

Observations on the nature and consequences of wounds and contusions of the head, fractures of the skull, concussions of the brain, etc / [Percivall Pott].

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OBSERVATIONS

ON THE

NATURE AND CONSEQUENCES

OF

WOUNDS AND CONTUSIONS

OF THE

HEAD,

FRACTURES OF THE SKULL,

CONCUSSIONS OF THE BRAIN, &c.

BY

PERCIVALL POTT,

SURGEON to St. BARTHOLOMEW'S Hospital.

Nullum capitis vulnus contemnendum. HIPPOCRATES.

Nam veluti magna et gravia capitis vulnera non semper sequitur mors, sic et levia sæpenumero mortis causæ sunt.

GALEN.

L O N D O N :

Printed for C. HITCH and L. HAWES, at the Red-Lion, Pater-noster-Row. M.DCC.LX.



John Whitfield Surgeon.

TO THE
PRESIDENT, TREASURER,
and GOVERNORS
Of *St. Bartholomew's Hospital.*

GENTLEMEN,

THE execution of that office, with which I have, by your favour, been several years intrusted, has enabled me to make many chirurgical observations.

THE following pages, which contain a few of them, are published with a sincere desire of being beneficial to



mankind, by giving some little information to those of my brethren, who have not had the same opportunity.

IF they should in any degree answer that end, they will prove, that the benefits arising from a public Hospital, are by no means confined to the poor therein received, but are capable of being extended to all ranks and degrees of men: and that these houses, in which surgery, an art so generally necessary, and so extensively beneficial, is taught, have a natural, and just claim, to the protection
and

DEDICATION. v

and patronage of all those who, either by their situation or circumstances, are enabled to relieve the various distresses of their fellow-creatures.

To you, GENTLEMEN, who are the Guardians of that particular hospital, to which I have the honour to belong, these sheets are addressed, in testimony of that respect, with which

I am,

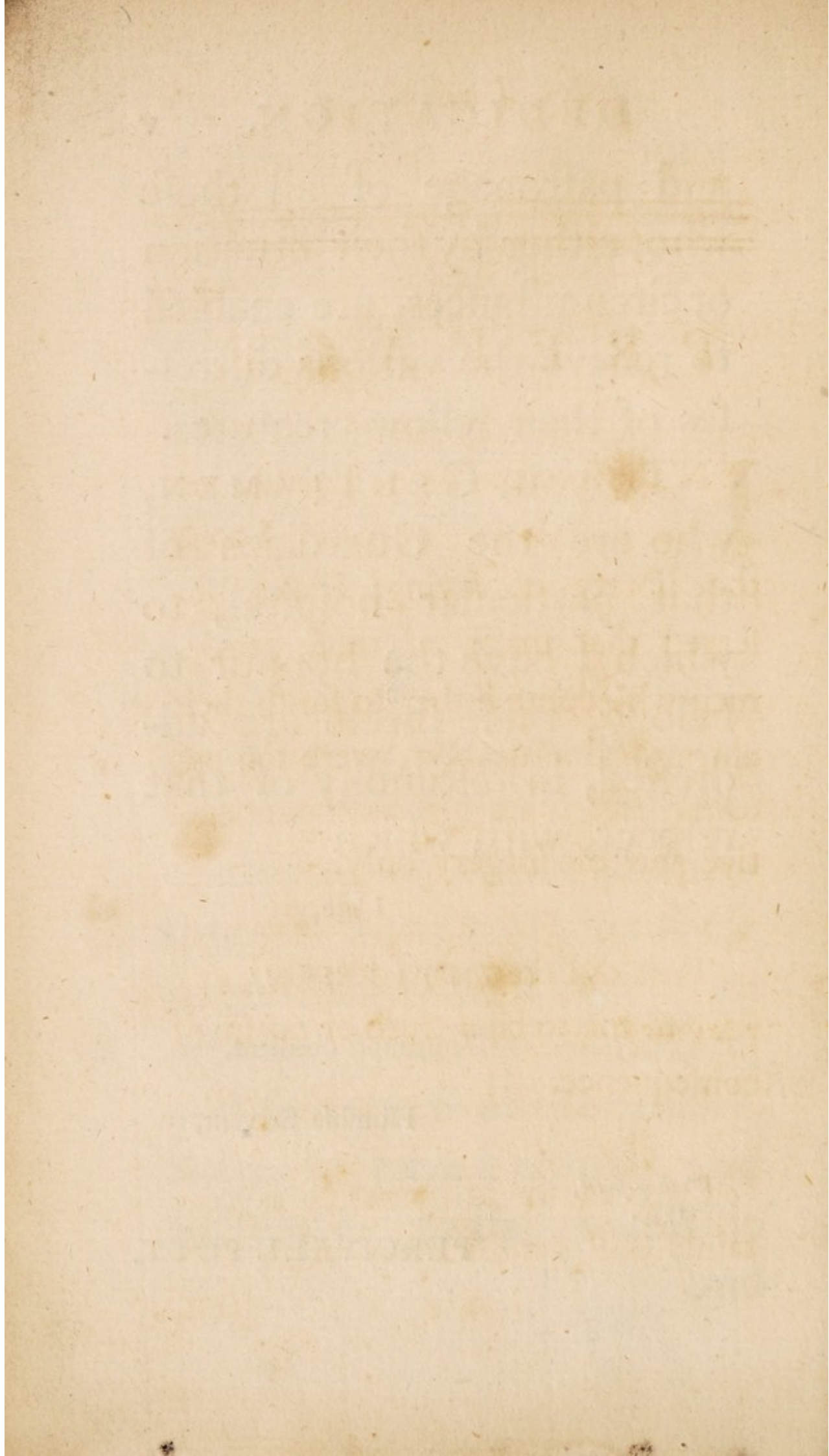
GENTLEMEN,

Your most obedient,

Humble Servant,

Watling-street,
1759.

PERCIVALL POTT.



P R E F A C E.

IN the preface to a Treatise on the Fistula Lachrymalis, I took the liberty of saying, I had observed that many of those gentlemen who come hither to finish their chirurgical education, were too apt to fix their attention on the operative part of surgery only.

THIS did then, and does still, appear to me to be a truth of no small consequence.

DEXTERITY in operating is certainly one qualification of a surgeon,

geon, but it is only one; many others are equally necessary. The preservation of any part of the human frame has, at least, as much merit, as the most dextrous manner of removing it: and there are many disorders strictly within the surgeon's province, the management of which will require more real skill, and judgment, than are necessary for the mere performance of any operation whatever; not to add, that the power and capacity of a practitioner are full as often shewn by preventing an operation, as in performing it.

NEITHER is this faculty of dexterity confined (as is most absurdly supposed) to capital operations only; every

every part of the art will furnish manifold proofs to the contrary : every part of it requires a hand accustomed to execute, as well as a head capable of directing. The different manner in which fractured limbs may be disposed, dislocated joints replaced, and many surgical disorders treated, will not only shew the abilities of the surgeon, but will produce an almost inconceivable difference to the patient, as well in his present sensations, as in the future consequence of his complaint. Pain is a real evil to him that feels it ; lameness, and deformity, are sometimes the inevitable consequence of disease, but they are also sometimes produced by inattention and awkwardness,

I SHOULD be very sorry to have it thought that I meant to dissuade the students of surgery from endeavouring to become good operators. This is far from my intention; I know the necessity and importance of it, and only mean to dissuade them from making it their sole object.

JUDGMENT in distinguishing, and ability in treating diseases, are not to be attained by a transient cursory view of them; merely running round an Hospital for a few months, or reading a general system of surgery, will not form a complete practitioner: the man, who aims at that character, must take notice of many little things, which
I the

the inattentive pass over, and which cannot be remarked by writers; he must accustom himself to see, and to think for himself; and must regard the rules laid down by authors, as the outlines only of a piece, which he is to fill up and finish: books may give him general ideas, but practice, and meditation, must make him adroit and discerning; without these, his reading may possibly keep him clear of very gross blunders, but he will still remain injudicious, and inexperienced.

THE great variety of habits, and constitutions; the frequent complications of diseases with each other; and the strange effects of external violence, make a large field of
con-

contemplation ; but he who runs hastily thro' it, will be but little acquainted with it, and will often fall into errors, disgraceful to himself, and pernicious to others.

SURGERY is founded on observation, and supported by experience ; it not only requires a good deal of time to become well acquainted with it in general, but even the most judicious, and best experienced, sometimes find themselves under a necessity of changing their opinions, and altering their conduct : what was said by an extreme good judge of man, will be found equally just and true in arts as in ethics^a, especially such an art as
ours,

^a Nunquam ita quisquam bene subducta ratione ad vitam fuit, quin res, ætas, usus, semper aliquid aportet
novi,

ours, which depends upon reiterated experiment, and whose subject is liable to so much variation.

LORD Bacon advises a student to consider one part, and one disease at a time, and to become thoroughly acquainted with that before he undertakes another.

PERHAPS a strict, literal adherence to this rule, would render the study of medicine too tedious to be accomplished in any reasonable time; but under certain limitations the advice will be found useful.

THE compilers of systems, or institutes, cannot possibly consider
dis-

novi, aliquid moneat; ut illa, quæ te scire credas nescias, et, quæ tibi putaris prima, in experiundo ut repudies.

TERENT. Adolph.

diseases with that accuracy and minuteness, which many of them require; and opinions formed from such general accounts only, must often be very superficial.

THE writer who confines himself to one subject at a time, may, without incurring the charge of prolixity, descend to many little particulars, both in practice and theory, which are extremely necessary to be known, but which would swell a general system into an immoderate size. He does not lie under the necessity of treating his subject with such brevity; and therefore it is his own fault if he is not explicit.

THIS

THIS has always been my opinion; and in consequence thereof, I have already ventured to submit my thoughts on one or two diseases to the public. The favourable reception they have met with, has emboldened me to publish the following practical remarks on another; which, perhaps, has neither been so carefully attended to, nor so thoroughly explained, as the great importance of the subject requires; and which is accompanied with more uncertainty, creates more anxiety to the surgeon, and more hazard to the patient, than almost any other ill, to which the human frame is liable from external violence: I mean, wounds of the head.

THIS

THIS is a general term, under which have always been comprehended several different disorders, produced by various immediate causes, and affecting different parts. All injuries done by outward violence to the scalp, pericranium, skull, membranes of the brain, or to the brain itself; either by cut, laceration, or bruise of the integuments; by wound, contusion, or fracture of the cranium; by wound of the brain, or its membranes; or by the pressure of fluid, extravasated in consequence of injury from without.

SOME of these ills are visible, and therefore known immediately; others have often no external mark,

and therefore can be judged of, only by the disorders which they produce.

IF these cases were always simple, and uncombined, the particular kind of mischief would, in general, be indicated by its particular symptoms; but unfortunately this does not often happen; great violences offered to the head, seldom produce one simple effect on one part only; and when different symptoms, proceeding from various mischief, are blended together, it becomes extremely difficult, not to say impossible, to distinguish the immediate causes from each other, however important such distinction would be in practice.

THIS alone will necessarily occasion some degree of confusion, and obscurity; but the difficulty of determining precisely in these cases, is still increased by another circumstance, which is, that in some instances, different kinds of mischief produce almost the same symptoms.

FOR example: the head is sometimes so shaken, as to occasion a disorder in the medullary structure of the brain, without any apparent breach of vessels, or effusion of fluid; this is called a commotion. If it is to a considerable degree, it is often attended with a stupor, or loss of sense, and of voluntary motion: the extravasation of blood or serum between the membranes, on the
fur-

surface of the brain, or in the ventricles, is frequently accompanied with the same kind of symptoms; but tho' the effects are nearly similar, yet the causes are very distinct.

THE symptoms brought on by the pressure of a piece broken off from the inner table of the skull, are scarcely distinguishable from those produced by blood or lymph pressing on the brain, each of which is certainly a very different cause of mischief.

THESE combinations of causes and symptoms, and the uncertainty which necessarily attends them, make this a very disagreeable part of surgery: but merely lamenting, will never mend it; and as the inconvenience

venience which we feel is great, our attempts to get information ought to be in proportion.

By a minute examination into a number of these cases, possibly we may find, that tho' a clear and perfect knowledge of them is not attainable by us, yet more information is to be gained, than an inattentive practitioner is aware of. It may perhaps, upon a more close inquiry, be found that some of those which appear to have many of their symptoms in common, have still some peculiar characteristic, some mark by which they may be distinguished from each other, and by which the most proper method of treating them may be indicated.

IF this could be reduced to any tolerable degree of certainty, it would be a great acquisition; for at present there is no part of surgery, in which many people are so much puzzled as in this: general terms are made use of, by which no precise idea is conveyed, and the surgeon not being clear in his own conception, of the nature of the disease, is at a loss how to account for it to others, or how to act most properly in attempting to relieve it.

WHETHER it is absolutely necessary to perforate the skull immediately, or not hazardous to defer it; what consequences will most probably follow from the one or the
 a 3 other;

other; what appearances portend good, what ill; what symptoms are capable of being relieved, and by what means; are things which every man who calls himself a surgeon, should know as perfectly as the nature of the thing will admit; and which are to be known only by frequent and close attention.

To prognosticate, means no more than to judge of probable events, by a comparison of similar cases: this is an act of deliberate judgment, and therefore, in this part of our art a man generally shews what his real abilities are.

To be able to foretel approaching mischief, is as necessary to a practitioner, as to predict success;
friends

friends and relations have a right to be informed of the motives of a surgeon's conduct; and what is still more, he should be able to satisfy himself that it is rational, and that he does his duty.

THE only means by which true and useful knowledge is to be obtained, in this and in every part of surgery, are, a competent knowledge of the anatomical structure of the human frame; a close attention to the symptoms of diseases in the living, and a minute examination of the appearances in the dead: these are the great fountains of all medical knowledge, and by these very useful information is still to be had, even in this obscure part of it.

By these it will among other things be found, that fractures of the cranium, considered abstractedly, are not attended with those symptoms, or that danger, which are commonly supposed; that large quantities of matter may be formed between the dura mater and skull, without any previous effusion of blood; and, that the detachment, and putrefaction of that membrane, tho' least taken notice of by modern writers, is a more frequent cause of bad symptoms, and of death, than all the others put together.

THE great length of time which often intervenes between the receipt of the injury, and its fatal effects; the

the seemingly safe state of the patient during that interval ; the very terrible symptoms which sometimes follow very slight blows on the head ; and the little power of art in many cases to resist, or to remove them ; contribute to make this a very melancholy part of practice, and render the smallest acquisition of knowledge worth all our trouble.

Too many of these accidents are indeed quite out of the reach of all assistance ; but even in deplorable cases, there is some kind of satisfaction in being acquainted with the true cause of the mischief ; in knowing what it is which renders our pains fruitless ; and in believing that

we

we have done all that the nature of the case will admit of.

Est quodam prodire tenus si non datur ultra.

My intention in the following pages, is to inquire into some of the ills to which mankind are liable, from injuries done to the skull and its contents; in doing which, I do by no means intend a regular treatise, but only to put together such practical remarks on the most interesting circumstances attending these disorders, as my observation and reading, have at different times suggested to me. Many things, which should necessarily make part of a complete formal treatise, will be omitted, as being no part of my design.

IF in some few particulars I shall be found to differ from the commonly received doctrines, I must beg leave to observe, that it is not the consequence of mere opinion, hastily embraced, but the effect of a careful attention, to the repeated opportunities which a large, publick hospital has furnished me, of seeing and examining such cases.

I COULD produce many histories to confirm my assertions, if I thought that they would add to their use or force, but have suppressed them, because they do not appear to me likely to do either, as the reader must still depend upon my veracity, as much in one instance as in the other; the man who

is

is capable of asserting what he knows to be false, must have a very defective imagination not to be able to form cases in its support.

THE quotations in the notes, may possibly be thought too numerous, and I may, on that account, be charged with affectation, but whoever does this will do me injustice. The antient methods of treating these disorders are not known to every practitioner, and consequently many of them are unacquainted with the real merit of modern improvement; beside which, many of the best of the old writers have particularly considered this subject, and have made very sensible animadversions upon it. As they attended

tended very closely to the appearance of diseases, their pathological observations are in general very accurate, and the judgments formed from thence extremely just: these, and these only, were the reasons that induced me to quote so freely, in order to prove the truth of my assertions in the first instance, and to do justice to the memory of the antients in the second.

Few people are capable of judging impartially of themselves, or of their own productions; and the following pages may possibly prove, that I have greatly overrated my own abilities in the attempt.

IF I have treated the subject in such a manner as to give satisfaction

to those who are judges, and any degree of information to those who stand in need of it, I shall be much pleased: if I have failed in both, I can only plead the goodness of my intention, and beg the reader's pardon for making him mispend his time; wishing that somebody more capable, would execute it better; as it is a point in which mankind are much interested, and which is by no means sufficiently understood by many who are daily liable to be employed in it.

THE judicious reader will, I make no doubt, find some things which he will object to; but there is one too frequent fault in medical books, which I hope he will
not

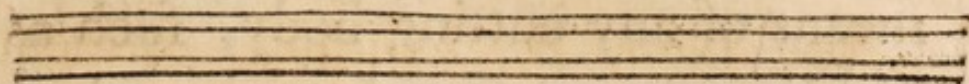
not find me guilty of; I have paid no compliment to surgery, at the expence of truth; nor have I endeavoured to avail myself of what seems the prevailing character of the times, viz. a propensity to believe implicitly, whatever is advanced boldly ^b.

WHERE our art is capable of doing good, or of being improved, I have asserted it freely; where it is deficient, or ineffectual, I have acknowledged it candidly, leaving the arts of delusion and falsehood, to those who think them worth employing; to those who, tho' equally ignorant and shameless, are by the credulity of the multitude, and the prevalence

^b I mean in matters of physic and surgery.

lence of fashion, largely rewarded for poisoning, blinding, tormenting, mutilating, and murdering mankind, under the titles of DISCOVERERS OF SPECIFICS, OCULISTS, CANCER-CURERS, AND OPERATORS FOR RUPTURES.

