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Modern Small-Bore Rifle Wounds

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The law by which the employment of unqualified assistants has been made illegal has naturally raised the demand for qualified medical men, and the numerous openings, official and otherwise, in the Colonies have further drained the supply. The introduction of the five years' curriculum, with the consequent increase in the expense of education, must also influence the rate of income required to attract good candidates. This is not a point on which I can speak with authority, but it is well worthy of consideration.

In conclusion, I consider the chief points necessary to place the R.A.M.C. on a proper footing and secure a good class of candidates are: (1) Increase of pay at home and in the colonies. (2) The pay in India to be brought up to the level of combatant officers at least. (3) The strength of the R.A.M.C. to be increased to at least 1,000 executive officers with the formation of an adequate reserve. (4) The reappointment of medical officers to militia regiments. (5) The extension of military titles to militia and volunteer medical officers. (6) A guarantee of a fair amount of leave for study and also for recreation. (7) Surgeon-generals should be granted the title of major-general, and be graded with the rest of the general officers of the army. (8) The proper recognition of major-generals and colonels on the staff of the army and on the staff of the general officers commanding districts. (9) A more equitable distribution of honours and rewards.

Surgeon-General O'DWYER, P.M.O., Aldershot, advocated the desirability of the P.M.O. on active service being on the staff of the General Commanding-in-Chief in order that he might be enabled to administer his department under the most favourable circumstances. He also advocated that this P.M.O. should have executive powers *re* sanitary matters, and instanced many advantages which would result if it were so; he remarked that there were not many Generals who now sanctioned this.

Surgeon-Major CAVERHILL, M.B. (Lothians and Berwickshire Yeomanry) considered that the authorities would have great difficulty in getting suitable candidates for the R.A.M.C. in the future. First, there were fewer entrants to the medical profession owing to the greater expense attending the extended curriculum of five years' study; and, secondly, the increased number of appointments in civil life caused by the abolition of the unqualified assistant conducting branch practices. The R.A.M.C. was undermanned even in peace time; in an emergency their places could not be efficiently filled by undisciplined civil practitioners. The deficiency of medical officers was the cause of great dissatisfaction as regards leave with its opportunities for study and keeping abreast of recent advances in medical science. In the German army, completely equipped bacteriological laboratories accompanied each army corps. They were also to be found in the Russian army both in the medical and veterinary departments. These were not provided for in our regulations. The time had now come for the formation of a special sanitary organisation evolved from the ranks of the R.A.M.C. This body could be reinforced, if need be, by men of special training and great practical experience such as our county medical officers. These medical officers of health as inspecting officers or as consultants would be of equal, if not greater, importance to the well-being of the army than the consulting surgeons appointed in the recent campaign.

Surgeon-Captain HARPER, M.D., V.M.S.C., said that, in consequence of the drain of medical officers of the R.A.M.C. to South Africa many civilian practitioners had been called in to assist or take charge of military hospitals or troops at home. A most important matter for consideration in this connection was the Volunteer Bill at present before the House of Commons, which, by substituting the words "sudden emergency" for the words "actual or apprehended invasion," altered the whole position of the volunteer force. "Sudden emergency" was far too elastic a term, and practically meant nothing. Sir Howard Vincent's statement in the House that the volunteers on the whole were in favour of the change was, so far as he could gather, quite incorrect. It was impossible that any large proportion of officers or men with families depending on them for support could remain in a force under the proposed new conditions. If the Bill became law, it would be followed by a very large number of resignations, and those of many of the best and keenest officers and

men. The matter was one of vital importance, both to the medical and combatant branches of the volunteer force.

Surgeon-General HAMILTON, in reply, said that the position of P.M.O.s on lines of communication was all wrong. They ought to be with the general in command and under his instructions should issue orders to the subordinate P.M.O.s. In the same way P.M.O.s should be on the immediate staff of the G.O.C., and under his instructions correspond "by order." The future supply of candidates was a most important question, which must be gone into by the British Medical Association. Volunteer medical officers would be in a very difficult position under the new Act, if passed, and men could not be expected to give up their practices to go off on a small salary to distant military stations.

MODERN SMALL-BORE RIFLE WOUNDS.

