

AN
INAUGURAL DISSERTATION

ON

Fracture.

SUBMITTED TO THE
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BY

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OF

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To
Paul F. Eve,
Professor of Surgery in
the Medical Department
of the University of Nashville,
and President of the American
Medical Association &c.,
in admiration of his sound
judgment—skill in surgery,
and excellence as a lecturer;
this essay
is dedicated,
by L. A. Hill.

Fracture.

Fracture is a solution of continuity in a bone.

The causes of fracture are divided into Predisposing, and Exciting.

The Predisposing causes are,—

1st. Old age in which the earthy matter becomes deficient, and the animal matter loses its elasticity, rendering the bone soft and brittle.

2nd. Disuse;—in certain affections where the use of a limb has been suspended for a long time; or when an individual has been confined to bed for years, the bones become very fragile.

3d. Certain Diseases, such as Mollities ossium, Fragilitas ossium, and Cancer render the bones easily broken.

4th. Original conformation;—in some

people the bones are exceedingly brittle without any assignable cause, rendering them very liable to fracture.

The Exciting causes are two.

1st. Mechanical violence; which may be direct, or indirect. It is direct when the fracture occurs at the point where the force is applied, as when the skull is fractured by a direct blow upon the head. It is indirect when the force is applied to different parts of the bone, which gives way between. This sometimes occurs in the clavicle when the individual falls upon the shoulder — the sternal end of the bone being impelled by the weight of the body, and the acromial by the object against which it falls, causing the bone to give way in the middle.

2nd. Violent muscular contraction, which sometimes causes fracture, mostly perhaps, where some of the predisposing causes exist in the bone. This however is comparatively rare.

Fractures are divided into Simple, Compound, Comminuted and Complicated.

Simple fractures are again, subdivided into transverse, oblique, and longitudinal.

The transverse is the most simple of the three, and is usually the result of direct violence — its direction being transverse to the longitudinal axis of the bone. It most usually happens in children, or young persons, and is attended with but little displacement, or laceration of the soft parts.

The oblique is perhaps the most frequent of all, and is usually attended with more displacement than the transverse in consequence of its direction; and more danger in consequence of sharp edges, or spiculae of bone, lacerating important blood vessels or nerves, and thus rendering it complicated.

The longitudinal is a splitting of the bone in the direction of its axis, and is comparatively rare. It sometimes occurs in gun-shot wounds, and is said to have a tendency to run into a joint, especially if near one.

Compound fracture is when there is an open wound communicating with the fracture.

Comminuted fracture is when the bone is broken into numerous fragments.

Complicated fracture is when there is luxation, laceration of large blood vessels &c, in connection with the fracture.

The Reparation of fracture ordinarily takes place,—

1st. By the organization of plastic lymph, which is effused from the tissues surrounding the fracture forming a complete capsule over the fractured ends of the bone, and adhering to them firmly so as to prevent motion in the fracture. This is called provisional callus, and is formed in the course of two weeks. As the restorative process advances this provisional callus becomes more firm and elastic, like cartilage, and receives the name of definitive callus. The formation of definitive callus generally occupies six,

or eight weeks for its completion, which in the course of six, or nine months becomes absorbed, and the bony union is complete. The period however required to effect these changes is greatly influenced by the age, and constitution of the patient, the plan of treatment, and the nature and seat of the fracture.

2nd. When fracture of the cranium, olecranon, patella, cervix femoris, or any bone invested with synovial membrane occurs, there is no callus formed, but union takes place by means of a white fibro ligamentous substance: however, if the fragments be kept in the strictest apposition for two or three months, bony union will generally take place. The reason why callus is not formed in these cases, is very evident from

a consideration of the functions of the parts enumerated. The evil results which would inevitably follow the formation of a hard lump of callus in the interior of the cranium, or into the cavities of the joints are quite sufficient to justify nature in her course, and is an evidence of her wisdom in the healing art.

Symptoms. The signs of fracture are nearly all more or less equivocal when taken individually and singly, and may arise from other conditions of the part, being common to other injuries. It is the simultaneous occurrence of two or more of them, that we consider pathognomonic of the existence of fracture.

Some of the more equivocal signs

are pain, swelling, and helplessness of the part.

The more special signs are three.

1st. Deformity. (I am aware that some object to the use of this term here, but I think its true meaning cannot be mistaken, and it is shorter than the phrase — A change in the direction of the bone," hence my preference.) It may be due to the displacement of one, or more of the fragments being driven from their natural position, by the force which occasioned the fracture. As for instance, when a portion of the skull is driven in by a blow upon the head; or it may be owing to muscular contraction, drawing the lower fragment upwards causing the fractured ends of the bone to overlap — shortening the limb,

and giving a change in its direction; or it may result from the mere weight of the limb hanging downwards.

2nd. Mobility. This is proof positive that fracture does exist, when it is observable where no motion should exist. It occasionally happens however, that fracture may occur and owing to the impaction, or wedging of the fragments together, mobility may not be perceptible; hence its absence cannot in all cases be construed into a proof of the non-existence of fracture.