The reader is desired, in page xvi, line 5, of the preface, after the word *parts*, to put a semicolon followed by a small *a*; in page 12, line 19, to remove the comma from the word *separation*, and place it to the next word *extended*; in page 69, line 15, for *this*, to read *the*; in page 116, line 11, instead of *sufficiency* to read *insufficiency*; and in page 131, line 5, instead of *light*, to read *tight*.



O N

WOUNDS and CONTUSIONS

O F T H E

H E A D.

S E C T. I.

ALL the injuries which the cranium is capable of receiving, may be brought under three general heads; wound, contusion, and fracture.

UNDER the term wound may be comprehended, every kind of penetration beyond the surface of the bones, made by the point or edge of any instrument or weapon; and all

B

remo-

removals of parts of the bones, by means of any cutting body, such as hatchet, broad-sword, axe, sabre, &c.

THAT all bones which consist of two tables, with an intervening medullium, are capable of being hurt by contusion, is beyond all doubt; the bones of the cranium therefore are liable to this species of injury, from their construction merely.

BUT if it is also considered, that the whole skull is covered and lined by a firm strong membrane, of a tendinous kind of structure, plentifully furnished with blood vessels, which passing from one membrane to the other, through the medullium, keep up a constant circulation between them; and that the inner of these membranes is one of the immediate coverings of the brain; it will appear, that from bruises of
parts

will appear, that from bruises of parts of such structure, so connected, and of such important use, great consequences may sometimes follow, and consequently that under the article **CONTUSION**, many very interesting circumstances may occur.

THE word fracture, taken in a general sense, will include every violent division of the parts of a bone, not made by incision or puncture.

WOUNDS of the cranium, made by a pointed or piercing instrument, are of three kinds :

I. Those which penetrate the first or outer table only, and do no mischief to the inner.

II. Those which pass through both tables.

III. Those which pierce the outer and break the inner table.

A **WOUND** piercing the outer table only, and not attended with symp-

toms of any other kind of mischief, may be treated as simple, and suffered to heal immediately; but if it is accompanied with such appearances or such complaints as indicate any other injury beside the mere wound in the bone, the treatment must be varied as such other mischief may require.

THE ills which may attend a wound of this kind are such as flow from the mere force with which it is inflicted, and are, extravasation of fluid; contusion, with all its consequences, both with regard to the skull and the membrane underneath; and concussion of the brain.

IF the instrument has passed thro' both tables, it is not very likely that the dura mater has escaped being wounded; from whence hæmorrhage or inflammation are to be expected: the loss of blood is seldom large indeed, but the danger in this
 case

case arises from the insinuation of a quantity of it between the cranium and membrane, where it will produce all the bad effects of any foreign body. A puncture of the dura mater, like the same kind of wound in every other tendinous or firm membrane, is capable of exciting very terrible inflammation; and one of the known effects of a smart blow upon or contusion of the skull, is the separation and putrefaction of the membrane under it.

THE structure, uses, and connections of the dura mater, render each of these of the utmost consequence to the patient.

AN inflammation is generally attended with a fever, which eludes our utmost skill: the putrefaction or suppuration of it is most frequently fatal; and the confinement of blood, either between it and the

skull, or between it and the brain, is productive of very bad symptoms and great hazard.

THE symptoms of an extravasation are such as are produced by the pressure it makes on the brain and nerves, viz. Vomiting, drowsiness or great propensity to dozing, a stupid inattention to external objects, and the defect or loss of voluntary motion.

THESE are in a greater or less degree, according to the quantity and situation of the extravasated fluid, and are frequently attended with a slow, labouring, interrupted pulse.

THE symptoms of inflammation or suppuration of the dura mater are all of the febrile kind; quick pulse, hot and dry skin, flushed cheek, inflamed eye, anxiety, restlessness,

lesness, nausea, vomiting, rigor, and delirium. ^a

HENCE it appears, that mere extravasation of blood, and inflammation of the dura mater, are very distinct causes of mischief, and accompanied by very different symptoms. A proper attention to this, will frequently give us an opportunity of distinguishing the one from the other, and thereby not only produce that satisfaction which necessarily arises from believing that our conjectures are well founded and true, but will also, in some instances,

^a Vomiting is a general tho' an equivocal symptom ; it always indicates some violence offered to the brain, tho' it does by no means inform us, of what kind. It has always been reckoned among the symptoms of a fracture of the cranium ; but, as it most frequently attends every kind of external injury offered to the head, by which the brain is either shook or pressed on, it should always be regarded as an indication of violence done to that part, and accordingly put us on our guard ; tho' we cannot from thence conclude, with any degree of certainty, of what particular kind the mischief is, nor whether it will remain or not.

stances, point out the most proper method to be pursued, in order to obtain relief; for tho' the curative process is in general nearly the same in both cases; yet, in some respects, they vary enough to render a knowledge of the immediate cause extremely well worth obtaining, where it is possible.

FOR example. Extravasation of blood, if large, or attended with urgent symptoms, is hardly ever relieved without perforation of the skull; and the more pressing the symptoms are, the sooner should the operation be performed. Neither evacuation, nor any other means, are sufficient to obviate the ill which this pressure will produce; and all other attempts are worse than useless, as they often occasion a loss of that time and opportunity, which are never to be had again.

INFLAMMATION of the membrane always requires, and if slight sometimes yields to, large bleeding, gentle purging, and a general febrifuge cooling regimen. The time employed in these methods is not lost, but will turn to the patient's advantage, even tho' perforation of the cranium should become necessary afterward: so that, in the one case, we should perform the operation immediately without delay; and, in the other, we are vindicated in trying whether we cannot prevent it.

WHETHER the trephine be applied for the discharge of extravasated blood, or for the relief of the wounded or inflamed membrane, the intention is thereby to make such an opening, as may give free discharge to blood, serum, or matter, which either is or may be collected

lected or formed, upon or under the surface of the dura mater.

THE crown or saw of the instrument used upon this occasion should be large, and it should be so set on, as to have the wound in the bone as near as can be in the center of its circle.

WHEN the piece of bone is removed, and the dura mater laid bare, the state and circumstances of this membrane will determine the future conduct.

IF it is wounded, or seems likely to inflame, it should be dressed with the softest applications possible; while by bleeding, lenient purges, and a proper general regimen, all endeavours are used to appease the inflammation, and prevent the membrane from becoming sloughy.

IF it is found considerably detached from the inside of the cranium,

nium, or already sloughy or purulent, the operator must consider, whether the opening he has made will be sufficient to answer the intention; and, if it is not, the instrument must be applied again, in such manner as shall seem most likely to serve the purpose.

IF the case is a simple extravasation of blood, and the quantity is small; if it lies on the outer surface of the dura mater, immediately under the perforation, and is neither diffused to any distance, nor has considerably detached the membrane from the inside of the bone; the symptoms may possibly remit, upon the discharge of the coagulum, and the patient, by proper general treatment, may soon get well.

BUT if the quantity of blood is large, or diffused to a considerable distance, the case is worse, and the
event

event more doubtful : a large quantity makes a greater pressure, produces more urgent symptoms, and is more difficultly discharged than a small one. Beside which, more mischief is to be feared in future, from the large detachment of the dura mater from the inside of the skull, even tho' all the extravasated blood should be discharged, and the symptoms proceeding from pressure disappear : for the small vessels, which united the outer surface of the dura mater to the inside of the cranium, being broke, and all communication between that membrane and the skull being thereby destroyed, the former becomes sloughy or purulent as far as such separation, extended matter is collected on its surface, and the symptoms attending suppuration succeed to those which

which were occasioned by mere pressure.

ALL this may happen, if the extravasated fluid lies on the outside of the dura mater; but if it is underneath, between it and the pia mater, the case is still worse.

I MUST acknowledge, that I am far from agreeing to the opinion that the division of the dura mater is a matter of indifference. I think I could produce reasons, supported by experience, which would prove the contrary; but be that as it may, in these circumstances it becomes absolutely necessary, and must be done; the extravasated fluid has no natural outlet, and cannot remain between or under the meninges, without great hazard to the patient.

HERE also, as in the case of extravasation upon the surface of this membrane, if the quantity is small,
lies

lies all together, and immediately under that part of it which is laid bare by the trephine, the patient has much more chance of being relieved by the division of it, than in the contrary circumstances of large quantity, or diffused to a considerable distance.

MUCH more might be added on this subject, but as the proper treatment of all these cases, will be fully spoke of under the articles of contusion, extravasation, and concussion; I shall, to avoid prolixity and repetition, refer the reader thither.

ALL that has been said in the preceding part of this section, of wounds of the skull made by such instruments or bodies as pierce, or as it were wound it by puncture, is applicable, with very little variation, to such large weapons as remove
parts

parts of it, or wound it by incision, such as broad-sword, sabre, ax, &c.

IF a piece of the cranium is totally separated from the rest, but is still attach'd to the pericranium and scalp; it may, if there are no bad symptoms, be worth while to replace it immediately, and endeavour to procure its reunion: if the attempt succeeds, a good deal of time is saved; if it does not, the piece may be removed at any time.

IF a portion of the outer table only is cut off, and no other mischief appears to be done, it may be treated as simple, at least until bad symptoms come on, which are always to be feared; it very rarely happening, that such force is applied to the head, as to remove a portion of the skull, but that at the same time, it either causes an extravasation, or does some material mischief to the
parts

parts within ; by which the nature of the case, and the proper method of treating it, are necessarily altered.

IT sometimes happens that an external body pierces the outer table of the skull, and is stopt by the inner, which it breaks, and by that means produces a fracture of one table only. The same effect sometimes flows from a blow, which does no apparent mischief to the external table.

THIS fracture is of different extent in different cases ; but whatever may be the size of the broken piece, it either keeps its place, and does not alter the equality of the internal surface of the skull, or it is removed from its natural situation, and presses on, or wounds, the membranes or brain.

IF the broken fragment is not depressed, and no injury is done to the
dura

dura mater, by its being wounded or detached from the bone, it possibly may produce no bad symptoms, and may pass off totally undiscovered.

OF this there are many instances upon record; the vestigia of fractures of the internal table have been discovered after the death of those who, while living, were not hurt by them; at least, not in such manner as to indicate whence the mischief arose, or to make any surgical process necessary.

THAT many persons, whose symptoms have been supposed to proceed from concussion, or extravasation, have been destroyed by this kind of undiscovered fracture, I make no doubt; while others have suffered some partial injury^b, or, tho' they

C

have

^b Platner gives an instance of a fracture of this kind, discovered nine years after it happened; the patient died
of

have at first had some alarming symptoms, from the general effect of the blow, yet the piece not being displaced, nor the dura mater injured, and its inflammation being by evacuation and general remedies prevented, they have escaped farther mischief.

IF the broken piece is depressed, and merely bears on the surface of the dura mater, without injuring its texture, the symptoms are those of pressure made on the brain, and nerves; stupidity, inclination to sleep, loss or failure of sense and voluntary motion, &c. all which, as they are produced by the situation of the broken fragment, appear immediately, or very soon after the accident.

IF of some other disorder, and he, Platner, was induced to examine his head, by his having been deprived of memory, and rendered desipient from the time he received the blow.

Other instances of this kind of fracture, are to be met with in the writers of observations.

IF the force which breaks the bone is so great as to cause a separation of the dura mater from the inside of the cranium ; or if that membrane is so injured in its texture, as to inflame, or become sloughy ; the symptoms attending the formation and confinement of matter under the skull, will indicate such mischief. These, I have already observed, are of the febrile kind, and do not come on until some days after the accident.

IN both these instances, the application of the trephine is absolutely necessary : for if the broken piece presses on the membranes, so as to produce bad symptoms, it must be removed at all events ; and if suppuration is the consequence of the dura mater being wounded, or detached, nothing but perforation

of the cranium can give the least hopes of relief.

S E C T. II.

Of Contusions of the Head.

TH E bones of the cranium, like most of the other flat ones, consist of two tables, separated from each other by a cellular or reticular kind of substance.

THIS substance serves for the distribution, and suspension of an infinite number of membranous cells, plentifully furnished with blood-vessels, and containing an oily matter, in nature and office analogous to the medulla in the long bones.

FROM this general idea of their structure, it is obvious, that by violent
 lent

lent blows the two tables may be compressed together; or, to speak more properly, the outer table may be so beat in upon the under one, as to bruise and do much injury to the cellular bony substance, and its medullary membrane.

ACCORDING to the degree of this compression, these parts will suffer more or less; and if they are so much hurt as to inflame and suppurate, the matter, having no natural outlet, necessarily spoils a part of the bone, and renders it carious^c.

The caries, thus produced, affects sometimes one table only, and sometimes both; and the exfoliation, which is the necessary consequence

C 3 of

^c When the lues venerea affects the skull with that kind of caries which spreads wide, without making any considerable elevation of the surface of the bone, the medullary membrane is the original seat of the disease; the reticular substance is expanded, and the exfoliation is most frequently of both tables, and to a considerable extent.

of this disease, is also sometimes of one table only, and sometimes of both^d.

THAT this is now and then the effect of bruises on the head, is well known to practitioners, both antient and modern ; but the principal and most frequent mischief attending such contusion, arises from the intimate connection of the pericranium, cranium, and dura mater, with each other.

THE ills produced by blows, in consequence of this connection of parts, have most commonly been confounded with those arising from other immediate causes, under the general term CONCUSSION; a term which strictly and properly signifies
a cause

^d The destruction of both tables of the skull is particularly remarked by Celsus. — *Vix unquam nigrities integrum, caries per totum os perrumpit; maximeque ubi vitata calvaria est.*

a cause of mischief, but conveys no idea of its particular effects.

THE symptoms which have been produced by extravasation of blood, or serum; those proceeding from commotion of the medullary substance of the brain; and those occasioned by the pressure of undiscovered fractures; have all of them, at times, been indiscriminately attributed to concussion; which, from the obscurity this part of surgery has been suffered to remain in, has been thought a sufficient solution, without entering any farther into the precise effects of such particular cause.

THESE effects are various, and very often much complicated with each other; but as they are also sometimes very distinct, and as there are several other causes of bad symptoms of wounds of the head,

beside concussion, it may possibly be of some use, to distinguish them as exactly as the nature of the subject will admit.

THE particular disease, of which I mean now to speak, is attended with some symptoms almost peculiar to itself; arising from mischief done by the blow to the parts in immediate contact with the skull, viz. the pericranium, medullary membrane, and dura mater. The other parts contained within the cavity, tho' they may be injured by the same accident, yet have no necessary connexion with this particular complaint.

As this kind of injury is very different in its nature from extravasation and commotion, so, when it is simple and uncombined, does it produce very different effects: but as it is also very often connected with

other ills proceeding from the same violence ; this accidental complication has been the occasion of much confusion in the description, and much unsteadiness in the treatment of these disorders.

THE pericranium is so firmly attached to the external surface of the skull, as not to be separable from it without violence ; and when such violent separation is made in a living subject, the cranium bleeds freely from an infinite number of small vessels, which go into, or come out from, the cellular texture between the tables.

THE dura mater is a firm, strong membrane, as intimately attached to the inside of the skull as the pericranium is to the outside, and by the same means, viz. its vessels. These are of various sizes, and pass thro' the pores and foramina of almost every

every

every point of the internal surface of the cranium into the medullium ; by which means a constant circulation is carried on between the pericranium, the internal part of the bone, and the dura mater.

THAT this is truly the case, is clear from all the appearances which attend the scalping a living person, or the separation of the cranium from the dura mater of a dead one.

IN the first, blood will be seen issuing from almost every pore of the outer surface of the bone, especially if the subject is young. In the second, not only some force will be found necessary to detach the sawed skull from the membrane ; but, when it is removed, an infinite number of bloody points will be seen all over the whole surface of the dura mater. These, if wiped clean, immediately become bloody
 2 again,

again, being only the broken extremities of torn vessels; and as these vessels are largest and most numerous at the futures, so there the adhesion is the firmest^e.

IT has been thought by many, that the dura mater was attached to the skull at the futures only; that in all the spaces between them it was loose and unconnected; and that it enjoy'd a constant oscillatory motion, or was alternately elevated and depressed. This, tho' it has really no foundation in truth, yet being inculcated by some writers of eminence, has misled many in their opinions, not only of the structure and disposition of this membrane, but of the nature of some of its diseases.

THE

^e These vessels, or bloody points, are most conspicuous in the heads of malefactors, who have been hanged; or in young people who die apoplectic; for reasons which are obvious.

THE dura mater does to the lower surface of the bones of the cranium the office of perioftium, in the same manner as the pericranium does to the upper: to this it is so universally and firmly attached, as to be absolutely incapable of any the least motion. The alternate elevation and subsidence, which are observable when any portion of it is laid bare in a living subject, are nothing more than the motion of the blood thro' the arteries of the brain.

By blows, falls, and other shocks, some of the larger vessels which communicate between the dura mater and skull are broke, and a quantity of blood is shed upon the surface of that membrane. This is one species of bloody extravasation, and indeed the only one which can be
be-

between the cranium and dura mater.

IF the broken vessels are few, and the quantity of blood small, the symptoms are slight, and by proper treatment soon go off: if the broken vessels are large or numerous, and the quantity considerable, the symptoms are urgent in proportion: but whether they are slight or alarming, whether they appear immediately or not, they are always such as indicate pressure made on the brain and nerves, *viz.* drowsiness, the diminution or loss of sense, speech, and voluntary motion.

THIS is one very frequent consequence of blows on the head: but it also often happens from the same kind of violence, that some of the small vessels which carry on the circulation between the pericranium, skull,

skull, and dura mater, are so damaged as not to be able to execute that office any longer, tho' there are none so broke as to occasion an effusion of blood.

