

## LECTURE III.

## BROKEN BONES OR FRACTURES.

The methods of rendering first aid in such accidents—The application of splints and bandages—The signs of fracture—The difference between fractures and dislocations—First aid in cases of sprains and contusions.

WHEN a bone is broken it is said to be *fractured*. Any of the bones of the skeleton may be injured in this way. Sometimes a fracture is caused by direct violence, such as a kick from a horse, or a fall of rock, the bone being broken at the seat of injury. In other instances a fracture is caused by indirect violence, as when a man jumps from a great height and has his legs broken, and this though he alights on his feet. Similarly many a collar-bone has been broken by heavy falls on the shoulder, elbow, or outstretched hand. More rarely a bone is fractured by violent action of the muscles. The most familiar example of this is fracture of the knee-cap by a desperate effort to recover oneself after slipping. When a bone is fractured by very great violence, as in gunshot wounds, railway accidents, etc., the flesh at the seat of injury is often torn and lacerated, so that there is a wound right down to the broken ends of the bone. Such a fracture is said to be *compound*. When a bone is broken, and there is no accompanying injury to the flesh or any other of the neighbouring parts, then the fracture is a *simple* one. Now a simple fracture can be made into a compound one very easily by the struggling and efforts to rise of the patient himself, or by the rough and careless handling of the injured part by the bystanders. If the patient struggles or attempts to move himself, or if others try to carry him away from the scene of the accident without the injured limb being properly supported, the broken ends of the bone are liable to be pushed through the skin, making the fracture a compound one. Such a mishap is most serious, for it not only adds to the pain and suffering of the patient, but it, at the best, delays his recovery, and too often either his limb or his life is sacrificed. Even if—in spite of incautious movements of the

patient, or careless handling of him by his helpers—the broken ends of the injured bone do not actually penetrate through the skin, they may nevertheless tear open a large blood-vessel, wound an important nerve, or injure one of the chief internal organs, such as the brain, the lungs, or the bladder—thereby forming a *complicated* fracture. It is a well-known fact that many a limb, and, alas, many a life, has been lost by the unskilful, careless, or rough handling of well-meaning but ignorant friends, who in their attempts to give help in cases of fracture have forced the broken ends of the bone either through the flesh and skin, into some large blood-vessel, or into some other important neighbouring structure. When any of the bones of the trunk are fractured, one or other of the important internal organs are often injured, or if these escape at the time of the accident they will certainly be torn or crushed by the broken edge of the fractured bone, should any carelessness or unskilful handling be displayed in carrying the patient from the scene of the accident. Thus great care must be taken in the transport of a man who has had two or three ribs fractured, or the rough jagged ends of the broken bones will be pressed against the lungs.

Now comes the question, How can you give help in cases of fractured bones? You can render most valuable assistance by supporting the injured part so as to prevent the fragments of the broken bone from moving about and tearing the surrounding tissues. By so doing, in all instances you can relieve pain; in the case of an injured limb you can prevent a simple from becoming a compound fracture, or the jagged end of the bone from wounding some important blood-vessel or nerve; in the case of an injury to one of the large cavities of the trunk, such as the chest or pelvis, you can hinder the rough edge of the broken bone from penetrating some important internal organ, and even if there is some internal injury resulting from the accident, you can at least prevent further mischief during the conveyance of the patient to his home or the hospital.

In fractured limbs you can best support and fix steadily the broken fragments of the bones by means of splints and bandages, and you should apply these, if possible, *before the patient is moved*. It may be necessary, however, to get the injured man away from the place where he was hurt immediately; for example, he may be in a position of great danger,

and you have no time to provide or apply splints before removing him to a place of safety. Frequently too, especially in coal-pits and other large works, accidents happen in spots where, from overcrowding, want of room, and bad light, it is practically impossible either to examine the patient or to apply splints until he is removed, at all events, a short distance. It is very important, therefore, that you should know how to hold a fractured limb so as to properly support it during the removal of the patient. A person cannot well apply splints single-handed, so it is equally desirable that you should be able to grasp and steadily raise a fractured limb while a comrade binds on the splints. Now, in handling a fractured limb—whether you have charge of it during the removal of a patient, or are assisting to apply splints—you must hold it firmly and fixedly in as natural a position as possible, taking particular care that there is no bending of the limb at the point where the bone is broken; and to accomplish your object you should place one hand underneath the limb above the fracture, the other underneath the limb below the fracture, and grasp the limb with sufficient firmness to prevent it slipping or rolling. In this way the limb rests upon, and is well supported by, the palms of the hands, and can be held safely in position without risk of the fragments of the bone being displaced until splints and bandages are put on.

You have received from the Ambulance Association several wooden splints, some of which are provided with a metal socket at one end. These are for use in cases of fractured limbs; and you are able by means of the sockets to fit two or three splints together, so as to form, if you require it, one long support—such as would be needed, for example, in the case of a fractured thigh. These splints would be very useful to you in an emergency if they were close at hand, and they are invaluable for practising with amongst yourselves. But you never know where you may be, or under what circumstances you may be placed, when an accident occurs; and most probably it will happen that, when you most require them, these ready-made splints will not be available. You must always be prepared therefore in an emergency to make temporary splints out of any suitable materials that chance to be near. Thus for this purpose you can use cardboard, the backs of books, folded or rolled up newspapers, leather, gutta-percha, pieces of wood (Fig. 31), trellis flower-pot covers, cigar boxes, sticks of all kinds, parasols and umbrellas, broom-

