THE WOUNDED AS WE SEE THEM AT HOME.*

BY

W. C. ALLARDICE, M.D. GLASG., F.R.C.S. EDIN.,

SURGEON, STOKES WAR HOSPITAL AND THE NORTH
STAFFORDSHIRE INFIRMARY.

THE establishment of the local war hospital has brought us in contact with a class of case we did not see in civil practice—namely, septic wounds which do not readily respond to routine treatment. The reason for this is realized when we consider the surroundings of the soldier at the time the wounds are inflicted.

The important point is that the wounded man may have to lie for a considerable time on the ground, which has been highly cultivated and is rich in all kinds of pathogenic germs. A typical example was one case which received a shrapnel wound in the foot and lay for four days in a shell hole. He had a piece of biscuit on the second day from a comrade, and on two occasions drank his own urine to quench his thirst; on the fourth night he managed to crawl to the British lines in an exhausted condition. On admission here it was found that the fibula and astragalus had been smashed by the bullet, and he had lost three toes from frostbite. The whole foot was thoroughly septic, but eventually he made a good recovery. The length of this man's exposure is exceptional, but it is quite common for patients to be wounded in the early morning and not to be brought in till the night. Under such conditions serious wounds have plenty of time to become thoroughly septic, and it is no cause for wonder that the treatment is difficult and anxious. Indeed, the condition of these wounds has led some writers to talk of the failure of antiseptics, and to draw comparisons with the state of affairs in the Crimean war.

I have heard that campaign discussed by the late Sir George Macleod, who had been surgeon to a hospital in the Crimea. As might be expected previous to Lister's teaching, the results of wounds were deplorable. Suppuration was the rule, erysipelas and hospital gangrene quite common, and secondary haemorrhage was a frequent cause of death. The lower wards in a hospital were often ventilated through the floor of the ward overhead. When acute sepsis occurred on the ground floor it was noticed that round those primitive ventilators on the next floor the wounds were specially liable to go wrong. Any wound of a joint necessitated amputation to avoid pyaemia, and amputations were planned for rapidity in the first place, flaps being but roughly fashioned, and coaptation obtained by a few strips of plaster. The object was to leave the wound freely open for the escape of the pus which was sure to form. This method is comparable to the modern guillotine amputation, which has the same end in view. Blood vessels were ligatured with waxed threads, and the ends left long to hang out of the wound. After a week had elapsed the surgeon pulled on these ends until the ligature came away. When this happened without a gush of blood the patient was considered fortunate. Secondary haemorrhage was treated by cauterizing the bleeding point and flexion of the limb or pressure on the main artery, or a temporary ligature was sometimes applied round the main artery at some distance from the bleeding point. Wounds were incised freely for drainage, and one of the best dressings was found to be the linseed meal poultice. The reason for this we now know was that the poultice was changed frequently, and the warm, moist surface applied to the wound increased the flow of lymph, inhibiting the growth of bacteria, and thus bringing the wound into a healthy condition. The poultice is the predecessor of the modern aseptic fomentation so extensively used in the present war.

Dressings were forwarded to the Crimea from this country, and consisted chiefly of old household linen scraped on one side with a sharp comb to roughen it, and thus form lint, or "charpie" as it was called. An old patient tells me that all the schools in North Staffordshire were given a week's holiday while the scholars prepared this lint and rolled other materials as bandages. Sterilization was unknown in those days, and these dressings, packed in rough sacks, were forwarded to the front, thus

adding multitudes of germs from this district to the miseries of the wounded in the Crimea.

The measure of our advance is given by comparing this method with the local modern Red Cross supply depot, where the work is done under aseptic conditions, and all dressings are sterilized before being sent out to the front.