SMART and severe strokes on the middle part of the bones, at a distance from the sutures, are most frequently followed by this kind of mischief^f: the coats of the small vessels which sustain the injury, inflame and become sloughy; and in consequence thereof the pericranium separates from the outside of that part of the bone which receives the blow, and the dura mater from the inside; the latter of which membranes, soon after such secession, inflames, and in due time becomes sloughy also.

THIS

^f Every other part of the bone is equally liable to this kind of injury; but as the vessels are considerably larger at the sutures than they are in the middle of the bone, a blow on these is apt to produce a bloody extravasation also, and thereby render the case complex.

THIS is a very different disease from extravasation or commotion, and is also attended with different symptoms †.

ALL the complaints produced by extravasation, are such as proceed from pressure made on the brain, and nerves; and from obstruction to the circulation of the
blood

† The difference betwixt these two effects of contusion seems to be very well understood by Beringarius Carpenfis, who says, “ Interdum etiam a contusione non rumpitur aliqua vena, sed rumpuntur ligamenta illa duræ matris, a quibus refudat aliquid: hisce vero, nisi succurratur, accidunt sæva accidentia et mors.”

Paulus Ægineta also has been very particular in distinguishing between that degree of contusion which affects only the outer table and medullium, and that which injures the dura mater: “ Porro contusionis hujus duræ existunt differentiæ; vel enim calva per totum ipsius crassitiem contunditur, ut frequenter etiam cerebri membrana abscessu occupetur, vel omnino a calvaria hæc per totum, aut non per totum, premitur; sed exteriorem duntaxat superficiem, usque ad laminam secundam depremitur.”

Hippocrates also has very justly remarked the different extent and effects of contusion of the cranium: “ Contundi quaque os potest, quamvis in suo statu maneat, et nulla ossi colliso se jungat rima. Sunt vero contusionis species plures; etenim plus aut minus contunditur, aut contusio pervadit totum os, aut in summo magis hæret, non in toto.”

Hippoc. de vuln. capit.

blood thro' the former ; stupidity, loss of speech, sense, and voluntary motion, obstructed respiration, &c. and, which is of some consequence to remark, these symptoms appear immediately, if the effusion is at all considerable.

THE symptoms attending such a state of the membranes as I have just now described, are all of the febrile, inflammatory kind ; pain in the head, restlessness, and want of sleep, frequent and hard pulse, hot and dry skin, flushed cheek, inflamed eye, nausea, vomiting, rigor ; and, toward the close, convulsion and delirium : and none of these appear at first, seldom until some days are past.

ONE set of symptoms are produced by an extravasated fluid, making such pressure on the origin of the nerves, as to impair or abolish
voluntary

voluntary motion and the senses; the other are occasioned by the inflamed or putrid state of the membranes covering the brain^h; seldom or ever affecting the organs of sense or motion until the latter end, when a large quantity of matter is formed, which must press like any other fluid.

I AM sensible that it is a generally received opinion, that blood shed from its vessels, and remaining confined in one place, will become pus; and that the matter found upon the surface of the dura mater toward the end of these cases, was originally extravasated blood; both which positions I apprehend to be false.

THAT

^h “ Sed accidentia quæ sequuntur ad prædictam contusionem inter commissuras, non sunt per contusionem tantum, sed sunt per putrefactionem panniculi læsi.—Et cum venit ad certam quantitatem determinatam, incipit febris et alia accidentia, et tandem sequitur mors, nisi cito succurratur, quamvis etiam tunc sit difficile succurrere.”

JACOBUS BERENGARIUS CARPENSIS.

THAT pure blood shed from its vessels will never turn to or become matter, is proved incontestibly by every day's experience in many instances; in aneurisms by puncture, in retentions of the menses, by imperforate vaginæ, and indeed by every considerable ecchymosis. True pus cannot be formed from blood merely, as may be known from the formation of all abscesses, and from every circumstance attending supuration: and that the matter found upon the surface of the dura mater, after contusions of the head, never was blood, I am as certain as observation and experience can make me. Some of the French writers have divided the symptoms of what they call a concussion, into two sorts, and have named them primitive or original symptoms, and secondary or consequential ones. Among

mong the first, they rank immediate loss of sense, flux of blood, involuntary discharge of urine, or fæces, great propensity to sleep, &c. Among the second, they reckon fever, nausea, rigor, delirium, and convulsion.

THE first they impute to the extravasation of blood upon the membranes of the brain ; the second, to the putrefaction of that blood: and in this they have the authority of some of the best writers among the Ancients, to whom I would pay all possible regard and deference, without hurting truth ; but the fact is most certainly otherwise.

IT is true that the symptoms are very different, and very distinguishable from each other, as well in their nature, as in the time of their access ; and so far these Gentlemen are right : but they are much mistaken,

ken, when they attribute them to the same cause: for the first are occasioned either by the pressure of an extravasated fluid, or a commotion of the medullary part of the brain; and the second, by the inflammation, and consequent putrefaction, of the dura mater.

THESE are undoubtedly very different causes; and tho' they are sometimes found complicated in the same patient, and produced by the same violence, yet they are also very often perfectly distinct, as any one who will carefully and diligently attend, both to the living and the dead, will find.

ACCORDING to some varying and accidental circumstances, this effect of contusion is discovered sooner or later.

SOMETIMES the scalp is so little hurt, as not to claim even the patient's

tient's own regard ; in some cases it is much bruised, and in others it is wounded : sometimes no other injury is done to the parts within the skull, than that of which I am now speaking ; and at other times the same force which occasions this disorder, produces also extravasation of fluid, fracture of the cranium, commotion of the brain, &c. And when any of these happen, the symptoms which necessarily attend such other injuries arise, and the case becomes complex.

I SHALL first consider it by itself, independant of all other mischief.

IF there is neither fracture, commotion, nor extravasation, and the scalp is neither much bruised nor wounded, the injury is not discovered, or attended to, for some days ; at the end of which the patient feels pain in the part where he re-

ceived the blow: this pain, tho' most exquisite in that immediate point, is extended more or less over the whole head, and is accompanied with a disagreeable languor, or failure of strength, an increased velocity of pulse, and disturbed sleep.

A DAY or two after this, if no means preventive of inflammation are used, the part struck swells, and becomes puffy; and if it is now divided, the pericranium is found of a darkish hue, and detached from the skull, with a small quantity of a brown ichor between them.

THE colour of that part of the cranium from which the pericranium is detached, is even at this time somewhat different from that of the rest of the bone. Of this alteration it is not easy to convey an idea by words, tho' it is a very visible one: some of the best writers
have

have taken notice of it; and all who have attended to it, will know it when they see itⁱ.

FROM this time the symptoms advance more hastily, the fever increases, the skin is hotter, the pulse quicker and harder, the sleep less and more disturbed, and the patient is shook by irregular rigors, which are neither followed by a sweat, nor afford the least relief.

IF the scalp has not been removed till the patient is in this state, the alteration of the colour of the bone is more apparent; it is whiter, and drier, and looks, as Fallopius has very justly observed, more like

D 4

a

ⁱ Inspiciatis diligenter os detectum; quod os, quando est in natura sua, est coloris subrubri, non candidi prorsus, nec rubri prorsus, sed est veluti color mixtus ex albo declinans ad rubicundum, ut si multo lacte, vel alio colore candido, pones parum sanguinis, vel alterius rei rubræ.

Sed si videritis inæqualitatem coloris in ipso osse detecto, ita ut adsint veluti puncta coloris albi et aridi ossis; quæ aridæ particulæ aliquando majores sunt, aliquando minores, &c. sciatis quod os sit contusum.

FALLOPIUS:

a dead bone ; the fanies betwixt it and the pericranium is more in quantity, and the latter is more inclined to a livid hue. In this state of things, if the dura mater is denuded, it is found detached from the inner surface of the cranium, altered from its natural bright tendinous appearance, to a dull sloughy cast, and smeared over with something glutinous, but has as yet no matter on its surface.

EVERY hour after this period, all the symptoms are exasperated ; the heat and thirst become intense, the strength decreases apace, the rigors are more frequent, and at last convulsive motions, attended in some with coma, in others with delirium, finish the tragedy ^k.

IF

^k The whole process of this disease, is very accurately and justly related by Theodoric :

“ Si vero propter ictus vehementiam dura mater ab osse
“ fuerit separata, vel aliquo modo læsa, sano et illæso ex-

IF the scalp is removed during this last period, a very offensive kind of matter is found between it and the cranium; the bone is much discoloured; and if the perforation is made in a part of the skull where the two tables are most distant from each other, a discoloured sanies often issues from the diploe instead of blood: the vacant space, made by the detachment of the dura mater, is filled with matter, which sometimes insinuates itself over the whole surface of that membrane, and is also often found between it and the pia mater.

THE primary and original cause of all this, is the stroke upon the skull.

“ istente cranio, sic cognosces; cum dolor capitis, et lenta
 “ febris singulis diebus augmentantur, oculorum anguli,
 “ ac si spasmani vellent, aliquantulum distorquentur, genæ
 “ rubent, quod signum pravum est in qualibet capitis læsione;
 “ pannus balneatus superpositus citius desiccatur, cutis etiam
 “ arida et sicca; et si vulnus fuerit et os fuerit discooper-
 “ tum, color ossis velocius alteretur, &c.

“ Et propter negligentiam curæ, ægro superveniunt dolo-
 “ res et febres, spasmus, syncope & permistio rationis.”

THEODORIC de Vuln. Capitis.

skull. By this, the vessels which carry on the circulation between the scalp, medullium, and dura mater, are damaged, and no means being used to prevent the impending mischief, or such as are used proving ineffectual, that communication ceases, and both pericranium and dura mater separate from the skull, inflame, and become putrid¹.

WHOEVER will attend to the nature of the symptoms, the time of their

¹ The following passage from an ancient writer contains a very accurate account of the effects and appearances of suppuration or putrefaction, either between the tables of the skull, or on the surface of the dura mater; the cause assigned, putrefied blood, is not indeed the true one, but nevertheless the description is, in other respects, perfectly just.

“Concurfio fanguinis subterlabentis, quæ quidem sub
“superiore duplicis offis parte fit, ut sub unguibus mani-
“festa est: fanguis autem tempore in pus conversus, os
“livens ostendit, sed hanc et cognoscere, et curare perforando
“duntaxat atque humore emanante facilius est.

“Quæ vero super cerebri membranam fit, utraque ra-
“tione difficilis est; nam et læsis membranæ apparet, ideo
“enim febres cum horrore accedunt, faciei rubor et calor
“longe major quam pro febris modo, somnique tumultuosi,
“oculi subpingues, et gramiosi, et rubentes.

“Ulcus neque alitur neque pus maturat, et fordidum fit.”

ARCHIGENES de sanguine subtercurrente.

Petrus

their access, and their progress, will find them all easily and fairly deducible from this account. For as the detachment of the membrane is not immediate, so neither are the symptoms. These never appear until some days are past; that is, until the membranes begin to separate and inflame. The fever is at first slight, but increases gradually, as the dura mater becomes more and more diseased, until matter is collected in such quantity as to bring on convulsion, stupor, and death.

HITHERTO I have considered this disease as unaccompanied with any apparent injury of the external parts. Let us now suppose the scalp to be wounded at the time of the accident;

or

Petrus e Largelata, having related the symptoms attending the formation of matter under the cranium, in consequence of a fracture, says, “ Si autem fractura sit parva et
 “ penetrans, tunc fiunt illa signa post aliquod tempus, eo
 “ quod tunc humiditates quæ sunt sub cranio putrescunt;
 “ et tunc fiunt illa accidentia.” And then adds, “ secundo
 “ notes, quod omnia illa accidentia possunt advenire ex
 “ percussione capitis, cranio non fracto.”

or that, the symptoms being alarming, it has been removed in order to examine the bone.

IN this case the wound will, for some little time, have the appearance of a simple wound of the scalp; will discharge at first a thin sanies, and then matter; will digest, begin to incarn, and, in short, look well: but after a few days these favourable appearances all vanish; the fore loses its florid complexion, and granulated surface, and becomes pale, flabby, glassy, and painful; instead of good matter, a thin gleet is discharged from it; the lint, with which it is dressed, sticks to all parts of it; and the pericranium, instead of adhering firmly to the bone, separates all round from it to some distance from the edges^m. At the same time that
the

^m “ Ubi cunque autem ex vulnere intereundum sit, neque
“ possit homo sanitatem recipere, neque servari, ex his
“ notis

the fore undergoes such alteration, and makes so morbid an appearance, the rest of the scalp remains in a natural state, free from either inflammation, or tumour.

As the alteration in the fore is produced by the diseased state of the dura mater, so it is confined to that part of the scalp which lies immediately over the inflamed, or sloughy part of that membrane, and does not at all affect the rest.

THIS is so generally true, that tho' the scalp has been wounded in, or removed from, other parts of the head, where the dura mater is not detached

“ notis intelligere convertit moriturum, et quod futurum est
 “ præsignificare; hyeme plerumque ante diem quartum,
 “ æstate post septimum, febris accedit, quæ quum super-
 “ venit, vulnus reddit non sui coloris, et saniem modicam
 “ effundit, quodque ex ipso inflammatum est emoritur,
 “ glutinosum efficitur, et carnem sale conditam repræsentat,
 “ ruffum est et sublividum, tumque os corrumpi incipit, et
 “ nigrum fit, læve existens; tandem subpallidum vel album
 “ se ostendit; ubi autem, jam purulentum est, aut pustulæ
 “ in lingua nascuntur, laborans mente non constante
 “ consumitur.”

detached or inflamed, yet in those places the fores preserve a healthy appearance, while the former are in the state just now described, and the symptomatic fever is daily increasing.

NAY, tho' the integuments of the head should be attacked with an inflammation of the erysipelatous kind, a thing by no means infrequent, and by which the scalp is swelled, and the patient often much disordered, yet if the dura mater is every where unhurt and adherent, the sore will bear no such diseased appearance, as it always does when that membrane is injured; as has been most truly, and judiciously remarked by Hippocrates^a.

THE

^a Ubi autem in capitis vulnere sive sectio adhibita fuerit, sive non, osse tamen detecto, tumor rubicundus ac ad erysipelatis naturam accedens in facie, oculis, sive alterutro, sive utroque oritur, dolens ad tactum, febris item superveniat et rigor, ulcus vero quod ad carnem attinet, bono esse loco videtur; os et quæ juxta sunt recte procedant, faciei tumore
3
excepto,

THE first appearance of alteration immediately succeeds the first attack of the fever, and as the febrile symptoms increase, the fore becomes worse and worse.

THRO' the whole time, from the first attack of the fever to the last fatal period, an attentive observer will mark the gradual alteration of the colour of the bone : at first it is whiter and drier than the natural ; and as the symptoms increase, and the membrane becomes sloughy, it inclines gradually more and more to a purulent cast^o.

AND

excepto, neque ullus in victu error commissus fuit ; alvus homini solvenda, medicamento quod bilem detrahit. Si sic purgatus febris desinit, tum et tumor evanescit, et sanitati æger restituitur. HIPPOCRATES de Vuln. Capit.

^o Jacobus Berengarius Carpenfis, has been very particular in his remarks on this head ;

“ Quando sanies est infra cranium, ipso non fracto, cranium est male coloratum, et æger sentit gravedinem in ea parte qua est sanies.— Est os sanum illud scilicet, cui adhæret dura mater, coloris albi mixti rubedine.— Et quo separatio est major, eo major ossis quantitas est mutata in colore.—

AND it may also be worth while to remark, that if the blow is so near to a future as to bring it into view, either by the original wound, or by scalping, that soon after the dura mater is become sloughy, and purulent, the future seems to separate and let thro' a loose flabby kind of fungus, which gleans largely, and is painful to the touch—A certain sign of considerable mischief underneath^p.

I HAVE already taken notice, that in those cases where the bruise of the scalp is inconsiderable, and there is neither wound nor other bad symptom; that as the patient feels little or no inconvenience, he seldom complains

“ colore.—Ultra vero colorem cognoscitur etiam os eo quod
 “ ficcius sit sano.—Et ultra, colorem et siccitatem, quando
 “ incipit ista separatio incipiunt aliqua sæva accidentia, ut
 “ febris, mentis alienatio, stupor, vigiliæ, &c. quia incipit
 “ supra panniculum aggregari materia, quæ incipit cor-
 “ rumpi.”

JAC. CARPENSIS.

^p Sutures tempore curationis disjungi grave est.

ARCHIGENES de Signis.

complains until some few days are past, at the end of which ^a he is attacked with such symptoms as I have related, and which soon increase to such a degree as generally to baffle all our art.

BUT if the integuments are so injured, as to claim our more early regard, very useful information may from thence be collected; for whether the scalp be cut or torn by the accident, or whether it is found necessary to divide, or remove it, for the discharge of grumous blood, or on account of worse appearances, or more urgent symptoms, the state of the pericranium and bone will thereby be known.

IF the membrane is found detached in the manner which will
be

^a From such observation as I have been able to make, it has appeared to me, that the symptoms come on much sooner in the summer than in the winter, especially if the weather be hot, or the patient in a close place.

be mentioned, p. 57. it may be regarded as a pretty certain indication, that unless the proper means are used, the dura mater will suffer, and such symptoms ensue as have just been related: from hence therefore it may be learnt, that no time is to be lost, but that every means capable of appeasing or preventing inflammation should be immediately used.

THIS particular effect of contusion is frequently found in fissures and fractures, as well as in extravasations of blood, where the bone is intire; and, on the other hand, fissure, fracture, and extravasation, often happen without such additional mischief; all this is matter of accident: but let the other circumstances be what they will, the spontaneous separation of the altered pericranium, in consequence of the
 blow,

blow, is almost always followed by the putrefaction of the dura mater, the proper symptoms of which do not appear until some days are past; that is, until that membrane begins to inflame, and to be upon the stretch; a circumstance extremely well worth attending to in the case of fissure, or undepressed fracture, as the principal danger attending these is owing to this cause, as will be more fully explained when we come to speak of such cases.

