1861

A manual of military surgery - Chapter V: Wounds and other injuries

The *excretions* should be removed as speedily as possible from the apartment, and the vessels in which they are received immediately well scalded, the air being at the same time perfectly purified by ventilation, or ventilation and disinfectants.

Finally, the nurse must take care of herself. She must have rest, or she will soon break down. If she is obliged to be up all night, she should be spared in the day.

CHAPTER V.

WOUNDS AND OTHER INJURIES.

THE injuries inflicted in war are, in every respect, similar to those received in civil life. The most common and important are fractures, dislocations, bruises, sprains, burns, and the different kinds of wounds, as the incised, punctured, lacerated, and gunshot. With the nature, diagnosis, and mode of treatment of these lesions every army surgeon must, of course, be supposed to be familiar; and I shall therefore limit myself,

in the remarks which I am about to offer upon these subjects, to a few practical hints respecting their management on the field of battle and in the ambulance.

Most of the cases of *fractures* occurring on the field of battle are the result of gunshot injury, and are frequently, if not generally, attended by such an amount of injury to the soft parts and also to the bone as to demand amputation. The bone is often dreadfully comminuted, and consequently utterly unfit for preservation. The more simple fractures, on the contrary, readily admit of the retention of the limb, without risk to life.

In transporting persons affected with fractures, whether simple or complicated, the utmost care should be used to render them as comfortable as possible, by placing the injured limb in an easy position, and applying, if need be, on account of the distance to which they have to be carried, or the mode of conveyance, short side splints of binders' board, thin wood, as a shingle, or junks of straw, gently confined by a roller. For want of due precaution the danger to limb and life may be materially augmented. Perma-

nent dressings should be applied at the earliest moment after the patient reaches the hospital. If the fracture be attended with splintering of the bone, all loose or detached pieces should at once be extracted; a proceeding which always wonderfully simplifies the case, inasmuch as it prevents, in great measure, the frightful irritation and suppuration which are sure to follow their retention. When this point has been properly attended to, the parts should be neatly brought together by suture, and covered with a compress wet with blood. As soon as inflammation arises—not before—water-dressings are employed. A suitable opening, or bracket, should be made in the apparatus to facilitate drainage and dressing.

Dislocations, accidents by no means common in military operations, are treated according to the general rules of practice; they should be speedily reduced, without the aid of chloroform, if the patient is faint or exhausted; with chloroform, if he is strong or reaction has been fully established. The operation may generally be successfully performed by simple manipulation; if, however,

the case is obstinate, pulleys may be necessary, or extension and counter-extension made by judicious assistants.

Bruises, or contusions, unless attended with pulpification, disorganization, or destruction of the tissues, are best treated, at first, until the pain subsides, with tepid water impregnated with laudanum and sugar of lead, or some tepid spirituous lotion, and afterward, especially if the patient be strong and robust, with cold water, or cold astringent fluids. If the injury be deep seated, extensive, and attended with lesion of very important structures, the case will be a serious one, liable to be followed by the worst consequences, requiring, perhaps, amputation.

Sprains are often accompanied with excessive pain and even severe constitutional symptoms. They should be treated with the free use of anodynes and with warm water-dressings medicated with laudanum, or laudanum and lead. The joint must be elevated and kept at rest in an easy position. Leeches may be applied, if they can be obtained; otherwise, if plethora exist, blood may be taken from the arm. By-and-by sorbefacient

liniments and friction come in play. Passive motion should not be instituted too soon.

Among the accidents of war are *burns*, and, occasionally, also scalds. The former may be produced by ordinary fire or by the explosion of gunpowder, either casual or from the blowing up of redoubts, bridges, houses, or arsenals, and vary from the most trivial to the most serious lesions, involving a great extent of surface or of tissue, and liable to be followed by the worst consequences. Such injuries always require prompt attention; for, apart from the excessive pain and collapse which so often accompany them, the longer they remain uncared for the more likely will they be to end badly.

