Observations and experiments on a new mode of treating fractures of the leg and fore-arm : especially compound fractures / by William Beaumont.

OBSERVATIONS AND EXPERIMENTS

ON

A NEW MODE OF TREATING

FRACTURES

OF

THE LEG AND FORE-ARM;

ESPECIALLY

COMPOUND FRACTURES.

BY

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"MULTA DIES VARIUSQUE LABOR
RETULIT IN MELIUS." *VIRGIL.*

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PREFACE.

It was after making a series of experiments, for the purpose of examining the processes by which the union of fractured bone is effected, that I conceived the possibility of greatly accelerating the reparation, and also of diminishing the danger, of compound fractures: excepting however, those cases, in which the contusion or laceration of the soft parts, might be very extensive. It appeared to me, that by maintaining in compound fractures a continued exclusion of the atmosphere from the broken surfaces of the bone, union might proceed, *ceteris paribus*, as rapidly as in simple fractures, and with almost as little danger.

The means which I employed to attain this object, not only succeeded, but also preserved, without making any undue or unequal pressure, a far greater steadiness of the fractured limb, than can possibly be

accomplished by splints; and though the trials of this practice have been made only upon brutes, yet in my mind, they are as satisfactory as if they had been made on man.

That treatment of the less severe cases of compound fracture, adopted some years ago, first, I believe, in St. Bartholomew's Hospital, with the intention of producing union by adhesion, of the divided integuments, but seldom obtained this advantage. I cannot remember, during six years that I was studying in St. Bartholomew's, more than a very few cases, in which this practice was successful. One case I will briefly relate, because it shows that in compound fractures, even roughly made wounds of the integuments, may unite by adhesion, when they and the subjacent fractured bone are kept in a state of perfect quietude.

Thomas Connor, a robust, healthy Irishman, was admitted into Colston's Ward, St. Bartholomew's, on the 4th Nov. 1824, at which time I was a dresser under the late Mr. Abernethy, and this patient happened to be in my care. The case, I have

no doubt, is in the memory of many gentlemen, then students at the hospital, for Mr. Abernethy particularly called their attention to it.

The man's scalp was much bruised and lacerated; one severe wound on his forehead, full two inches in length, exposed a fracture of the frontal bone, the rough edge of which could be distinctly felt. He and a compatriot stated, that they had been fighting with pokers; and that with this weapon, the aforesaid wound and fracture had been made. It was in the morning of the 4th, that Connor received the injury; in the evening I closed the wound, bringing the edges accurately together, and maintaining them so with adhesive plaster, of which I put several layers one over the other. I directed his head to be shaved, and folds of linen constantly wet with cold water, to be kept upon it. I also gave him repeated doses of purgative medicine, until his bowels were freely opened; in which relaxed state I kept them till he left the hospital. On the third day after his admission, I removed the dressing, and found

the edges of the wound united in their whole extent; thus converting a compound into a simple fracture. On the fifth day I again removed the dressing, when the wound was firmly healed, and the surrounding skin without the least appearance of inflammation. On the sixth day the man was turned out of the hospital for disorderly conduct: up to which time from that of his admission, he had had no head-ache, save on one day, and his pulse too had scarce risen above a healthy pulse.

Now this advantage of procuring union by adhesion of the divided integuments, is more likely to be obtained, when a compound fracture of the leg or fore-arm, is put up according to the method proposed in the following pages, than when put up in splints; because, by the former means, there is ensured a much greater steadiness of the fractured limb, and consequently there would be a greater probability of the inflammation subsiding without suppuration. And when union of the wound in the soft parts should fail to take place by adhesion, still would the atmosphere remain

artificially excluded from the fracture; by which, it will be seen, from some experiments, that reparation of the broken bone may proceed as rapidly as in the case of a simple fracture, and apparently with almost as little danger.

The same means of cure, (on account of the perfectly motionless state maintained by it) I think might be followed by success in many old fractures, where a ligamentous union may have taken place. Mr. Abernethy used to say of these cases, that he would never advise the severe and dangerous operation of cutting down to, and rasping the broken ends of the bone; that an osseous union, in his opinion, could never be brought about by any means whatsoever, if such union could not be obtained by exciting a slight degree of inflammation in the broken surfaces, and by afterwards enforcing for some weeks, the most strictly motionless state of the limb.

The result of my experiments, as to the effect in compound fractures, of a continued exclusion of the atmosphere from the

broken surfaces of the bone, was invariably a rapid reparation of the injury; and chiefly on this account, I offer for consideration the following method of treatment.