It is no unusual thing for a smart blow on the head to produce some immediate symptoms, which after a few hours disappear and leave the patient perfectly well. Pain in the head, quickness of pulse, a slight degree of vertigo, and nausea, sometimes immediately follow such a blow, but do not continue more than 24 hours, especially if any

evacuation is used soon after the accident. These are most probably owing to a slight degree of commotion of the brain, which rest, and the loss of a little blood, give nature an opportunity of recovering.

BUT if, after an interval of some days, these symptoms are again renewed; if the patient again becomes feverish and restless, and this fever and restlessness are accompanied with slight rigors, and do not yield immediately to evacuation and a low regimen; mischief under the skull is certainly impending.

THIS may be in the substance of the brain, in the ventricles, between the membranes, or on the outer surface of the dura mater: of the three former I do not know any certain indications, but of the latter I think there is one which may almost be deemed so; I mean a puffy tumor
of

of the scalp, and the detachment of the pericranium from the skull under such tumor. These appearances following a blow, and attended with quickness of pulse, restlessness, and shiverings, generally, I had almost said infallibly, indicate an inflamed or sloughy state of the dura mater, and matter between it and the cranium^r.

It may not be amiss in this place to explain, in few words, what I mean by a puffy tumor of the scalp, and the separation of the pericranium.

E 3

By

^r Si statim ab initio febris primo aut secundo appareat die, illa proculdubio causam agnoscat, perturbationem humorum ac animi, quum vulnus incuteretur; cessante causâ procatartica, ac ubi se collegerit, æger desinat illa febricula.

Si vero primis diebus nihil febrile, nec ullum symptoma sentiat æger, seque in nullo discrimine existumat; hunc si subito, die scilicet septimo vel quarto-decimo (nihil licet in victu rebusve externis peccarit) ac præter expectationem febris invadat, significatur latens aliquod in cranio, cerebro, aut corpore vulnerati.

PET. PAAW in HIPPOCRAT.

By the former is not meant a general, but a confined, circumscribed swelling of the integuments, produced by the collection of a fluid between the pericranium and skull, of little more extent than the separated part of that membrane, not very tense or renitent, the quantity of fluid, which makes the elevation, being but small in proportion to the size of the tumor.

THE scalp, upon being either bruised or wounded, is, in some habits and constitutions, liable to be attacked by an inflammation and swelling of the erysipelatous kind, which tumor is not circumscribed but general.

THIS is sometimes the consequence of the mere bruise; sometimes it is occasioned by a wound of the skin and cellular membrane; and sometimes it is produced by a puncture
 or

or laceration of the tendinous aponeurosis of the muscles of the scalp.

THE first of these is particularly taken notice of by Hippocrates, and has already been mentioned.

THE two others are very distinguishable as well from each other, as from that occasioned by the detachment of the pericranium.

THAT which proceeds from a wound of the skin, and cellular membrane, has the appearance of an œdematous kind of tumor, mixed with some degree of inflammation; it pits, or receives and retains the impression of the fingers; is not very painful to the touch, seldom is attended with any alarming symptoms, always comprehends the ears and eyelids, and generally gives way easily to bleeding and gentle purging, &c. That which is produced by a puncture or wound

whereas that which I mean is spontaneous, and is produced by the destruction of those vessels, by which it was connected to the skull, and by which the communication between it and the internal parts was carried on; and therefore it is not the removal of the external membrane, which is the occasion of the bad symptoms, but the inflamed and diseased state of the meninges, in consequence of the destruction of those parts, by which they maintained a correspondence with the cranium, medullium, and scalp.

IN this case, the inferior surface of the pericranium, which before the accident adhered firmly to the skull, is totally detached from it, and is perfectly smooth; its colour is very different from that of the same membrane in a healthy state, and between it and the bone, a brown thin kind
of

of fluid is generally contained; the quantity of which is larger, and the alteration of the colour of the membrane greater, in proportion to the date of the injury: this is what forms the puffy tumor of the scalp, just now described, and which may always be distinguished from every other kind of swelling of these parts.

A FALSE notion prevailed for many years, that the dura mater was not in general connected with the internal surface of the skull, but adhered to it only at the sutures; and that in all other parts of it, such a vacancy was left, as gave free room for what they called its pulsatory motion. This opinion, which was embraced by many even of the most eminent writers and practitioners, has always appeared to me to be the reason why this effect of contusion of the head, was

not for some years duly and properly attended to. The supposed vacuity was thought sufficient, in general, to defend the dura mater from all external violence, and the blood and matter so often found between the cranium and it, were thought to be deposited in a space which they found vacant*. But
 who-

* If we consider how very clearly and plainly many of the most antient writers describe the intimate connection between the skull and the dura mater, and how perfectly well acquainted many of them were with its morbid separation, we shall wonder how it came to be forgot; but that it was is most certain.

In Hippocrates, Galen, Paulus, Oribasius, Rhafes, and others of the antients, are many passages which prove this knowledge of the natural structure and adhesion of this membrane: and that some of the most eminent writers of later times, had either forgot, or did not attend to it, the following quotations, selected from many, will evince.

“ Dura mater calvariae connectitur futurarum ope, ut
 “ *pensile*, et erectum teneat cerebrum, tum etiam ut per
 “ futuras egressus pericranium procreat. Spatium vero in-
 “ ter futuras recte natura liberum reliquit, ut vacuum
 “ quoddam esset inter duram matrem, et calvariam; has
 “ nimirum ob causas: primo, ne quicquam ipsius cerebri
 “ systolæ atque diastolæ obstaret; secundo, ne venæ et ar-
 “ teriæ per extremam duræ matris partem sparsæ, levi
 “ aliquo ictu in cranio facto, rumperentur; postremo, ut
 “ ruptis in dura matre venis, sanguis non inter duram et
 “ *piam*,

whoever will consider this matter as it really is, will easily be convinced of the truth of what I have said.

It sometimes happens that the scalp is so wounded, at the time of the accident, that the pericranium is

“ *piam matrem, sed inter duram et cranium effunderetur,*
 “ *et cranio perforato facilius extraheretur.*

“ *Et hic est ordinarius naturæ ordo.*”

FAB. HILD. Obs. 7. Cent. 1.

Fælix Wirtz says, that the elevation of the skull in slight impressions is needless; “ *Id enim motum cerebri, propter*
 “ *vacuum et distantiam, quæ est inter meningem et cra-*
 “ *nium, minime impedire.*”

And Hildanus, by way of reproof to Wirtz, says, “ *Ali-*
 “ *quando duram matrem cranio undique adherere vidimus.*”

Fallopian, speaking of the dura mater, says, “ *Continuo*
 “ *pulsat, quare non facile sanatur.*”

Petrus e Marchetti supposed the dura mater to be always at a distance from the skull, in those who were bald: speaking of the treatment of a particular case, he says, “ *Post*
 “ *septimam nempe, oleum Hyperici, quia calvus erat pa-*
 “ *tiens, atque membrana à calvaria distabat; quod in cal-*
 “ *vis semper observavi.*”

Aliquando contingit aut dura mater cranio satis firmiter adhæreat, sed hæc admodum raro evenire solet, atque præter naturæ consuetudinem est.

MUYS Praxis Rational. Chirurg.

This was also the opinion of Ambrose Pare, Serj. Wiseman, Sylvius, Barbette, Baglivi, and Pacchioni, as well as all those who talk of the oscillation of the dura mater, or of that membrane lying higher at one time of the moon, or at one age, than at another; the number of which is too large to be inserted.

is cut or torn away in such manner, as to leave the bone quite bare ; and yet the violence of the stroke has not been sufficient to produce the evil in question. In this case, if the pericranium is only turned back with the wounded scalp, and there is any probability of its reunion, it should be replaced ; if this succeeds, a good deal of time is saved ; if it does not, the whole piece must be removed, and then the case becomes the same as if the scalp and pericranium had been carried away at the time of the accident ; and the worst that can happen, is an exfoliation from the bare skull^t.

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^t Not that exfoliation is the necessary consequence of the skull being made bare : this depends on other circumstances beside the mere removal of the scalp and pericranium. The solidity of the surface of the bone, the size of the vessels, and the impulse of the blood thro' them, are what principally determine this.

If the cortex of the bone is not perfectly hard, and the impulse of the blood thro' the vessels, is capable of counterballancing the effect of the external air, a granulation of
new

IT does also sometimes happen, that the force of the blow is such, as to occasion the mischief of which I am now speaking; but the scalp and pericranium being forced or cut off, at the time the injury was received, there is no criterion whereby to distinguish it immediately.

IN these circumstances the edges of the wounded scalp will digest as well, and go on as kindly for a few days, as if no mischief was done underneath; but after some time, the patient becomes feverish and restless, and

new flesh will be generated upon the surface of the bone; which will cover and firmly adhere to it, without its throwing off the smallest scale; and this will very frequently happen in young subjects. On the contrary, if the bone is much hardened, and the vessels thereby constricted; or if such applications are made use of, as will produce an artificial constriction of the vessels, the surface of the bone will become dry, and the juices ceasing to circulate thro' it, it will exfoliate to a certain depth; that is, that part of the surface thro' which the circulation ceases to be carried on, will be separated from, and cast off by, the vessels which circulate the fluids thro' the rest of the bone.

Might not some practical inferences be made from hence, with regard to carious and diseased bones?

and complains of pain in his head, the edges of the scalp lose their vermilion hue, and turn pale and flabby; the fore, instead of suppurating kindly, gleans, and the pericranium loosens from the skull, which changes its natural colour for one which has already been described. Immediately after this come on the general symptoms, which are almost hourly exasperated, until the dura mater is become putrid, matter collected, and that fatal period arrives, which, tho' uncertain as to the exact number of days, does but too certainly arrive in few.

THE METHOD OF CURE, if such name ought to be given to the very little which surgery is capable of doing in many of these cases, consists in two points :

1. To endeavour to prevent the inflammation, and consequently the separation of the dura mater.

2. To give discharge to matter which may be collected under the skull, in consequence of such inflammation and detachment.

OF all the remedies in the power of art, there is none yet discovered equal to bleeding, in inflammations of membranous parts: to the truth of this many diseases bear testimony, pleurifies, hernia's, &c. and if any thing can prevent the ill arising from the injury I am now treating of, it is phlebotomy; but then it must be used truly as a preventive immediately after the accident, before the fever has got to any height; and it must be done largely, and repeated often ^u. I

^u That is, as long as the pulse requires, and the strength will permit. This may seem much to those who have not sufficiently considered the subject; but who will alter their opinion, when they come to know that this evacuation will often make all the difference between life and death.

I am very sensible that it will often be found very difficult to persuade a man, who has had what he calls only a knock on the pate, to submit to such discipline, especially if he finds himself tolerably well. He will be apt to think his surgeon too apprehensive, or guilty of a much worse fault ; and yet in many instances, the timely use, or the neglect of this single remedy, makes all the difference between safety and fatality.

It may perhaps be said, that as the force of the blow, the height of the fall, the weight of the instrument, &c. can never determine the effect, nor whether any mischief is done to the parts under the bone or not, that a patient may lose a large quantity of blood without any necessity, in order to prevent an imaginary evil.

THIS is in some degree true ; and if the advice just given was universally followed, some few would lose more blood than was necessary : but on the other hand, many a very valuable life would be saved, which without this must inevitably be lost.

“ Nihil interest presidium an factis tutum sit quod unicum est,” is a maxim in medicine : and if it is allowed to use such means as are in themselves hazardous, surely it cannot be wrong to employ such as are not at all so ; at least considered in a general sense, whatever they may be to some few particular constitutions.

WITH regard to the unnecessary use of phlebotomy ; tho', as I have just now said, it may possibly sometimes happen to the most knowing, and the most careful, yet in the generality of these cases, there is very
early

early something in the pulse, and even in the countenance, of which, tho' it is almost impossible to convey an idea by words, yet is very well understood by those who have carefully observed these matters.

ACCELERATION, or hardness of pulse, restlessness, and any degree of anxiety, are always to be suspected, and attended to, after a blow on the head; immediate, plentiful, and repeated bleeding, have removed these in several instances; in which I do verily believe, that without such evacuation, fatal mischief would have ensued.

IN this, as in every other part of practice, we have no other method of judging but by comparing diseases apparently similar. I have more than once, or twice, seen that increased velocity and hardness of pulse, and that oppressive languor,

which are the general precursors of mischief under the bone, removed by free and repeated bleeding ; and have too often seen cases end fatally, whose beginnings were full as flight, but in which such evacuation was either neglected, or not permitted.

I would by no means be thought to infer from hence, that timely bleeding is a certain preservative in all these cases ; and that those only die, in whom it is neglected : this, like all other remedies, at least all that I am acquainted with, is fallible : there are many of these cases out of the reach of it, or any thing else ; but where any human means can take place, this bids the fairest, and succeeds the most frequently.

THE second intention can be answered only by the perforation of the cranium.

WHEN from the general symptoms, and from the appearances, there is reason for suspecting mischief under the skull, this cannot be done too soon; the misfortune is, that it is seldom done soon enough: surgeons in general not thinking themselves authorized to propose it, until the appearances are such as indicate the membrane to have become sloughy, or purulent; at which time that symptomatic fever is begun, which rarely ends but with life*.

THIS propriety, or impropriety, of applying the trephine, in cases where there is neither fracture, fissure, nor symptoms of extravasation, is a point which has been much litigated among practitioners. Where neither of these appear, and

F 3 where

* So true is the observation of Archigenes, " His ubi cito manus admoveatur spes aliqua salutis subest ubi serius plerique omnes moriuntur."

where the pericranium remains firm, to all parts of the skull, there is certainly no indication where to apply the instrument, let the symptoms be what they will, and therefore no authority for using it at all: but whenever that membrane is found spontaneously detached from the cranium, and altered in colour, I think there is as good reason for trepanning as in the case of fissure or fracture, if not better; since it is by no means impossible for these to do well without it; whereas the other, if followed by putrefaction, never can.

ALL the best practitioners have always agreed in the necessity of trepanning, in the case of a stroke on the skull made by gun-shot, even where the bone is not broke; and very good practice it is.

A WOUND by gun-shot, as far as it relates to the skull, is to be regarded as a very great degree of contusion, and therefore most likely to be attended with the consequences thereof : among these the separation and inflammation of the dura mater stands as a principal. Experience confirms both, for most of the symptoms of gun-shot wounds are symptoms of contusion ; and the formation of matter, on the surface of the dura matter, or the putrefaction of that membrane, is a most frequent consequence.

IN short, the spontaneous separation of the altered pericranium, especially if attended with any degree of restlessness, chilliness, or fever, appears to me, from what I have observed of its consequences, to be so sure and certain an indication of mischief underneath, either in present,

or in future, that I should never hesitate one moment about the operation, if bleeding, and general evacuation, had not totally freed the patient from all complaints; or if I did not see him until the use of these means would most probably prove ineffectual.

IF a portion of the scalp, and pericranium, are totally removed at the time of the accident, the trephine may be applied on the bare bone, whenever the symptoms shall require: but if the integuments are not quite removed, but only bruised or torn, and the pericranium is in the state which I have already described, they should be taken away quite as far as such separation extends; that is, as far as the bone is bare; and then the instrument should be applied on such part of it, as will
be

be most likely to be serviceable for the discharge of matter.

THE state of the dura mater, when uncovered, will in great measure determine the surgeon's future conduct. In some cases one opening will be found sufficient, in others several will be required, according to the quantity of the membrane, which is become sloughy, or according to the discharge. The repetition of the operation is warranted by the best authorities, and by the nature of the case itself, there being no comparison to be made between the inconvenience attending the laying the dura mater bare, and the certain mischief that must follow the confinement of matter under the cranium.

IF matter is collected also under the dura mater, between it and the

pia,

† The way to make this most frequently so, is to use a trephine with a large crown, which never can do harm, and will often save the trouble of repetition.

pia, it must, at all events, be discharged by a division of the former.

THIS being all that surgery is capable of doing in these melancholy cases, I wish I could say that it was more often successful; sometimes it is. The operation is not in itself painful, or hazardous, and is the unicum remedium; some have been preserved by it, and none can, in these circumstances, be saved without it. As there are no certain indications whereby to judge, whether it will prove successful, or not, before it is tried, the event only can determine it; when that is happy, the means are justly commended; but when it is not so, they ought not to be therefore condemned, since they are built on rational principles, and are the only means in human power.

S E C T. III.

Of FISSURES, and SIMPLE FRACTURES of the CRANIUM.

FRACTURES of the cranium, were, by the antient writers, divided into many different sorts, under as many different appellations, which were derived either from the figure of the breach, or from the disposition of the broken pieces.

THESE are to be found in all the old books ; but as they merely load the memory, without conveying any useful knowledge, or serving any practical purpose, they have been almost totally disused by the moderns.

ALL fractures of the skull whatsoever, may be reduced under two general heads.

1. THOSE in which the broken parts still keep their proper level or equality of surface with the rest of the cranium.

2. THOSE which do not ; or, in other words, fractures with depression, and fractures without.

THESE two distinctions are all that are necessary, and will fairly comprehend every violent division of the parts of the skull, not made by a cutting instrument, from the finest capillary fissure, up to the most complicated fracture ; for fissures and fractures differ from each other only in the width of the breach, or in the distance of the separated parts ; and the disposition of the broken pieces, in the large fractures, is so various, that distinctions and names drawn from thence might be multiplied ad infinitum.

A fracture of the cranium, considered abstractedly, is not so dangerous a thing as it is commonly supposed to be : it is not the breach made in the bone, which produces either the symptoms or the hazard ; these are owing to injury done to other parts. The many instances of fractures which have been undiscovered a great length of time, and of those which, tho' known, have caused no ill effects, are sufficient to evince this.

SUDDEN loss of sense, and motion, vertigo, coma, convulsion, vomiting, flux of blood from the nose, or ears, &c. are called the symptoms of a fractured skull : and true it is, that some of them do very frequently attend large wounds, or severe blows on the head ; but it is as true, that they are so far from being the certain, authentic, univocal

cal signs of a breach in a bone, that even where there is a fracture, if there is no depression, these symptoms arise from injury done to other parts, and not from the division of the cranium.