Various remedies have been proposed for these injuries. I have myself always found white-lead paint, such as that employed in the arts, mixed with linseed oil to the consistence of very thick cream, and applied so as to form a complete coating, the most soothing and efficient means. The dressing is finished by enveloping the parts in wadding, confined by a moderately tight roller, It should not be removed, unless there is much discharge or

swelling, for several days. If vesicles exist, they should previously be opened with a needle or the point of a bistoury. A liniment or ointment of glycerin, lard or simple cerate, and subnitrate of bismuth, as suggested by my friend, Professor T. G. Richardson, of New Orleans, is also an excellent remedy, and may be used in the same manner as the white-lead paint. In the milder cases, carded cotton, cold water, water and alcohol, water and laudanum, or solutions of lead and laudanum, generally afford prompt relief. Amputation will be necessary when there is extensive destruction of the muscles, bones, or joints. Reaction must be promoted by the cautious use of stimulants; while pain is allayed by morphia or laudanum given with more than ordinary circumspection, lest it induce fatal oppression of the brain.

In burns from the explosion of *gunpowder*, particles of this substance are often buried in the skin, where, if it be not removed, they leave disfiguring marks. The best way to get rid of them is to pick out grain after grain with the point of a narrow-bladed bistoury or cataract needle.

The subject of *wounds* is a most important one in regard to field practice, as these lesions are not only of frequent occurrence, but present themselves in every variety of form and extent. Their gravity is influenced by numerous circumstances which our space does not permit us to specify, but which the intelligent reader can readily appreciate. In many cases death is instantaneous, owing to shock, or shock and hemorrhage; in others it occurs gradually with or without reaction, at a period of several hours, or, it may be, not under several days. Sometimes men are destroyed by shock, by, apparently, the most insignificant wound or injury, owing, not to want of courage, but to some idiosyncrasy.

The indications presented in all wounds, of whatever nature, are—1st, to relieve shock; 2dly, to arrest hemorrhage; 3dly, to remove foreign matter; 4thly, to approximate and retain the parts; and, 5thly, to limit the resulting inflammation.

1. It is not necessary to describe minutely the symptoms of *shock*, as the nature of the case is sufficiently obvious at first sight, from the excessive pallor of the countenance, the

weakened or absent pulse, the confused state of the mind, the nausea, or nausea and vomiting, and the excessive bodily prostration. The case must be treated promptly; by free access of fresh air and the use of the fan, by loosening the dress or the removal of all sources of constriction, by dashing cold water into the face and upon the chest, by recumbency of the head, and by a draught of cold water, or water and spirits, wine or hartshorn, if the patient can swallow; aided, if the case be urgent, by sinapisms to the region of the heart, the inside of the thighs and the spine, and stimulating injections, as brandy, turpentine, mustard, or ammonia, in a few ounces of water. No fluid must be put into the mouth so long as the power of deglutition is gone, lest some of it should enter the windpipe, and so occasion suffocation. Whatever the cause of the shock may have been, let the medical attendant not fail to encourage the sufferer by a kind and soothing expression, which is often of more value in recalling animation than the best cordials.

During an actual engagement, the medical officers, as well as their servants, should carry

in their pockets such articles as the wounded will be most likely to need on the field of battle, as brandy, aromatic spirits of hartshorn, and morphia, put up in suitable doses.

2. The *hemorrhage* may be arterial or venous, or both arterial and venous, slight or profuse, primary or secondary, external or internal. The scarlet color and saltatory jet will inform us when it is arterial; the purple hue and steady flow, when it is venous. When the wound is severe, or involving a large artery or vein, or even middle-sized vessels, the bleeding may prove fatal in a few minutes, unless immediate assistance is rendered. Hundreds of persons die on the field of battle from this cause. They allow their life-current to run out, as water pours from a hydrant, without an attempt to stop it by thrusting the finger in the wound, or compressing the main artery of the injured limb. They perish simply from their ignorance, because the regimental surgeon has failed to give the proper instruction. It is not necessary that the common soldier should carry a Petit's tourniquet, but every one may put into his pocket a stick of wood, six inches

long, and a handkerchief or piece of roller, with a thick compress, and be advised how, where, and when they are to be used. By casting the handkerchief round the limb, and placing the compress over its main artery, he can, by means of the stick, produce such an amount of compression as to put at once an effectual stop to the hemorrhage. This simple contrivance, which has been instrumental in saving thousands of lives, constitutes what is called the *field tourniquet.* A fife, drum-stick, knife, or ramrod may be used, if no special piece of wood is at hand.

