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PRINCIPLES OF SURGERY IN THE FIELD
INCLUDING TRANSFUSION

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This talk will be on professional matters but I hope that every professional matter discussed will have an important administrative aspect.

The Senior Officer however employed must know most things about surgery if he is to be of value as an administrator whether the country be at war or peace.

I went into a hospital overseas the other day and found two cases with each finger immobilized on a hand splint. Any inspecting officer should know that he ought to enquire the reason for that and should know that it is now one of the deadly sins to immobilize every joint of a hand because one finger is at fault. In the same way, in war if he is to avoid putting the wounded unnecessarily in jeopardy, he must know the accepted principles of surgery in the field. His must be the decision as to whether the ideal methods of treatment can be carried out and his must be the responsibility for accepting the inferior alternative. I make no apologies then for going into some detail in describing the ordinary treatment for an ordinary wound. Wounds other than ordinary are treated more or less on the same lines with modifications for some types—chests, abdomens, heads.

The first principle, and it has been stressed after every war we have taken part in during this century, is early and adequate surgery. The day of excising skin is over, only frayed edges are removed. Skin is very valuable, and it does not matter how far the wound is extended longitudinally, the bigger the opening the better, one can get at the damaged tissues in that way. It does not matter how big it is because the administrative officer is going to see to it that the case will be moved on at the right time so that in a very few days it will be closed from end to end and proceed to heal. There must be no
tension at all so deep fascia must be incised longitudinally and transversely also if need be. Then all devitalized muscle and everything foreign must be removed. Wounds heal all right without penicillin and without sulphonamides. They did all right in 1918 but they go catastrophically wrong if any dead tissue is left behind and nothing given orally or by injection, whether it be penicillin or sulphonamides or what you will, can ever reach tissue which has lost its circulation. All the shattered fragments of a bone left unattached used to be removed, now these fragments are carefully conserved as a scaffolding so that with good surgery and penicillin they will act as a bone graft.

It all fails if the wound remains open, but under reasonable campaign conditions, these wounds will be closed. Fixation these days is by plaster and whenever a plaster is used there have to be very strict rules so that if a limb swells under the plaster it will still have room. The worst preventable catastrophies seen in war are the gangrenous limbs, gangrenous because the plaster was not split for a journey. The severe flesh wounds need fixation, the bony injury of course must have it. Fixation is by plaster, add the Thomas splint, combine the two in the Tobruk plaster and we have all the fixing apparatus required. Vitally important and life saving they are. Three main principles then are involved in the treatment of wounds:

1. The relief of all tension.
2. Removal of everything foreign and devitalized.
3. Fixation for evacuation.

This means that wounds are left open during the period when the body is mobilizing its defences against invasion. That is the first stage of the two-stage operation.

I have said once or twice already that a wound however large will be closed. The wound left open will become infected with suppuration and all its ills resulting. Skin is the best wound dressing. The closed wound, closed by suture or other form of wound cover, will heal. Ogilvie says that any wound left open for more than a week is a reproach. For the second stage of the operation the wounded man is moved on after primary operation to a centre where he can be held. Ideally he should reach that centre on the second to the fourth day so that the wound can be closed on the third to the fifth day. These are the optimum times. After a week the process of scarring has begun and secondary closure becomes a more complicated procedure. The cases, when closed, remain where they are. If they have to be moved the wounds go wrong. Stitches and ambulance journeys are incompatible. Stitches are removed on the tenth to twelfth day. Exercises are commenced next day. The cases are fit in a week for Convalescent Depot.

Over 90 per cent of wounds should be closed successfully and uncomplicated wounds, however big, should be thoroughly healed in three weeks. There are many benefits from treating wounds in this way:

(i) The lightly wounded are got back quickly to work.
(ii) Hospitalization is cut down by 50 per cent to 60 per cent.
(iii) The wounded get back to a higher category than they used to.
(iv) Wound dressings are cut out and the cross infections which go with
them.
(v) All this without mentioning the prevention of pain and suffering and
the late sequelae of osteomyelitis. There is a non-adherent linear
scar instead of the distortion and troubles which result from scarring
and chronic infection.

