impossible to irrigate or even dress without moving the thigh if so treated. For these, because immobilization is as important in clearing up the infection as in securing bony union, greater security is demanded. The most difficult form of treatment is often, in this fracture, the most satisfactory in the end; thus the fenestrated plaster-of-Paris spica is recommended. Such a cast, if carefully applied during strong extension and abduction of the leg, if reaching from the nipple to the toes of the injured side, will assure perfect rest and ample opportunity for cleansing the wound by irrigation or the syringe. In such plaster splint the bed-pan may be used and the patient transported any distance in comparative comfort. Plaster-of-Paris will help to save both life and limb, but it must be properly applied by one who is willing to remove it if necessary, thus sacrificing hours of labour if there is any suggestion that some unknown change or affection is taking place underneath the plaster.

In treating fractures of the middle and lower third of the femur, whilst one may in certain cases prefer the use of plaster-of-Paris, the Thomas knee splint is usually a most efficient form of fixation. With this not only may extension and fixation be secured, but the latter may be rendered doubly sure by the coincident use of one of many forms of splints or splinting.

Compound Fractures Implicating and Injuries Penetrating the Knee-joint.

In dealing with injuries to the knee-joint it must be realized that they present one of the most serious problems of surgery. If this joint is penetrated by infective material, and especially if, added to this, there is an injury to either of the great bones forming the joint, life is endangered. Thus treatment of such wounds demands the greatest care. We should here, whilst endeavouring to save the joint, always bear in mind the fact that it is easier to save the limb than the joint. Nearly all serious injuries to the knee-joint are followed by limitation of movement if not by ankylosis. This latter causes the greatest inconvenience. We may well, then, consider whether it is worth while attempting to save a leg in which ankylosis at the knee is the best we can hope for when this attempt to save is made at the risk of the patient's life, and when we know that amputation in the lower third of the femur allows of the use of an artificial limb with a knee-joint far superior to a natural, though ankylosed, knee.

The danger of suppuration in the knee seems to lie mainly in two things—first, the difficulty of drainage, and secondly, the liability of the infection to spread into the synovial pouches and about the intermuscular septa both in the thigh and in the leg. From a mechanical point of view, then, the head of the bed should be elevated in all such cases, in order to minimize the possibility of the spreading of the infection into the thigh, which often means the loss of our means of retreat by amputation through the lower third of the femur in patients in whom our conservative position of watchful waiting has become plainly untenable.

Because of the anatomical conformation of the joint, surrounded as it is by muscle and tendon, and formed by the close apposition of two of the largest bony surfaces of the human frame, drainage depends on the position in which bony apposition is least marked and gravity counts most; thus the outer side of the joint is the position of choice for drainage, and the flexed and strongly abducted and everted position of the thigh and knee is the best attitude of this member during any attempt made to save an infected knee-joint. Other means there are of draining this joint, but my firm belief that an artificial leg, as already suggested, is often better than an ankylosed knee impels me to refrain from describing methods which are indicated only in cases of such gravity that an immovable knee is the best result possible.

Compound Comminuted Fractures below the Knee.

Such fractures can be treated with drainage and almost any form of splint; that used by Mr. Robert Jones of Liverpool—the thin sheet-iron splint covered with boiler-felt—is as good as any, but here again my personal predilection is for plaster-of-Paris.

Compound infected fractures of the ankle can be treated by a variety of splints of a right angle in form. If the astragalus is fractured it is best to excise it.

Compound fractures of the tarsal and metatarsal bones are treated in much the same way as similar conditions of the bones forming the ankle-joint. Here conservative surgery again is the most profitable. The injury to a foot must be indeed severe before we are forced to amputate it, and it is only when our line of retreat—in this case a possible amputation through the lower third of the leg—is threatened that we are forced to consider the loss of the foot, provided always life itself is not threatened.

Wounds of the Thorax.

In attending patients with wounds of the thorax we should be willing to "wait and see," interfering only when called upon by the advent of untoward symptoms or conditions.

Wounds of the Abdomen.