sticks, policemen's truncheons, laths, spokes of wheels, wickets, paling, the bark of trees, mats, baskets, rolls of straw, heather, brushwood, rushes, and small branches; and on the battlefield, lances, bayonets (Fig. 33), scabbards (Fig. 32), rifles (Fig. 29), and carbines. Straw mats were used by the French at the last siege of Paris as splints. Telegraph wire and wire gauze are utilized by military surgeons for the same purpose. Bundles or rolls of straw tied together make very good splints; "a pair of these are rolled in the opposite borders of a cloth, the intervening portion of which is placed beneath the wounded limb; the bundles are thus adjusted, one on each side of the limb, and can be fastened there with cord" (Fig. 30).<sup>\*</sup> A similar arrangement can be made with straw bottle-casings, and a handkerchief, napkin, or triangular bandage. In the same manner a coat may be slipped under a fractured limb, and the borders rolled up to it on each side, the whole being secured by handkerchiefs, scarfs, or straps. When splints are made of wood or other hard material it is necessary to place some sort of soft padding between them and the injured limb, such as cotton, wool (Fig. 28), wadding, hay, moss, horse-hair, dried sea-weed, lint, linen, flannel, or parts of the clothing (Figs. 29, 32 and 33). You can bind the splints on to the fractured limb by triangular bandages, pocket-handkerchiefs, napkins, neck-handkerchiefs, scarfs, garters, braces, tape, cord, belts, and straps of all kinds. In fractures of some bones—as the lower jaw, for instance—the application of a bandage is sufficient to give the necessary support to the broken fragments until medical aid is procured (Fig. 27), while in other cases, as fracture of the back-bone, all your efforts must be directed to the conveyance of the patient—gently, carefully, and without altering the position of his body—on a stretcher either to his home or to the nearest hospital.

Having explained to you in a general way how you can render valuable first aid in cases of broken bones, I will now refer more in detail to the different fractures which you are likely to meet with, and endeavour to point out how you may best give assistance in each case. I will begin with fractures of the face and trunk.

The *lower jaw* is not unfrequently broken by direct violence, such as a kick from a horse, a blow from a man's

<sup>\*</sup> *The Treatment of Wounded in War*, Esmarch, translated by Clutton.

fist, or a heavy fall. You can easily recognise this: the man cannot use his jaw, the gums are torn and bleeding, and usually one or more teeth are loosened. The line of the teeth and the under margin of the jaw are irregular; and on examining the injured part you can easily feel the broken fragments of bone rubbing one against the other. This rubbing or grating together of the rough edges or ends of the fragments of a broken bone is in any part of the body a sure sign of fracture, and is called *crepitus*; it can be felt by placing the hand on the seat of fracture (and in many instances heard as well) during movement of the injured part. The patient often distinctly feels the bone give way at the time of the accident, and, finding that he has lost power over the jaw, frequently tries to support it with his hands. You can give great relief in an accident of this kind by placing the broad part of a folded triangular bandage or handkerchief underneath the injured jaw, carrying the ends up and tying them at the top of the head; or if the handkerchief is long enough you may cross the ends at the top of



FIG. 27. — Chin-Sling of Handkerchiefs for a broken lower jaw.

the head, bring them down again, and tie under the chin. In this way the broken jaw will be well supported, but you can fix it more securely still by placing the centre of another handkerchief—should you be fortunate enough to have one—on the front of the chin, and carrying the ends backwards tie them behind the neck (Fig. 27).

Fractures of the skull, spine, and pelvis are usually associated with injuries of very important internal organs, and are therefore of an extremely dangerous nature. In fracture of the skull the brain suffers; in fracture of the spine the spinal cord is injured; and in fractured pelvis the bladder and other vital parts are endangered. If symptoms of serious brain mischief follow after an accident, such as a heavy fall or blow on the head, then you may reasonably suspect fracture of the skull,\* even though there is no appearance of

\* The brain, however, is not always injured in fractures of the skull, so that this accident may be followed only by symptoms of stunning, or indeed for a time by no symptoms at all. But if symptoms of serious injury to the brain follow a blow or fall on the head—whether there is any wound of the head or not—then you may reasonably suspect fracture of the skull.

external injury. A fragment of bone may be driven inwards on to the brain, or a blood-vessel may be ruptured inside the head, as frequently happens in fractures of the floor of the skull, or, as they are termed, “fractures of the base.” In such cases, usually spoken of as *compression* of the brain, the brain is pressed upon by the piece of bone, or by the accumulation of blood from the injured blood-vessel; and the patient lies insensible, more or less completely paralysed, with, it may be, occasional convulsive movements, snoring loudly, the eyes being insensible to the touch, the pupils insensible to light, and one or both of them dilated; and with all this there may be bleeding either from the ear, mouth, or nose, or, more rarely, a copious watery discharge from the ear.

Fracture of the spine is easily recognised on account of the accompanying injury to the spinal cord, and the paralysis of the parts of the body below the seat of the fracture. Many of you, unfortunately, have seen accidents of this description, and well remember the heavy fall of coal or dirt on your comrade's back, the tenderness and pain caused by the blow, and worst of all the loss of feeling in the sufferer's legs and his inability to move them—sure signs, you know as well as I do, of serious injury to the spine.

Fractures of the pelvis are the result of great violence—such as a squeeze between the buffers of two railway trucks. The patient is unable to stand, and any movement or attempt to get up causes great pain and a feeling as if the body was giving way. Sometimes you may be able to feel *crepitus*. The great danger in these cases is that the bladder or other vital parts may be torn.

Now, in all these serious cases of fracture you should endeavour to convey the sufferer as steadily and as gently as you can to the nearest hospital or to his home, and you must be particularly careful when lifting him on and off the stretcher that you disturb the injured part as little as possible. Medical aid should be sought for at once; but in the meantime the patient should be placed in the lying-down position with the head slightly raised. In fractures of the skull, you can, before the doctor arrives, apply cold to the injured part, especially if there is any bleeding from the ears, nose, or mouth. Ice may be used for this purpose broken into small pieces and tied up in a bladder; or you can apply sponges, cloths, or folded handkerchiefs steeped in cold water. You should be careful also to remove anything tight about



the neck and chest, such as the collar, necktie, and braces. The bedroom, too, should be darkened, and the patient kept as quiet as possible. Above all things, do not attempt to give any brandy or other stimulant, and keep the room clear of talkative, noisy, though it may be sympathetic and well-meaning, friends.