By CLINTON DENT, F.R.C.S.,

Surgeon and Joint Lecturer on Surgery, St. George's Hospital, London. So much has been written during the past few months on the subject of small-bore rifle wounds that it is well nigh impossible to break new ground. The surgeons who have been working in this campaign seem on the whole to be fairly well agreed as to the general lines for practice. It may not be unprofitable if I endeavour to summarise some of the conclusions on surgical points, so far as they appear to be justified by the evidence already collected. This campaign has given us valuable experience of the effects of small-bore bullets travelling at high velocities. Between the Mauser and the Lee-Netford rifle there does not appear to me to be really anything to choose, if we regard solely the destructive effects of the weapon. There can be little doubt, I think, that our service rifle has shown itself to be a thoroughly good weapon and one that deteriorates very slowly from hard work. My experience was almost wholly derived from wounds inflicted by the Mauser bullet, but the same views really must hold good for both weapons. One difference perhaps of importance in the Lee-Netford and Mauser bullet is the steel sheath of the latter, which breaks up worse. It may still be a question for military experts to determine whether the small-bore rifle, as at present adopted, is suitable for every sort of warfare. It is pretty clear that for the South African campaign it was eminently fitted and has proved altogether a success. At the same time I believe that the tendency in the future will not be in the direction of further diminution of bore, increase in rapidity of twist, and diminution of weight of bullet, thereby securing higher velocity and longer range. Already it would seem that the range of modern rifles is longer than is really absolutely necessary. Efforts will be made, no doubt, to increase the flatness of trajectory, and the frequency of short range wounds will increase. Much has been said as to the importance of the stopping action of bullets, and it is asserted that the small high velocity bullet does not compare favourably with the older weapon in this respect. For civilised warfare, however, the stopping action is certainly quite adequate, and as warfare with savage tribes is likely to become less frequent, and as moreover commercial enterprise tends to provide belligerents in every part of the globe with modern weapons, long-range warfare is likely to become more and more the rule. For some time to come, therefore, bullet wounds—and these still constitute the huge majority of wounds received in warfare—are likely to be of the class that we have had to deal with in the Boer war. Broadly speaking, in the South African campaign bullet wounds of all kinds have done well. Recoveries from very severe wounds have been numerous, and many of these recoveries have been most remarkable. The percentage of wounded men who have been fit to return to duty has been unusually high. Wounds causing permanent disability are less frequent than was formerly the case. Injuries of the limbs necessitating amputation are, it will be found, fewer proportionately than in any previous war. Conservative surgery has—and most properly—been carried further, and with highly successful results, than in former campaigns. These satisfactory results have been ascribed mainly to the so-called humanity of the modern small-bore bullets, and it would seem to follow from this that, from the military point of view, the modern weapons do not fulfil the prime conditions of warfare. If the victory is to rest with the