The most reliable means for arresting hemorrhage permanently is the *ligature*, of strong, delicate, well-waxed silk, well applied, with one end cut off close to the knot. Acupressure is hardly a proper expedient upon the battle-field, or in the ambulance, especially when the number of wounded is considerable. The rule invariably is to tie a wounded artery both above and below the seat of injury, lest recurrent bleeding should arise. Another equally obligatory precept is to ligature the vessel, if practicable, at the place whence the blood issues, by enlarging, if need be, the

original wound. The main trunk of the artery should be secured only when it cannot be taken up at the point just mentioned. Lastly, it is hardly requisite to add that the operation should be performed, with the aid of the tourniquet, as early as possible, before the supervention of inflammation and swelling, which must necessarily obscure the parts and increase the surgeon's embarrassment, as well as the patient's pain and risk.

Venous hemorrhage usually stops spontaneously, or readily yields to compression, even when a large vein is implicated. The ligature should be employed only in the event of absolute necessity, for fear of inducing undue inflammation.

Torsion is unworthy of confidence in field practice, and the same is true of *styptics*, except when the hemorrhage is capillary, or the blood oozes from numerous points. The most approved articles of this kind are Monsel's salt, or the persulphate of iron and the perchloride of iron; the latter deserving the preference, on account of the superiority of its hemostatic properties. Alum and lead are inferior styptics.

Temporary *compression* may be made with the tourniquet, or a compress and a roller. It may be direct, as when the compress is applied to the orifice of the bleeding vessel, or indirect, as when it is applied to the trunk of the vessel, at some distance from the wound.

Constitutional treatment in hemorrhage is of paramount importance. It comprises perfect tranquillity of mind and body, cooling drinks, a mild, concentrated, nourishing diet, especially when there has been excessive loss of blood, anodynes to allay pain, induce sleep, and allay the heart's inordinate action, fresh air, and a properly regulated light.

Internal hemorrhage is more dangerous than external, because it is generally inaccessible. The chief remedies are copious venesection, elevated position, opium and acetate of lead, cool air, and cool drinks.

Exhaustion from hemorrhage should be treated according to the principles which guide the practitioner in cases of severe shock. Opium should be given freely as soon as reaction begins to quiet the tremulous movements of the heart and tranquilize the

mind. When the bleeding is internal, the reaction should be brought about gradually, not hurriedly, lest we thus become instrumental in promoting or re-exciting the hemorrhage.

Secondary hemorrhage comes on at a variable period, from a few hours to a number of days; it may depend upon imperfect ligation of the arteries, ulceration, softening or gangrene of the coats of these vessels, or upon undue constriction of the tissues by tight bandages. In some cases it is venous, and may then be owing to inadequate support of the parts. Whatever the cause may be, it should be promptly searched out, and removed.

3. The third indication is to remove all *foreign matter*. This should be done at once and effectually; with sponge and water, pressed upon the parts, with finger, or finger and forceps. Not a particle of matter, not a hair, or the smallest clot of blood must be left behind, otherwise it will be sure to provoke and keep up irritation.

4. As soon as the bleeding has been checked and the extraneous matter cleared away, the edges of the *wound* are gently and evenly

approximated and permanently retained by suture and adhesive plaster, aided, if necessary, by the bandage. The best suture, because the least irritating, is that made of silver wire; but if this material is not at hand, strong, thin, well-waxed silk is used. The adhesive strips are applied in such a manner as to admit of free drainage. The bandage is required chiefly in injuries extending deeply among the muscles; when this is the case, its use should be aided by compresses arranged so as to force together the deep parts of the wound.

5. When the wound is dressed, the next duty of the surgeon is to moderate the resulting *inflammation*. For this purpose the ordinary antiphlogistic means are employed. In general, very little medicine will be required, except a full anodyne, as half a grain of morphia, immediately after the patient has sufficiently recovered from the effects of his shock, and perhaps a mild aperient the ensuing morning, especially if there be constipation with a tendency to excessive reaction. The drinks must be cooling, and the diet light and nutritious, or otherwise, accord-

ing to the amount of depression and loss of blood. In the latter event, a rich diet and milk-punch may be required from the beginning. A diaphoretic draught will be needed if the skin is hot and arid, aided by frequent sponging of the surface with cool or tepid water. General bleeding will rarely, if ever, be required; certainly not if the injury is at all severe, or if there has already been any considerable waste of blood and nervous fluid.