In all these serious injuries to the head and trunk you should make a point of examining the patient's feet, and if they feel cold you should apply hot-water bottles, bladders of hot water, or heated bricks wrapped up in flannel. You must be careful, however, in cases of insensibility from a fractured skull or loss of feeling in the feet and legs from a broken back-bone, not to make your water bottles or bricks too hot, or the feet of the patient may be severely burnt. I allude to this precaution, as not very long ago I met with a case of fractured spine in which this misfortune actually happened.

I wish once more to impress upon you, in all these serious cases, the supreme necessity of exercising the greatest possible gentleness, care, and judgment in the conveyance of the patient from the scene of the accident. The injury resulting from the accident is always very dangerous, but any roughness, careless handling, jolting, or jerking, on your part, will aggravate the existing mischief and render the case positively hopeless.

*Fracture of the ribs* is a rather frequent accident. The patient complains of sharp catching pain at the seat of injury, greatly increased by coughing and deep breathing. He describes the pain as "catching his wind," or "catching his breathing," or he says he "cannot get his wind for it"; and in order to relieve his suffering as much as possible he takes short breaths. This kind of breathing is described as *shallow*. You may feel crepitus if you place your hand over the seat of injury when the patient coughs. Frequently, in these accidents, the lung is penetrated by the broken end of a rib, and there is internal bleeding and spitting of blood. Now, though of course the ribs must continually move in the act of breathing, you can steady and support fractured ribs, and prevent undue and excessive movement of the broken fragments by applying a broad bandage over the seat of injury and carrying it around the chest. A triangular bandage, or a good-sized handkerchief, folded broad, or a scarf, would serve the purpose very well, the broad part being

placed over the seat of injury, and the ends carried around the chest and securely fastened with pins or tied. Firmer and more comfortable support is afforded by binding the chest around tightly with a good flannel bandage about six inches wide. If plenty of sticking-plaster is available, you may apply broad strips, one overlapping the other, right around the side of the chest from the breast-bone to the spine. In this way, by steadying and supporting the injured ribs, and checking undue motion of the broken fragments, very great relief is given to the patient, and the risk of the lung being wounded by the broken ends of the bone is very much lessened. A patient with broken ribs, after being bandaged, should always, when practicable, be removed on a stretcher, the upper part of his body being supported by cushions or folded clothes, so that the chest may be well raised and at the same time slightly inclined towards the injured side.

*Fracture of the collar-bone* is a common accident, frequently being caused by falls on the shoulder and out-stretched arm. In other instances it is broken by direct violence to the bone itself. You can, as a rule, easily see what is the matter. The patient comes to you with his head leaning towards the injured side, and supporting the elbow of his helpless arm with the other hand; the shoulder is much lower down and nearer the breast-bone than is natural. On passing your finger along the collar-bone you at once notice the irregularity caused by the fracture, and can feel the broken end of the inner portion of the bone through the skin, the outer fragment of the bone being depressed. If you raise the shoulder by pushing up the elbow most of the disfigurement is removed, and if you gently twist the arm at the same time that your other hand is placed over the fracture, crepitus is easily felt. There is no difficulty, therefore, in recognising a broken collar-bone, and you can give very valuable assistance to the patient. You must improvise a good pad, and push it right up into the armpit of the injured side at the same time that you raise the shoulder by pressing up the elbow, keeping the latter, however, close to the side. You then put on a large arm-sling, so as to keep the shoulder raised to its proper height; and lastly, you bind the arm to the side with a scarf, folded handkerchief, or triangular bandage. The pad should be firm and of a fair size; it should be about three inches thick at its upper part and taper downwards, so as to be of a

conical or wedge shape. When the pad is pushed well up in the armpit at the same time that the elbow is pressed against the side, the shoulder is thrown outwards into its natural position, and is kept at its proper distance from the breast-bone. The large arm-sling, which should thoroughly support the elbow, keeps the shoulder raised to its proper height.

In *fracture of the arm-bone* the arm is, of course, quite helpless; crepitus can be felt; there is often more or less deformity—or loss of the natural shape—of the arm, which is due to shortening caused by the lower fragment of the arm-bone being drawn upwards by the action of the muscles; and there is mobility at the seat of the fracture—that is to say, the arm can be bent at the place where the bone is broken. To support the injured bone, and keep the broken fragments steady in their place, you should apply three or four padded splints to the arm (Fig. 28). These splints should reach from the shoulder to the elbow; and after they have been securely bound on by means of triangular bandages, handkerchiefs, or straps, a small arm-sling should be put on. It is undesirable to use the large arm-sling in this instance, because on no account must the elbow be pushed up. In the diagram (Fig. 28) you notice that a roller bandage is applied from the hand to the elbow; but, though the fore-arm would be bandaged by the surgeon in his treatment of the case, you—in giving first aid—should at once direct your attention to putting on the splints and slinging the arm; indeed, in an emergency, you would neither have the time nor the means for anything else.

*Fracture of the fore-arm* is rather a common accident, and, as in the case of fracture of the upper arm and I may add fractures of all the long bones of the limbs, you easily know it by the unnatural shape of the injured part, the crepitus, the mobility at the seat of the fracture, and the complete uselessness and helplessness of the limb. You can best support a broken forearm by bending the elbow at a right angle, with the thumb pointing upwards, and applying two splints—one on the inside of the fore-arm from the bend of the elbow to the ends of the fingers, and the other on the outside of the fore-arm from the elbow to the wrist. After you have securely bound on the splints you should further support the fore-arm by putting on a large sling.

For *injuries of the small bones of the hand* you bind on a splint along the front or palm side of the hand, and then put

on a small sling. These fractures are not unfrequently the result of fighting, and can be usually recognised by the pain and swelling of the affected part, and crepitus. To support a broken finger you can easily fix a small cardboard splint along the front of it by means of strips of sticking-plaster, pieces of tape or ribbon, or a strip of your handkerchief; and do not forget to sling the hand. When putting on the small arm-sling in cases of this description it is better to arrange it so that the end which passes in *front* of the hand shall be carried over the *opposite* shoulder, as in this way the hand receives the most support; and if handkerchiefs or scarfs are not available for making a sling, (you may as mentioned in the previous lecture) use either a *pin-sling*, or make the skirt of the coat or the cut sleeves of the coat and shirt serve the required purpose by pinning them up over the injured arm. Men who have sustained fractures of the arm or collar-bone should not be allowed—even when first aid has been rendered to them—to walk home or to the surgery by themselves, as they may become faint or giddy on the way and fall in such a manner as to greatly aggravate (and increase the danger of) their injuries. If in much suffering, the injured man should be carried either in the sitting position or on a stretcher; if on a stretcher, he should be resting on his back or on the sound side, as in such a position there is less chance of the broken limb being disturbed during the conveyance of the patient.