8, *Fitzroy Street,*
Fitzroy Square.
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OBSERVATIONS AND EXPERIMENTS,

&c. &c.

The mode I am about to propose of treating fractures of the leg and fore-arm, especially compound fractures, consists, for the most part, in the incrusting of the limb in plaster of Paris. It possesses, I am confident, considerable advantages over the means now employed, over splints; for it of necessity prevents, and unremittingly, any motion between the portions of the fractured bones, and of consequence, any change of the relative positions in which the surgeon, when putting up the fracture, may have placed the proximal and distal extremities of the limb.

It is well known that where a fracture runs very obliquely across a bone, splints cannot prevent the muscles from retracting the distal on the proximal portion, and thus shortening the limb. It is true, that as often as such retraction may take place, the fractured limb

may be re-adjusted; but the motion of the retraction or re-adjustment must necessarily undo all that nature may have done towards the raparation of the injury: and besides which loss of time, the patient has to suffer, in many instances, some considerable pain in the re-setting of the fractured bone. It also happens in the like cases, when the muscles of the limb continue long irritable, that one is at last obliged to leave the one portion of the bone, or bones, retracted on the other: under which circumstances the patient recovers, of course, with a shortened limb. And in such a case, where by tightening the splints, it is attempted to prevent retraction, the pressure made thereby, is unequally distributed on the limb, it may be excessively painful to the patient, and occasionally sufficient to cause ulceration or sloughing of some portion of the skin. Whereas, by incrusting in plaster of Paris a fractured leg, retraction of the distal upon the proximal portion of the bones (no matter how oblique the fracture, or disposed to contract may be the muscles) is afterwards prevented, by the impossibility of drawing the foot into the space occupied immediately above it by the ankle, or the bent knee into the space immediately below the knee. And the same with regard to a fractured fore-arm; the hand cannot be drawn into

the space occupied by the wrist, and only large enough to contain the wrist; nor can the bent elbow be drawn into the space immediately below the elbow.

Splints can only prevent retraction by their lateral pressure, which, to effect that purpose, must be great in proportion to the obliquity of the fracture, and the force with which the muscles may be disposed to contract: but by the mode of treatment I propose, no lateral pressure is necessary to prevent retraction; for the two extremities of the fractured limb are gently grasped as it were, and held at an unvarying distance from each other: wherefore, if the limb be but extended to, and maintained of its proper length, during the deposition and hardening of the plaster, it is utterly impossible that on the recovery of the patient, his limb should be found in the least shortened. And in like manner with regard to the preservation of its form: let the distal portion of the limb be held during the consolidation of the plaster, in a position neither everted nor inverted, nor bent upon the proximal portion, and of necessity it must continue so, as long as the incrustation remains unbroken. In this manner the shortening of a fractured leg or fore-arm, its eversion or inversion may be prevented, whilst the pressure employed need be neither painful

nor injurious: in fact it can be no more than that made by the bandage put around the limb previously to the incrusting of it in plaster of Paris. It is true that where the soft parts have been much bruised, inflammation may supervene, disposing the limb to swell: in which case, I apprehend that gentle pressure made equally on every part of the limb from its very extremity, would rather tend to diminish than to augment inflammation. It would form an impediment to the passage of an increased quantity of blood into the vessels of the limb, whilst it could not at all obstruct the exit of blood from them: and such being the case, it would, (as it appears to me) be a means of lessening rather than of aggravating inflammation. But should, however, the pressure become painful from a disposition on the part of the limb to swell, there could be no difficulty in removing the incrustation and bandage, and again putting up the limb with a degree of pressure on it which could be comfortably borne. It certainly would be more troublesome than the loosening of a pair of splints, but I believe, from the trials of the practice which I have made upon brutes, that it will be seldom or never necessary to meddle with a limb after the incrustation shall have been made around it.