side that can most quickly kill or efficiently disable a large number of its adversaries, then wars are likely to be prolonged and the humanity of the bullet would prove to be but a curse in disguise. I think the so-called humanity of a small-bore bullet a great deal exaggerated. There are other conditions to be reckoned with. In the South African campaign I believe that the surgical healthiness of the climate and the wide adoption of the open-air method of treatment have had quite as great a share in bringing about the favourable statistics as the character of the weapons employed. The idea is far too prevalent that the injury inflicted by a small-bore bullet is almost trifling, whatever part be hit. It is largely a question of whether the wound becomes septic or not, and septic complications attacking either bullet or operation wounds have been very rare. Indeed, in South Africa operation wounds of all kinds have done exceptionally well. This possibly may be ascribed to the efficiency with which the antiseptic system has been carried out in military surgery. But truly aseptic surgery is practically impossible under the conditions of active service. It is a matter of the faithful observance of elaborate detail by all, and they are many, concerned in the operation. Surgeons have to do the best they can in base as well as field hospitals, and they have to work with orderlies: a hard working and highly septic body of men. The want of dressers in a military hospital is, to my mind, more felt than in a civil hospital. Certain views that have recently obtained with regard to bullet wounds have now, I think, been finally exploded, but these cherished traditions die rather hard, and one still sees reference to them. One of these is that the heating of the bullet sears the track of the wound, and so destroys any germs that might lodge, favouring thus the immediate union and preventing any septic complications. The bullets, as a matter of fact, fired from modern small-bore rifles, are, in the first place, usually sterile, for they have a hard smooth surface, and in the next place they are not heated; but even if white hot, the time that they occupy in passing through the body is so extremely short that no cauterising action could possibly be exerted. The arrest of movement might heat the bullet, but a bullet that can travel a couple of miles and hit hard at the end of it does not have much movement arrested, and thereby converted into heat. A bullet making a flesh wound 6 or 8 inches long, occupies at a range of 800 to 1,000 yards somewhere about $\frac{1}{1000}$ of a second. A bullet that strikes a bone and lodges has its forward movement and its rotation arrested, but no cauterising action is found in the neighbourhood of such, and the energy is really dissipated in other directions, of which the effect is very manifest; and this brings me to another theory that is now, I think, pretty generally discarded; the so-called hydrodynamic or hydraulic theory has been held to explain the extending or explosive effects of rifle bullets on animal tissues. Those who believe in this theory look upon a limb as a closed vessel containing fluid, and account for the destruction which is undoubtedly seen sometimes at short range as due to the enormous increase of pressure caused by the ingress of the bullet on the incompressible contents of the part hit. This theory, though abandoned for the most part with regard to the greater part of the body, is still considered by some to hold good for penetrating wounds of the skull. Experiments, however, do not bear out the hydraulic view, and the explosive or expanding effects are now held to be due to the energy of the bullet, which radiates out in lines from the long axis of the bullet track. The hydraulic theory is now almost as wholly discarded as the projectile air theory. This imagines that a cushion of highly compressed air is carried in front of the bullet and exercises the explosive effect. This is an old theory which has been recently revived. It may be heard of again, but it is hardly worth while at present to administer the *coup de grâce* to what is already defunct. So again wind confusions from large projectiles are no longer believed in. They disappeared when round shot ceased to be used. For round shot would strike a part and inflict the most grievous injury on the deeper tissues, though as they glanced off the skin might show no mark whatever.

As instances of cases in which military surgery is now much more conservative may be cited penetrating abdominal wounds, compound fractures, wounds of joint, and nerve injuries. There is a general consensus of agreement that the

great bulk of penetrating abdominal wounds are best left alone. The hopes that recent advance in abdominal surgery might lead to great improvement in the treatment of these serious injuries has been altogether falsified. Patients operated on, generally speaking, do not do well, or in other words, the majority die. It is impossible to make a thorough examination of the viscera and to ensure that every wound of the intestine—and the wounds may be very numerous indeed from a single shot—is dealt with without inflicting the most grievous damage on the abdominal contents. Adhesions, which form with great rapidity, are likely to be broken down, hæmorrhage set up, and extravasation of the intestinal contents brought about by manipulation. On the other hand a remarkable number of cases in which the intestines have been undoubtedly perforated, perhaps in many places, have recovered. The patients can seldom if ever be operated on early enough, or get the lengthy and undivided attention that their condition would require in the field hospitals; and even if they could secure this, their chances of recovery would probably be little increased. A large proportion of cases of wound of the large intestines do well. Patients with these injuries have their best chance if they have been long fasting, and if they abstain for a long time after from any sort of drink; even a glass of water if given too early may bring about a fatal result in a man who might otherwise recover. The shock of small-bore bullets in abdominal wounds is very much less than might be expected; indeed, former views as to shock from all kinds of bullet wounds must now be greatly modified. The ingenious view has been put forward that the wound of the intestine produces a sort of tetanus of the gut, and that the arrest of the peristaltic action allows time for lymph to be exuded while the slits in the intestine are sealed up. Wounds of joints perhaps show the most remarkable contrast of any class of injuries compared with former experience. Very few cases have gone wrong where the knee-joint has been wounded by bullets, and I can recall a number of cases of wounds of joints, such as the elbow, which have done perfectly well without any complication or operation. Primary excisions have been excessively rare. Formerly it was considered highly conservative surgery to save the limb by operating on the joint, now the joint can be left alone. Wounds of the ankle-joint have on the whole done worse than any others. Of nerve injuries, which are very common indeed, it need only be said here that the expectant treatment has proved the best. Many cases were operated on at the outset in which it was imagined that the nerve had been wholly or partially divided in which it was found that the trunk was quite intact, and that the bullet track had only been near it. While the extent of recovery in these cases is very great, it is seldom in my experience altogether complete, but the main point is that it is not likely to be rendered more complete by operation, even when a mechanical lesion that can be dealt with is found.