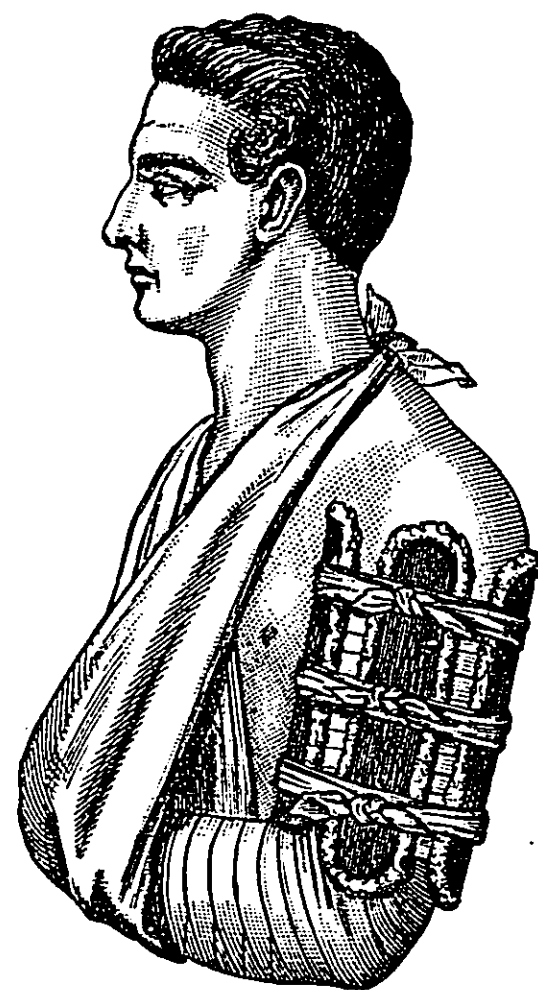


FIG. 28.—Splints for a broken arm.

*Fractures of the thigh* are among the most important injuries for which you may be called upon to give first aid, partly on account of their frequency, but chiefly because of the extreme care, gentleness, and skill required in the conveyance of the sufferer from the scene of the accident to his home or the hospital. These injuries, I have observed, are

in coal-pits frequently caused by heavy falls of coal or dirt from the roof. In some instances the patient feels the bone give way or "snap;" in others, when he is almost buried and much shaken by the fall, he is unaware that his thigh is injured until he attempts to use it, when he finds it powerless. The unnatural appearance of the limb at once shows what has occurred. There is shortening, as the lower end of the broken bone is dragged upwards by the action of the muscles; the thigh is swollen and enlarged as the lower piece of the bone is drawn up on the inner side of the upper piece, and the muscles become thicker during their contraction; and the limb below the seat of the fracture falls or twists outwards so that the foot rests on its outer side, not on the heel. If there is any movement of the limb, either through the struggling of the patient, or rough handling by the bystanders, loud crepitus, or rubbing of the broken ends of the bone against one another, may be *heard*, and should one of your hands be placed over the seat of injury—easily *felt*. Now, I need hardly remind you that in these accidents it is of the greatest importance to the patient, more particularly

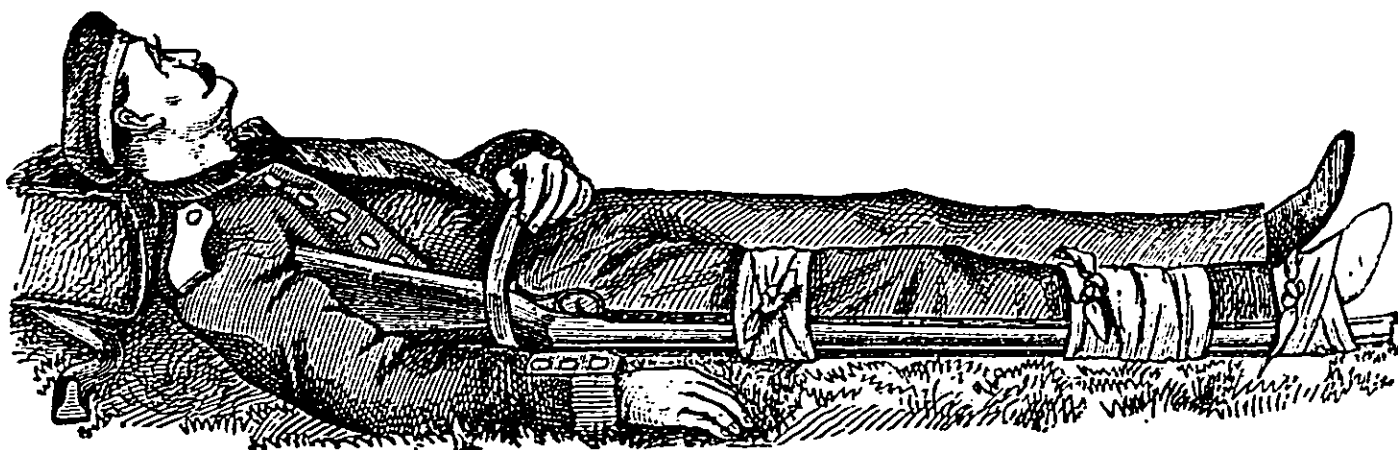


FIG. 29.—Rifle as Splint for a broken thigh.

if he is a working man, that he should not only recover his health and strength, but also have a useful limb. An ordinary case of simple fracture of the thigh can be successfully treated by the surgeon, but it is very different if the artery of thigh or ham is injured by a jagged fragment of the bone, or if one of the broken fragments is driven through the flesh and skin, making the fracture a compound one. In such cases as these the patient is in danger of losing either his limb or his life; indeed, it is not at all unlikely that he may lose both, for—according to one of our most eminent surgeons—amputation for injuries of the thigh-bone itself

is one of the most fatal operations in surgery. You can appreciate, therefore, the grave responsibility that rests upon you when called upon to give help in cases of broken thigh; you must surely see the necessity of acting with all the care, gentleness, coolness, and judgment of which you are possessed, so that you may give up the injured man into the surgeon's hands in the same condition, *not worse*, as when the accident occurred. If you once lose your head, and act hurriedly, roughly, and injudiciously, you will make the injury *worse*; a large blood-vessel will be torn, the flesh lacerated, or the skin actually pierced by a broken end of the bone; and through your carelessness the limb may have to be amputated to give the unfortunate sufferer his only chance—a *small* chance—of life.