Much trouble is, at times, experienced both in civil and military practice, especially in very hot weather, in preventing the access of flies to our dressing. The larvæ which they deposit are rapidly developed into immense *maggots*, which, creeping over the wounds and sores of the patient, and gnawing the parts, cause the most horrible distress. The soldiers in Syria, under Larrey, were greatly annoyed by these insects, and our wounded in Mexico also suffered not a little from them. The best prevention is bran, or light saw-dust, with which the injured parts should be carefully covered. The use of cotton must be avoided, inasmuch as it soon becomes hot and

wet; two circumstances highly favorable to incubation.

The best local applications are the water-dressings, either tepid, cool, or cold, according to the temperament of the patient, the tolerance of the parts, and the season of the year. Union by the first intention is, in all the more simple cases, the thing aimed at and steadily kept in view, and hence the less the parts are encumbered, moved or fretted, the more likely shall we be to attain the object.

The medical attendant should have a constant eye to the condition of the *bladder* after all severe injuries, of whatever character, as retention of urine is an extremely common occurrence, and should always be promptly remedied. Attention to this point is the more necessary, because the poor patient, in his comatose or insensible condition, is frequently unable to make known his wants.

Such, in a few words, are the general principles of treatment to be followed in all wounds; but there are some wounds which are characterized by peculiarities, and these peculiarities are of such practical importance

as to require separate consideration. Of this nature are punctured, lacerated, and gunshot wounds.

Punctured wounds are inflicted by various kinds of weapons, as the lance, sabre, sword, or bayonet. In civil practice they are most generally met with as the result of injuries inflicted by nails, needles, splinters, and fragments of bone. They often extend into the visceral cavities, joints, vessels, and nerves; and are liable to be followed by excessive pain, erysipelas, and tetanus; seldom heal by adhesive action; and often cause death by shock or hemorrhage. When the vulnerating body is broken off and buried, it may be difficult to find and extract it, especially when small and deep seated. When this is the case, the wound must be freely dilated, an eye being had to the situation of the more important vessels and nerves. In other respects, the general principles of treatment are similar to those of incised wounds. Opium should be administered largely; and, if much tension supervene, or matter form, free incisions will be necessary.

In *lacerated wounds* the edges should be

tacked together very gently, and large interspaces left for drainage. A small portion will probably unite by the first intention; the remainder, by the granulating process. Such wounds nearly always suppurate more or less profusely, and some of the torn and bruised tissues not unfrequently perish. The same bad consequences are apt to follow them as in punctured wounds. Warm water constitutes the best dressing, either alone or with the addition of a little spirits of camphor. Opium should be used freely internally, and the diet must be supporting.

Gunshot wounds, in their general character, partake of the nature of lacerated and contused wounds. They are, of course, the most common and dangerous lesions met with in military practice; often killing instantly, or, at all events, so mutilating the patient as to destroy him within a few hours or days after their receipt. The most formidable wounds of the kind are made by the conical rifle and musket balls and by cannon balls, the latter often carrying away the greater portion of a limb, or mashing and pulpifying the muscles and viscera in the most frightful and destruc-

tive manner; while the former commit terrible ravages among the bones, breaking them into numerous fragments, each of which may, in its turn, tear up the soft tissues, in a way perhaps not less mischievous than the ball itself. The old round ball is a much less fatal weapon than the conical, which seldom becomes flattened, and which has been known to pass through the bodies of two men and lodge in that of a third some distance off.

When a ball lodges it makes generally only one orifice; but it should be remembered that it may make two, three, and even four, and at last bury itself more or less deeply. Such cases are, however, uncommon. Should the missile escape, there will necessarily be two openings; or, if it meet a sharp bone and be thereby divided or cut in pieces, as sometimes happens, there may be even three. The orifice of entrance and the orifice of exit differ in their appearances. The first is small, round, and often a little discolored from the explosion of the powder; the other, on the contrary, is comparatively large, slit-like, everted, and free from color. These differences, however, are frequently very trifling, particularly if the

ball be projected with great velocity and it do not encounter any bone. The opening of entrance made by the round ball is often a little depressed or inverted, but such an appearance is extremely uncommon in wounds made by the conical ball.

