Description of Specimen.

The specimen removed shows a large sac—even now, after shrinkage in preservative, fully 1½ in. in diameter—which projects into and distends the sterno-mastoid muscle on the one hand, and on the other comes to within a quarter of an inch from the skin surface. The portion of the aneurysm in the muscle presents a distinct sac wall, composed of the dilated coats of the vessels, while that which projects toward the skin surface has no true wall, and is occupied by a dark red thrombus.

In this case, as in the last, while there is a perfectly distinct history of wounding, no metal was found, either by x-ray examination or at the operation. The presumption is, therefore, that the penetrating fragment was a very small one, and so was overlooked. It is possible, however, that it penetrated quite beyond the area examined. The complex nature of the aneurysm will be noted, that part which projected into the sterno-mastoid muscle having a true sac wall derived from the coats of the damaged and distended vessels, while the portion which projected toward the skin was of the purely traumatic type, there being no true sac wall.

It is remarkable that this man should have suffered such grave injury to his carotid artery, internal jugular vein, and vagus nerve, and yet have complained only of headache due to the throbbing of the aneurysm. So far as he is aware, he never lost consciousness.

It is significant of the changes in methods of warfare that while the two cases reported above were caused by shrapnel, the patient in Case III was wounded by a rifle bullet.

CASE III.—Traumatic Femoral Aneurysm.

T. B., a Boer, was shot on February 8th, 1900, the bullet, presumably a Lee Metford, entering the thigh at the junction of the middle and lower thirds of the femur, in the line of the femoral artery, and coming out about 6 in. higher up, on the outside of the thigh. The wounds of entrance and exit were alike in appearance. The patient was brought to the Military Stationary Hospital, Orange River, where I was stationed as a civil surgeon, on April 8th, 1900, and placed under my care. The history given was that he had been supposed to be suffering from fracture of the femur, with great throwing out of callus, and that he had been treated by massage without effect.

On examination the whole limb was found to be oedematous, while a large swelling existed on the front and inside of the thigh, extending from above the wound of entrance to about the apex of Scarpa's triangle in front, and to 3 in. below the groin on the inside, where the swelling was most prominent. The swelling was very tense and hard in front, but it presented slight fluctuation on the inside. Pulsation of the femoral artery could be faintly but distinctly made out below Poupart's ligament, and a slight thrill was also occasionally detected over the swelling. Pulsation of the popliteal or tibial arteries could not be detected, but the oedema was quite sufficient to account for this, even had pulsation been present. The patient complained of pain and discomfort over the whole limb.

Operation.

The operation was performed on April 12th. An incision, 4 in. long, was made over the most prominent part of the swelling. Immediately the skin had been incised dark blood clot presented, while dark-coloured blood flowed from the upper end of the incision. The clot was removed in large masses, both fresh and old, some portions having become organized. About four pints of clot were removed. As the tourniquet did not entirely control the bleeding and it was impossible to determine the bleeding point within the sac, the superficial femoral was ligatured through a fresh incision, and then the remainder of the clot was turned out and the cavity packed with iodoform gauze.

After-History.

The patient was collapsed after the operation, but quickly responded to restoratives. The oedema had very markedly decreased by next day, and on the day following had almost disappeared. The patient made an uninterrupted recovery, the temperature never rising much above normal.

The aneurysm in this case was of the regular traumatic type, in which, the vessel having been wounded—and extensively wounded—the blood is poured into the surrounding tissues, which are stretched and compressed thereby. There was, therefore, no true sac wall, the blood being confined by the compressed surrounding tissues and by blood clot. The diagnosis of fracture, with great effusion of callus, made in another hospital should not be lightly set aside as ridiculous, since the hard nature of the swelling, its slow increase in size, and the entire absence of pulsation might easily mislead.

THE Governor reports that in the two weeks ending September 9th, 7 cases of plague occurred in Mauritius, with 2 deaths.

THE TREATMENT OF WOUNDS IN WAR.

BY

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A YEAR after the beginning of the present European war all surgeons who have had experience of recent military surgery agree that our preconceived notions on the subject require considerable modification. Since the war began I have worked in an Indian General Hospital, seeing and treating every variety of injury produced in modern warfare. The purpose of this paper is to call attention to the importance of certain methods of treatment and to describe some modifications of practice which, in my hands, have given very gratifying results after unusually short convalescence.

With the exception of some perforating wounds of soft parts, practically all wounds met with are septic, the majority suppurating freely. The kind of wound to which I particularly wish to draw attention is the large lacerated wound of soft parts with considerable loss of skin, often accompanied by compound comminuted fracture of the long bones—for example, the so-called explosive exit type. This is the type of injury which causes the most permanent disability, the subsequent usefulness of the limb depending very largely on the nature of the treatment adopted.