If you have splints near at hand, or there are any materials lying about with which you can make temporary splints, you should apply a long one on the outer side of the injured limb from the armpit to the lower part of the foot, and another shorter one on the inner side of the thigh from the top of the thigh to the knee. While you are fixing on these splints a friend should keep the injured limb extended to its natural length by grasping the foot and drawing steadily down until the feet are level, taking care that the foot of the injured side is in its natural position with its heel (not its outer side) next the ground. If you are unable to extemporise a long outside splint, you can apply two splints—one on the outer side, the other on the inner side—from the top of the thigh to the heel, with a third short splint on the front of the thigh. On the battlefield a rifle placed with the butt in the armpit is found to make a first-rate long outside splint (Fig. 29). When you can get them, always apply the splints as soon as possible, and before the patient is moved, taking care to pad them well with hay, straw, portions of the clothing, or anything that is convenient and suitable. As an additional safeguard, you should never omit to *tie the legs together*, as still greater support is thus afforded to the injured limb. Should no splints, nor any materials from which you can improvise some, be near when you are called upon to give help for a broken thigh, you must not be disheartened, but must make the sound leg do duty as a splint. Place a little soft material, such as folded clothing, hay, or straw between the limbs and bind them firmly together with handkerchiefs, scarfs, or straps. It is always best to tie



the limbs together at several places in order to give greater steadiness and security to the injured thigh; so you should not only bind the feet to each other, but also the knees, and the thighs above the level of the fracture. I have already told you how, at the last siege of Paris, the French used straw matting to wrap around broken limbs. The same material may be used, when available, for a fractured thigh, more especially when it is required to move the patient a con-

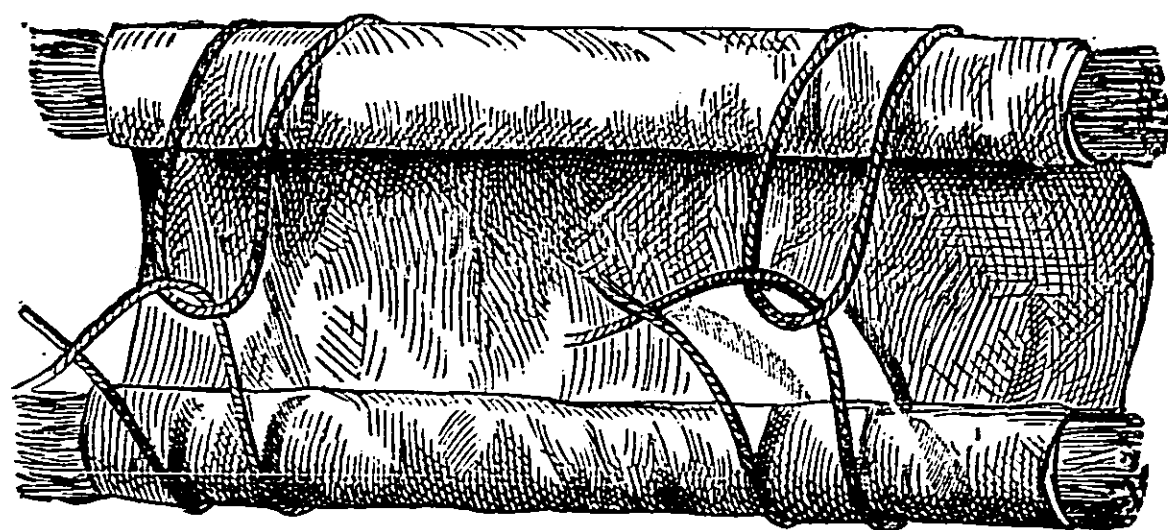


FIG. 30.—Bundles of Straw or Rushes used with a Cloth to support a Broken Limb.

siderable distance. The injured man is laid on the straw mat; some rolled up clothing, a sand-bag, a bundle of straw, or other suitable padding, is placed between the thighs, and the matting is wrapped around the patient's hips and thighs, and securely bound on by straps or cords.\* When you have supported the injured limb and secured it as firmly and comfortably as possible in its natural position, then it is safe to move the patient from the scene of the accident to his home or the hospital; and the rule is, in cases of broken thigh or other fractures of the lower limb, to lay the patient on his back, inclining towards the injured side, on the stretcher (as in such a position there is less likelihood of the broken-bone being disturbed during the conveyance of the injured man); and the greatest care must be taken in lifting the patient on and off the stretcher. It must be the sole business of one man to attend to, and take charge of, the injured limb; and certain precautions, which I shall explain to you in the last lecture, must be taken by the bearers of the stretcher.

\* *Surgeon's Pocket Book*, Surgeon-Major Porter.