The army diagnosis of "G.S.W." (gunshot wound) covers most of the cases we are called on to treat, and includes injuries by all kinds of modern projectile. So far as I know, very few cases of bayonet wounds have been admitted for treatment. The reason for this is that those wounds are so often immediately fatal, as the points aimed at are the eye, the throat, the chest, and the abdomen. The modern bullet, conical in shape and consisting of a lead core encased in harder metal, may become lodged in the tissues as a whole, or, splitting in pieces, it may scatter fragments of metal through the tissues. Fired at a moderate range, it may have an explosive effect—that is, after making a small entrance wound, it may shatter the tissues in all directions and make a large exit wound. Shrapnel bullets—round lead balls of varying sizes—make a larger entrance wound, but do not do so much damage internally, as their propulsive force is not so great. As might be expected, rifle bullet wounds are common in the head, shoulders, and arm, from exposure of those parts in firing from cover. Shrapnel wounds, on the other hand, are often multiple on the head and neck, for the shrapnel shell bursting in the air showers its bullets on the head of the soldier in the trench, or on his back, if he is lying in the open taking cover.

High explosive shells rely for their lethal effect on the concussion of the explosion and the scattering of irregular pieces of metal which cause severe lacerated wounds. Every soldier carries in the lining of his tunic an emergency dressing which consists of two packets each containing sterilized gauze in waterproof. That this dressing is of use is proved by the fact that when applied promptly cases may heal up practically by first intention. If the bullet has not carried infection into the wounds the pads prevent subsequent contamination.

Cases are sent as rapidly as possible to the casualty clearing station at the nearest railhead. We have had cases at the military hospital here well within two days of being wounded in Flanders. The reason for this rapid removal is the necessity of clearing hospitals in France during heavy fighting. No one can tell how many casualties are coming in, and accommodation must be kept for cases which cannot be passed on, either from the fact that operative interference is required, or that the injury is too grave to admit of removal. The maintenance of a large body of wounded with the necessary attendance in France, is, of course, a difficult matter.

On admission to hospital in this country, the one fact obvious is, that these patients are exhausted and short of sleep. Warm and comfortable in their unaccustomed beds they sleep more or less for two or three days. After a life of anxiety in the trenches comes the excitement of battle, with the shock and pain of the wound, followed by a more or less exhausting journey. Unless absolutely necessary, operative interference is best deferred until they have fully recovered from this state of exhaustion. These men, however, do well—better than could be expected from the nature of the wounds received. It has to be remembered that they were in good health on enlistment, and that their physical health has been improved by the subsequent military training. They were in the best possible condition when they reached the firing line, and despite many drawbacks they are there fed better, and their sanitary surroundings are better supervised than in almost any previous campaign. In addition to this a severe wound or the loss of a limb is unable to upset the cheerful optimism of the average British soldier of the present day. These facts, then, all tend towards good recovery when we get them safe in hospital in this country.

Wounds.

We all know that in civil practice the future of an injury, such as a scalp wound, depends almost entirely on the treatment received in the first few hours. Hence we find in war work that suitable gunshot wounds, when seen early, have their track excised and disinfected, and the wound stitched up. Many such cases heal up by first intention, thus greatly shortening convalescence. In the majority of cases this method is impossible, owing to the

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extent and severity of the wound, and the firm hold sepsis has on the tissues, before the opportunity of treatment occurs. Thus we find that a more or less lacerated wound is the type we have to treat, while either at the moment of infliction the projectile has carried germs into the depth of the wound, or from the length of exposure sepsis is well established. The bacteria have plenty of time to invade the deeper layers of the tissue of the wound before systematic treatment can be commenced. This accounts for the difficulty in treatment, for antiseptics cannot be expected to penetrate the tissues so as to kill the germs and not the tissues themselves. When the wounds of a convoy smell badly on admission, when first dressed, it is certain some of the cases are serious; high temperatures will be common, secondary haemorrhage will occur, and there may be some deaths from the severity of the septic infection. These features were marked in a convoy of wounded Australians. These big well-built men did not stand septic infection nearly so well as the average English soldier. It seemed as if another factor were at work, which may have been the change from the sunny colonial life to the damp and confined trenches. This would tend to lower their resistance to the pathogenic germs encountered there among inferior hygienic surroundings. The important part of the treatment of those wounds is to encourage free discharge and to provide free drainage. With this end in view Sir Almroth Wright's method of using salt solution is of great value. He found that 2 per cent. will begin to inhibit and 5 per cent. completely arrest the growth of pyogenic organisms. Sodium citrate is added to prevent the lymph coagulating. The practical rule is to use sodium citrate when the discharge is being confined by a dressing, and to omit it as unnecessary when washing away the pus. This is obtained by continuous irrigation by gauze wicks coming from a flask of salt solution or from rubber tubing, with the flow regulated by clips. The effect of this is to wash away all discharge as it is formed and to encourage the flow of lymph outwards through the wound. An unhealthy sloughy wound, with thin irritating discharge quickly improves. The sloughs separate, red florid granulations form, and the discharge becomes what was called in former days healthy laudable pus.