All surgeons are agreed on the desirability of procuring free drainage at the earliest possible opportunity. To attain this end the entrance wound is enlarged if necessary, and a rubber drainage tube passed along the track of the wound. Free drainage is then taken for granted, although the object of the tube is only too often defeated by placing a thick pad of dressing, such as gauze or cotton-wool, over the wound. What happens is that at first the discharge flows freely into the dressing, but the discharge is of a viscid character, and capillary attraction soon fails to make the fluid permeate into the dressing as fast as it is exuded from the wound. In a short time, varying according to the amount of the discharge, drainage comes to a standstill. Pus accumulates in the wound behind the tube, dammed back by a sodden, practically impermeable, mass of dressing, and the surgeon, on removing the latter, is greeted with a flood of pus, a most disappointing and disconcerting end to an honest effort to secure free drainage.

If further proof be required, take a dressing partially soaked in pus and run a gentle stream of water over it. It will be seen that where the dressing is covered with pus the water runs over it as over the back of a duck, and with an equal amount of penetration in either case. If water behaves like this, what of viscid pus? Of course, in time a certain amount of pressure will arise behind the pus, but let us hope, for the sake of the patient, that this seldom amounts to anything appreciable. To get over this difficulty, I have for some time treated these cases without anything in the way of dressings in contact with the wound; the method adopted is as follows:

A piece of perforated zinc sheeting is bent, so as to form an arch of suitable size over the wound. Some wool is arranged to absorb any discharge after it has left the wound. The zinc sheeting arch is fixed in position by a bandage at its extremities only, and covered with two thicknesses of gauze. The wound is now inside a little chamber, open freely to the air; there is nothing to hinder the exit of discharge, and it is protected from flies or dust by the gauze, which acts as an efficient filter. The free access of oxygen seems to be of distinct benefit, and of greater value than the occasional application of hydrogen peroxide, though there is no reason why this should not be used as well. In the case of a limb it is at times of great help to sling the limb by flannel strips to a Balkan splint, the discharge dripping into a mass of cotton-wool placed on a mackintosh sheet on the bed beneath.

As to the results obtained, at the end of forty-eight hours the discharge diminishes to an extraordinary extent. At the end of a week or ten days there is only a scanty, thin, sero-purulent discharge, which continues until the wound heals completely. From the commencement the wound should be irrigated from time to time with saline—either normal or hypertonic, or some weak antiseptic lotion. In severe cases continuous irrigation may be called for.

The position of the drainage tube is, of course, very important. The tube and patient must be so arranged that the uttermost recesses of the wound are reached, and that full advantage of gravity is taken to assist the flow of discharge towards the mouth of the wound. Sometimes this ideal state cannot be reached, but much can be done by care and experiment. A mistake frequently made is to drain a wound with a tube, and although the tube is not carrying off all discharge by the action of gravity alone, to imagine that free drainage has been attained by the insertion of such a tube. If the drainage is not perfect it is soon manifest; if a wound so treated continues to discharge freely after three or four days, then there is only one cause for it—namely, a foreign body; for example, a large slough, dead bone, pieces of shell or portions of clothing, etc. The wound should be explored and the cause removed.

As to the lotion employed, Sir A. Wright's arguments seem convincing; it really makes no material difference whether a sterile or a weak antiseptic solution be employed; the irrigation depends for its good effects entirely on the mechanical action of lavage of the surfaces, and its antiseptic action only affects those micro-organisms present in the pus, leaving those in the walls of the wound unaffected.

Secondary Suture of Septic Wounds.

Until recently it was thought that nothing could be more fatal than to sew up a wound in the slightest degree septic. Practical experience has shown that this is far from being so. Once a wound has been brought by the

Fig. 1.—Wound of thigh. Leg slung to Balkan splint. Wound, without dressing, allowed to drain into dressing in bed. A, Beam of Balkan splint; B, flannel strips slinging leg; C, perforated zinc; D, rubber drainage tube; E, one layer of gauze over perforated zinc; F, cotton-wool to receive discharges from wound.

treatment above described to a suitable condition, secondary suture will give almost the same union as that of an aseptic incision.

For secondary suture of septic wounds, the following conditions are necessary:

1. Absence of any foreign body. If there be a compound fracture, the discharge must be almost purely serous, which will not obtain as long as any dead bone is present.