That then is the treatment of wounds in general—the ruthless sacrifice
of muscle and other tissue which is no longer of value but is a danger because it
has lost its vitality. If any other rule is accepted it means gambling against
blazing infections and gas gangrene of the 1915 type. Yet in some campaigns
the surgery can be less mutilating and safely so, but it takes an expert experi­
cenced Consulting Surgeon with a Force to lay down rules for or to some extent
against ruthless surgery. Wounds did very nicely in South Africa without it.
They tended to do comparatively nicely in Palestine in the 1914-1918 War,
while at the same time in Flanders, the story was of frightful infections, gas
gangrene and tetanus. They did very well on trimming operations in the
African campaigns of the recent war, but stepping over the water into Sicily
changed the whole picture. The whole surgical policy had to be changed and
there was no consulting surgeon there to change it because the C.-in-C. appar­
ently would not have one at the start.

Commanders-in-Chief have learned a lot. They know something about
preventive medicine. Some of them know the true meaning of the word
hygiene, and they ought to know that the wounded who have fought and may
die may live if there is a consulting surgeon skilled and common sensed. I
emphasize this because I have heard it emphasized so often by the leaders in
the civilian profession. No consulting surgeon asks to be regarded as the
teeth of the Force. A commander needs all the teeth he can take with him
on his campaign. He should not leave any part of his frontal lobes behind.

Policies may have to be changed to suit conditions. Operationally, wounded
may have to be moved when surgically they should be held. The journey to
the base may take three hours over a perfect tarmac road; it may take three
weeks over a wilderness. Wounds may have to be kept open, freely draining
into plaster cases but even so their closure later by a different technique
becomes all the more necessary. Methods must be flexible to suit conditions
but the methods must all be proved ones—proved in all climates and condi­
tions.

Then we should not expect to start a new war with the surgical triumphs
which were the rule at the close of hostilities in 1945. We cannot count on
having experienced surgeons. Already the Tobruk splint technique and the
necessity for closing the sucking wound of the chest have to be taught to those
now practising war surgery. We cannot count on lease lend with everything
provided nor can we count on victorious conditions with all the benefits which
accompany them—the possibilities of full resuscitation, the ability to hold,
the air ours not theirs, good nursing, special centres sited where we want
them. Reverse the process, with the British Army on the run, an enemy
around and above them and all the old terrors of infection—which incidentally we know all about—will return.

Now a minute or two about wounds in special sites.

Abdomens.—Delay is as dangerous as ever but chemotherapy does hold infection in check to a little extent and justifies a little delay. Certainly it justifies the essential delay of 1½–2 hours during which a case is being resuscitated.

Dominating the whole position is the vital question of whether or not the case can be held for at the very least a week after operation. It is one of the most difficult decisions, but it must be faced, choosing whichever course is least likely to result in the death of the patient.

(i) Immediate operation with risk of his compulsory transfer in a day or two,

or (ii) At the expense of very valuable time, transfer him for operation where he can be held.

The scales are weighted too heavily. It is little exaggeration to say that if he has to be moved early, he dies; whereas if held, with operative technique and post-operative care as practised in 1945, he has a far greater chance of living than of dying.

Reluctantly I must refrain from a fuller discussion of techniques—gastric suction, etc., which have resulted in this improvement.

Chests.—The sucking wound of the chest is one of the few examples of a wound which requires far forward surgery. The to and fro suction must be stopped by dressing or operation. It is a good example of a life which can be saved by a stretcher bearer. Incidentally, it is often not realized that the stretcher bearer does much more than just collecting and carrying. The way the patient is handled from the battlefield to the operating theatre can materially affect the mortality rate especially in abdominal wounds. The sucking wound travels badly but he should be got out of the forward noisy area.