*Fractures of the leg*, between the knee and ankle, are about the commonest accidents of importance at collieries and other large works. They occur frequently also among those who follow less laborious occupations, being caused by kicks from horses, carriage accidents, heavy falls, kicks at football, jumping or stumbling from great heights, and other kinds of violence. They are second in importance only to fractures

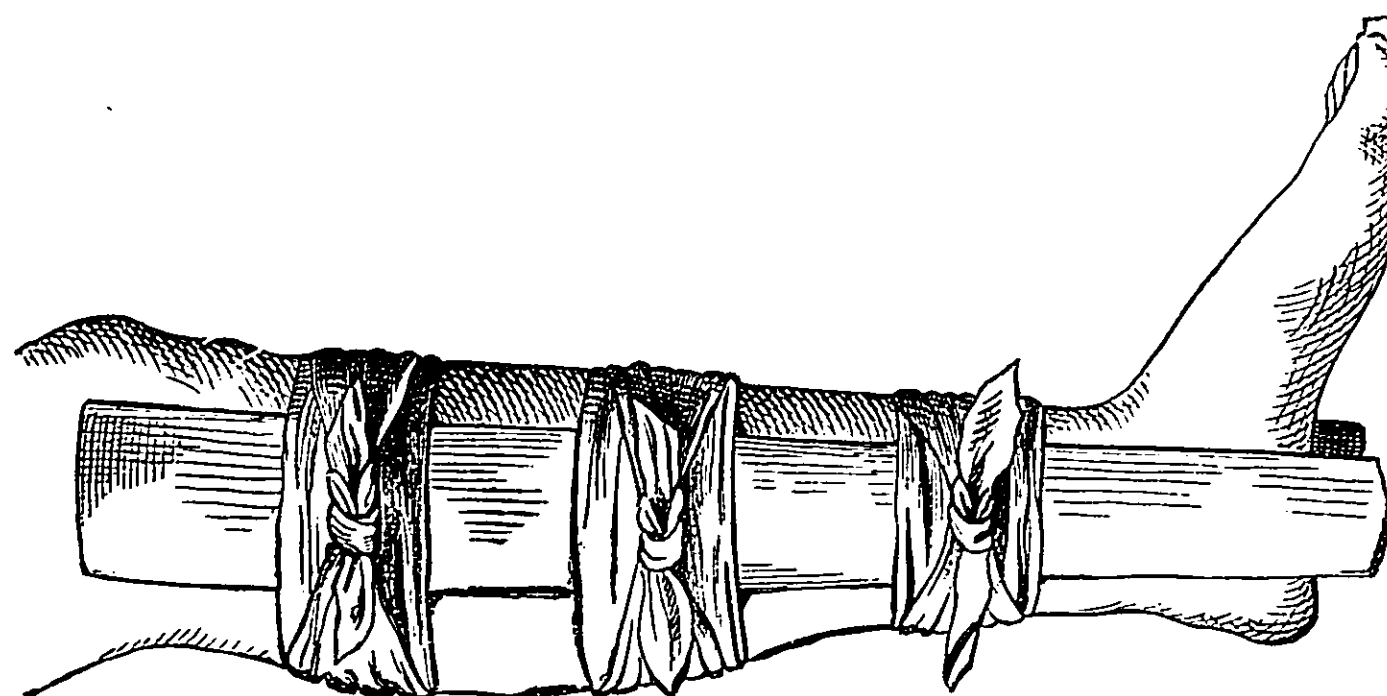


FIG. 31.—Wooden Splints for a Broken Leg.

of the thigh; and as you might expect from the exposed and superficial position of the larger bone of the leg, or shin-bone, compound fractures of the leg are more common than similar injuries in any other part of the body. A simple fracture of the leg is, for the same reason, very easily converted by careless, rough, or unskilful handling into a compound one; and though such a mishap is not usually attended by the danger that attends a compound fracture of the thigh, still at the very best the suffering of the patient is much increased and his recovery greatly delayed. This, especially in the case of a working man, is a most serious matter. If he has no club, no money at all is forthcoming; and if he has a club, about half—or it may be only a quarter—of the amount of his usual wages is all there is to support himself and his family. And this state of affairs lasts two or three months longer, looking at it in its most hopeful light, than if the case had been one of simple fracture. There is always the chance, too, of the surgeon being obliged to amputate the

man's leg to save his life; and if the case progresses unfavourably there is further the risk of a fatal result. I am not at all exaggerating. This story of disaster has followed over and over again the careless or unskilful handling of a broken leg by well-meaning but badly-informed friends.

The usual signs of fracture are present when a leg is broken. There is swelling, and the shape of the limb is unnatural; there is crepitus; on passing your finger down the large bone of the leg you can feel the irregularity caused by the ends of the broken fragments at the seat of fracture; and the patient complains of pain and is unable to use the limb. When both bones of the leg are broken the nature of the injury is usually very plain; but if only one bone is