To incrust in an unyielding matter the broken limb of a man, or other animal, whose skeleton is internal, that is, whose skeleton is surrounded by the soft parts, is to imitate in some measure the structure of those animals whose skeletons, whose inflexible parts form a covering to the rest of their bodies; it is to give to the limb a sort of external skeleton, whilst that which is internal is rendered useless: whereby is supplied one office which the bone can no longer exercise, that of sustaining the limb in its proper length and form. Splints are intended for the same purpose, but every surgeon knows that in many instances they very imperfectly accomplish it. A trifling movement on the part of the patient, is generally sufficient to derange the limb, and in the case of a compound fracture to produce considerable mischief; so much so, that a person having met with such an injury, if the broken limb be the leg or thigh, can seldom, under two or three months, change his position without danger. Now I am sure that by making a firm incrustation around a broken leg, be the fracture simple or compound, the patient may in perfect safety (with assistance) turn occasionally from side to side, or even be moved from one bed to another; which change of position would not only afford very considerable relief, but in persons of weak con-

stitution, where the skin covering the back and buttocks, is likely to ulcerate, or slough, from a long-contined pressure on it, it would also be the means of preventing, or greatly diminishing so serious a mischief. That there would be no risk of disturbing the fractured limb, and of increasing, or reproducing inflammation in it, I may believe, from several cases of severe compound fracture made on the legs of brutes, which with their broken limbs placed in due form, and incrusted in plaster of Paris, were as frequently moving, and with as little care as though their limbs had been entire: notwithstanding which, union took place, and with the same rapidity as in the case of a simple fracture; nor had I any reason to suppose that during the process of reparation, there were going on any injuriously inflammatory action: and when such an occurrence may take place, one of the most efficient means of subduing it, evaporation, may be carried on from the porous incrustation, certainly to an extent capable of allaying any undue heat.

Where the soft parts are so much bruised or lacerated, as to render their mortification to considerable extent almost inevitable, the method of treatment I propose, cannot be advisable: but I do believe, from some experiments, that even very severe cases, will do infinitely

better under this treatment, than under that now in use.

The advantages, then, which I may state this practice to possess over the employment of splints, are, 1st. the maintaining of an unremittingly motionless state between the portions of the broken bones, notwithstanding any moderate movement on the part of the patient: 2dly. the consequent liberty of changing his position, as often as may be necessary to relieve the weariness of a long continuance in the same posture; which change of position, would, in all probability, prevent any ulceration, or sloughing of the integuments of the back or buttocks, when from excessive debility, such an occurrence may threaten to take place: 3dly. the better and complete preservation of the proper length of the limb, in cases where the fracture runs very obliquely across the bones; and also the certainty of preventing any eversion, or inversion, or crookedness. Lastly, there is in thus treating compound fractures, the advantage of so perfectly excluding the atmosphere from the injured parts, as to render the process of union as rapid as in simple fractures. The great danger too, almost invariably attendant upon compound fractures, is also much diminished; if I may so judge from the little apparent suffering of the animals

on which I made experiment, as to this mode of treatment. It is seen, moreover, that where there is much constitutional disturbance, the reparation of a compound fracture, or other severe injury, does not proceed with any degree of rapidity, if it proceeds at all; wherefore, as the reparation of the compound fractures, which I have treated according to the method I propose, did proceed with rapidity, one must needs conclude, that the said compound fractures were not accompanied by much constitutional disturbance: so that the mode of treatment, by which the curative processes are most expedited, must also be that by which the danger is most diminished. Now, with the exception of those cases of compound fracture, in which the soft parts are so much bruised, or otherwise injured, as to suppurate, or slough, to great extent; or of those cases, in which a something may happen to destroy life, not necessarily connected with compound fracture, I have not the least doubt, that with the exception of such cases, compound fractures, at least of the leg and fore-arm, may, in general, be made to get well, as rapidly as simple fractures, and, I believe, with almost as little danger.

There appears no other essential difference between a compound and a simple fracture,

than that in the former, the broken surfaces of the bone, the lacerated soft parts, the effused blood and secretions, are exposed to the action of the atmosphere, whilst in the latter, they are not so exposed. If, then, such is the only essential difference between the two injuries, the exclusion of the atmosphere in the former case, whether artificially, or naturally, must needs remove that difference. There can be no doubt, that exposure to the atmosphere of the broken ends of a bone, and the lacerated soft parts, is of itself, a sufficient cause for that degree of inflammation, which in two or three days after the accident, produces a secretion of pus: and this purulent secretion being kept up by contact of the injured parts with the atmosphere, it is impossible that those parts should, at the same time, secrete the cartilaginous and osseous matter by which the fracture must be repaired: and hence, one cause that in compound fractures union is so long retarded.