The first few days of the treatment of a chest wound are better left to the general surgeon, who resuscitates, corrects the disordered physiology and diminishes the risk of infection. The physician has an important place in the team, the proper aspiration of haemothoraces is of very great importance in preventing or controlling infection and ensuring the return of lung function. The surgery is as described for wounds in general but does not deal with lung damage nor with the fragment which caused it. The damaged lung is collapsed, does not tend to bleed, and is not prone to gas gangrene infection. Its treatment is deferred until the case reaches the chest centre. The latter wants the case early, but if conditions are difficult and the case does not reach the centre for seven days, it will still have arrived before important complications are due.

I must again avoid details, the modern treatment of infections, the great part played by anæsthetists in development of chest surgery, the routine rehabilitation.

Heads.—Head wounds casualties do not suffer from any marked degree of shock unless associated with other injuries, and do not require transfusion or
respond to it. Pain is not a feature unless there is compression, and they travel well. Penicillin controls infection in the extradural tissues and sulphadiazine deals with the cerebrospinal fluid. Head wounds do not therefore need the high priority in treatment that was once insisted on. It is generally agreed that when the dura is penetrated the case has a better chance of uncomplicated survival if a neuro-surgeon operates on him and the rule has been that if the case can reach a neuro-surgical centre in seventy-two hours, with chemotherapy meanwhile, that should be the method of disposal.

When that is impossible and when a head wound is associated with other injuries, e.g. abdominal, the general surgeon becomes responsible, and so in addition to Neuro-surgical-Maxillo-facial Centres with Ophthalmologists and Otologists completing the team, certain of the general surgeons at other hospitals must be trained and sufficiently equipped to deal with head wounds.

Chemotherapy: There are one or two axioms:

(1) Chemotherapeutic drugs given systemically can only reach those tissues which have a blood supply.

(2) There is evidence that sulphonamides given orally, whether they can affect lacerated tissues or not, do reduce systemic infections, both penicillin and sulphonamides are therefore still required. I have considered recently that the methods practised in 1945 might be due for some amendment. My views have been as follows and I recently submitted them to the Medical Research Council.

(a) The wounded patient need not be wakened for a penicillin injection every four hours during the journey, but a larger dose, say 250,000 units twice daily, might be considered sufficient.

(b) That sulphanilamide is still the sulphonamide of choice for oral administration in that it is effective against the streptococcus and is the drug least likely to result in renal disturbances under all tropical conditions.

(3) The necessity for local treatment of a wound with penicillin-sulphathiazole is open to argument if surgery has been adequate; penicillin is given parenterally and sulphanilamide orally. This does not refer to head wounds. In them sulphamezathine locally is an accepted principle.

(4) The sulphanilamide and penicillin labels may now require amending and might be combined, the red sulphanilamide on one side and the yellow penicillin on the other.

I have just received a reply on these points from the Medical Research Council. They have been submitted to Florey, Colebrook, A. A. Miles (who was a director of the former Wound Infection Research Unit) and Long at the National Institute. They are fully agreed on the following points:

(a) That 200,000 to 300,000 units of penicillin should be given to the wounded at intervals not exceeding six hours. They point out that a dose of this magnitude should be dispensed in sterile distilled water of a volume not less than 5 c.c., otherwise the injections will be painful, since the solution will be markedly hypertonic. (I am not convinced that this works out in practice.)

(b) That a penicillin sulphonamide powder should be applied locally to the wound at the first and later dressings. All concur in thinking this important.
But while Florey and Colebrook suggested sulphathiazole powder for the purpose, Miles and Long think it would be better to apply the penicillin in a mixture of sulphonamides so as to lessen the risks of sensitization and of anuria. They suggest that a powder containing penicillin, sulphamerazine, sulphathiazole and sulphadiazine should be tried.

