures, 2d. edit. p. 143.

196. The first turns of the trephine may be executed boldly and quickly; for the operator runs no hazard of doing mischief. It is necessary occasionally, with a view of facilitating the action of the instrument, to clean away the particles of bone-dust with a little brush, usually kept for the purpose in every case of trephining instruments. Were this plan neglected, the action of the cylindrical saw would be very much clogged. The operator, however, must increase his caution, when the sawing has made greater progress; for, were he to be too bold, he might sometimes lacerate the membranes of the brain with the teeth of the instrument, particularly as the thickness of the cranium is subject to infinite variety, both in different parts of the same head, and in different subjects. The surgeon, therefore, should never forget to examine frequently with the point of a cut quill or tooth-pick, whether any part of the circular groove is cut through, or nearly so, for, when this is the case, the instrument must be worked in such a way, as only to make pressure upon, and cut, the part of the circle, which yet remains to be divided. We are sometimes informed of the progress we make by blood issuing from the groove, when the saw reaches the diploe; but we should recollect, that in very young and very old persons, there is no diploe; and therefore, very few turns of the saw will suffice. The possibility of discriminating the arrival of the teeth of the saw at the diploe is so uncommon, and so fallacious, that it should never be expected or relied on. After the first few turns of the trephine, the remainder of the operation should be conducted with extreme caution.

197. A prudent man will always prefer exerting a little force for the purpose of breaking the

bony connexion, retaining the circular piece of bone, to running any hazard of injuring the dura mater, by sawing too deeply. After a certain time, therefore, it is better to lay down the trephine, and endeavour to elevate the portion of bone, with the aid of a pair of forceps constructed for the purpose, or else by means of an elevator, which, perhaps, is still better calculated to effect the object.

198. The matter or extravasated blood having been removed, or the depressed piece of bone elevated, according to circumstances, the irregularities of the edges of the perforation are to be cut off with the lenticular knife; the divided scalp is to be placed as nearly as possible in its natural situation, and lightly dressed with a simple pledget of any unirritating ointment. In applying the dressings, the surgeon should invariably keep in view these objects; namely, to let whatever is put on the wound be as light as possible, not apt to make pressure on the brain, and of a nature which cannot excite irritation. All stimulants are to be strictly avoided; nor will any bandage be better than an ordinary night-cap of sufficient size to be put on with facility. It may be secured with bits of tape tied under the jaw.

199. The practitioner should not now conceive that he has done all that he ought to do. Let him remember the urgent necessity of keeping off, or diminishing, the inflammation of the dura mater and brain, which is still to be feared. Let him bleed the patient largely and repeatedly; exhibit saline purges, clysters, and antimonials; and, if the symptoms continue, let him apply a blister to some part of the head. But the necessity of this practice has already been sufficiently insisted on in the preceding pages.

200. The aperture in the skull usually becomes closed with soft granulations, which slowly acquire a hard, but not perfectly bony consistence. While the cicatrix is soft, it should be protected from external injury with a thin piece of horn or metal. Exfoliations from the margin of the perforation sometimes retard the healing of the wound; but now that the practice of dressing with drying spirituous applications has been exploded, and the removal of any part of the scalp is condemned by all the best surgeons, these unpleasant consequences are rendered much less frequent than in former days.*

* For the above accurate details of the operation, I am principally indebted to Cooper's Surgical Dictionary, article "Trephine."

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