COMMOTION of the brain, or extravasation of fluid, either upon, or between the membranes, or in the ventricles, will produce all these symptoms, when the cranium has suffered no kind of harm; and therefore, tho' they are frequently found in cases where the skull is broke, yet do they by no means indicate a fracture.

THE doctrine of Celsus has been copied by almost all succeeding writers, and implicitly believed by almost all readers: his words are,
 “ Igitur ubi percussa est calvaria
 “ protinus requirendum est, num
 “ bilem is homo vomuerit, num
 “ oculi

“ oculi ejus obcæcati sint, num per
 “ nares auresve sanguis ei affluxerit,
 “ num conciderit, num sine sensu
 “ quasi dormiens jacuerit.” These
 words contain a very just descrip-
 tion of the symptoms which fre-
 quently attend wounds of the head ;
 but his conclusion, “ hæc enim
 “ non nisi osse fracto eveniunt,” is
 so far from being true, that the skull
 is often broke, and not one of these
 symptoms appear ; and there are
 many other injuries to which the
 head is liable, and which constant-
 ly produce some of them *.

THE fear of removing the scalp,
 and of being disappointed by not
 finding a fracture, has been the occa-
 sion of other signs or symptoms be-
 ing

* Si læsus instar dormientis, expers sensus deprehenda-
 tur ; si obcæcati fuerint oculi, si obmutuerit, si bilem vo-
 muerit, si animalis instar malleo icti conciderit, hæc om-
 nia maximam ac subitanam significant cerebri commotio-
 nem, perturbationem, ac concussionem ; quæ non raro in-
 tegro manente, nec ulla ex parte rupto cranio, mortem per-
 cussio adferunt.

ing mentioned by many of the old writers ; such as holding a silk or horse-hair tight between the grinding teeth, and making it vibrate by striking upon it ; biting a hard body, and attending to the part where the pain is felt, &c. &c. &c. These are called equivocal signs, and indeed are so truly so, as to deserve no notice at all *.

ALL considerations also which are drawn from the manner in which the wound was given, or received, the kind of weapon or body which inflicted it, the force of the blow, the height of the fall, &c. are all equally fallacious ; for every body knows, that very terrible fractures
are

* Lanfranc talks of striking the head, and attending to the sound : “ Item percutiatur caput cum levi baculo sicco, de salice, aut de pino, et pone aurem tuam apud caput, & si sanum est, tunc audies sonum sanum ; si fractum, aut scissum, audies sonum mutum, secundum comparationem factam a campana sana, ad campanam scissam,” &c. with other signs or marks equally absurd and trifling.

are sometimes produced by very slight blows ; and that people often escape unhurt from such accidents as seem likely to be followed by the most terrible consequence.

IN short, nothing but the sight, and the touch, are to be depended upon ; all the symptoms, as they are called, are fallacious, but these are certain ^b.

THEREFORE, if the integuments are not wounded, or if the wound made in them is too small to admit a proper examination of the bone, and the circumstances are such as render a view of it necessary, a circular piece of the scalp should be removed immediately.

IF

^b By the touch, I desire to be understood to mean that of the bare bone, having many times experienced the fallacy of feeling thro' the bruised scalp ; a coagulum of blood under which, will sometimes create such a deception to the fingers, as may, by a person who is either inattentive, or not much versed in these things, be mistaken for a fracture with depression.

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IF there is no wound, the point struck should be made the center of the incision ; if there is a wound, that wound should be the central point ; and in both cases, the piece removed should be of such size as to bring all that part of the bone into sight, which is supposed to be injured ; and to admit the application of the trephine, if it is found necessary.

IF the scalp is so wounded as to detect the fracture, the course of it will direct the incision ; and if it is much bruised, it will always be adviseable to take away the greatest part of what is so bruised ; for the removal will very little protract the cure, if every thing else succeeds happily ; and the leaving it on, in such circumstances, may be attended with both pain and trouble in future.

IN scalping, the knife should be held in such manner, as to cut perpendicularly down to the skull, thro' the skin, and pericranium at the same time, that the portion of each may be equal.

It is hardly necessary to insert a caution against pressing too hard with the scalping knife, in large fractures, with loose pieces, the danger is so obvious; and it is as apparent, that there is but one way of avoiding the danger, which is by extending the incision so far beyond the broken parts, as to cut upon a firm, stable part of the skull: by this means, there will not only be less risk of hurting the membranes and brain, but the whole mischief will be more fairly and clearly brought into view; a thing which, sooner or later, must be done, and is always best done at first, be-

fore the parts are inflamed, or the patient feverish. No part of the scalp should ever be wantonly, or unnecessarily, cut away ; but, on the other hand, it should always be remembered, that this operation is performed with intention to bring, if possible, the whole fracture into view ; and whatever falls short of that, where it is practicable, is wrong, not only as it does not answer the purpose for which it is intended, but as it generally puts the patient under a necessity of undergoing the same pain and trouble again.

WHEN the scalp is bruised, or wounded, such wound or bruise, points out the place from whence the piece should be removed, in order to examine the bone : but all the antient, and many of the modern writers, speak of a kind of
I fracture

fracture in which the scalp is uninjured, called counter-fissure.

THIS has formerly been the subject of much litigation and controversy ; the whole of which amounts to no more than this, that the cranium has sometimes been found cracked on the part opposite to that which seemed to have received the blow ; and therefore, if the symptoms make it probable that the skull is broke, and no fracture is discovered, under the part struck, or wounded, the scalp should be removed from the part opposite, to see if there is one there.

Now, not to mention the great difficulty of determining this, or of knowing certainly, when a man falls from on high, or is knocked down by a ponderous body, which was the part first struck ; or whether the blow, or the fall, produ-

ced the fracture ; I say, not to mention these, and other difficulties attending such enquiry, it can be of no possible use in practice : for if there are such symptoms as induce the surgeon to think that the skull is broke, he will certainly examine the whole head carefully ; if there are any external marks sufficient to authorize the removal of the scalp, he will make his incision where such mark indicates ; and if, by this means, a fissure, or fracture, is discovered, the method of treating it is not at all altered by the manner of its production.

ON the other hand, if the symptoms are only general, and there is no external direction where to make an incision, I cannot, notwithstanding all that has been wrote upon the subject, think myself authorized to cut away a part of the scalp, in or-

der to hunt for a counter-fissure, which it is ten to one if I find.

INDEED if there were any certain, unerring signs of a fractured cranium, the case would be different; the appearance of these would prove that there was a fracture somewhere, and we should thereby be authorized in searching for it: but I have already taken notice, that all the signs are equivocal, and that tho' they are often found in persons, whose skulls are broke; yet as they are not caused by the fracture, they do not indicate its existence.

No clearer proof of the truth of this need be sought for, than what may be drawn from the chirurgical method of treating these cases; for as the symptoms are not caused by the breach made in the bone, so neither is the trephine applied, nor any other means made use of, in or-

der to procure a reunion of it. The symptoms attending these cases arise from injury done to other parts; and to the relief of these, all our helps are, or should be, administered.

THESE injuries are commotion, or disturbance of the medullary part of the brain; extravasation of blood, or serum; inflammation or supuration of the dura mater; some or all of which may, and generally do, attend fractures of the skull, and are the causes of the symptoms, the hazard, and the necessity of perforation.

PREVIOUS to the directions for the proper management of fissures, and simple (that is, undepressed) fractures, it may not be amiss to inquire into the opinions of our forefathers in these cases; to take a short view of their intention and conduct;

conduct; to see in what we differ from them, and whether the difference is well grounded, and to our advantage; it being neither antiquity, nor novelty, but utility alone, which constitutes chyrurgical merit.

WHEN a fissure passes both tables of the skull, we generally, upon removing it, find a line, or streak of blood, upon the surface of the dura mater, more or less in quantity, but exactly correspondent to the track of the fissure.

THIS is sometimes the consequence of a breach of some of the small vessels which connect the dura mater to the inside of the skull, but is more often shed from the torn vessels of the diploe.

THE antients, in general, believed that this blood did, by confinement, become corrupt and putrid; that it degenerated into matter, and contributed

tributed largely to those collections which are so frequently found in these cases.

WHEN a fracture has either not been discovered, or the bone not perforated until some days after the accident, and the patient begins to be feverish, upon removing a piece of the cranium, the dura mater is most frequently found in a sloughy, or purulent state.

THIS our forefathers supposed to be the effect of a corrosive sanies, which dropped down from the edges of the fracture, and lodging upon the membrane, spoiled its texture, and rendered it foul.

MANY of them also were perfectly well acquainted with the secession of the inflamed dura mater, and the abscesses in consequence thereof; but still they supposed the matter to have been originally putrefied blood.

THESE

THESE things being taken for granted, they acted accordingly; their intention, in the first instance, was directed to the removal of the extravasated blood; in the second, to the defence of the membrane against the dripping sanies; and in the third, to the discharge of matter.

IN order to accomplish the first, they enlarged the fissure by the abrasion of its edges with scalp-ra of various shapes and sizes; the second, they aimed at, by means of bindons, or other dressings, applied close to the membrane, under the edges of the fracture; and the third, by the removal of a larger piece of the skull.

HOWEVER accurate the antients were in the observance of effects and appearances, they were often wrong in assigning causes; of which

which the present case is an instance: for the coagulated blood, found under a fissure, does never become matter, neither does the sanies dropping from the edges of the broken bone, produce the sloughy state of the dura mater.

IF blood is shed upon that membrane, between it and the skull, it will most probably do mischief; but what mischief it does, it will do mechanically, merely by its pressure, without any tendency to putrefaction; and, if it is suffered to continue in that situation, may prove fatal, without undergoing any change, remaining still a mere coagulum of blood, unaltered, and indeed incapable of such alteration as is supposed.

ALL the symptoms attending such extravasation are proofs of this: they are all such as arise from pressure
made

made on the brain; and are, according to the quantity and situation of the extravasated fluid, greater or less, from the slightest vertigo, up to the most lethargic insensibility.

THE cause assigned for the putrid, sloughy state of the dura mater, viz. the dripping sanies, is equally wrong.

THIS is a cause very unequal to such an effect; an effect which can only be accounted for by the detachment, and inflammation of that membrane, produced by the force of the blow, at the time of the accident.

THE nature of the symptoms, the time of their access, the concomitant fever, the state of the parts when examined, and the general event, all prove this, as will more fully appear, if what was said in the preceding section, be transferred hither: the fracture makes no difference

rence with regard to the membrane ; and the cafes are fo far exactly parallel ; for whether the bone be broke or not, the detachment of the dura mater, from the infide of the fkull, is occafioned by violence done to its connecting veffels ; and the inflammation, and putrefaction of it, being the confequence of fuch detachment merely, may equally attend a found or a broken bone.

Now whether the cafe be of the firft fort, and blood is to be let out ; or of the latter, and matter is to be difcharged, the method of doing either of them, by fcalpra or rugines, is liable to many objections ; it is irkfome and hazardous to the patient, tedious to the operator, and often unequal to the intention.

THAT by the ufe of fuch kind of instrument, the opening of a fifsure may be enlarged, is beyond all doubt ;

doubt ; but if it is of any considerable length or size, it is a very operative method ; it jars and shakes the head immoderately, is attended with danger, if done unskilfully, or inattentively, and when finished cannot serve all the purposes for which it should be designed, as it will neither remove enough of the cranium, nor lay bare a sufficient portion of the dura mater, in cases where the extravasation is large, or the inflammation extensive.

OF this themselves were sensible ; for if the fracture was of such size, or so circumstanced, that the scalp-*abrasoria* were deemed improper ; or if the accident was attended with such a degree of contusion, as to render it most probable, that the parts underneath were much injured ; they did not depend upon scraping away the edges of the fissure,

sure, but endeavoured to remove a large piece of the skull^c. This was effected by means of several different instruments, according to the circumstances of the case, or the humour of the operator: terebræ and terebellæ of various sorts and sizes; the cyclifcos, or scalper exciforius, and the modiolus^d; all which, as they were then made and used, were subject to great inconveniences, arising partly from their form, and partly from the inartificial manner in which they were applied.

IF

^c “ Ex fracturis vero quæ ad cerebri membranas usque
 “ pervenerunt, si simplex tantum fractura sit, angustis
 “ scalpris utendum; si cum contusione aliqua, quod con-
 “ tufum est excidi debet; idque vel terebellis prius in
 “ circuitum foratum ac mox scalpris admotis, vel protinus
 “ ab initio cyclifcis.”

GALEN.

In iis que usque ad cerebri membranam divisa sint, si sola rima sit, iisdem radulis utendum; si collisio aliqua una sit, terebris excindere collisum oportet, scalpris adhibitis.

ORIBASIVS.

^d Figures of which are to be seen in many of the old books, in Albucasis, Andreas a Cruce, Fabritius ab Aquapendente, Guido, Lanfranc, Scultetus, Hildanus, Berengarius; and in Peter Paaw's comment upon Hippocrates de vulneribus capitis.

If the piece intended to be removed was larger than could be comprehended within the modiolus, the operation was performed by means of terebræ; and was, like that of the scalprum, painful, tedious, and hazardous ^e.

THE piece to be taken away was surrounded with perforations, made at small distances from each other; and then, in some cases, the scalper excisorius or cyclifcos; in others, the scalprum lenticulatum was introduced, and, being struck with a mallet, cut thro' the interspaces between each perforation: by this means, the portion of bone, so surrounded, was removed, and the dura mater laid bare ^f.

THE

^e At si latius est vitium quam ut illo (modiolo) comprehendatur, terebra res agenda est. CELSUS.

^f The following passages, from Oribasius and Celsus, may serve to give us a clear idea of the whole process.

THE terebræ, terebellæ, or trypanæ, (for all these names are sometimes given to the same kind of instrument) were various, both in form

“ Ministri juxta assideant, quorum unus caput læsi contineat, alter opportuna ministerio faciat; aurium foramina lana coacta obturanda sunt, ne sonitu in excisione tereatur; his factis infigendus calvariæ est mucro acutus terebræ, qua læsum os colorem immutavit, juxta integrum, deinde lente habena terebram convertere debemus, donec inciso offi mucro insistat, ac tum citatius circumagere oportet habena terebram convertente, donec mucro in spatium inter duplex os descendat; ubi autem foramen altius adactum sit, ultra crassitudinem spatii inter duplicem testam ossis quod perforatur, tum terebræ multo circumspectius convertenda est, ne repente descendens, cerebri membranam violet.

“ Cum jam terebra adacta fuerit, et vel conjectura deprehendatur totam ossis crassitudinem esse perforatam, vel perparum solidæ sedis infra relictum, tunc is qui operatur altitudinem degustet, demissa tenuis acus obtusa parte, ac si quid continuæ sedis etiam reliquum sit, deprimendus altius terebræ mucro est, eaque lente circumacta, solidum os perforandum, eadem quaque facienda est in aliis foraminibus, donec rima in ambitu perforata sit. Septa vero media, inter foramina satis habent spatii fere quantum specilli angusti averfa pars est. Factis foraminibus ad excisionem quæ dicitur veniendum est; ut excisis tum foraminibus, tum mediis, læsa ossa removeantur.

ORIBASIUS.

“ Ea (terebra) foramen fit in ipso fine ossis vitiosi, atque integri; deinde alterum non ita longe, tertiumque, donec totus is locus qui excidendus est his cavis cinctus est, tum excisiorius scalper ab altero foramine ad alterum. Malleolo adactus, id quod inter utrumque medium est excidit.”

CÆLUSUS.

form and size ; but may be reduced to three principal ones.

1. ONE, which was much like to our common carpenters or coopers auger, which is turned by the hand, while one extremity rests on the bone, and the other is kept steady by the chin or breast of the operator.

2. ONE, which is turned by a cross-bar and double fillet ; “ terebra quæ duplici habena vertitur,” such as is in use among the smiths, and workers in copper, and is called a drill.

3. ONE, upon the same principle as the second, but turned by a strung bow, “ terebra que arcu vertitur,” like what is used by our watchmakers, and many other artificers ; figures of all which are to be seen in Vidus Vidius’s Commen-

tary on Hippocrates, in Andreas a Cruce, and others.

THE tediousness which attended the making so many perforations, the disturbance given to the patient's head, as well by the terebra as by the mallet and chizel ^z, the hazard of wounding the membranes, and brain, notwithstanding the use of the meningophilax, and the coarseness and unhandiness of the whole process, are too obvious to need a comment.

OF this all the best practitioners were perfectly sensible; they felt the inconveniences, and dreaded the danger.

THEY found, that they very often wounded the dura mater, and sometimes

^z “ Quod vero per cyclifcos opus administratur, ne id quidem omnino vitio caret, quum quatiat immodice caput, quod potius quietem postulat.” GALEN.

“ Sæpe scalpros pulsantes, adeo ut totum cerebrum permoveatur.” GALEN.

times the brain ^b; and therefore used all the precaution which such accidents suggested to them. In some instances, they advise the perforations to be made not quite thro' the bone, but to leave a thin lamina of it intire ⁱ; in others, tho' the perforations are made quite thro', they direct the piece of bone to be left adherent, for two or three days to the membrane, lest the latter should be hurt by a sudden or violent separation of them.

THE cautions laid down by Hippocrates, Galen, and others, concerning the part of the bone whereon to apply the instrument, and the great

H 3 atten-

^b " At quæ per terebellam quidem ratio fungitur parum tuta est, propterea quod dum audacius eam tractant, duram membranam non raro violant. GALEN.

ⁱ " Si a principio morbi curam per mediolum adgressus fueris, non statim oportet os ad membranam usque perforare, verum quando in eo est ut parum absit quin totum os penetraverit, et os ipsum moveri jam incipiet, ab operatione desistere." HIPPOCRATES.

attention which they admonish the operator to pay to its execution ^k, all proceed from the same fear.