For obvious reasons these rarely have to be dealt with on the lines of communication, but in these conservatism should be our motto. Of the few cases we have seen, those in which no operation was performed did best. The hospital nearest the front is the proper place for the treatment of these, and if patients suffering from abdominal injuries are carried there early enough, operations entirely inadvisable in our hospitals further from the firing line can be successfully performed.

In closing this memorandum, based principally on the work of my section in this hospital on the lines of communication, I would accentuate the fact that not only my experience but the experience of others has forged my credo of conservatism as the motto of war surgery.

WORK AT A BASE HOSPITAL.

IMPRESSIONS AFTER SIX MONTHS AS A SURGICAL SPECIALIST.

By W. RANKIN, M.A., M.B., CH.B.,

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Six months spent as a surgical specialist at a base hospital teach one many things—above all, patience. While the variety of cases is infinite in the way of injuries to particular structures, the curious sites from which shrapnel is removed, etc., yet the actual types of operations done are limited, and to one who has had a large experience of emergency work in a busy city such as Glasgow the class of work presents little new or difficult.

Far too little credit has been given to the astonishing healing powers of the fighting man, who, up to the moment of his wounding, is in a state of health much above that of the usual hospital patient, as the result of his open-air life and abundant diet. When this is properly appreciated less will be said about the results of wonderful new antiseptics, and of methods which make the antiseptic era a back number, and of vaccines, etc. Nearly all the cases are septic, and if the work is to be done efficiently, expeditiously, and at a moderate cost, I believe it can best be with a technique in which antiseptics play a large part. A rigorous aseptic technique is a farce in such a type of work, is needlessly expensive, and will not, in my opinion, stand the test of twenty serious operations, packed into twenty-four hours.

Most of my actual operating was done with the assistance of my theatre sister only, though when I required further help I always had willing and able assistants. The procedure in an ordinary case of shrapnel embedded in muscle was as follows: The dressing gowns and towels had been sterilized by steam. The gloves and instruments were boiled, the lotion basin and trays were boiled or flamed out. The gloves were used wet out of sterile water. I scrubbed my hands with soap and water, soaked them for a short time in 1 in 40 carbolic lotion, drew on a pair of gloves, redipped my hands in the lotion basin, and when I had my gown put on I was prepared to start whenever the anaesthetist signified that the patient was ready. I prepared the skin with iodine and fixed the necessary towels with clips. I used the best probe in the world, an index finger, which becomes marvellously educated in seeking out the track of a foreign body through the tissues. I located the piece of shrapnel and removed it with a pair of forceps. I then swabbed out the

track with methylated spirits, made whatever incisions I considered necessary for the relief of the cellulitis, and packed the wound with gauze wrung out of spirits. A dry dressing was then applied and kept in position by strapping or any form of bandage which suited the part best. After the operation I scrubbed the gloves in a special basin, took them off and put them in the sterilizer, where they were reboiled, as was every brush that had been in use. After they had been boiled and put into their proper basins, the instruments went into the sterilizer. I did not change my gown unless it was visibly soiled. I did not wear long-sleeved gowns. The hand-basins which held the carbolic lotion were swilled out, wiped clean of any blood stains, and refilled with lotion. By the time the next patient was under the anaesthetic I was again prepared to begin. This technique was simple: each step was well defined; a brush was boiled, placed in a dish, picked out and used; put after use into a second dish, from this was placed in the sterilizer, and then became ready again for use. Nothing but carelessness could produce a hitch, and it meant a minimum of work to the staff who had lots to do when the rush came. I only lost one case from cellulitis or gas gangrene; in it a piece of shrapnel had tunnelled its way from the thigh to the retroperitoneal space over the brim of the pelvis, and efficient drainage was established too late. It was not always possible to arrange the cases in the degree of their infectivity, but so far as I could judge no case became septic or more septic as the result of coming after a particularly foul case.

Excision of wounds and any perfectly clean case I had satisfied me that my simple routine was quite efficient and therefore, for the type of work, sufficient. The rapidity of healing and the good results made me very slow to change my methods, though there were a few cases in which a variation to some other antiseptic or dressing did benefit. For the most part, carbolic lotion, iodine, and methylated spirits gave most satisfactory results.