Supposing the contusion and laceration of the soft parts, and the injury of the bone, in a compound, and in a simple fracture, to be equal, why is the former case attended with so much constitutional disturbance, and the latter with so little? There appear to me but two causes; one, the necessarily greater degree of local inflammation; the other, the occasional

absorption of putrid matter. It is a fact, that parts not habitually exposed to the atmosphere, will, when so exposed, inflame; and from this cause alone, may arise in compound fractures, the greater degree of local inflammation. It is also a fact, that the absorption of putrid matter will produce that state of extreme constitutional derangement, to which Mr. Abernethy has given the name of sympathetic typhoid fever. In compound fractures, therefore, as blood and pus will often lodge in hollows around the broken ends of the bone, and as the matter thus lodged, of necessity becomes putrid, and of course may be, and no doubt frequently is absorbed; so this circumstance, the possible absorption of putrid matter, is sufficient, without other sources of derangement, to account for the sympathetic typhoid fever, so often attendant upon these injuries.

So far, then, as these causes are productive of the great constitutional disturbance accompanying compound fractures, so far, such constitutional disturbance cannot exist under the treatment I propose, in as much as under that treatment, the causes themselves cannot exist.

Of several experiments as to this mode of treating compound fractures, I relate the two

following, being those cases, in which the injury done to the soft parts, was the most severe.

June the 17th, 1830, I fractured the hind leg, the tibia, of a rabbit, and pushing both broken ends of the bone fairly through the skin, I made a large and rough wound, completely exposing the fracture. The edges of this wound I drew together, and retained them so by adhesive plaster; I also put two or three layers of very thin leather, spread with the Emplastrum Resinæ, over the wound, and adjoining part of the limb, with a bandage from it's very extremity to the middle of the thigh. In this state I incrusted the limb in plaster of Paris, having first bent the foot on the tibia, and the tibia on the femur; so that the rabbit could still use it's broken leg as a means of locomotion.

It seemed but little affected by the injury: for the first few days it fed perhaps not quite so well, and became somewhat thinner, but it soon regained its appetite, and continued to move about with considerable force and activity.

July 12th, three weeks and four days after having made the fracture, I removed the incrustation and bandage. A strong, and seemingly osseous union had taken place: the wound in the integuments had not completely healed,

there remaining a small ulcer, about one-sixth of an inch in diameter, through which might be seen a part of the tibia, near the situation of the fracture. There was about the ulcer some quantity of semi-fluid matter, resembling pus deprived of its more liquid parts; which matter had no offensive odour, or other sign of putrefaction. In two or three days more, the rabbit was able to bear, and move pretty well, upon its recently broken limb, unsupported by any splint or bandage.

On the 15th, four weeks after the fracture, I killed the rabbit, and on examining the limb, I found the medullary cavity closed at the broken end of each portion of the tibia, by a considerable quantity of osseous matter. The bond of union, although at first apparently unyielding, was composed, not of bone, but of strong ligamentous fibres attached to knobs of bone deposited around the broken ends, and these fibres so binding together the two portions of the tibia, as to render almost imperceptible, the greatest possible extent of motion between them.

Thus it is seen that, in this case, the cure of a compound fracture took place in about the same space of time as that ordinarily requisite for the cure of a simple fracture, (for in rabbits a simple fracture does not unite much under three

or four weeks). It is seen too, that the wound in the integuments was so severe as to leave an ulcer exposing the bone at the place of fracture, even after union between its two portions had taken place: wherefore, this rapid union was not the consequence of a trivial wound in the soft parts healing by adhesion; but doubtless it was the consequence of the broken bone being placed essentially under the circumstances of a simple fracture; that is, the atmosphere was excluded from its broken surfaces, and from the surrounding lacerated soft parts: and how completely the means employed effected this purpose, is proved by the absence of any offensive odour in the purulent matter found about the ulcer when the incrustation was removed.

July 30th, 1830, I fractured the right radius and ulna of a rabbit: opposite the fracture and passing completely down to it, I made a slough with nitric acid, full half an inch long, and about one-third of an inch broad; and through this slough I pushed the broken ends of the proximal portion of the bones: I then put up the fracture in the same manner as in the preceding case.

Aug. 25th, three weeks and five days after having broken the limb, I removed the incrustation. An abscess had formed, burrowing from the fracture to half way up the humerus, where it had made for itself an opening, through which this bone could be seen separated from the superjacent muscles. Union had not taken place, but there was deposited around the fracture, especially on the proximal side, a considerable quantity of cartilaginous matter. The wound in the soft parts had not healed, it still left exposed the fractured bones. I again put up the limb as before.

Sept. 9th, five weeks and six days after fracturing the bones, I examined them again. Union by ligament had taken place; the distal portion of the radius and ulna could be bent to a trifling extent forwards, on the proximal portion, but backwards it could not be bent beyond a right line. The abscess and wound in the soft parts had almost healed; there, however, still remained a small ulcer exposing the bones in the situation of the fracture. I again incrusted the limb in plaster of Paris.