(c) All the advisers are almost unanimous in considering that sulphanilamide should not be given orally, only Colebrook seems to think that anything can be said in favour of it and even he is extremely lukewarm. Florey is flatly against it. The others consider that they would not advise sulphonamides for the purpose, but that if it is decided upon it had better be in the form of a mixture, but they consider it to be really better to omit it altogether. (This advice will require grave consideration and no steps can be taken to implement it until the Advisory Committee of Surgeons have had full opportunity to discuss it.)

(5) Air Transport.—We started off the last war by calling certain cases suitable and certain unsuitable and allotting priorities for those suitable:

1. Maxillo-facial.
2. Burns especially of hands and face (after shock overcome).
3. Perforating wounds of the globe of the eye.
4. Limbs and Joints.
5. Heads.
6. Spinals, etc.

We soon placed at the top of the list eye injuries in which the iris was prolapsed with the wounded man in the gravest danger of losing his vision.

We raised, then lowered in priority, the heads, having come to the conclusion that with chemotherapy, even if it took three days to reach a head centre, all would be well.

We listed as unsuitable for air transport:

1. Those shocked or likely to develop shock (giving them twenty-four to thirty-six hours' treatment first).
2. Abdominal and thoracic wounds.
3. Recurrent severe haemorrhages.
4. Acute abdomens.
5. Gas gangrene before treatment.

Several of these obviously are unsuitable for high altitude flying. Anyone who has flown at 12,000 feet with a full fountain pen in his pocket knows what happens to a container containing air and fluid, when atmospheric pressure drops. To say the least, it is obvious that there will be serious disturbances within the abdomen and thorax.

But by the end of the war we had come to the conclusion that there was only one type of case which did not travel reasonably well and that was the wounded abdomen which had had an adequate surgical operation.

Certain others are all the better for preliminary treatment and chests are all the better for being held during the first five or six days, but as in all other aspects of war surgery, often the correct treatment and disposal is a counsel
of perfection and very often the lesser of two evils has to be chosen, the ideal being ruled out.

But abdomens are the exception. It must not be forgotten that the case operated on and moved within a week, whether by air or ambulance or any other way, is very, very unlikely to do well.

(6) Transfusion.—The choice of fluid is limited by campaign conditions. Severe blood loss demands replacement, and in such conditions blood is two to three times more effective than plasma. It not only brings the blood volume up but supplies haemoglobin necessary to combat infection. When it is plasma that has been lost as in severe burns and crushes, the indication is for plasma. But blood has to be distributed from refrigerators and there will always be difficulties connected with transport and storage in forward areas.

Only stored blood is available in forward areas as a rule. The clinical response is better after fresh. After stored blood transfusions, reactions are more frequent, infection is more liable, and so dried plasma is the best solution to the problem there. Plasma, when the exigencies of the service demand its use, is a life-saving substitute for blood, but not one devoid of risk. Obtained as it is from large donor pools, it may be contaminated with icterogenic agents of infective hepatitis and homologous serum jaundice. It is an important risk, for contamination may result in an incidence of 10 per cent sometimes with fatal cases, and the incubation period being very long, the damage is done before discovered.

We should therefore use plasma only when it is really indicated or when blood is not immediately available. Recently in Hungary I felt compelled to talk at length on this subject when the French were boosting plasma as the perfect answer, and the satellites were boosting the Russian policy of using corpse blood. My views were quite new to the audience.

Without going into details, one or two points might be emphasized. Advanced wound shock is irreversible. If a case is transfused and the condition allowed again to deteriorate, a second attempt to resuscitate is much less likely to be successful. It may be a mistake therefore to transfuse too far forward. The aim should be to transfuse so that the patient reaches the optimum time for operation at the time when surgical facilities become available. If a patient resuscitated has to undergo a journey, deterioration may be prevented by continuing transfusion by drip during the journey by ambulance car, plane, etc.