FOR this reason also, many of them endeavoured to furnish their perforating instruments with such guards, or defences, as should prevent them from going too deep^l. In
Albu-

^k “ Cavere oportet ut in terebellæ admotione ne falleris, verum qua parte crassissimum os esse visum fuerit in eam semper terebellam admotam adigito.”

HIPPOCRATES.

“ Verum quod excidi oportet id totum cyclificis nudandum non est, sed ea maxime ex parte qua fractura est gravissima, nam præter alia, etiam membrana ipsa ab offibus quæ vehementer sunt afflicta, recedit celerrime,” which last words plainly prove how clear and perfect an idea the author (Galen) had of the detachment and inflammation of the dura mater in consequence of external violence.

“ Terebellis autem ipsis ut mergi non possunt, parum supra cûspidem nonnulli supercilium extans efficiunt.”

GALEN.

“ At sæpe accidit, ut terebræ repente adactæ, ob naturalem perforatorum ossium debilitatem, vel tenuitatem, membranam fauciarent.”

ORIBASIIUS.

^l “ At quia dum terebrum hoc circumagitur, periculum inminet ne membranæ ledantur; ideo nonnulli, ut quominus aberrarent et hoc periculi genus evitarent, terebras excogitarunt quæ mergi non possunt, et ob id a græcis abaptista dicuntur.”

ANDREAS a CRUCE.

“ Si os autem est forte durum, tunc oportet ut perfores in circumitu ejus, antequam tu administres incisoria cum terebris,

Albucasis, Andreas a Cruce, and others, are found figures and descriptions of “modioli duabus vel “quatuor alis muniti,” of some called abaptista, of others called mespilati and torculati, and of terebellæ so guarded as not to be capable of passing thro’ both tables, or at least not intended so to do ^m.

BUT whoever will consider the very different thicknesses of different skulls, and of different parts of the same skull, will easily see how little dependance is to be made on such defences, and how hazardous

H 4 the

“ terebris, quæ nominantur terebra non profundantia; et
 “ non nominantur ita, nisi quoniam ipsa non pertranseunt
 “ terminum ossis carnei, ad illud quod ut post ipsum;
 “ propterea quod terebro est extremitas rotunda, super illud
 “ quod est sub capite ejus acuto, similis margini, et circu-
 “ lus parvus prohibet submergi, et pertransire spissitudi-
 “ nem ossis. Et convenit tibi ut accipias ex istis terebris
 “ numerum multum, quorum unum quodque conveniat
 “ quantitati spissitudinis ossis, donec presens fit tibi omni
 “ cranio terebrum, &c.”

ALBUCASIS.

^m Expedi itaque id genus complures preparatas habere,
 ad omnem calvariae crassitudinem.

GALEN.

the use of such Instruments must prove.

IN short, from an attentive consideration of the doctrine and practice of the antients, in this part of surgery, it will appear, that their observations of the symptoms, and appearances of the diseased parts, were in general extreamly just and accurate ; that their curative intentions were very proper ; but that their instruments, by being extreamly aukward, and unmanageable, prevented them, in some cases, from obtaining their proposed end, and, in others, were the occasion of much mischief.

REDUCTION of the number, and simplicity in the form of our instruments, is one of the merits of modern surgery.

THE present practitioners have, in this as well as some other parts of
the

the art, laid aside many useles, or at least unnecessary ones, and have brought those which they still retain, to such plainness, that no future mischief can properly be set to their account. A trephine, an elevator, and sometimes a pair of forceps, are all the instruments now in general use; and these are so made, as to be manageable by the hand of any judicious man, with the most perfect security.

To those who are not very conversant in, or have not thought much about these things, (and for whose use these papers are principally designed) it may not be amiss to explain, in few words, what is intended by perforating the skull, in the case of a simple fracture; with what view, and for what purpose, it ought to be done; and what suc-
cess

Instruments

cess may most probably be expected from it.

IT has already, in the course of this work, been remarked, that some of the ills attending severe blows on the head produce their symptoms immediately, and require immediate assistance; and that there were others which, though really occasioned by the blow, yet did not shew themselves, until some days were past.

OF the first kind, are all those which produce immediate pressure on the brain; such as extravasation of blood upon, or between, the membranes; and fractures with depression.

OF the latter, are gradual, limpid extravasation; and inflammation of the separated dura mater.

A FISSURE, or a simple fracture, may be attended with all these, except

cept depressed bone ; and most frequently is with some : and hence arise what are improperly called the symptoms of it. A quantity of blood may be shed from its vessels, and bring on immediate bad symptoms ; or the dura mater may be so hurt by the blow, as to separate, inflame, and in due time produce matter.

PERFORATION of the cranium is necessary in both. In the former, it is immediately so ; for the relief of urgent symptoms, and imminent danger : in the latter as a preventative, or with design to obviate such inconveniences as would most probably follow, if such care was not taken.

Now, tho' the symptoms give the alarm much sooner in the former case, yet the necessity of the operation is full as great in the latter ; for nei-
ther

ther matter nor blood can be discharged from under the cranium, without perforation; nor can either of them be suffered to remain there, with safety to the patient.

AND thus the truth of what was asserted, at the beginning of this section, is evinced; viz. that the chirurgical method of treating fissures, and simple fractures of the skull, by having no tendency towards procuring a reunion of the broken bone, proves that it is designed to relieve, or obviate ills not arising from the fracture, but from mischief done to other parts; than which nothing can be more plain: for the trephine, instead of lessening, enlarges the breach; and if there was neither extravasation of fluid, separation of membrane, nor any other injury beside the mere crack

crack in the bone, would be useless, and therefore wrong.

BUT as it very seldom happens, but that either blood is extravasated, which requires immediate assistance; or the dura mater is injured, which, if not very early taken care of, seldom admits of relief: therefore the operation of the trephine is, in general, absolutely necessary; if not for the removal of immediate bad symptoms, yet as the most probable means in our power to prevent such as most frequently follow if it is neglected.

THE chirurgical intention therefore in simple fractures is, to make such an opening in the cranium as shall give immediate discharge to extravasated blood, if there is any underneath it; or, by means of the same opening, to obviate, or remove if possible, the evils flowing from an
in-

inflamed, or putrid state of the dura mater.

FOR these reasons, the trephine should always be set on in such manner, as that the fissure should traverse the circle made by the saw, where it is possible; or, at least, the saw should always comprehend the breach in the bone.

I AM aware that the direction given by some of the old writers of great character, is very different. Among these, Fab. ab Aquapendente is very particularⁿ; but notwithstanding these authorities, the comprehension of both edges of the fracture within the circle of the saw, is so necessary, and attended with such

ⁿ “ His consideratis in latere ipsius rimæ interposito digiti spatium apponimus modiolum.”

And in another place, “ Tum musculus modiolus figendus ad rimæ seu fracturæ latera est tam distans a rima ut ipsam non attingat comprehendatque modioli ora.”

FABRITIUS ab AQUAPEND.

such manifest advantages, that I must again inculcate a constant attention to it.

THE saw or crown, as it is called, of the trephine, should never be small, especially if the patient is adult; a circumstance which I think necessary to mention, as the instrument-makers, if not forbid, are apt to make them so.

THE appearance of the membrane, and the other circumstances attending the case, will determine whether one perforation is sufficient, or whether more are necessary.

IF the trephine was applied for a bloody extravasation attending a fissure, and such discharge is made by the first perforation as to remove the symptoms; a repetition may possibly be unnecessary. But if the first opening discovers a lodgment of coagulated blood, but yet does
not

not relieve it, and the symptoms still continue; it must be repeated again and again, along the whole tract of the fissure; still observing the caution, of keeping the breach of the bone within the circle of the saw.

IF there are no immediate bad symptoms, and the trephine is applied as a preventative; one, or two, according to the length of the fissure, may be sufficient at first: and if more are necessary, the future symptoms, and appearances, will indicate it. But if the operation is not performed until some days are past, and the symptomatic fever, in consequence of injury done to the dura mater, is begun; the sloughy or purulent appearance of that membrane will authorize, and fully vindicate, the free use of the instrument. The operation is neither painful, nor hazardous; and, in these circumstances,

ces,

ces, can do good only by being freely administered.

IN this state, the great, and indeed almost the only object of consideration is, the extent of the separated or diseased part of the dura mater. This is what will most probably determine the patient's safety, or danger; and by this must our conduct be regulated.

IN the two instances already mentioned, of extravasation of a small quantity of blood immediately under the fissure, and of simple fracture not attended by any bad symptoms, the application of a small trephine merely along the tract of the fissure may be sufficient; in one, for the discharge of the blood; in the other, to prevent a lodgment of matter, if any should be formed. But in the present instance, where the dura mater is injured to some

I extent,

extent, the symptomatic fever begun, and matter, or floughs forming, the one, only hope of relief must arise, from denuding a large portion of the surface of that membrane. Nothing but this can do any service; nor can this be done too soon, as must appear to every one who will consider the tendinous structure of the dura mater; the tension which arises when it is inflamed; its confinement within the cranium; and the part it almost immediately invests.

IT is indeed no easy matter to determine, with any great degree of precision, the extent of the injury done to this membrane; the concealment of it within the skull prevents our knowing this, with so much certainty as might be wished: but still I think there are some appearances, both before and after perforation,

foration, from which some kind of information is to be obtained.

FOR example ; if, upon scalping, the pericranium is found altered, and detached from the surface of the cranium ; or if, some days after the scalp has been removed, the edges of the fore quit their adhesion to the bone, and become ill-conditioned ; or if the denuded skull suffers apparent alteration of colour ; from any of these circumstances, we may most reasonably presume that the dura mater is injured ; that is, separated, and inflamed : and this presumption may take place before the operation is performed. But if, added to these appearances, before the instrument is set on, we find, upon perforating the bone, that the dura mater is plainly detached from it, or is altered from its natural, bright, tendinous colour, or is purulent,

rulent, or sloughy; the case becomes but too clear, and must be treated accordingly: that is, by laying bare so large a part of the surface of that membrane, as to give way to its inflammatory tension, and allow a free discharge for gleet, matter, &c. this may sometimes produce good effect; and nothing without this can.

I have already endeavoured to explain the sufficiency of enlarging a fissure, by the abrasion of its edges with scalpra, or rugines, according to the custom of our ancestors. The objection made to it was, that it did not remove enough of the cranium, for the relief of the inflamed dura mater; by which means, that membrane pressed against the inside of the skull, matter was not discharged with the freedom it ought, and the symptoms were not lessened, or at least not removed.

So

So also, in the present practice: if in the case of extensive separation, or inflammation of the dura mater, the surgeon contents himself with the application of a small crowned trephine, along the tract of the fissure only, he will, in general, be disappointed, and for the same reasons.

THE only method of obviating this inconvenience is, either to use an instrument, whose circle is so large as to answer the proper purpose by a few applications; or else, to use a small one, in the same manner the ancients did their terebellæ; that is, to perforate all round the piece intended to be removed, and thereby lay bare a large portion of the membrane.

WHATEVER are the means used, this is the end which should be aimed at; as it is from this, principally,

that relief can be expected. Whatever degree of hazard may be supposed to be incurred, by exposing the dura mater to the air, can hardly be increased by the largeness of the opening: and if we put our patients to any risque at all, it should certainly be with a prospect of greater good.

SOME very eminent practitioners, both antient and modern, observing that fissures, and simple fractures of the cranium, have sometimes lain concealed a long while, without doing mischief; and, at other times, have never produced any bad symptoms, or at all affected the patient's health; have opposed the use of the trephine, scalprum, or any other instrument; and have advised the leaving the local injury to nature, and a superficial dressing; depending solely on evacuation, and regimen, for a cure.

THE observation, on which this advice is built, has certainly some foundation in truth: it does now and then happen, that neither extravasation of blood, nor separation of the dura mater, attend a simple fracture; and, in persons of very good habit, they will sometimes do well, with little or no chirurgical assistance.

SEVERAL instances of this have been met with; and was it in our power to know with certainty, when the mischief was of this simple kind, the operation might sometimes be omitted°. But unfortunately the

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symp-

° The two different states of penetrating fissures, as far as relates to the safety, or injury of the dura mater, was perfectly well known to several of the antients: among the rest, Paulus Ægineta has given a very particular and just description of both.

“ Si ad cerebri membranam usque pervenerit fractura,
 “ non rademus, sed agnoscere conabimur utrum mem-
 “ brana ab osse recesserit, an affixa permaneat. Si enim
 “ ipsa manet, inflammatio nulla infestat vulnus, æger
 “ paulatim feбри liberatur, et pus coctum apparet. Si re-
 “ cesserit

symptoms of that sort of injury, which produces those fatal collections of matter found between the dura mater and the skull, do not appear at first ; and when they do, it is so very often too late to do any good, that a general rule, to apply the instrument indiscriminately to all penetrating fissures, would, in all probability, save many lives, which are
lost

“ cesserit membrana, augentur dolores, et febris simili-
 “ ter, os olium sumit colorem, pus tenue et crudum effer-
 “ tur ; et si medicus negligentius rem tractet, nec perfora-
 “ tione utetur, hoc graviora symptomata aboriuntur ;
 “ nempe bilis vomitus, convulsio, mentis delirium, et fe-
 “ bris acuta.

PAULUS ÆGIN.

“ Dico debet dari signum fracturæ, a qua removeatur
 “ panniculus grossus in primo debes scire dispositionem
 “ siphac, utrum est adhærens an non ; videlicet, si ad-
 “ hæserit ossi, non fiet in vulnere apostema calidum ; et
 “ licet accidit, modicum erit, arugo manabit de eo mo-
 “ dica, et putredo erit digesta.

“ Sed si fuerit remotum, vehementiores erunt dolores et
 “ febres, mutabitur color ossis, et corrumpetur, et manabit
 “ de eo putredo tenuis.”

RHASES.

“ Si rima in superficie sit, cerebris membrana non ab-
 “ cedente, curatio eadem adhibeatur quæ ad os nudatum
 “ demonstrata est. Cerebri vero membrana abcedente, et
 “ humore ibi collecto, post primos curationis dies ad tere-
 “ bram properandam est.

ORIBASIUS.

lost by neglecting it. And tho' perhaps it might, in some few instances, add a little unnecessary trouble to the patient; yet, if judiciously performed, it cannot (I think) ever add to his hazard; on the contrary, it will most frequently lessen it.

I would not be understood to mean, that I think the laying the dura mater bare, to the contact of the air, a thing of indifference; and that no mischief can arise from thence: this is a point, concerning which, many able men have differed, and about which, I am by no means satisfied; but I think, I can venture to say, what is fully to the present purpose, viz. that enlarging a fracture by the trephine, will not produce any risque, additional to that of the fracture.

THE breach made in the bone, has already let in the air upon the mem-

membrane, therefore that consideration is at an end ; and the point in dispute is, whether, upon a supposition, that the dura mater may possibly not be so injured, as to inflame, (the patient being at first free from any bad symptoms) the operation should be deferred while it might be of service, as a preventative, until such complaints arise, as indicate the necessity of performing it ; at which time it is generally too late to do any good.

I know that Hildanus, Wiseman, and some other great practitioners, have been of opinion, that fissures, tho' they do pass through both tables, yet if they are not attended by any bad symptoms, may be let alone. The authority of these gentlemen is certainly of weight ; but on the other hand, it should be considered, that extravasation of blood,

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was the great, if not the only object of their consideration, in simple, undepressed fractures: this they looked upon, as the cause both of the early, and the late symptoms, considering it either as coagulated, or as putrefied; and therefore, when there was no symptom of such extravasation, they did not see any necessity of perforating the cranium.

BUT had they conceived rightly of the universal adhesion of the dura mater to the skull; and had they carefully attended to the consequences of its being detached, and inflamed; I am inclined to believe, that they would not have thought of leaving penetrating fissures to nature ^p unassisted by art.

IN

^p This doctrine of leaving penetrating fissures to an external, superficial application only, is of antient date, and is particularly mentioned by Celsus; who has added so accurate a description of the different states of the patient, and of the appearances of the sore, under the different

IN such points as these, every man must be determined from his own judgment and experience ; for my own part, the number of those in whom the membrane is injured, seems to me, so greatly to exceed that of those, in whom it escapes unhurt,

rent circumstances of hurt, or unhurt membrane, as to be extremely well worth attending to.

“ In omni vero fisso fractove osse protinus antiquiores
“ medici ad ferramenta veniebant, quibus id exciderent ;
“ sed multo melius est, ante emplastra experire quæ cal-
“ variæ causa componuntur, &c.

“ Si caruncula increfcere cæperit, et febricula aut soluta
“ fuerit aut levior, et cupiditas cibi reverterit, fatisque som-
“ ni accedat, in eodem medicamento perseverandum est :
“ hac ratione rimæ sæpe callo implentur.

“ Si vero prima sub curatione febris intenditur, breves-
“ que somni et iidem per somnia tumultuosi sunt, ulcus
“ madet neque alitur, et in cervicibus glandulæ oriuntur,
“ magni dolores sunt, cibique super hæc fastidium increfcit,
“ tum demum ad manum scalprumque veniendum est.”

To which he might have added, that it was then very often too late to do any service.

Hippocrates, the most careful observer, and most faithful relater of appearances, was clearly of opinion, that some degree of contusion generally attended fissures, however fine ; as appears from many passages. “ Quodcunque telum os
“ findit, idem illud etiam contundit magis vel minus. — Ri-
“ mæ quoque contusionem comitem esse omnino necesse est,
“ vel magis vel minus,” &c. And daily experience will convince all who will observe, that the great mischief attending capillary fissures is, from the effect of contusion ; and that very few escape feeling such effects.

unhurt, that I should very seldom, if ever, omit the operation.

WHEN I say this, I desire to be understood to mean, that I should perform it immediately, as soon as the accident had happened; and that I should do so, with intention to obviate or prevent the ills arising from the injured membrane.