At the expiration of eight weeks from the time the fracture was made, an unyielding osseus union had taken place; the wounds in the soft parts had healed, and the rabbit was able to bear upon the limb.

In this case I produced mortification in order to imitate those compound fractures in which this occurrence ensues; but I admit that the case is not analogous to all compound fractures in which there is sloughing of the contused soft parts; inasmuch as this state is often the result, not altogether of the injury done to them, but rather, of the constitutional derangement and weakness of the patient; and under these latter circumstances there cannot be the same chance of saving the limb, or the patient's life, as when sloughing is the effect solely of local injury.

Supposing the case of a compound fracture of the tibia, (the fibula being also broken,) supposing the fracture to run very obliquely across the tibia, and the mucles of the limb to have drawn the one portion of the bones considerably over the other: under these circumstances I would advise the following mode of putting up the fracture. The patient should be placed upon his side, with his broken leg and adjoining part of the thigh resting upon a horizontal plane, the outer, the fibular side of the limb being downwards, and the leg bent upon the thigh nearly at a right angle.

A board, about thirty inches long and eighteen broad, which I have had made to place a

fractured leg upon during the incrusting of it in plaster of Paris, has a staple fixed at one end, and at the other, a strong piece of iron projecting longitudinally about nine inches, to which is attached an apparatus of pullies, similar to that used to reduce dislocations; two pullies, however, need only be employed, instead of four. In that part of the board, along which it is intended the limb should lie, there are cut several transverse grooves, about three-quarters of an inch deep, and nearly two broad; they are not more than an inch apart, and from three to four inches long. By these grooves, the plaster of Paris, when poured upon the limb, can pass beneath it, and connect below as well as above, the incrustation on one side with that on the other.

A bandage should be put upon the limb from the very extremity of the toes to near the middle of the thigh; which is for the purpose, both of making an equal pressure on the whole of the limb, and also to prevent the plaster of Paris from sticking to, and irritating the skin. The eighteen-tailed bandage should, as usual, be employed, but in order to guard against any derangement of its folds by the force which may be necessary to extend the limb to its proper length, I would advise, as each tail may be

laid over its corresponding tail, to sew them firmly together.

In the putting on of this bandage, the greatest attention will be requisite that a moderate and equal pressure be made by every part of it, or, at all events, that the upper part shall not make more pressure than the lower.

Beneath, and also above the limb, that is, along its fibular and tibial sides, should be placed between it and the bandage, several strips of soft linen or flannel, from three to four inches broad; they will form pads better adapted to the purpose than almost any other.

The bandage should, at first, be put on from the toes to an inch or two above the ankle; and a similar bandage from the head of the tibia to a few inches above the knee. A sort of leather cap which I have had made to fit the ankle, and another to fit the knee, should then be buckled round these parts. The knee is to be made fast to the staple of the board by loops attached to it's leather cap; and that covering the ankle, is to be fixed to the cord passing through the pullies. By these means, extension may be gradually made, and as nearly as possible in the direction of the axis of the tibia: the one portion of which having been drawn as far off the other as should be, the cord is to be made fast in order to retain it so. Having thus extended

the limb to its proper length, the distal portion should be placed and held, in a position neither everted, nor inverted, nor bent upon the proximal portion.

The edges of the divided integuments are now to be drawn accurately into contact, and maintained so with strips of adhesive plaster; which with the surrounding skin should then be thickly overspread with some tenacious, unirritating substance, such as will serve to exclude the atmosphere from that which it may envelop: the whole should then be covered with a piece of kid, or chamois leather, the under surface of it having also been spread with the same substance, in order that it may closely attach itself to the parts beneath.*

The eighteen-tailed bandage should now be continued up the leg as far as the knee; which being completed, there should be fixed to the board on which the fractured limb is lying, that which sculptors call a wall, a sort of raised border, from three to four inches in height,

* The following composition I have found to adhere to the skin with great tenacity, and without irritating it: it may also be melted by a very low degree of heat:—

℞ Picis Nigræ, ℥ij.
Ceræ Flavæ, ℥i.
Resinæ Flavæ, ℥ij.
Terebinthinæ, ℥ss. Ft. Emplastrum.

placed as nearly parallel as possible to the outline of the leg, about an inch from it, and extending from the toes to four or five inches above the knee.