2. The wound should be of such a nature that healing by granulation would be a lengthy process.

These conditions are generally present, in a wound treated in the method above described, in from five to ten days, according to the nature of the wound. The operation is performed under an anaesthetic. The lacerated muscle is united by deep sutures of strong catgut inserted mattress fashion. If the loss of skin is great, free undercutting must be resorted to, and the edges brought together by coarse silk-worm-gut mattress sutures. It is important to use mattress sutures of coarse gut, as they often have to be left in for ten days or more. Fine gut inserted in the ordinary way will cut out at the end of eight or nine days. Before the sutures are applied, the wound must be thoroughly cleansed by gentle swabbing out with ether, followed by rectified spirit. Any tendon or fascia seen lying loose in the wound should be clipped away, as it is a most frequent source of long-continued suppuration. The skin sutures are removed as soon as union is certain,

namely, about the tenth to the fifteenth day. No drainage is employed. The deep sutures are absorbed.

Skin-Grafting.

When the skin edges cannot be brought together by undercutting, without undue tension, skin-grafting should conclude the operation. By the following method a wound, however large, can be completely covered in and healed after eight days. The subsequent scar is soft and flexible, leaves scarcely any deformity, and is freely movable on the subjacent tissues. Healing by granulation, on the other hand, often means (1) very slow healing—perhaps two to four months; (2) a deep, puckered, unsightly scar; (3) adhesions of the cicatrix to the underlying muscles and tendons, causing deformity and disability of the limb. The technique is as follows: The surface from which the grafts are to be taken is prepared the previous day. The front of the thigh is a suitable spot. It is first washed with soap and water and shaved. It is then thoroughly rubbed over with ether followed by rectified spirit. A sterile dressing is then put on.

The operation is commenced by thoroughly cleansing the wound by sponging with ether followed by rectified spirit, special attention being paid to the edges of the skin, all sodden epithelium being removed. The surrounding skin is painted with tincture of iodine, care being taken that this does not reach the wound. The graft site is then exposed and once more cleaned with ether and alcohol. The grafts are then cut from the dry skin with an ordinary sharp razor, the size varying somewhat with the extent of the surface to be covered, an average graft

Fig. 2.—Wound of forearm. Perforated zinc shield in position for skin-grafting. Z, Shield alone showing shape adapted to arm; U, ulcer; G, one layer of gauze; B, bandage, fixing ends of perforated zinc.

being about 1 sq. in. The graft should be about the thickness of stout brown paper. The surface from which the graft has been removed should appear dead white with numerous freely bleeding points all over it. The graft is immediately placed on the raw surface of the wound and spread out with a couple of probes. This is repeated until the whole area has been covered in. Finally, gentle pressure is exerted with a dry swab to get rid of any air bubbles or blood between the grafts and the wound and to ensure accurate contact in all places. No dressing is placed on the grafts, but the site is protected, as is also that from which the grafts have been taken, by a piece of perforated zinc sheeting, just as above described for the treatment of septic wounds. There is no need to scrape the granulations or to cause bleeding by rough handling. Provided that there is no active inflammation, slight suppuration is no contraindication, the pus escaping between the grafts.

On the second day the grafts are unchanged in appearance, except that a little pus or serum may appear between them and they are a little swollen. To the touch they can be felt quite firmly in position and adherent to the underlying granulations. By the eighth day the wound is completely healed up, all the grafts having invariably "taken," and each graft being united to its neighbours and to contiguous margins of the wound.

As to the source from which the grafts were taken, a scab forms under which the epithelium is regenerated. This scab falls off about the twentieth to the twenty-fifth

day. A general anaesthetic is usually required to graft any area larger than a five-shilling piece, but for smaller areas I have used local anaesthesia with success.

Summary.

To sum up, I am of opinion that the above described treatment for septic cases has the following advantages:

1. Simplicity.
2. A saving of expense by cutting down dressings to a minimum.
3. Better results than those obtained by other methods.
4. Ununited fractures tend to unite rapidly when once the superficial wound is healed.
5. A very much shorter convalescence for the patient.

In conclusion I may say that the substance of this paper is based on the treatment of many cases which have remained from start to finish under my own personal care.

ON THE RECRUDESCENCE OF LOCAL SEPSIS IN COMPLETELY HEALED WOUNDS

AS THE RESULT OF SOME SURGICAL INTERFERENCE OR PASSIVE MOVEMENT.

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THERE are reasons for thinking that cases are occurring in the military hospitals in the country in which some slight surgical interference—for instance, an incision for the removal of a piece of shrapnel under strict antiseptic conditions—has relighted a violent local reaction in the neighbourhood of a recently healed wound. Further, I have records of several cases under different surgeons in which, after all incisions and sinuses round a compound fracture involving the elbow or hip or other joint had completely healed, even such a simple procedure as passive movement of the joint under an anaesthetic has lighted up quite a violent reaction, the reappearance of the old sepsis, and the formation of local abscesses, although no incision was made nor any solution of skin surface produced.