Surgeon-General O'DWYER wanted to know how the more frequent nerve injuries with the small-bore bullet when contrasted with those caused by larger bullets could be explained. In wounds through the lungs, even though the patient might be fit to resume his duties, he always when questioned complained of a little shortness of breath. Why if the South African climate was so effective in healing wounds, was not civil surgery more successful there? He thought the prompt use of the first field dressing and instructing men how to do so had had much to do with the success mentioned. He was glad to know that it was now an established fact that abdominal wounds from small-bore bullets had better be left alone. What was the proportion of wounds from field guns? "Septic orderlies" on field service were difficult to avoid.

Surgeon-General HAMILTON said that flat trajectory was what the military authorities aimed at, and that it was a convertible term with velocity. The great object, of course, was that any mistake in judging distance was remedied by the flatness of the trajectory. He assisted Mr. John Rigby years ago in experiments with express bullets, and they found that bullets propelled by small charges penetrated into sawdust much further than when fired with large charges. This was, of course, caused by the bullet not "setting up" or mushrooming as it did when fired with

heavy charges. The larger the bullet the greater the shock, and when shooting big game in India he found that a spherical bullet from a smooth bore stopped the charge of a tiger or a bear better than smaller bore express bullets. The smaller the bullet the less the shock, and in this way the modern bullet was more merciful.

Mr. CLINTON DENT, in reply, said he knew many cases of joint wounds in which this field dressing was not employed for many hours; one especially, a wound of the knee-joint and popliteal artery, which made an excellent recovery. He considered it was now proved that nerves and tendons might be pushed aside by small-bore bullets, but thought the high velocity accounted for some nerve injuries, the nerve not being visibly injured. He considered the South African climate more favourable for wound treatment than that of this country. According to Mr. Cecil Rhodes artillery fire demoralised; "it gets on your nerves, though it may not kill much." The effect of artillery fire at Paardeberg was lessened by Lord Roberts's humanity, the fire being directed mainly on the commissariat; at Magersfontein the trenches indicated great effects from shrapnel. He was satisfied that the expectant treatment in abdominal wounds from small-bore bullets was best.

Surgeon-General HENRY SKEY MUIR, C.B., M.D., War Office, mentioned a case of a small-bore bullet in South Africa striking the cervical spine and carrying away two teeth in its exit, the patient now being in fair health.

INFECTIOUS DISEASE ON BOARD SHIP.

By W. J. COLBORNE,
Staff-Surgeon, R.N.

THE ships of Her Majesty's Navy are now such complicated engines of war, and so filled with machinery, that the space that can be allotted to the sick is necessarily limited, but although limited, it is sufficient for all the ordinary ailments and diseases met with; yet provision cannot be made for isolation and observation wards, and so it behoves the medical officer to take such measures as he can to prevent the onset of infectious diseases, and, when they do arise, to combat them with the means at his disposal, so as to limit their spread and to safeguard the health of the patient and that of the ship's company.

Our ships now carry many men; they visit ports in all parts of the world; a large amount of leave is given to visit the shore; and the crew consists of young men; and therefore the possibility of infectious disease being contracted is very considerable. Remembering all this, one of the first duties of the medical officer on visiting a port is to make inquiries from the port authorities as to the prevalence or absence of infectious disease, its extent, and the district affected, and, should it be necessary, report the same to the proper authorities of the ship, so that they may take the necessary steps to either warn the men from visiting a particular district or restrict the leave. Circumstances alone can be a guide as to the necessity of curtailing the leave and the length of time the ship remains in the port.