There is another method of employing this treatment. Under an anaesthetic the wound is opened freely and cleansed. It is then covered with a layer of gauze and tablets of sodium chloride inserted; these are covered with gauze and more tablets used. This is repeated until the wound is filled up, when the surface is covered with gauze and a bandage applied. The great advantage is that the wound does not require dressing for several days, thus saving the patient much pain. The discharge from these wounds smells badly, and soon soils the superficial dressing. This can be changed if necessary, but in this instance it does not mean that the wound is going wrong. The best indication for the renewal of the deeper dressing is quickening of the pulse.

The most commonly used routine dressing for superficial septic wounds is an aseptic fomentation of saline solution, or some antiseptic in weak solutions. These fomentations should be changed frequently. Wounds of the limbs improve rapidly on immersion in baths of similar solutions. Dakin's solution or some modification is most efficacious in cleaning offensive wounds.

A septic wound with a dry gauze dressing which is not frequently changed soon goes wrong. The first discharge cakes on the gauze, and the next accumulates underneath, giving rise to a smell. A patient with an extensive wound of the soft parts ought certainly to have a splint applied, as movement tends to spread deep-seated suppuration, and to cause autoinfection.

As regards drainage, when a wound is found to extend into the deeper tissues, each track must be opened up freely under an anaesthetic. This usually causes a rise of temperature from septic absorption by the freshly-cut tissues, but the temperature soon drops, and no harm is done. Drainage tubes should be of large calibre, with frequent holes cut in them. Tubes should not touch any blood vessel, owing to the risk of causing secondary haemorrhage, nor should they touch the bone in cases of compound fracture, from the additional risk of necrosis. They should not be inserted far into the joints, but only down to the capsule, as otherwise they increase the injury to the inflamed synovial membrane.

Gauze plugging tends to pen up the discharge and cause extension of suppuration in the depths of the wound. When the patient is travelling, and changes hands, it is quite easy for the plug to slip inside the wound and be overlooked at the next dressing and so act as a very septic foreign body.

Each wounded man receives a prophylactic injection of antitetanic serum before being sent home, and this largely diminishes the number of cases of tetanus. If any suspicious symptoms of this dread disease occur the prompt and repeated intraspinal injection of the serum is most important. When this is done the foot of the bed should be raised to allow of the upward spread of the serum to the cervical portion of the cord.

Gangrene may develop in a wound which is not drained properly. The freest possible incisions with the largest drainage tube and the liberal local use of oxygen may fail to arrest its spread. The guillotine amputation may offer the only hope, and this may not be feasible from the locality of the wound. Indeed, the rapid onset and quick death of a patient in a severe case of gas gangrene has to be seen to be believed.

Secondary haemorrhage occurs in septic wounds from ulceration of the blood vessels, and is prevented by the free drainage which should be provided in all cases. If plugging the wound fails to arrest the haemorrhage, or if the bleeding point cannot be secured in the wound, then the main artery should be tied at a distance. If the haemorrhage recurs, then amputation must not be delayed until the man is too weak to stand it. These points were well illustrated by one of my cases with a gunshot wound of the middle of the thigh. The wound was opened and drained on admission, and at the first haemorrhage it was again opened up and the artery secured in the wound. Haemorrhage recurred, and the common femoral was ligatured. A week afterwards there was another haemorrhage and the man was beginning to get dangerously weak and anaemic. A circular amputation was done above the original wound and the man recovered; he would have died from another haemorrhage.

Amputations.

