

# Observations on the Treatment of Wounds in War

BY

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*Originally published by John Bale, Sons and Danielsson, Ltd., Oxford House,  
London, 1915*

## Observations on the Treatment of Wounds in War

I have now received letters from Mr. Arthur Edmunds covering the first few weeks of his work at the Dardanelles, and although he will no doubt later publish full details of his work and experiences, it may be of interest if I give a short account of what he is doing in the form of extracts from his letters, and also make some remarks on an "investigation" which has been carried on by some surgical consultants and others in France. Before doing so, however, let me once more emphasize the suggestions I have made as to the treatment of these cases, because, although I thought that I had made my views quite clear on several occasions, they have evidently not been grasped by the authorities in France, and hence the extraordinary muddle which they have made of the whole matter.

Last November I was asked to give an address on the treatment of wounds in war before the Medical Society of London, and in it I pointed out that all severe wounds which reached this country from the front were septic, many of them very badly so (this is still the case), and that evidently no real attempt was being made to disinfect these wounds soon after their infliction. I went on to describe how we (*i.e.*, those trained under Lord Lister) had been in the habit of dealing with similar wounds, especially compound fractures, in civilian practice, the results which we usually obtained, and how I would go about the disinfection of wounds at the Front in the present war. I especially referred to the period of time after the infliction of the injury during which there was a probability that such disinfection might be successful, varying, according to the experience of Reyher and others in the Russo-Turkish war, from eight to twelve hours. The gist of my remarks was that the first and most essential point in the treatment of these cases was that all severe wounds should be thoroughly opened up and disinfected in the manner described, provided they come under the surgeon's care in reasonable time and that then the wounds should be drained and dressed with materials containing antiseptics. If this was done early I expressed my opinion that there was a good chance of success in a considerable proportion of the cases; even if the number of successes were comparatively small it would amply repay the trouble. That a certain number of cases – *e.g.*, those infected by the bacilli of tetanus and gas gangrene would almost certainly fail with the means then described is true, but in the course of more recent researches we have found that a powder consisting of equal parts of salicylic acid and boric acid, which we have termed "borsal", is very efficacious against infections by these organisms, so that now, with the addition of this substance to the other measures, the chances of successful disinfection, if undertaken within eight to twelve hours after the infliction of the wound, are very considerably improved.

A very important and reasonable objection was raised to this plan by those with experience at the Front – *viz.*, that it was comparatively seldom that the cases could be brought under treatment in time to enable thorough disinfection to be carried out with any real chance of success. I therefore turned my attention to this point, and made experiments with the view of seeing whether any plan could be devised by which the growth of the infective organisms which had got into a wound might be delayed, and so the period of time during which disinfection was possible might be lengthened. This matter was investigated by a small committee appointed by the Director-General of the Naval Medical Service, consisting of Fleet-Surgeon P.W. Bassett-Smith, Mr. Arthur Edmunds, and myself, and we very soon found that certain

antiseptic substances had the power of diffusing through blood-clot and dead tissues and inhibiting the growth of micro-organisms in a remarkable manner and over a considerable area. Hence we suggested as a preliminary point for investigation at the Front (where alone it could be done) the temporary introduction of various pastes and powders into wounds as soon as possible after their infliction, with the view of delaying the growth of the infective organisms, and thus lengthening the interval after the infliction of the wound during which satisfactory disinfection might be possible.

My recommendations therefore consist of two parts: (1) the disinfection of wounds, and (2) preliminary treatment with the view of lengthening the time within which such disinfection might be possible. The second suggestion is practically the use of an improved first field dressing. Curiously enough, and to me quite inexplicably, these two recommendations have been confused together in the minds of the surgeons at the Front, and the second has somehow or other been looked upon as the most important and as meant to displace the first.

### **History of an “Investigation” in France**

A short historical account of a so-called “investigation” of my suggestions which has been carried on in France may be of interest and, if it did not concern such a very grave subject, somewhat amusing as an example of how not to carry out a scientific investigation.