It is often a matter of great importance to determine, when two openings exist in a limb, whether they have been made by one ball, which has passed out, or by two balls, which are retained. The question is of grave importance, both in a practical and in a medico-legal point of view; but its solution is, unfortunately, not always possible. Sometimes the openings of entrance and exit are materially modified by the introduction but non-escape of a foreign body, as a piece of breast-plate, belt, or buckle, along with the ball, which alone passes out, or by the flattening of a ball against a bone, or its division by a bone into several fragments, each of which may afterward produce a separate orifice. Generally speaking, the missile, at the place of entrance, carries away a piece of skin, and rends the skin where it escapes, the former being often found in the wound.

Bullets sometimes glance, bruising the skin, but not penetrating it; at other times they effect an entrance, but, instead of passing on in a straight line, are deflected, coursing, perhaps, partially round the head, chest, or abdomen, or round a limb. Such results are most commonly caused by a partially spent bullet coming in contact with bones, aponeuroses, and tendons; and the round is more frequently served in this way than the conical.

Gunshot wounds bleed profusely only when a tolerably large artery has been injured, and in this event they may speedily prove fatal. During the Crimean war, however, many cases occurred in which there was no immediate hemorrhage, imperiling life, notwithstanding the limbs, lower as well as upper, were left hanging merely by the integuments. Under such circumstances, *intermediary* hemorrhage, as it is termed, is apt to show itself as soon as reaction takes place; generally within a few hours after the accident.

The pain is of a dull, burning, smarting, or aching character, and the patient is pale, weak, tremulous, nauseated, and despondent, often in a degree far beyond what might be

expected from the apparent violence of the injury, and that, too, perhaps, when the individual is of the most undaunted courage and self-possession in the heat of battle. At other times a man may have a limb torn off, or be injured in some vital organ, and yet hardly experience any shock whatever; nay, perhaps be scarcely conscious that he is seriously hurt. The pain and prostration are always greater, other things being equal, when a bone has been crushed or a large joint laid open, than when there is a mere flesh wound.

The gravity of gunshot wounds of the *joints* has been recognized by all practitioners, both military and civil, from time immemorial. The principal circumstances of the prognosis are the size and complexity of the articulation, the extent of the injury, and the state of the system. A gunshot wound of a ginglymoid joint is, in general, a more dangerous affair than a similar one of a ball-and-socket joint. The structures around the articulation often suffer severely, thus adding greatly to the risk of limb and life. Of 65 cases of gunshot wounds of different joints, related by Alcock, 33 recovered; but of these 21 lost the limb. Of

the 32 that died no operation was performed upon 18.

Gunshot wounds of the smaller joints, even those of the ankle, often do very well, although they always require long and careful treatment. Lesions of this kind, involving the shoulder, are frequently amenable to ordinary means. If the ball lodges in the head of the humerus, it must be extracted without delay, its retention being sure to excite violent inflammation in the soft parts, and caries or necrosis in the bone, ultimately necessitating amputation, if not causing death.

Gunshot wounds of the *knee-joint* are among the most dangerous of accidents, and no attempt should be made to save the limb when the injury is at all extensive, especially if it involves fracture of the head of the tibia or condyles of the femur. Even extensive laceration of the ligament of the patella should, I think, as a general rule, be regarded as a sufficient cause of amputation. In 1854, Macleod saw upwards of forty cases of gunshot wounds of the knee in the French hospitals in the Crimea, and all, except one, in which an attempt was made to save the limb, proved

fatal. Of nine cases which occurred in India not one was saved. Guthrie never saw a patient recover from a gunshot wound of the knee-joint; and Esmarch, who served in the Schleswig-Holstein wars, expressly declares that all lesions of this kind demand immediate amputation of the thigh.

When, in bad cases of these articular injuries, an attempt is made to save the limb, the patient often perishes within the first three or four days, from the conjoined effects of shock, hemorrhage, and traumatic fever. If he survives for any length of time, large abscesses are apt to form in and around the joint, the matter burrowing extensively among the muscles, and causing detachment of the periosteum with caries and necrosis of the bones.