It has been said that under war conditions a limb requiring amputation is one in which, from the nature of the injury and length of exposure, sepsis had travelled beyond the limits of the original trauma. For this reason flap amputations do badly, and the guillotine method is the best. Here there is circular division of the skin, muscle and bone at one level, thus leaving an open raw stump. In one convoy four flap amputations were admitted under my care with gangrenous flaps and sloughy wounds. Two were amputations in the middle of the humerus, and both died from acute sepsis, despite all treatment; the other two cases were flap amputations with disarticulation at the knee joint. In each of these cases the articular end of the femur was exposed, surrounded by a sloughing wound, cellulitis extended up the thigh, and in one case secondary haemorrhage occurred from the popliteal artery. In both there was a long dangerous illness before re-amputation could be done, but both eventually recovered.

The guillotine method allows the freest possible drainage from the infected limb, and this is the secret of its success. Subsequently the stump may be skin-grafted, or the tissues brought down over the end of the bone by plaster extension, but in most cases re-amputation has to be done. By this time, of course, the patient's general condition has improved, the limb is free from sepsis, and a secondary amputation is undertaken under very favourable circumstances, giving a good firm stump.

Fractures.

This war has seen the increased use of the different forms of wire splinting associated with the names of Thomas and Robert Jones. These splints are light but rigid, permit of easy access for dressing wounds, and extension is easily arranged either for the arm or the leg.

A septic compound fracture heals slowly; indeed, a long critical illness may result in saving a limb which is of little after-use to the patient. In many cases early amputation would save much suffering, and the modern efficient artificial limb be of more service than the limb which is saved.

Every effort is made to retain fragments of bone at the seat of a compound fracture, as, if necrosis can be avoided, these fragments play an important part in the subsequent union of the bone. Plating a fracture is out of the question until the wound is healed, and even then must be delayed some time until the health of the patient has improved and there is less risk of operation stirring up a quiescent local septic focus. Fragments of metal in the bone are no detriment to plating so long as they are causing no irritation. In one case of non-union of a fractured radius, with the bone freely peppered with fragments of shrapnel, the bone was plated and the shrapnel left undisturbed; the result of the operation was good.

Head Injuries.

We have had sent us several most successful cases after the prompt trephining of depressed fracture of the vault of the skull, mostly caused by gunshot wound. As we get them there is a horseshoe incision in the scalp which is nearly healed, and under this can be felt the gap left by the removal of bone. These cases have no further symptoms, and require no further surgical treatment. They are fitted with an aluminium plate, held in position by elastic bands round the head, and are then discharged from the service.

Chest Wounds.

When a bullet wound of the chest is received, the patient should at once lie down, as any further exertion or movement increases the haemorrhage to a marked degree. The danger is, a man hardly knows he is hit, and goes on until forced to give up from extreme dyspnoea, due to a large haemorrhage into the pleura. Unless there are urgent symptoms, the chest should not be tapped, as septic infection easily occurs in these cases. Prolonged rest in bed, with strapping of the affected side, and potassium iodide internally, cause the effusion to absorb satisfactorily. If pus is found in the chest, then resection of a piece of rib, with a short but large tube inserted at the lowest border of the empyema, gives good results, and recovery is excellent. One typical case was a private, who had lain for four days on a stretcher, after receiving a perforating gunshot wound of the left chest. To relieve the dyspnoea an incision had been made in the intercostal space and 50 oz. of blood-stained fluid evacuated. On admission here he was dangerously ill; his heart was displaced over the right mammary region, there was an incision at the base of the left lung discharging offensive fluid, and he had a large bed sore over the sacrum. When he had sufficiently recovered, the chest was opened and drained on the above lines. The patient soon picked up, and, when last heard of, he was back with his regiment again.

Foreign Bodies.

Small fragments of metal under the skin can be removed under a local anaesthetic, but irregular pieces may be found firmly held by the subcutaneous tissues, and are difficult to extract. Deep-seated fragments causing no trouble, are, of course, left alone, and, unless very accurately localized by the x ray, are difficult to find; any attempt to grope for such a fragment is a difficult business, very likely to fail.

Conclusion.