Sufficient plaster of Paris to fill the hollow between this border and the limb, is now to be mixed with water, and poured into the hollow, so that an incrustation, about an inch in thickness, may cover the whole surface of the limb.*

Previously to pouring the plaster of Paris around the limb, the bandage covering it, and every part with which the plaster can run in contact, should be thoroughly wetted, so that they may not adhere: and in order that the caps buckled round the knee and ankle, may afterwards be withdrawn, their upper parts should be covered with some plastic substance of sufficient depth, that the incrustation may not rise above it.

The reason that I would not have the plaster of Paris attach itself to the bandage around the limb, is that that circumstance would give rise to great difficulty in the removing of the incrus-

* Great care must be taken that the plaster of Paris used, does not contain a large proportion of lime, as such, of course, gives out a considerable degree of heat when wetted. In mixing the plaster of Paris, it should be poured gradually upon the water, and as much of it as the water can liquefy.

tation, should its removal happen to be necessary.

As soon as the incrustation shall have acquired sufficient firmness to allow the limb to be loosened from the board on which it lies, the leather caps covering the knee and ankle should be taken off these parts, and the hollows left by their removal should be filled with plaster of Paris, as well as those deficiencies in the incrustation which will be found on the fibular side of the limb.

Above the knee, where the incrustation terminates, its inner edge should be pared away, in order that it may not press upon, and produce ulceration of the integuments. The space thus left between the incrustation and the skin should be filled with some of the aforesaid composition of pitch, wax, &c. which by adhering to the skin and also to the incrustation, will prevent the possibility of any communication between the atmosphere and the injured parts.

Should it become necessary to remove a portion, or the whole of the incrustation, it may be done, without disturbing the limb, by making with a fine saw, three longitudinal cuts from one end to the other of the incrustation, and nearly through it; these cuts should be equidistant from each other, that is, there should

be contained between any two of them one-third of the circumference of the limb. After this, by forcing a broad chisel into the cuts, the incrustation may readily be broken into three longitudinal portions of equal width: the whole can be removed, or the limb may be still supported by that portion which covers its fibular side.

As a long continued state of inaction will cause the muscular part of a limb to shrink, it may be right, after ten days or a fortnight from the putting up of a fracture, to remove so much of the incrustation from the knee to the ankle, (leaving, however, sufficient to retain the limb in *statu quo*,) that one may be enabled to tighten the bandage in those places where, from a diminution in the bulk of the limb, it may have become loose; which being done, the incrustation should again be made perfect.

A compound fracture of the fore-arm should be put up much in the same way as that which I have advised for the putting up of a compound fracture of the leg. The patient should lie upon the uninjured side, so that the broken limb may be conveniently placed upon the sort of board previously described. The fore-arm should be bent upon the arm nearly at a right

angle, and the hand should be placed about mid-way between the greatest extent of supination and the greatest extent of pronation; which position is not only the easiest, but it is also that in which the supinator radii brevis, and the biceps, on the one side, and the pronator radii teres on the other, would be likely to draw the proximal portion of the radius; that is, supposing the fracture of the radius to be below the insertion of the latter muscle into this bone: but if it should be above that point, it would be better to place the hand in a position near to complete supination; inasmuch as the supinator brevis and the biceps would, in this case, have no opposing power, and therefore would rotate the proximal end of the radius so far outwards, that the distal and proximal portions of the bone would not have the same relative positions which they had before the fracture, unless the hand, as I have said, were placed near to complete supination.

The longitudinal compresses advised by Boyer, for the purpose of preventing any undue approximation of the radius and ulna to each other, should be employed; they are, perhaps, more needed when a fracture of these bones is put up according to the foregoing method than when put up in splints.

In putting up simple fractures of the leg and

fore-arm, the same measures should be adopted, except that, of course, there need be taken no steps to exclude the atmosphere from the vicinity of the fracture.

If against the mode I have proposed, of treating compound fractures, it should be urged, that one cannot daily examine the limb in order to ascertain its state, I would say, that any examination of the local malady must be unnecessary so long as there is but little constitutional disturbance. Phlegmonous inflammation, the first local effect of a severe injury, cannot take place to any very great extent without a corresponding degree of inflammatory fever; nor can sloughing, without an equally strong manifestation of the constitution's sympathy with the injured part; so that in the absence of any great degree of constitutional disturbance, one cannot but be certain that the fractured limb is doing well: it is a matter about which one can have no doubt,—it is the arguing of the non-existence of a cause from the non-existence of a necessary, of an invariable effect of such cause.

FINIS.

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