The medical officer will also have to pay attention to the people who are allowed on board the ship—particularly washerwomen, bumboatmen, etc. Knowing of the existence of infectious disease on shore, particular attention must be paid to all minor ailments that may occur amongst the men, and endeavour should be made to detect the premonitory symptoms, and on the slightest doubt arising the patient should be immediately isolated from his fellows for as long as necessary, and carefully watched; a careful watch must also be kept on those who are his more immediate neighbours, both at mess and at night. To isolate the patient is not always an easy matter on board ship, and diligent search will have to be made for a spare cabin, small watertight compartment, or such other suitable place, and if none are to be found below decks, a suitable structure of canvas, if the weather will permit, will have to be built on the upper deck.

Should the case develop into one of an infectious nature, steps must be taken to isolate the patient and his nurse or attendant at once; and, having obtained a spare cabin or compartment, it should be prepared for their reception by removing all movable articles, swinging service cots and bedding, as well as utensils taken to the place, and the ventila-

tion attended to, particular care being taken that the ventilating trunk opens direct on the upper deck, so as to avoid the possibility of the infection being carried to other parts of the ship by means of these trunks; if necessary, the ventilation openings in this compartment should be closed and sealed. The patient and attendant should be kept strictly to this compartment, and neither of them allowed to leave it till opportunity occurs to send the patient to hospital. Should no cabin or compartment be available, and it be impossible to erect a temporary place on deck, part of the sick bay must be screened off, and this can be done by making a canvas screen, which can be so fitted by the carpenters with battens so as to reach from the beams above and to the deck beneath, and effectually cut off this part of the sick bay, and be used for the isolation of both patient and nurse. During the treatment of the case the screen should be kept moist or damp by spraying or other means with perchloride of mercury solution 1 in 1,000, and the deck frequently washed with the same. The food should be placed outside and taken thence by the nurse, and all excreta mixed with disinfectants before removal. The medical officer in attendance should wear a linen overall on visiting his patient, and be particular as to the disinfection of his hands and face, etc., and should go straight from the patient on deck, and remain there some time before mixing with his messmates and others. On the opportunity occurring for the patient to be sent to hospital, the patient's bed and bedding as well as the attendant and his clothes should be sent, and the boat washed with perchloride of mercury solution 1 in 1,000 afterwards. The attendant can be left to nurse the patient, or can be disinfected and kept under observation for a short period; the men who have carried the patient to hospital should also be disinfected. The bed, bedding, and clothing must be disinfected by moist heat in a disinfectant before being received on board again. The place occupied by the patient on board the ship should now be disinfected. The compartment should be sealed, the screen made wet with perchloride of mercury solution and sulphur burnt, not less than 3 lbs. of sulphur to each 1,000 cubic feet of space being used. The compartment and its contents should then be thoroughly scrubbed with perchloride solution 1 in 1,000, the screen taken down and soaked for twenty-four hours in perchloride solution, and then scrubbed and hung in the air, the wooden battens burnt, and the paint work should be repainted or limewashed.

During the presence of infectious disease on board ship, all men should be warned to report every slight ailment to the medical officer, who will watch every case, and endeavour by every means in his power to discover the onset of the disease, and by early isolation check the spread of the disease. Should a case of small pox occur every man on board the ship must be vaccinated. Should the ship be in a port where there is hospital accommodation cases should be landed immediately, and should the case be one of suspicion only, it is better that the patient should be landed for isolation and observation for a few days than run any risk of the disease occurring on board. If care is taken to isolate cases immediately on the appearance of the disease and attention be paid to details, the spread of the disease is practically limited, and the chance of an epidemic on board is reduced to a minimum. Whether any good result would accrue from the use of aerial disinfection, such as carbolic vapour or spray, which could be used during the treatment of the disease and at the same time be innocuous and pleasant to the patient, I must leave to those who have had some experience of their use.

SANITATION IN CAMPS.

By Major JAMES, R.A.M.C.

A SUBJECT which covers too much ground to be more than touched in one paper, which therefore consists of a series of suggestions, cannot pretend to be complete on any one point. But its importance cannot be exaggerated when one considers the proportion of deaths from disease in armies to those from wounds.

The conditions of camps are so various and depend upon so many circumstances that there are few points that apply to all in the matter of detail. The objects, however, to be kept in view in all cases are:

1. Protection of troops from weather and climate.