Muscles, badly injured by bullets, generally suppurate, and are very apt to become permanently useless. Special pains should therefore be taken to counteract this tendency during the cure. Large shot and other foreign bodies sometimes lodge among these structures, where their presence may remain for a long time unsuspected.

Cannon balls often do immense mischief

by striking the surface of the body obliquely, pulpifying the soft structures, crushing the bones, lacerating the large vessels and nerves, and tearing open the joints, without, perhaps, materially injuring the skin.

A very terrible form of *contusion* is often inflicted upon the upper extremity of artillerymen by the premature explosion of the gun while in the act of loading; causing excessive commotion of the entire limb, laceration of the soft parts, and most extensive infiltration of blood, accompanied, in many cases, by comminuted fracture, and penetration of the wrist and elbow joints. The constitutional shock is frequently great. If an attempt be made to save the parts, diffusive suppuration, and more or less gangrene, will be sure to follow, bringing life into imminent jeopardy. An attempt in such a case to save the limb would be worse than useless, if, indeed, not criminal; amputation must be promptly performed, and that at a considerable distance above the apparent seat of the injury, otherwise mortification might seize upon the stump.

In the *treatment* of this class of injuries,

the first thing to be done, after arresting the hemorrhage and relieving shock, is to extract the ball and any other foreign substance that may have entered along with it, the next being to guard against inflammation and other bad consequences.

In order to ascertain where the ball is, the limb should be placed as nearly as possible in the position it was supposed to have been at the moment of the accident. A long, stout, flexible, blunt-pointed probe, like that sketched in the annexed cut, or a straight silver catheter, is then passed along the track and gently moved about until it strikes the ball. In many cases the best probe is the surgeon's finger. Valuable information may often be obtained by the process of pinching, or digital compression, the ends of the fingers being firmly and regularly pressed against the wounded structures, bones as well as muscles, tendons, and aponeuroses. Occasionally, again, as when a ball is lodged in an extremity, its presence is easily detected by the patient, who may make such an examination as he lies in bed.

The situation of the foreign body having

been ascertained, the bullet-forceps, seen in the accompany engraving, take the place of the probe, the blades, which should be long and slender, being closed until they come in contact with the ball, when they are expanded so as to grasp it, care being taken not to include any of the soft tissues. If there be any loose or detached splinters of bone, wadding, or other foreign material, it should now also be removed; it being constantly borne in mind that, while a ball may occasionally become encysted, and is at all times, if smooth, a comparatively harmless tenant, such substances always keep up irritation, and should, therefore, if possible, be got rid of without delay.

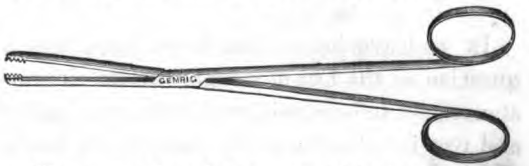
Although preference is commonly given to the bullet-forceps, properly so called, as an extractor, the polypus and dressing-forceps,

represented in the annexed figures, generally answer quite as well, especially the former, the latter being adapted only to cases where the foreign body is situated a short distance below the surface, or where the wound is of unusual dimensions, admitting of the free play of the instrument.

During the extraction, the parts should be properly supported, and if the wound is not large enough for the expansion of the instrument, it must be suitably enlarged. When the ball is lodged a short distance from the skin, it may often be readily reached by a counter-opening.

When a bullet is embedded in a bone, as in the head of the tibia, or in the condyles of the femur, and the parts are not so much injured as to demand amputation, ex-

traction may be effected with the aid of the trephine and elevator. Sometimes a bullet-worm, as it is termed, an instrument similar to that used in drawing a ball from a gun, will be very convenient for its removal.



The operation being completed, the parts are placed in an easy, elevated position, and enveloped in tepid, cool or cold water-dressings, as may be most agreeable to them and to the system. The best plan, almost always, is to leave the opening or openings, made by the ball, free, to favor drainage and prevent pain and tension. If the track be very narrow, it may heal by the first intention, but in general it will suppurate, and portions of tissue may even mortify. Erysipelas, pyemia, and secondary hemorrhage are some of the bad consequences after gunshot injuries, the latter usually coming on between the fifth and ninth day, the period of the separation of the sloughs.