3d. Crepitus. This is a sign of much value in practice, and is produced by moving, or rubbing the fractured surfaces together. This can only be felt, and heard, when the fragments are in contact and moveable.

Treatment. The indications for the treatment of fracture are, —

1st. Reduction. This is usually accomplished, (if it be a fractured limb,) by extension, and counterextension, while the surgeon adjusts the fragments, and places them in their proper direction.

The extension should be made firmly; but gradually and gently in order to overcome muscular contraction. The limb should always be kept in a position, so as to relax the muscles as much as possible.

2nd. A roller bandage, or some of its substitutes are then to be applied, from the extremity of the limb, for the purpose of preventing oedema, and confining the muscles so as to prevent their contraction, which would

be likely to disturb the fracture; and also, to protect the skin from the irritating effects of the other appliances, which are necessary.

3d. In the next place it is necessary, to apply some firm unyielding substance in such a manner as to give support, and prevent displacement of the fragments. For this purpose a very great variety of substances, and kinds of apparatus have been employed. Gin, wood, leather, gutta-percha, binders board, and more recently, the starch bandage or appareil immobile, which consists merely of layers of bandage, lint, or linen, imbued with a mucilage of starch, gum, or dextrine, which can be accurately applied to the limb, and when dry forms a remarkably

light, firm and unyielding support. If splints of wood, or tin be used, they should be well cushioned, or padded, and accurately adapted to the part, so as to equalize the pressure as much as possible, otherwise the circulation might be interfered with, or even ulceration induced.

4th. These splints should be secured to the limb, by means of a second roller bandage, and the patient kept in as favorable, and as comfortable a position, as the nature of the case will admit of.

This dressing should not be removed, if possible, until union of the bone takes place; and if it becomes necessary from any cause to remove it before union has occurred, great care should be taken not to displace the fragments.

The remaining treatment of fracture must be conducted on general principles. If the shock be very severe, cordials may be given, or even stimulants in order to restore the patient; and afterwards venesection may be resorted to, especially if the patient be plethoric, and of a sanguine temperament. The catheter is to be used, when there is inability to evacuate the bladder, which is very common after fracture of the leg — opiates to allay pain and muscular twitching, and aperients if necessary. Cold lotions, leeches, bleeding &c., are to be employed at the discretion of the practitioner.

The diet should be light until the inflammatory stage has passed, and then it should be nourishing. When swelling comes on, the bandages should be loos-

ined, care being taken that no displacement of the fracture occurs, if such should be the case however, it should be rectified as soon as possible.

I will now give an account of a case of fracture, that came under my own observation a few years ago, as correctly as my memory will enable me to do, which will doubtless be more interesting; notwithstanding the treatment was different in some respects from the ordinary plan; than the mere rehearsing, as it were, of what I have been taught by my teachers, and authors.

During the winter of 55-6 P.S., a youth about fourteen years of age, robust, and of sanguine temperament, by accident fell on the frozen ground, and was passed over by a loaded wagon, which

fractured the tibia and fibula, three or four inches below the patella; also the os femoris, three or four inches below the trochanters.

I saw him within an hour or two, after the accident occurred. I immediately administered a full dose of laudanum. The fracture below the knee was very evident, from the preternatural mobility, and crepitation—the latter sign being very distinct, from the fact that the fracture was transverse, or nearly so.

While I was engaged in exposing the limb, I discovered the fracture in the thigh also, by mobility, and deformity. No crepitus could be heard, or felt, from the fact that the fracture was oblique,—the fractured sur-

face of the superior fragment, looking forwards, outwards, and downwards; while that of the inferior, looked backwards, inwards, and upwards - the lower fragment being drawn upwards, and made to mount, or ride upon the superior fragment, by the contractions of the muscles.

I placed the limb in a position so as to relax the muscles as much as possible, and had a number of light wooden splints prepared, suitable for both fractures, well padded or cushioned. I then applied four of them to the leg, temporarily, so as to enable me to dress the thigh. Extension was made from the lower end of the femoris, in a direction so as to relax the muscles, by the hands of an assistant, while

counterextension was maintained at the pelvis, by a second assistant. The fragments were now placed in their proper position, and five splints applied as accurately as possible, one anterior, one posterior, and one on each lateral surface; while the fifth was applied between the anterior, and external lateral, the tendency to displacement being in that direction. These were bound to the thigh, by a number of simple bandages merely tight enough to prevent displacement, and to these the splints were fastened, so as to prevent their slipping in any way.

I then removed the temporary dressing from the leg - placed the fragments in their proper position, and bound four splints on it, in a similar manner

to those on the thigh.

I then went to work, and succeeded in constructing a couch, or bed, such as I will endeavor to describe.

It consisted of three principle parts, and was about two and a half feet wide. The first was for the body, the second for the thighs, and the third for the legs.

The part upon which the body rested was so constructed on hinges, that the patient could be elevated, from a recumbent, to a sitting posture at pleasure, by means of props, or stays. The second portion, upon which the thighs rested, was fixed so that the knees were considerably elevated - the thighs being kept at an angle of 35° , from a horizontal plane.