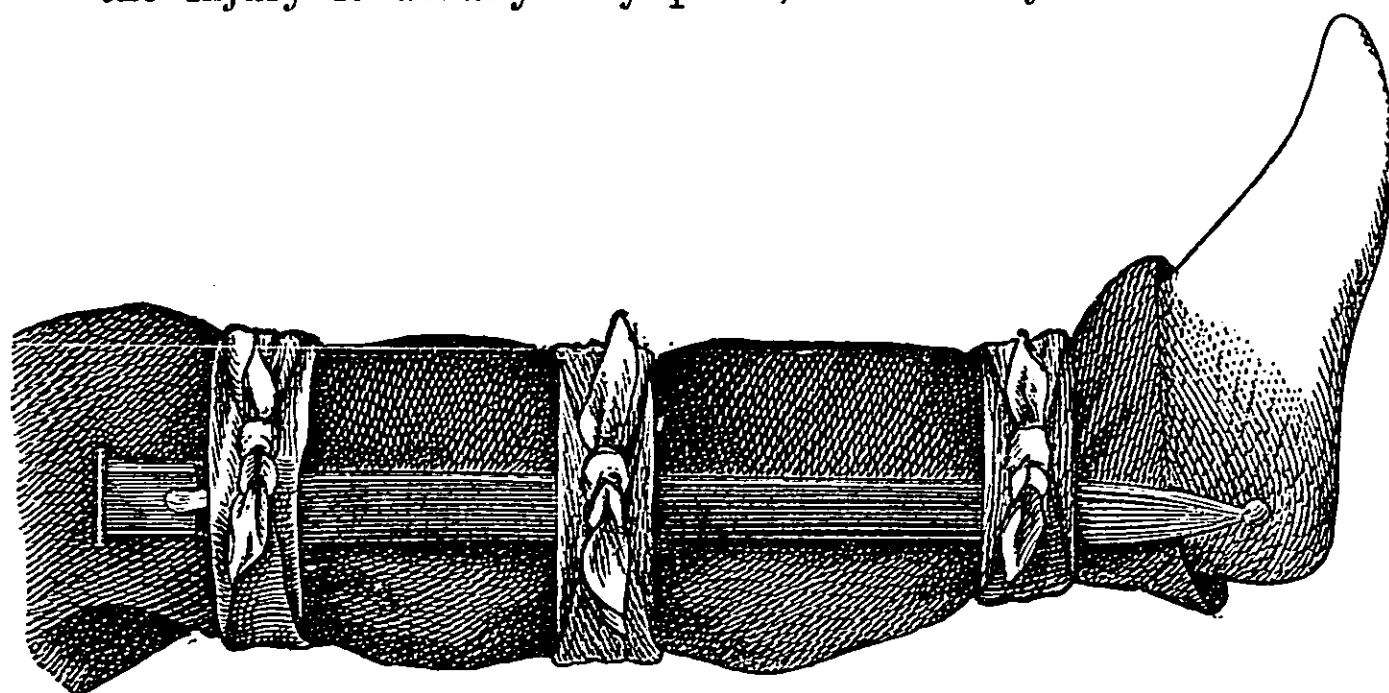


FIG. 32.—Scabbard as Splint for a Broken Leg.

fractured, then the sound bone acts as a splint for it, keeping it in position, and there is more difficulty in telling what has occurred.

If you have the necessary materials at hand, you should support the injured limb by binding on two splints—one on the outer side, one on the inner side, of the leg (Fig. 31). These splints should be properly padded, if made of hard material such as wood; but, as I have already explained to you, very good temporary splints may be made of rolls of straw, or straw bottle-casings, wrapped up in cloths or handkerchiefs (Fig. 30), folded newspapers, cardboard, and similar articles. The diagrams (Figs. 32 and 33) show how fractured legs may be put up with bayonets and bayonet scabbards; and in these illustrations you will observe that

the trousers are made use of as padding. When you have securely bound on your splints you should tie the legs together at the knee and ankle, so that additional support may be given to the injured limb by the sound one. If you cannot get anything to make splints of, the sound leg must serve as your splint, and you should place some pieces of clothing, hay, or straw between the limbs, and bind them securely together. Should there be a board handy, you could place it under the two limbs, and fasten them to it; or if on the battlefield, you could bind the two legs together and support them on a knapsack in the same way, but you should always remember to use something soft, as straw, fragments of clothing, etc., to place between and under the legs so as to make

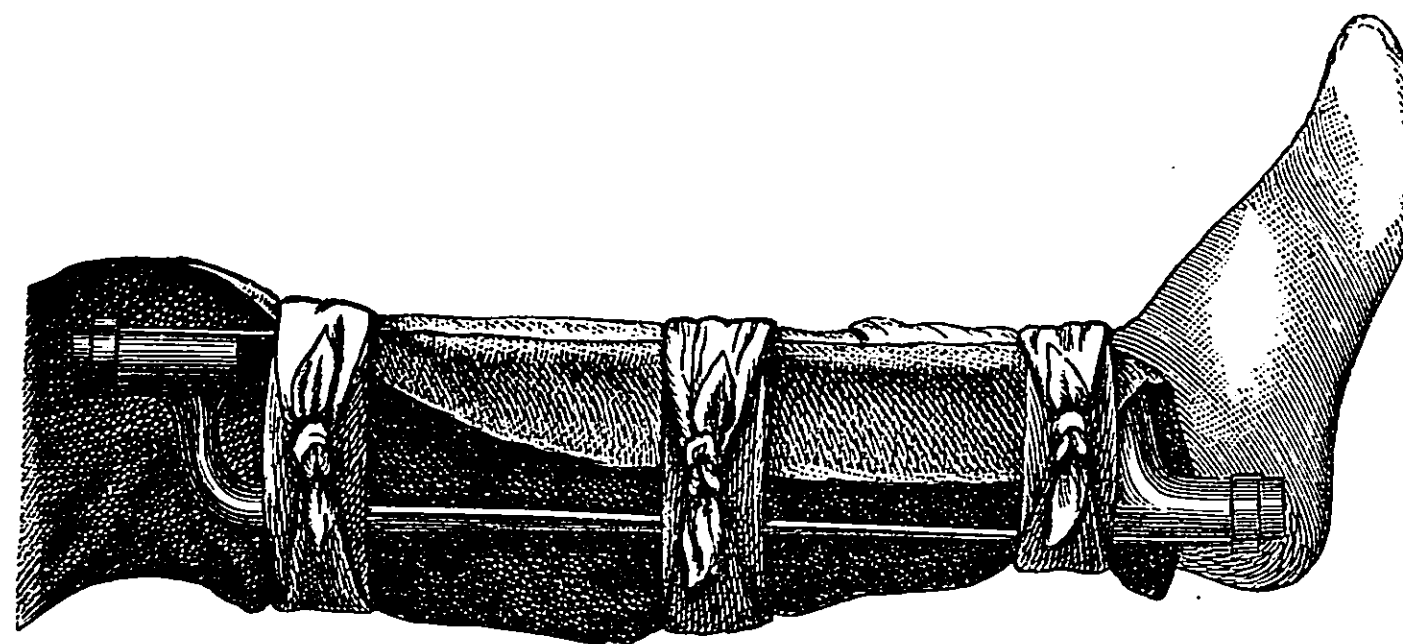


FIG. 33.—Splint made of two Bayonets for a Broken Leg.

the patient as comfortable as possible. When you have secured the broken limb by one or other of these methods the patient is ready to be moved away on a stretcher.