Where I failed to find the foreign body I availed myself of the help of x-ray plates. I did not then succeed in every case, but the proportion missed was small.

The incisions I made were always free and were packed with gauze. I did not often use drainage tubing, and never when a vessel of any size was near the track of the wound. In the cases which came from the front with tubing inserted, the track left after its removal was so foul that I avoided its further use. I had no case of secondary haemorrhage of any importance; in the one case which recurred it was easily controlled, and for this happy freedom from an awkward complication I give credit to the free incisions and the gauze packing.

I early recognized that a superficial bullet or shrapnel graze is of the nature of a burn, and that if these apparently trivial wounds are not completely excised, they will remain unhealed for many weeks or months. All such wounds, as well as many other large and small superficial wounds and gutter and tunnelling wounds, were excised without delay. In some cases of wounds of the thigh and the chest wall the wounds after excision were over 12 in. long and had involved muscle. All the big wounds and nearly all the small healed without a stitch abscess, and the excision saved many weeks of painful dressing. At first I used to wash the wounds and mop them with spirit; afterwards I used Colonel Gray's simpler technique—painting the wound and the skin around with a 10 per cent. solution of iodine in rectified spirit before the excision. The excisions which did worst were those over the shin bone.

The line of excision should be in the course of the superficial nerves, not across them. There should be no tension in the sutured wound. Excision should not be performed when there is clear evidence of acute cellulitis round the wound. Multiple punctures and dressing for a few days will allow this to subside, and then excision can safely be performed. Fomentations make the worst possible preliminary dressing, as they cause the area to be soaked in pus.

In every case of scalp wound which came to hospital the wound was excised and the skull beneath examined. The whole scalp should be shaved, since neglect to do this leads to delay and trouble in the theatre, for often it is the unexpected case that has the depressed fracture. No man can by means of a probe correctly diagnose the

extent and seriousness of the scalp wounds made in modern warfare; the wound must be excised, and the condition of the exposed bone examined with the finger and the eye. In this way one learns the number of cases which have fissured and depressed fractures and appreciates why such patients may have headache and other symptoms afterwards. To draft a man with a healed or healing scalp wound to the convalescent camp without having exposed the bone and examined it properly is to court a disaster sooner or later.

The elevation of depressed fractures, the trephining out of small discs where a fracture of the inner plate was suspected, and the evacuation of superficial brain abscesses were common operations; the results were good. Where there was a perforating brain lesion, deep penetration by shrapnel or a bullet, and hernia cerebri, the foreign body was removed when this could be done without danger to life; the further treatment was to apply compresses of alcohol to the exposed brain, but the majority of these patients died. I worked on two principles: (1) to make the skull opening no larger than was really necessary, and (2) to try and do at the first operation all I thought possible for the patient in the way of exploration.

Of the few amputations I did nearly all were partial amputations of hands and of fingers; one amputation only of the foot was done—after astragalectomy had failed to get rid of the infection. I had many cases of infected injuries, to the knee and elbow joints especially, and of compound fractures into these joints, which could have been saved a long convalescence by an early amputation, but free incisions, dressings under anaesthetics, and patience, both on my part and on that of the patients, enabled me to send them home with their limbs in a most satisfactory condition, some with the joints excised, and all glad that they had "stuck it" and happy in the possession of the limb. A run of cases may occur in which primary amputation is clearly indicated, but experience shows that by patience limbs can be saved which lack of judgement would have sacrificed. The surgeon should always consider the question from the point of view of the patient—say two years hence.

For fracture cases I followed the simple methods described in my handbook,¹ and with a good supply on hand of Gooch's splints, of Middeldorp's triangles, and a few long osteotomy and half box splints I was never at a loss to get a patient into a state of comfort. Middeldorp's triangle can be best fitted by means of short slings in place of ties and bandages; this plan was a boon in the cases of compound fractures when the splint required to be readjusted at the dressings. The use of these simple splints properly applied further up the line would save much distress during the train journey. Synovitis of the knee is very frequent, and I was at a loss at first to pick out the cases which would probably do well enough not to be sent home. Latterly I explored all with a fine needle on a good syringe, and in many cases, which gave no history of traumatism, I found the effusion to be blood-stained. These cases were transferred home, whilst the others, with clear effusion and no history suggestive of a loose cartilage or any other derangement, were treated by rest in bed, a Scott's dressing, and a posterior splint from the fold of the buttock to the heel. They usually made a good and rapid recovery, though I have no knowledge of their after-progress.