The legs rested on a slightly inclined plane - the feet being a little lower than

the knees.

Through the part upon which the hips rested, there was an opening made, through which the patient could evacuate the bowels and bladder, without disturbing the fracture. Over this opening a thin piece of plank, sufficient to cover it, was placed, well cushioned; and could be removed whenever necessary. The whole surface of the bed was now properly cushioned, except the part upon which the detached plank was placed, under the hips.

The drawing, (Fig. 1,) will assist in forming a more correct idea of the dimensions of the bed.

The patient was then placed upon the bed, and two long splints applied to the limb, one externally, and the

other internally, which were made to fit the surface of the bed—consequently the flexed position of the limb. The external splint extended from the ilium beyond the foot, the internal from the perinaeum beyond the foot also.

The external was first bound by a broad simple bandage across the pelvis, then both splints were bound by a number of simple bandages along the limb, pads being used to equalize the pressure as much as possible.

In the drawing, (Figs. 2 & 3) are designed to represent the long splints.

The patient's body was now kept in the horizontal position, until the inflammatory stage had passed; and it will be seen from the position that the patient occupied, that the dan-

ger of inflammation was greatly diminished, from the fact that the fractured limb was elevated above a plane with the body.

It was necessary to use the catheter to evacuate the bladder for several days.

A light, but nutritious diet was prescribed, and the only medicines that were used consisted of an opiate at night, and an aperient occasionally, merely to keep the bowels in a soluble condition. Very little swelling occurred, only requiring a few of the bandages to be slightly loosened.

The dressings, rough as they may appear to have been, were not removed until a firm union had taken place, which was accomplished in between

six and seven weeks, with but slight deformity of the thigh, and shortening of the limb of about one inch and a half,

The success in the treatment of this case is attributable in a great measure, to the bed upon which the patient was placed. Its advantages are, —

1st. Relaxation of the muscles is secured, which is no small object in the treatment of fractures.

2nd. The fractured limb is elevated so as to diminish the force of circulation in it, rendering it in a great measure, free from the danger of inflammation.

3d. The bowels and bladder can be evacuated without disturbance to the fracture.

4th. The patient can be changed
from the recumbent, to the sitting
position at pleasure, which wonderfully
diminishes the terrors of such fractures.

Before dismissing this subject, I
will suggest an improvement on the
above described fracture-bed.

It consists in having a valve, or shut-
ter, for closing the opening under the
hips, well cushioned on its upper sur-
face, and attached by means of a
hinge, to the lower surface of the bed, so
as to open downwards; and when
shut secured by means of a latch.

This arrangement might supersede
the necessity of the patient's body
being supported by the nurse while
defecating, which was necessary in
the above-mentioned case, from the

fact that the hips would have sunk too low, when the cushioned plank was removed from under them.

A foot-board might be appended also, if necessary, in any particular case, to keep up continued extension; however, if the fracture is in the femoris alone, (for which I would recommend this bed chiefly,) and the part upon which the thighs rest, be of the proper length, the mere weight of the body, in such a position, I consider amply sufficient for that purpose.

If it were thought necessary in any particular case, the crutch like splints might be used also, by having each lateral splint composed of two, and connected at the hip joints by a hinge like connection, so as to

accommodate the body in the sitting, as well as the recumbent position. Indeed almost any method of dressing can be used on this bed, with but few modifications.

This bed may appear to be entirely too complicated, for a majority of physicians, and surgeons to construct whenever needed, but it seems to me that a man, that has genius enough to manage successfully the great variety of injuries, in their many forms, to which mankind is liable, has also enough to construct some such apparatus, as that referred to, which will fulfill the indications in my opinion better, than any apparatus with which I am acquainted.

Fig. 1.

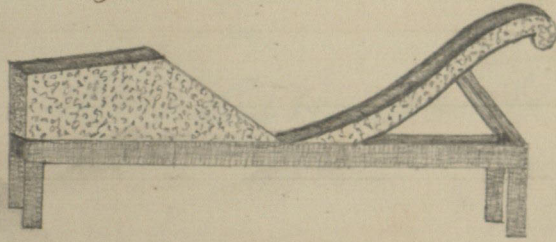


Fig. 3.

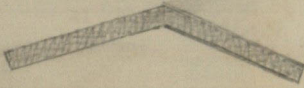


Fig. 2.

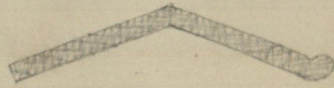
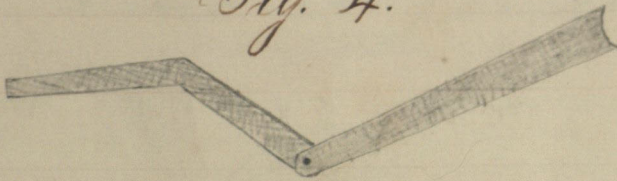


Fig. 4.*



* Figure 4 is designed to represent the crutch like splint, modified so as to be worn on the above bed.