The *knee-cap* is fractured sometimes by heavy blows or falls, but it is more usually broken by violent efforts to recover oneself after slipping, the bone being, so to speak, torn across by excessive muscular action. In these fractures there is no shortening of the limb, and the two fragments of the bone, which are separated one from the other, can be readily felt. The leg is perfectly useless, the patient being unable to stand upon it or to raise it; and the more the knee is bent, the farther the two pieces of bone are separated. In an accident of this kind you can either apply a splint to the back of the limb, and bind a handkerchief or scarf around the



knee like a figure of eight, so as to keep the two fragments of bone as near together as possible; or if you cannot improvise a splint, you should tie the two limbs together at the ankle, knee, and thigh. Always keep the limb as straight as possible, and a little raised.

*Fractures of the bones of the foot* are the result of great violence, so that there is considerable pain and swelling of the injured part. The foot looks an unnatural shape and you may be able to feel crepitus. All you can do is to keep the foot raised, and apply cold by means of sponges, folded handkerchiefs, or cloths steeped in cold water.

So far I have been speaking to you about fractures or broken bones, and explaining to you the best way of giving first aid in such cases. But there are other injuries to the skeleton with which you may meet besides fractures. A bone may, without being broken, be displaced put out of joint, or *dislocated*. Most of you have heard of, and perhaps known, some one who has had his "shoulder put out," his "elbow out," or his "jaw out." Such injuries are spoken of as *dislocations*—dislocation of the shoulder, elbow, jaw, etc., as the case may be. This displacement, or unjointing, of a bone is a very different thing from a fracture, and is just one of those accidents for which you can give no help, except by assisting the patient along, or carrying him to his home or to the nearest doctor. *Never interfere with a dislocation, but leave it to be taken in hand by a qualified medical man.* By meddling with an injury of this kind you may do great harm; but if you wish to display your zeal, send for the doctor, or help to convey the patient to where he will receive professional assistance.

In fractures it is in your power to give most valuable help before medical aid can be procured; in dislocations you must attempt nothing, but leave everything to the surgeon. You should therefore be able to distinguish fractures from dislocations. The bones of the limbs may be either broken or displaced as the result of violence: in either case the patient is unable to use his limb, and there is pain at the seat of injury, with distortion—or an unnatural shape—of the limb. In a fracture, however, the seat of injury is usually somewhere about the middle part of the bone—not at a joint; there is crepitus—or grating between the broken ends of the bone—felt and sometimes heard on movement of the injured part of the limb; the limb is unnaturally movable at the seat of

the fracture; there is frequently shortening of the limb from one of the broken ends of the bone overriding the other; and often the rough ends, edges, or sharp points of the broken ends of the bone—or some irregularity—can be felt at the seat of fracture.

In a *dislocation*, on the other hand, the seat of injury is at a joint; there is no crepitus; the injured joint is more or less fixed and immovable; and there may be either shortening or lengthening of the limb. In dislocation of the jaw the mouth is open and the jaw fixed; there is no crepitus, or irregularity of the line of the teeth and the lower margin of the jaw (as there is in fracture), and in many instances it is caused by gaping. Women are the most frequent sufferers; and if the accident occurs once, the patient has to be very careful in future, or the jaw will slip out of place again. Indeed after any joint has once been dislocated the different tissues (such as the ligaments, etc.) of the affected part are so weakened that displacement of the bones will much more readily occur from some violence or incautious movement than at the time of the first accident.

#### SPRAINS AND STRAINS.

Sometimes, from over-exertion, or from slipping on rough ground, a joint gets wrenched, twisted, or *sprained*. The joints most frequently injured in this way are the wrist and ankle. Colliers, labourers, and others who work hard with their arms often get their wrists sprained; and sprained ankles are pretty frequently caused by slipping over a loose stone, stepping in a rut or hole, or "turning your foot." In these accidents the ligaments, tendons, and other tissues about the joint are stretched, twisted, and torn to a greater or less extent; the small blood-vessels of the part are ruptured as well, so that blood escapes underneath the skin in and about the joint, causing swelling and a bluish-red discoloration. These injuries, as some of you know from bitter experience, are often extremely painful. If the pain is very severe, soak the injured part in hot water thoroughly—as hot as can be conveniently borne for about a quarter of an hour,

and then apply a good large hot bran poultice. This usually gives great relief; but if hot water cannot be obtained, or should hot applications fail—as in some cases they do—to give much ease, then apply cold, in the form of cloths, handkerchiefs, clean soft rags, or sponges, steeped in cold water, spirit and water, or vinegar and water, taking care to keep your applications constantly cold and wet. But always remember, whatever else you do, to give the injured joint *absolute rest*, and to keep it continually *in a raised position*. Later on, when the pain is relieved and the swelling has more or less subsided, friction and stimulating liniments, such as hartshorn and oil, are useful.

Sprains or *strains* of the muscles or flesh of the back, loins, hips, and shoulders, are rather common amongst labourers, platelayers, and others who get their living by manual labour. The pain and stiffness caused by these muscular sprains or strains is best relieved by hot fomentations and bran poultices, followed by good hard rubbing with a strong liniment of hartshorn and oil.

#### CONTUSIONS OR BRUISES.

These are caused by violence, as falls, blows, squeezes, etc., and are every day occurrences. They may be extremely trivial, or very severe. In these injuries the skin is not broken, but the soft tissues underneath the skin are more or less torn and lacerated; the small blood-vessels are torn and the blood escaping from them causes swelling and discoloration of the bruised part. The colour varies from a purplish-red at first to a greenish-brown or yellowish tint later on. You may study these changes of colour conveniently in the next black eye you see. In trivial contusions you can apply cold by means of wet sponges, cloths, or handkerchiefs; but for severe and extensive contusions, such as I often find colliers suffering from, as the result of heavy falls of coals and dirt from the roof of the pit, there is nothing that gives so much relief as copious hot fomentations, followed by large thick bran poultices, over which vinegar has been sprinkled.

In very severe contusions, such as those occurring from railway accidents, heavy falls of rock, and other forms of

great violence, one or more of the important internal organs, such as the liver and intestines, are sometimes torn, and then the case is a most dangerous one. You can usually tell that something very serious has happened by the faint, pale, and prostrate condition of the patient. I shall speak of this prostrate state—or, as it is called, collapse—in the next lecture.