Struck by the frequent absence in many cases of guiding signs, either local in the condition of the tissues, or general in the condition of the patient, which can be relied on as accurate indications that the original septic process has quite died down, and that all pathogenic organisms in the neighbourhood of the fracture and along the track of the wound have been completely killed off in any given case, we have lately tested this point in some cases by dropping the piece of shrapnel or the fragment of bone removed at the time of operation directly into a culture tube, and I hope to record these results on a subsequent occasion. I wish now, however, to express the opinion that if observations on these lines were carried out by surgeons on an extended scale as a routine procedure, valuable information would probably be obtained on some points in the life-histories of pathogenic organisms in their relation to the body tissues which are now obscure. For instance, we want to know more about the conditions under which pyogenic organisms can dig themselves into the tissues and remain quiescent in sheltered situations without causing any local or general symptoms and without losing their virulence, just as the malaria organism is supposed to bury itself in the bone marrow or the tubercle bacillus to become encapsulated in a lymph gland.

To what extent is the capacity of such organisms to remain alive and virulent the result of the formation of the barrier of fibrous or granulation tissue which surrounds them, or is it aided by the concomitant presence of a foreign body or some devitalized piece of tissue—for example, a fragment of bone—within the uneven surfaces of which the cocci can more readily defend themselves against phagocytic action?

Is the time interval of essential importance, and, if so, how long after the complete healing of a wound under ordinary conditions may we suppose that the cocci or

bacteria which caused the original sepsis can retain their virulence and their capacity for renewed activity?

How does the surgical interference, the incision, or the passive movement under an anaesthetic bring about the renewed activity of the organisms and the reappearance of the local sepsis? For it is quite clear that this result is due to the lighting up of the activity of organisms already present in the tissues, and not to the introduction of a fresh infection. The fact that passive movement without skin incision can bring about the result is conclusive evidence on this point.

Does the fresh mechanical injury operate by breaking through encapsulating barriers of tissue cells or by lacerating capillaries or lymphatics plugged with the cocci or their spores? Such suggestions seem only partially adequate to explain what happens. For, although the injury may set free the organisms, it also causes a refushing of the local area with blood serum, and this might be expected to inhibit the growth of any organisms liberated amongst tissues which have themselves recently experienced and recently recovered from infection, and which should therefore have acquired some degree of immunity against subsequent attack.

The routine examination of the cultural characters of the reactivated organisms and a comparison between these and the characters of the original infection would probably throw light on this problem.

Meanwhile, some highly practical questions also arise. It would, for instance, seem desirable to allow a longer interval of time to elapse after the sound healing of a wound before undertaking any renewed surgical interference in some cases than in others, and at present we do not know how to distinguish the cases in which the longer interval is necessary. Some guidance can be derived from a previous bacteriological examination of the serous fluid withdrawn by a needle from a joint or cavity in the neighbourhood of which the foreign body lies embedded. Thus, in the case of a piece of shrapnel embedded in the cartilage of the outer condyle of the femur and removed from the knee-joint of a soldier at the Leicester Royal Infirmary two months after the healing of the wound, a few cubic centimetres of the serous effusion aspirated from the joint some days before operation proved to be sterile. In this case the piece of metal removed from the cavity in the bone and dropped direct into a cultural tube failed to give any growth of organisms.

In this case also previous attempts to use the joint had brought on considerable effusions on repeated occasions, but these were evidently due to the mechanical effect of the foreign body, which projected slightly into the joint cavity, and not to infection.

Some indication that danger of renewed sepsis does exist may also, I think, be gained at the time of operation from a close scrutiny of the condition of the tissues immediately surrounding the foreign body. If, on cutting down, the piece of metal is found in a distinct cavity, which also perhaps contains some grumous fluid, then it is probably wise to take steps to sterilize the cavity and to drain, instead of completely closing the possibly reinfected wound.

In conclusion, I should like to add that the renewed septic process which I am here describing is no mere slight reaction, or swelling or effusion which subsides with rest and time. It represents a violent reaction on the part of the tissues against a renewed virulent infection. It ends in local suppuration, and in some cases has been sufficiently serious to threaten the limb or even the life of the patient.

FROM statistics published by our Italian contemporary, the *Avvenire Sanitario*, it appears that in the whole of France there were before the war some twenty thousand practitioners. Paris alone had more than three thousand; next came Lyons, Nice, Dijon, Marseilles, and Montpellier. Of the Parisian doctors, five or six earned from £8,000 to £12,000 a year; ten or fifteen from £4,000 to £6,000, while eight hundred earned £400 to £600, and twelve hundred about £320. The rest averaged £160. Of the practitioners in the rest of France, only seven thousand earned professional incomes of more than £280. The others eked out a living by other means, including politics. As French parliamentarians are paid £600 a year, it is not surprising that so many doctors in France take to politics. The present Chamber of Deputies has about eighty medical members.