Many cases of painful and ingrowing toenail were sent to the base. The treatment was avulsion with, when necessary, a Mayo operation. The after-dressing is most important; it should be by a piece of gauze soaked in a 1 per cent. solution of picric acid, and applied moist over the raw surface. It was not removed for five or six days, and then the bed of the nail was invariably found to be healed and hard, so that the patient could be sent to the convalescent camp shortly afterwards.

Some apply wet dressing even after small operations, such as the extraction of a bullet lying superficially. By the time these cases arrived at the base the dressings were simply reeking pus poultices. Useful in a few selected cases no doubt, this form of dressing is absolutely unsuitable as a routine dressing.

The surgeon cannot detach himself from all responsibility for the anaesthetic, but he ought to be relieved as far as possible by being provided with a congenial colleague already an experienced anaesthetist. When a big rush of

work comes the anaesthetist is of more importance than the anaesthetic. Though open ether is my anaesthetic for choice, most of my colleagues had had the training in the giving of chloroform. To all of them I wish to express my thanks for help in many a long day's work. The use of nitrous oxide gas for short and painful dressings proved a great boon. Local anaesthetics and spinal anaesthetics were made use of in selected cases, but neither method is suitable when the staff is small and many cases waiting.

REFERENCE.

¹ *The Elements of Bandaging and the Treatment of Fractures and Dislocations.* London: H. Frowde, and Hodder and Stoughton. 1913.

ULCERO-MEMBRANOUS STOMATITIS AND GINGIVITIS AMONG TROOPS ON ACTIVE SERVICE.*

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DURING the last few months my attention has been drawn to a freely communicable disease, which, while of a minor nature in so far as it rarely has a fatal issue, is nevertheless of serious import in that it very materially lowers the health and effectiveness of those attacked. I have found it widely prevalent among our troops, more particularly among men returned from the front. Without going into full details, I would here call attention to the symptomatology of the condition, its apparent causation, and what, in my hands, has proved a simple and rapid method of cure. I may state that these observations are based upon the study of more than 100 cases.

Symptoms.

Considerable attention has been given for some years past to pyorrhoea alveolaris, a condition in which small pockets of pus form between the tooth and the gum, so that pressure upon the gum just below where this abuts upon the tooth leads to the discharge of a drop of pus. American observers have shown that this condition is frequently associated with the presence in the pus infiltrating the tissues at the base of the pus pocket of amoebae, somewhat resembling those found in amoebic dysentery, and, like those organisms, acted on specifically by emetine, as demonstrated by Bass. Frequently pyorrhoea alveolaris can be cured by the exhibition of this drug; but not all cases of so-called pyorrhoea alveolaris show themselves equally affected by this treatment.

An examination of cases coming both from the front and from troops in the Shorncliffe area shows that in cases of this condition, both those presenting the amoebae and others in which they could not be found, the most striking feature revealed upon the examination of the smears made from the pus is the presence of what are known as Vincent's organisms in large, not to say preponderating, numbers.

Further study has shown that these same organisms are present in what appear to be excessive numbers in a spreading affection of the gums and the tonsils, which cannot be included under the term "pyorrhoea." Thus, upon the gums (particularly around the last molars), the tongue, mucous surface of the cheeks, and the tonsils (which are most frequently affected), ulcers are to be found. The ulcers tend to spread laterally, save in the tonsils, where they burrow deeply into the tissues. They are covered by a white, friable membrane easily removed, and then leaving a bleeding surface beneath. This membrane is different from that found in diphtheria, which is tough and easily comes away intact. The lesions may suggest syphilis, and indeed Vincent's angina† may be superimposed upon a syphilitic infection of the mouth and throat; but in uncomplicated cases of the condition the Wassermann reaction has always been found negative.