The war has certainly altered our ideas of the transport of the sick and wounded in this district. The admirable voluntary organizations which perform these duties are worthy of every praise, and we must see to it, in peace time, that the sick and injured of civil life shall have the same prompt and efficient ambulance facilities available, such as the soldiers now have when sent to the Stoke War Hospital.

SINCE the outbreak of the war a scheme for the manufacture of aniline products on a large scale in Italy has been under consideration with the object of freeing the industry of that country from the domination of German enterprise. The *Industria Nazionale de Anilina* has now been formed at Milan with a capital of £240,000. The initiators, Senator Luigi Della Torre and Signor Aldo Venezini, have secured the co-operation of Professor Ciamician, Senator of the Kingdom of Italy.

THE NEW DIETETIC TREATMENT OF DIABETES MELLITUS.*

By P. J. CAMMIDGE, M.D.LOND.

I do not propose to deal with the practical details of Allen's method, as they are probably familiar, but shall devote my attention chiefly to the metabolic changes produced by the treatment, and its effect on different types of diabetes. The condition to which the name diabetes is applied occurs in a variety of forms with the one symptom of glycosuria in common, but differing in other respects. This variation is even more marked when the blood, urine, and faeces from a number of cases are systematically examined. During the last few years I have had the opportunity of analysing some eight thousand specimens from over five hundred cases of diabetes, including fifty-four I have treated by Allen's method. One of the most striking results has been the frequency with which indications of chronic catarrh of the upper intestinal tract were found (71 per cent.). It can hardly be assumed that the relation is accidental or that the catarrh is a secondary phenomenon, for the history shows that symptoms of indigestion have frequently preceded the discovery of sugar by several years. Cases of this description generally respond well to "alimentary rest," but they are apt to relapse unless the intestinal condition is considered in planning the subsequent treatment.

Although one can imagine that impairment of the functions of the pancreas is responsible to some extent for the imperfect carbohydrate metabolism in these cases, and that physiological rest of the gland will therefore bring about an improvement, we should not overlook the effect of starvation on the intestine itself. It may be partly a de-intoxicating process, as Guelpa supposed, but as Lombroso has shown that the intestine yields a glycolytic agent to the blood even more readily than the pancreas, it is possible that the physiological rest may influence the production of this substance and so control the glycosuria. The analogy between the diabetes produced in animals by partial extirpation of the pancreas and in the human subject is probably not as close, in this type of case at least, as some have imagined, since, on the one hand, we are dealing with a surgical mutilation of a non-progressive character, whereas on the other we have to treat a pathological state that tends to progress, and, even when checked, to recur.

It is comparatively uncommon, in my experience, to find evidence of advanced cirrhosis of the pancreas in diabetics, but signs of some interference with the digestive functions of the gland were met with in 72 per cent. of my cases. In most of them (67 per cent.) there were also indications that the functions of the liver were being imperfectly carried out, while in 27 per cent. the hepatic disturbance was more pronounced apparently than the pancreatic. It is convenient, therefore, to recognize three types: (1) the pancreatic, (2) the hepatic, and (3) the pancreo-hepatic—a classification I find of help in prognosis and treatment.

The outlook for patients with a cirrhotic pancreas is fairly good, provided a suitable diet is adopted. I have not found that they are materially benefited by starvation, and as their digestive powers for all three classes of food-stuffs are defective it is more important to ensure adequate nourishment than to worry over the traces of sugar they generally pass.

Strictly speaking, the hepatic type does not come under the heading of diabetes, for although a reducing substance is passed in the urine it is not a sugar, but an alpha-ketonic acid, to which I have given the name pseudo-laevulose, as it is laevo-rotatory, like laevulose. Pseudo-laevulose is met with in the urine of most advanced cases of diabetes, along with dextrose, especially if the diet contains much protein, and it is from protein that it is probably formed; but it also occurs alone, and may lead to an incorrect diagnosis of diabetes. To treat such cases on orthodox lines is a waste of time and may do more harm than good. A carbohydrate-free diet only makes matters worse. Although starvation will clear the urine of "sugar," the same result may be obtained, with greater comfort to the patient, by eliminating proteins from the

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