BUT if I did not see the patient until several days were past, and found him then perfectly free from every symptom of mischief, I should not think the reasons for perforation altogether so cogent; but being guarded by a proper prognostic, and having informed those concerned, of the general inefficacy of late assistance; I should wait till some further indication arose, most sincerely wishing that none might arise, for reasons already given.

Hi-

HITHERTO I have considered the fissure as being apparent, by an original wound of the scalp; or brought into view, by the removal of it soon after the accident; in both which cases it is known early.

BUT it sometimes happens, that tho' the bone is cracked, and the dura mater so injured as to inflame in due time, yet there being at first no symptom, either of extravasation, or commotion, and the integuments being neither wounded, nor apparently bruised, no notice is taken of the accident.

IN this case, after some days (very uncertain as to number) the patient feels himself languid, and out of order; is chilly, and hot, by turns; is restless, and complains of a dull kind of pain in his head; soon after this, the scalp begins to swell, and become puffy, in the
place

place where the blow was struck ; this appearance is accompanied by the symptomatic fever, which is soon so heightned as to require attention.

IF the scalp be now divided, the pericranium is found firmly united with it, but detached from the skull the whole length of the fissure, and to a much greater breadth ; very much altered in colour, being now of a blackish, or livid hue ; and containing, between it and the bone, a small quantity of a brown, thin ichor ^a.

ACCORDING to the date of the injury, the symptoms are more or less urgent ; at first, it is rather a restlessness and inquietude, than any great degree

^a Ossium rima occulta interdum non ante septimum diem, decimum quartum interdum, interdum serius, se ostendit ; tum caro ab osse abcedit, tumque os lividum apparet, dolores item ichorum diffluentium excitantur : atque hæc talia difficulter remediis cedunt. HIPPOCRAT. Coac.

degree of fever, tho' always attended with a hard, jarring pulse ; but in proportion, as the membrane inflames, and tends to putrefaction, every thing is exasperated ; the pain is greater, the fever higher, the patient gets little or no sleep, is frequently shook by rigors, and in short, suffers all that has been described at large in the sloughy state of the dura mater from contusion ; concerning which, enough has already been said to prove, that in this state there can be no hopes of relief, but from perforation of the bone.

It sometimes happens also, that a fine capillary fissure runs under the undivided part of the scalp, from some part of a larger fracture, and escapes unnoticed for some days.

If the dura mater under this crack is not injured, it may possibly
never

never give any trouble at all ; but if it is injured, and inflamed, which is the case nine times in ten, the scalp covering such fissure will, at the end of some days, swell, and become puffy, and painful to the touch ; the pericranium will separate from the skull, at the edge of the sore ; and a discharge of sanies, upon pressure, will shew a hollow, or sinus ; upon the division of which, the fissure will appear.

HOWEVER large the fracture may be from which this fissure departs, or however freely the trephine may have been applied for that purpose, yet the fissure must not in these circumstances be left to itself ; for it may be depended upon as a truth, that when the scalp and pericranium are detached, and make so diseased an appearance on the outside, that the dura ma-

ter underneath is in the same state, and can be relieved only by perforation: and therefore, that if the application of the instrument along the tract of the fissure is neglected, the case will end ill.

IT may not in this place be amiss to remind the young practitioner, that altho' it is impossible for any one, in the case of highly-inflam'd, or purulent dura mater, to do well without perforation of the skull; yet that operation should be considered as only one part of the process necessary towards a cure; and that frequent bleeding, gentle evacuation by stool, febrifuge medicines, and a low cool regimen, are full as necessary after as they were before.

THE removal of the piece of bone sets the inflamed and stretched membrane free from part of its pressure, gives discharge to matter, gleet, &c.
but

but every means, that can serve to appease the febrile heat; to lessen the quantity, and velocity of the fluids; to render the vessels less light, and springy; to empty, and cool the intestinal canal; and to procure rest, and ease; are full as much required after the skull has been perforated, as before: and this I am rather inclined to mention, because the operation being by many regarded as the last remedy, they are apt to be remiss in the use of others, when that has been performed.

S E C T. IV.

Of FRACTURES with Depression.

FRACTURES without depression differ from fissures, only in the distance of the broken edges

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from each other. When the separation is considerable, it is called a fracture; when the bone is merely cracked, so as that the parts seem hardly separated, it is called a fissure; but the chirurgical intention is the same in both, viz. to give discharge to any extravasated blood, in present; and to provide against the formation, or confinement of matter in future.

BUT in fractures attended with depression, the intentions to be fulfilled are more in number.

IN these, the depressed parts are to be lifted up; and such as are so separated as to be incapable of re-union, or of being brought to lie properly, without pressing on the brain, are to be totally removed.

ALL the circumstances of commotion, extravasation, inflammation, separation of the membrane, the formation of sloughs, or matter; in short, every thing that can attend a simple fracture of the cranium, may also be found in a depressed one: and as all these ills are to be obviated, or remedied, in the same manner in both cases; there is no need of repeating it in this place.

To free the brain from pressure, and to provide a sufficient opening for the discharge of blood, or matter, by elevating the depressed, or by removing the loose pieces of the cranium, was as well known to the ancients, to be the proper curative intention in this kind of fracture, as it is to us; but the means they made use of, to accomplish this end, are somewhat different from

those which we now use, and labour-
ed under some imperfections, and
inconveniences, which the present
practitioners have corrected.

MOST of the attempts made by
our ancestors, for the elevation of
depressed, or the removal of broken
parts, were made by the applica-
tion of instruments to the parts so
depressed. This was a palpable im-
perfection, to say no more of it. But
this was not all; for most of the
instruments used upon these occa-
sions were of such construction, as
to require some force in fastening
them to the piece, which they were
designed to elevate. The terebellæ,
the trochlea tripes, the trochlea
bipes, and all the pieces of machi-
nery designed by Albucasis, Guido,
Andreas a Cruce, Fabritius ab
Aquapendente, Pare, and Scultetus,
as well as those delineated by Hil-
danus,

danus, and Paaw, are proofs of this; they all require a perforation to be made in the depressed piece, either by, or for, the skrew with which it is to be elevated.

Now, not to mention that most of these instruments are so complex, as to render them necessarily awkward, and unmanageable; it is obvious, that by the application of any of them to the depressed, or loose bone, all the ills arising from pressure made on the brain are liable to be increased: beside which, in some kinds of fractures, it is impossible to make use of any of them; and, in others, if they were used, they must necessarily prove inefficacious.

CELSUS has directed the meningophylax to be used as an elevator; which instrument differs indeed but little either in form, or manner of

application, from the present common elevator: but then the opening, by which it is to be introduced, is to be made either with a terebra, or the cyclifcos; the tediousness, and inconveniencies attending which, have already been remarked.

IN short, all the objections which were made to the perforating instruments used in simple fractures, being of still greater force, in those accompanied with depression; and the application of any power to the surface of a loose, or depressed bone, being manifestly attended with some degree of hazard; the present practitioners are justified in laying them all aside, and endeavouring to accomplish the same end by methods which are less operose, and more free from danger.

ACCORDING to the present practice, a perforation is made with a
trephine

trephine in the found, undepressed part of the skull; either comprehending the edge of the fracture, or so near to it, (according to the circumstances of the case) that an elevator may be introduced thro' such perforation, under the loose, or depressed part; which is by that means elevated, or, with the help of a pair of forceps removed, and that without any risque, either of pressing on the brain, or wounding the membrane.

WHAT number of perforations may be necessary, can be determined only by the particular circumstances of each individual case; all the intentions with regard to extravasation of blood, or formation of matter, which have been mentioned under the article of simple fracture, are to be here fulfilled; with the additional ones, of removing the loose, or raising up the depressed piece :

piece: therefore, tho' the case may be so circumstanced, that one perforation may prove sufficient for the two last mentioned purposes; yet if the fracture be of any length, the instrument should certainly be more freely applied, for reasons which have already been given at large.

THE elevation of the deprest part of the cranium, is sometimes very easily accomplished; and sometimes is attended with a good deal of difficulty. It is sometimes followed by an immediate remission of the symptoms, and sometimes not; according as the case is more or less complex.

IF the whole disease consists in the pressure made by the broken piece of bone; the elevation of that, and the consequent dissipation of the symptoms, afford good hopes of a cure: but if the injury is not of

so simple a kind; if other parts are hurt, and other mischief done, the mere remission of such symptoms as proceeded from the pressure of the fracture, does not by any means give so good a prospect.

THE dura mater may be so hurt, as to be detached, to inflame, and suppurate; or a quantity of lymph, or blood, may be extravasated, in the ventricles of the brain; or its internal medullary structure may be so shook, that the merely raising up the depressed bone, tho' it may remove such symptoms as its pressure occasioned, will do very little towards producing effectual relief. For the extravasation of fluid, or the putrefaction of the dura mater, will prove as certainly fatal in the end, as the neglected fracture would have done.

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THE combination of different ill effects from the same primary violence, and the great difficulty of distinguishing them from each other, is one principal cause of that perplexing anxiety occasioned by wounds of the head. When one cause of bad symptoms is removed, another, or even several, may remain; each of which singly may be sufficient to destroy the patient. And therefore, tho' the means made use of are extreamly proper, being such as were pointed out by the most pressing symptoms, and such as in a simple case, would most probably be effectual; yet in a complicated one, by not being able to answer every intention, they frequently answer none.

THIS every practitioner should know, and the proper friends of every patient be informed of; lest the
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the former should promise what is not in his power to perform, and the disappointment of the latter be thereby rendered the more painful.

IF the bone is broke, and depressed in one part only, the trephine and elevator ^r must be applied, in such manner, and so often, as to answer the purpose intended: but if the depressed bone is cracked all around, the best and safest method is, to take away the whole of it; that is, all that part which is circumscribed by the crack; especially if the fracture was produced by a smart blow, or much force.

To those who are unused to things of this sort, so large an opening, as this must sometimes
make,

^r In most cases, the common elevator is sufficient for all purposes: but there are some particular fractures, with several loose pieces, in which the elevator of M. Petit, as improved by M. Louis in the Mem. de l'Acad. de Chirurg. will be found a very useful instrument.

make, will have a tremendous appearance: but it should also be considered, that however large the portion of the membrane may be, which is by this means uncovered, yet the same portion, or perhaps a larger, must have inflamed, and become sloughy, under the fractured piece.

IN cases where the broken piece is separated by a pretty wide fracture, and is loose all round from the rest of the skull, every body sees, and acknowledges the propriety of this removal, tho' they do not attend to it when the piece is not loose: whereas, in truth, the necessity is almost exactly equal in both cases. In the former, the piece is taken away, because it is so loosened from all connexion, either with the dura mater or the rest of the skull, that its re-attachment is
 thought

thought impracticable; and it would lie in the way, and hinder the discharge from the suppurating membrane; in the latter, tho' the piece is not perfectly separated from the rest of the cranium, yet, in general, all that part of the dura mater, which lies under the piece circumscribed by the fracture, is so injured, and detached, that its reunion with the bone is equally impracticable; and matter will as certainly be formed on its surface in one case, as in the other, with this very material difference, that the suppuration may possibly cast off the loose piece, but never can the other.

THE frequent observation of fatal abscesses, formed under bones which had been depressed, and perfectly elevated, joined to the trouble and difficulty which attended the antient manner of raising them up, I take
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to have been the reasons why our ancestors do, in general, direct the depressed part to be taken away.

WHATEVER was their motive, I cannot help thinking, that their conduct was right, and wish it was more frequently imitated; for the number of those who die by the pressure of the broken bone, bears no proportion to that of those who are destroyed by the inflammation, and putrefaction of the dura mater.

WITH regard to the operation itself, it is impossible to give any other than general directions: the manner of applying the instrument, the number of perforations it may be necessary to make, with many other particulars, can only be determined by the circumstances of each individual case.

THE elevation of parts depressed, the removal of such as are totally
dis-

disunited, the free discharge of blood in present, and of matter in future, are the general intentions which ought to be fulfilled: whatever comes short of these, is of no use at all, and might full as well have been omitted. And therefore, many of the prohibitions to be found in books, against applying the instrument upon particular parts, cannot be received as positive rules.

THESE places are the futures, the lower and hinder part of the head, the temples, and that part of the frontal bone which covers the sinuses.

THE reason given for not setting a trephine on the futures is, the fear of hæmorrhage.

WHEN it can, with equal utility, be applied on any other part of the skull, the futures should certainly be avoided; but if the necessity of the case requires it, they may be com-

L prehended

prehended within the perforation, without any hazard at all, as I have several times experienced. A small flux of blood generally follows, but I never saw it give any extraordinary trouble; a bit of dry lint and very moderate pressure for a few minutes has always restrained it: nay, I have been obliged to remove a large fragment of bone, which has been driven thro' the dura mater into the longitudinal sinus, without having any trouble from the bleeding.

IT is not indeed to be wondered at, that the antient practitioners were in general so fearful of wounding these parts^s; the pointed instruments which they made use of, the
 little

^s This is certainly the case of by far the greater number of the antient writers; but even, among these, there are some who have differed from the general opinion, and advised trepaning upon a future, if necessary; such are Berengarius Carpenfis, J. Baptista Cortesius, and a few others.

little command they had of them, and the apprehensions they were under, of the consequence of a hæmorrhage from a sinus, were sufficient to deter them ; but a better knowledge of the structure of the parts, and the use of the trephine, has removed this fear, and convinced us, that, when it becomes necessary, a future may be comprehended within the circle of the saw, and no mischief follow †.

IN truth, if this matter be considered properly, it will appear, that

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† In those cases where a piece of bone was to be taken away, on account of a fracture near to a future, our forefathers went as near to it as they might with safety ; applying the terebra in a strait line, between the fracture and future, but in a semicircular one, on the other side of the fracture ; as appear from many passages, as well as the following :

“ Quod si rima juxta futuram fuerit naturaliter se habentem, sola rima in ambitu perforetur, et excidatur ;
 “ ad tutam vero terebrationem, rectus ordo foraminum
 “ detur inter saturam et rimam, deinde alius paulum semicircularis, circumscribens totam fissuram.”

ORIBASIIUS.

in the case of bloody extravasation, or of suppurated membrane immediately under a future, the upper part of the sinus, and the cranium, are seldom if ever in contact with each other: in the former case, the coagulated blood lies between them; and, in the latter, the inflamed membrane is always detached from the bone; so that the hazard, if there really was any, would be confined to the case of depressed fracture without extravasation; in which the elevation of the piece of bone becomes necessary at all events.

THE hinder part of the skull may certainly be trepanned as low as the lambdoid future, or even lower if necessary. It is true, that the bone is thicker there than in any other part of the cranium, and the operation is more troublesome; but it is not therefore more hazardous.

THE reason generally given is, the fear of wounding the sinus's ; but a careful operator will be in no great danger of that ; to which it may be added, that when this part of the cranium is perforated, it is not done from choice, but from necessity ; and therefore, when the fracture does not run so low, as to render the application of the instrument absolutely impracticable, the trouble which may attend it, or even some little additional hazard, are no objects of consideration.

THE temples have been forbid, on account of the muscles on the outside, and the vessels both within and without : but repeated experience has proved, that the temporal muscle may be divided, and the bone perforated, without either convulsion, or considerable hæmorrhage.

It is true, that in that fatal kind of spasm by which the jaw is fixed, and the mouth kept shut, this muscle is much affected; but it is not this muscle only; many others are made equally rigid; all the muscles of the spine, but particularly those of the neck, being most frequently in the same state.

NEITHER is this spasm at all peculiar to wounds of the temporal muscle; but happens indifferently to those, and to injuries done to many other parts of the body; fractures of the limbs, of the ribs, wounds of the belly and breast, &c. in short, I hardly know a tendinous, or membranous part, which, by being wounded and irritated, has not at times produced this generally fatal spasm.

THE reason for not trepanning on the frontal finus is too obvious to need reciting.

WHEN the depreſt parts are raiſed, the looſe ones taken away, coagulated blood diſcharged, and the brain freed from preſſure, the bare membrane ſhould be dreſſed as lightly and as ſoftly as poſſible.

OUR ancestors had a multiplicity of medicines, which they made uſe of upon theſe occaſions ; and were very precise in ſuiting them to the different ſtates, as they called them, of the ſore : they were alſo very exact in making thoſe pieces of linen, or ſarſanet, called ſindons, which they dipped in theſe medicines, and applied upon the ſurface of the membrane, paſſing them alſo under the edges of the perforation.

I HAVE not ſaid any thing of either, becauſe I verily believe the

majority of the former, to be at best useless, and the latter often prejudicial.

IF the operation is attended with success, that is, if by the discharge of extravasated fluid, or by the elevation of depressed bone, the symptoms disappear, and no cause of mischief remains; the dura mater readily obeys the motion of the blood thro' the arteries of the brain, and is alternately elevated, and subsides; by degrees it loses its bright silver hue, and casting off a thin slough, is covered by a granulation of new flesh, of firm consistence, and florid colour; this daily discharges a moderate quantity of good matter, and rising gradually till it gets above the edges of the perforation, joins with that which springs from the surface of the bare cranium,

nium, and together with it makes a firm cicatrix.

DURING this whole time, the patient is free from fever, has quiet sleep, natural appetite, and natural discharges; is cool, and tranquil; and in short comes as near to being in health, as such circumstances will permit ^u.

ON the other hand, if the mischief is such that the means made use of prove ineffectual, the appearances, and the event, are generally very different from these.

IF

^u “ Salutis notæ sunt, ulcus non dolens, cerebrique
 “ membrana naturalem colorem ac motum servens, ulcus
 “ post suppurationem imminui, pus album æquale modice
 “ crassum, et non male olens; ulcus quod initio album
 “ apparuit post aliquod tempus rubescere, carnem millio
 “ similem producere, squamulasque suo tempore emittere,
 “ sine perturbatione somnum capere, sine febre esse, cibum
 “ appetere, assumpta digerere, æquas excretiones fieri,
 “ glandulas quæ primis diebus apparuerant, vel erysipelas
 “ cito dissolvi. ARCHIGENES de Signis.