The condition of the mouth in advanced cases strongly suggests scurvy. The gums bleed easily, are injected, retracted from the teeth, and spongy-looking. The teeth

are apt to become loose, and are often tender when tapped by a metallic instrument. In many cases they have become so tender that none but the softest of food can be masticated, and for weeks the men are unable to take the ordinary rations; as a consequence they become seriously run down. The breath becomes extremely fetid, and the patients complain of a foul taste.

There is always more or less glandular enlargement, the submaxillary and sublingual glands being most often affected. Although several authorities speak of a rise of temperature to 105° or higher, in the cases thus far examined from the British troops the temperature has varied between the normal and 102° F. at the highest. Accompanying this constitutional disturbance is lassitude and lack of "go." The most serious constitutional symptom, and one always present when the teeth and gums are affected, is severe depression.

What may be regarded as the acute malignant form of this disease is seen in noma, in which the necrotic tissue shows a dense massing of these organisms of Vincent.

We thus have the following conditions found associated with the presence of masses of the organisms in question:

1. Some (complicated) cases of pyorrhoea alveolaris.
2. Membranous stomatitis and tonsillitis.
3. Noma.

The term "Vincent's angina," in England at least, is generally understood to refer to a particular form of tonsillitis. Ulcero-membranous stomatitis appears thus to be the more satisfactory designation, unless we speak of "Vincent's disease."

The condition is clearly communicable. In our series of cases several were traced to a dentist who had treated a severe gingivitis for pyorrhoea, and the same day also the mouths of three other men; all three had contracted the disease, and were shown by stained smears to be infected with Vincent's organisms. In another case, while the disease had been unknown in two successive battalions that had occupied certain quarters in France, a third battalion using these quarters exhibited no less than 50 cases of the condition. The close association of troops either in camp or in the trenches, and using the same utensils, appears to favour the spread of the condition.

Vincent's Organisms, *Bacillus fusiformis*, and *Spirochaetes*.

If in these cases, by means of a sterile swab, a small portion of membrane or exudate is removed from the mouth and rubbed up in a little warm 0.85 per cent. saline solution on a slide, an examination with a dark-ground illuminator shows in all instances the presence both of spirochaetes and of characteristic fusiform bacilli. Both forms are motile; the fusiform bacillus passes backwards and forwards with a tumbling motion, and not steadily as is the case with the flagellate bacilli, such as *B. typhosus* and *B. coli*. If smears be made and stained, the clearest picture of these organisms is given by Giemsa's stain. Successful results are obtained with plain methylene blue or Loeffler's solution, which show the fusiform bacillus and the spirochaetes distinctly. The bacilli are not stained evenly, but are usually barred, with an occasional granule deeply stained situated anywhere in the organism. The bacillary forms are from 12 to 15 μ long, and vary in width from 1 to 5 μ . The spirochaetes are very slender and delicate organisms. The number of convolutions varies from 5 to 12, the usual number is 9. No membrane can be seen. In stained smears these spirochaetes have no definite relation to the fusiform bacilli present in the same specimen; they are found sometimes in large bundles, sometimes singly.

This Vincent's spirochaete can usually be distinguished from *Spirochaeta dentium*, which has commonly no more than five convolutions, and from the *Treponema pallidum* of syphilis, which has between five and twenty-five, and also stains faintly and with difficulty. *Spirochaeta refringens* (a form not uncommon in the mouth) is much coarser and has broad sections.

The organism has been cultivated by Tunncliffe, who states that she was able to obtain distinct transition from the bacillary to the spirochaetal form. We have obtained cultures by taking some of the exudate upon a sterile swab and rubbing this up with hydrocele or ascitic fluid, and inoculating the emulsion into a deep tube of peptone broth,

* The fuller paper, of which this is an abstract, will appear in the *Proceedings of the Royal Society of Medicine, Medical Section*.

† So called after Vincent, the French bacteriologist, who clearly laid down (in 1898 and 1905) the relation between these organisms and ulcero-membranous tonsillitis and stomatitis.