“ Spem vero certam faciunt; membrana mobilis, ac sui
 “ coloris, caroin crescens rubicunda, facilis motus maxillæ,
 “ atque cervicis. CELSUS.

IF the commotion is not relieved by the general evacuation, that wild look, and inconsistent discourse, that quick and full pulse, which are its general characteristicks, do not abate until the patient sinks into insensibility, and dies.

IF the case was an extravasation, out of reach, the oppressive symptoms occasioned by it remain; the patient, if let alone, would always doze; when not excited takes little or no notice of external objects, or else is perfectly stupid and insensible; has a full, slow, labouring pulse; and generally dies delirious, and convulsed.

IN both these, the membrane will cast off its slough, and seem inclined to incarn; but as the patient grows worse, that incarnation on the membrane, as well as the fore of the scalp, change, and become

come pale, glassy and soft; and, instead of matter, discharges a thin foetid gleet.

IF the dura mater is injured in such manner as to inflame, and become sloughy, instead of being loose, and easily obeying the motion of the brain, as it is called, it becomes tense, rises and presses against the edges of the perforation, or fracture, and notwithstanding all that has been said concerning its insensibility, is very painful to the touch.

IF the feverish symptoms run very high, it becomes black, and is extremely offensive; in which circumstance, the case is generally soon terminated ^w.

IF

^w “ Mala signa sunt membrana immobilis, nigra, vel
 “ livida, vel aliter coloris corrupti, dementia, acris vomitus,
 “ nervorum vel distensio, vel resolutio, caro livida, maxil-
 “ larum rigor, atque cervicis.”

CELSUS.

IF the symptoms are not quite so violent, but yet the mischief is of the fatal kind, the membrane casts off its slough, and is covered by an incarnation, which is not kindly, either in colour, or consistence; gleans largely, and thrusts up a fungus, greatly exceeding the limits of the perforation, but lying loose upon the surface of the cranium; which, instead of turning brown, as if it tended to exfoliate, puts on a purulent kind of colour; the edges of the scalp are loose, pale, and flabby; the fever continues, without remission; the strength hourly decreases; the sleep is little, and that very much disturbed; the cheeks are flushed, and the rest of the face yellow; the eyes are sunk in the orbits, and have lost their natural brightness, and lustre; the skin is dry, and intensely hot; and the

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the rigors, which at first* were few, and slight, are now severe and frequent.

FROM such circumstances as these, the worst conclusions are to be drawn; and, to use the words of Berengarius, “ *Hic casus est de his à quibus non evadunt aliqui nisi nutu dei.*”

S E C T. V.

Of WOUNDS of the MENINGES and BRAIN.

THE writers of memoirs, and of cases in surgery, seem in general to have had it much more in their intention to surprize, than to inform their readers; and have chosen to
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* “ Si rigor frequens et iteratus, febre non desinente, ægrum jam debilem invadat, lethale,” is a general aphorism of Hippocrates, and is most frequently true when considered in a general sense; but when applied to the particular case of wounds of the head, is invariably so.

give us such extraordinary relations in this part of surgery, as come more properly under the denomination of miraculous escapes, than cures.

IF we look into many of them, we shall find so many instances of success, where the membranes have been divided, and large portions of the brain discharged, that one would almost be inclined to believe, that it was a part very little necessary to life; and that the hazard consequent upon its being hurt, had been greatly exaggerated by our ancestors, did not frequent experience furnish most melancholy proofs of the truth of their doctrine.

I MUST desire not to be misunderstood, as if I meant to insinuate that wounds of the brain were necessarily fatal: I know from experience that they are not; but I know

know also, that the number of those who get well, under these circumstances, is so small, compared to that of those which are lost, that a recovery is little more than possible: the knowledge of which may serve to put a man upon his guard in prognosticating, but will not abate his industry, or lessen his attempts to serve his patient.

THE meninges, or brain, are wounded either by the instrument which breaks or divides the skull, or by the edges of the broken bone: the latter generally produces a lacerated wound of the membranes, and bruises as well as wounds the brain. Foreign bodies also, such as bullets, wadding, splinters, parts of weapons, &c. are sometimes lodged upon, or within it.

BUT let the kind of wound, or fracture, be what it will, or whatever

ever circumstances may attend the case, the chirurgic intention is short and plain; viz. to remove such foreign bodies as can be easily got at, and all loose pieces of the cranium; to free the brain from all pressure; and to make such an opening, as may serve all the purposes of the discharge either of blood, or matter.

WHEN the surgeon has done this, and has taken care of his patient by evacuation, and a general regimen, he has done all that is in his power, and may very truly say on this occasion, what Mr. Pope has justly said on another;

Thus far was right; the rest we leave to heaven.

THE dressing to the wounded membranes, or to the brain, should be as light and soft as possible; nothing that may inflame, or irritate,
nor

nor so applied as to press, or confine the necessary discharges.

AMONG authors, will be found a great variety of applications for this purpose; as preventatives of suppuration, as suppurants, as detergents, as incarnatives, &c. &c. &c. but whoever confides in any of them will be deceived. Suppuration, and incarnation, are acts of nature, not of art: when the latter has removed all impediments, the former will do her own business; and the practitioner will find, that soft fine lint, laid in lightly, so as to absorb part of the matter, without confining it, will in general answer all the purposes for which such a farrago of balsams, liniments, and oils have been prescribed.

S E C T. VI.

Of EXTRAVASATION *and* COMMOTION.

THESSE have been so confounded together, under the general term CONCUSSION, that hardly any distinction has been made between them, tho' they differ very essentially from each other.

BOTH of them have occasionally been spoken of in the course of these papers; and therefore I shall say no more of them here, than what may serve to illustrate, or explain the former hints.

EXTRAVASATION is either of blood, or lymph; which fluids lie either upon the surface of the dura mater, or between it and the pia mater, in the substance of the brain, or in its ventricles.

WHATEVER the fluid is, or wherever it is situated, if it is in such
quan-

quantity as to become prejudicial ; the symptoms it produces are those of pressure, and are constantly, and invariably attended with a greater or lesser degree of abolition of sense, and motion.

IF the extravasation be of blood, and considerable in quantity, it is sometimes accompanied by a bloody discharge from the nose and ear ; if the stroke, by which the extravasation is produced, is near to, or upon a future, the quantity is generally larger, than when the middle of the bone is struck.

EXTRAVASATION of lymph, and commotion of the brain, are frequently occasioned by blows on the head ; but they are also frequently produced by general shocks of the whole frame, in which no external violence is offered to the head in particular.

LYMPHATIC extravasation is most frequently in the ventricles, tho' it is sometimes between the membranes.

IT is sometimes produced all at once; but is most frequently accumulated gradually.

IF the deposition is large, and made at once, the symptoms are immediate, urgent, and similar to those from blood: if the quantity is small, the symptoms are at first slight, and either disappear upon proper treatment, or are gradually increased until the pressure becomes fatal.

I HAVE seen two very remarkable instances of this kind; one was a child about four years old, who fell off from a bed upon a soft carpet; the other was an adult, who slipped from an height not exceeding five feet, and fell upon her breech: in both, the extravasations were of the
limpid

limpid kind, and in the ventricles of the brain; they were both well several days after the accident, and their first complaint was a drowsiness; after which the symptoms of pressure hourly increased, until they became insensible, and died paralytick.

LARGE extravasations of blood, and depression of the cranium, are produced at the instant of the blow; and their symptoms therefore appear immediately: effusion of lymph, and detachment of the dura mater, tho' really the effect of the blow as much as the former, yet do not shew themselves by their symptoms until some days are past. Therefore, tho' the immediate appearance of bad symptoms does certainly indicate present mischief; yet the absence of them, for some days, does

by no means imply safety: a caution never to be forgot.

OF commotion of the solid parts of the brain, we have only a negative kind of proof.

VERY alarming symptoms, followed by the most fatal consequences, have sometimes been found to attend blows, falls, shakes, &c. and, upon the strictest examination, neither fissure, fracture, wound, nor extravasation of any kind, has been discovered. This is strictly and properly concussion; and tho' we have no proof what the immediate and precise effect of this shock is upon the brain, yet there can be no doubt but that some disorder is produced in that part of it from whence the nerves have their origin, or with which they have an immediate connexion. All the symptoms, while the disease is recent, and many of the
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the evils which follow such a concussion, and which sometimes remain during the rest of the patient's life, are proofs of this.

THE symptoms are proportioned to the degree of violence offered to the brain; and, when not accompanied by extravasation, are not of the oppressive kind; a wildness and inconsistency of look and discourse; a frequent and hard pulse; some degree of fever; vertigo, vomiting, and obstinate watching, frequently attend it at first; debility of understanding, a desipient or idiot countenance, failure of memory, paralysis of one part, or one limb; loss of one sense, or of the sight of one eye; spasm, contraction, or rigidity of one particular part, or muscle, are sometimes the consequence.

SOME of these are sometimes cured, others remain incurable; and it may not be improper to remark, that there is not one among them, that has not been seen to attend a commotion produced by a general shock of the whole frame, in which the head sustained no particular violence; that is, none ab externo^y.

IF the concussion is very violent, all sense and power of motion are immediately destroyed, and death is the ^z consequence: but between this, and that slight degree of confusion

^y An intimate friend of mine, by a fall on his breech, became immediately wild and inconsistent, talked idly, or rather raved, for several days, and never slept for as many nights: by means of a low diet, and very free evacuation by bleeding, he at last got well, but with the loss of one of his sensations. In this case, I always observed, tho' it was necessary to give him cathartic medicines, he being of a costive habit, that they always quickned his pulse, and added to his inquietude for some hours; but bleeding always sensibly relieved him.

^z " Quibus conquassatum est cerebrum continuo neque vident, neque audiunt, ac fere moriuntur."

HIPPOCRAT.

fusion which sometimes attends a concussion, there are many stages.

MERE commotion, unaccompanied with extravasation, or other evil, requires free evacuation by phlebotomy, a low diet, and extream quietness.

EXTRAVASATION of any kind, and wherever situated, is dangerous; a very small quantity will sometimes bring on the most threatening symptoms, and endanger life.

OF all the kinds, that of blood situated between the skull and dura mater, is the most likely to be relieved; next to that is the same fluid between the dura and the pia mater; those which lye deeper, whether of blood or lymph, are attended with the greatest hazard.

WHEN the extravasation is attended with no external mark of violence, there is no rule whereby to
judge

judge of its situation ; no direction where to remove the scalp, or perforate the cranium, in search of it; and consequently, no authority for doing either. In this case, our only hope is from phlebotomy. The intention by this, is to lessen the quantity circulating thro' the general system of vessels, so as to assist nature in the absorption, or dissipation of what is shed, and thereby take off the pressure it makes on the brain, and nerves.

THIS effect is not to be expected from the loss of a few ounces ; the operation must be frequently repeated, at short intervals, and from different parts, according to the strength of the patient, and the urgency of the symptoms.

By this means very alarming symptoms have been removed, and persons in very hazardous circumstances recovered.

recovered. This is one of those cases, in which a surgeon must not suffer himself to be influenced by the fears of friends and by-standers; but must act according to his judgment and the exigence of the case: large and repeated bleedings terrify the ignorant; but, in these circumstances, we have no other remedy.

BUT when extravasation is the consequence of such external violence, as leaves an apparent mark where it was inflicted; when the scalp is thereby bruised, cut or torn; then we have an indication, and an authority for doing something more. For if the extravasation is the immediate consequence of the stroke on the skull, and the deposition is made immediately under, or very near to the place struck, the removal of a piece of bone from that
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part, may be of great benefit ; and the bruise or wound of the scalp, is our director where to make such attempt.

NOT that such external mark is to be deemed infallible; extravasated blood is often found at great distance from it, and may be caused from the general concussion of the head, not by the blow; in which case, it is found in the substance of the brain, or in the ventricles, quite out of the reach of our assistance.

THESE are cases in which we are not to expect certainty, but must be content with such information as we can get ; and as our opportunities of being serviceable are too few, we should let none slip, but embrace even possibilities. The general maxim, laid down by Fab. ab Aquapendente, is extremely applicable

plicable to the present purpose^a; and therefore if the symptoms are urgent, and do not remit upon plentiful bleeding, the wounded, or bruised part of the scalp should be immediately removed, and the chance of relief from perforation of the cranium be embraced.

If the quantity of blood is small, and lies between the dura mater and cranium, immediately under the perforation, it may possibly be thereby discharged, and the symptoms may immediately disappear.

WHEN this is the case, it is certainly a full vindication of the operation, whether the event is lucky, or not; for it is very necessary, that those who are not well acquainted with these things should know, that
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^a " In vulneribus quæ sua natura admodum sunt periculosa, pessimum est expectare prava symptomata, et tunc demum providere, cum forsitan occasio præterit, nec amplius providere licet."

tho' the first symptoms may be only those produced from the pressure of the extravasated blood ; yet the disappearance of these symptoms does not, by any means, ensure a cure.

THE extravasation of that fluid, may be all the mischief produced by the accident ; it may be so small in quantity, as to separate a very small part of the dura mater from the inside of the cranium ; and the necessary evacuations, joined to the operation of the trephine, may prevent any farther mischief.

BUT, on the other hand, the quantity may be so large, or so dispersed, as to cause a large detachment of the membrane ; or the stroke may have been so smart, as to injure, and inflame it ; in both which cases, much, and even fatal mischief may follow, notwithstanding the first symptoms are taken off. The complaints

plaints produced by pressure, and those which arise from inflammation, and suppuration of the dura mater, are very distinct; the first may be relieved, or even totally removed, together with its cause; and the latter, in due time, produce its fatal effects, notwithstanding all that has been, or indeed, in many cases, can be done.

OF this every practitioner should be aware, lest he both expect and promise too much. The complication of different kinds of mischief, from the same cause, should always be in his mind; and his prognostic should always be made accordingly.

IN perforating those parts of the skull where the diploe is thickest, it will sometimes bleed very freely; and sometimes the separation of the piece included in the instrument,
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from the dura mater, will be followed by a small flux of blood; but from neither of these is the operator to expect relief: this is blood in a natural fluid state, and previous to the operation was circulating thro' its proper vessels; whereas that, whose pressure produces the symptoms, is out of the circulation, is always in a coagulated state; and it is the dissipation, or discharge of this only, which can bring relief.

THE nearer the extravasation is to the skull, the better; consequently, that which is between it and the outer surface of the dura mater is the best; the deeper it is, the more hazardous, not only as it presses more immediately on the brain, and nerves, but as it cannot be got at, nor can any attempt be made for its discharge, but by the division of parts of great consequence.

IF the coagulated blood lies under the dura mater, between it and the pia mater, and the symptoms are urgent, the former of these must be divided : for there being no natural outlet, whereby it can be discharged ; and the symptoms being so pressing, as not to afford time to wait the probability of its dissipation, the division of the membrane becomes the unicum remedium.

I HAVE often seen it done, and have sometimes done it my self ; the success, which has now and then attended it, has been sufficient to satisfy me of the propriety of it, when the symptoms are very urgent, and the appearances such as render it most probable that the extravasation is near to, or under that part of the membrane which is made bare by the perforation ; but I must

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again repeat, that it does not appear to me to be a matter of so much indifference, as it is by some said to be.

WOUNDS of the membranes of the brain, by whatever body, or in whatever manner inflicted, have always been regarded as hazardous; and, which is more to the purpose, have always been found so: it is indeed in some measure true, that a simple division of them, by a cutting instrument, is less dangerous than a wound made by a piece of bone, or any rough body, which tears, or bruises; yet this relates only to the manner of the division; the parts divided are the same in both, and the external air is equally let in upon the brain immediately, or upon a membrane of so delicate structure, that it is next to impossible that it should not slough, and leave the brain bare, which in these cases

cases generally thrusts up a large ill-natured fungus ; a very unpleasant circumstance to the surgeon, and no advantageous one to the patient.

SOME few writers have indeed affected to talk very freely of making incisions thro' the membranes into the brain, in search of extravasated blood, or matter, which may be supposed to be there.

THEY observe, with a kind of sneer, that the present practitioners seem as fearful of dividing the brain, as the ancients were of the meninges, tho' both may be done with great security.

FOR my own part, I cannot help thinking (and that from experience) that the apprehensions of both are far from groundless ; and tho' necessity, in the case already mentioned, will fully vindicate the division of the dura mater, for the discharge

of an extravasated fluid, yet a random incision into the brain is by no means warrantable.

I WOULD not be thought to encourage timidity, or add to the fears of a practitioner; and, when there is a probability of success, would go perhaps as far as any one who can give some kind of reason for what he does: but still I cannot help thinking that caution, and fear, are very different things; and that, when there is no reasonable prospect of doing some good, there is no authority for doing any thing.

THE very ingenious Haller has taken a great deal of pains himself, and has put a number of animals to a great deal more, to prove that the meninges are neither sensible, nor irritable; but whether this is strictly true, or not, it is plain, from the same gentleman's experiments,
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that they are the immediate covering to one of the most sensible, and most irritable parts of the animal: and we all know, from dire experience, that inflammations, and wounds of them, are so far from being matters of indifference, that they most frequently end fatally.

I HAVE already taken notice, that all the diseases hitherto mentioned, viz. wound, contusion, and fracture of the cranium; detachment, and inflammation of the dura mater; the effects of contusion, &c. may all be joined to an extravasation, and meet in the same case: when this happens, the difficulty of judging, as well as of acting, is much increased.

THE circumstance of fracture makes indeed but little alteration in
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the case of extravasation ; for if the blood lies upon the surface of the dura mater, and the fracture is tolerably open, it may possibly be discharged thereby ; but if the fracture is small, or deprest, the continuance of the symptoms will indicate perforation, and elevation ; after which, the treatment of both cases are nearly alike.

IN one sense, a fracture may be said to be an advantage ; for by making the application of the trephine immediately necessary, a discharge will be given to what might otherwise have been concealed, and done irreparable mischief.

F I N I S.