I may recall what I emphasized in the Hunterian oration, viz., that our work on the question of delaying infection in wounds, so as to lengthen the period during which subsequent disinfection was possible, was entirely preliminary, but that the time had come when the work must be transferred to actual wounds, and I suggested that a small committee should be formed, of which, of course, I should be a member, to look into the matter. For this purpose a small section of the Front should be set apart, and the committee should be able to follow the cases to the base, so that they remained from first to last in their own hands and did not pass through the hands of other surgeons who might not understand what was wanted and might, with the best will in the world, completely spoil the investigation. I also pointed out that, although I would begin with a carbolic or cresol paste, other things were being investigated which might act much better and which would naturally have to be tried.

No notice was taken of this suggestion, but after some weeks I received a letter from a consulting surgeon at the Front, whom I may designate by the letter A, asking me to send him out some tubes of cresol paste for trial; he said he already had some borsal. I therefore sent him some tubes with instructions for their use, taking the opportunity of emphasizing the value of borsal as compared with the cresol paste. I also pointed out that probably the chief difficulty that he would find would be to get the borsal and paste to the bottom of the wound, especially in the case of perforating wounds, and said that it was “up to him”, as a surgeon, to devise surgical measures for this purpose; there is no evidence that he made any attempt in this direction. I may say that A had been previously specially emphatic as to the impossibility of disinfecting these wounds, and therefore I did not hope for much from his work. For if anyone starts an investigation with the idea that the proposed aim is impossible of attainment, he becomes very easily discouraged and very quickly throws the whole thing aside. The investigator must believe that there is a reasonable prospect of success, and in

that case if he fails at first he tries other plans with the view of attaining the desired result.

In acknowledging the receipt of the tubes A made a very curious criticism. He says: "I see you advocate washing wounds with carbolic (1-20) and peroxide. Won't this make it more difficult to estimate the value of these other agents. For we get many good results from the carbolic and peroxide alone." This statement puzzled me a great deal. My suggestion was that the powder and paste should be applied in the trenches or the vicinity as soon as possible after the infliction of the wound, and that when the patient was brought to the first convenient place the wound should be opened up, thoroughly cleaned out and disinfected with peroxide, carbolic acid &c., as described in my paper before the Medical Society. The powder and paste were, therefore, only the first field dressing. After much reflection I could only come to the conclusion that A had not grasped my meaning, and that he was regarding our suggestions as referring to a method of disinfecting wounds meant to replace that described by me in my former paper. That, of course, could not be the case, in large and perforating wounds at any rate, because it would be quite impossible in the trenches to ensure that the powder and paste had reached the whole infected area, and if it did not do so infection of the deeper part of the wound must still occur. I therefore wrote A again reiterating the position, at the same time saying that it might be a legitimate experiment in the case of a small wound, where there was good reason to believe that the powder and paste had reached all parts of the wound, to wait a little and see whether infection had been avoided. If infection occurred the wound could always be opened up and drained, &c., as usual.

Some little time elapsed and then I had another letter from A in which he said that owing to the press of wounded he had not been able to carry out the proposed investigation, but that he hoped later on, when things became quieter, that he would be able to look into the matter. In the meantime he had distributed the tubes (he says nothing of borsal) to various hospitals. I confess that I was so disgusted that I did not reply to this letter. If our suggestions were to be of any use at all, it was when there was such a press of wounded that the surgeons could not hope to cope with the disinfection of the wounds within the requisite period of time, and his statement that he had distributed the tubes to the hospitals showed that he had still failed to grasp the point; they should have been distributed to the firing line. I often wondered afterwards what would happen if the tubes were used at the hospitals. However, as the opposition to the use of antiseptics was so great on the part of the authorities at the Front, I did not worry much about it, as I thought they would probably be thrown aside and not used at all.

About this time a surgeon, whom I may designate as B, called on me to discuss the question of the treatment of wounds in war as he was going to the Front. Knowing him to be a man of great energy and ability, I asked him to come down to Chatham, showed him some of our work, and instructed him as well as I could in my ideas. He went out to the Front and proceeded to carry out these ideas as far as possible, and on a visit to London some time later he told me about several of his cases and results, which seemed to be quite good. He had been working hard and under dangerous conditions in the trenches and at the dressing stations – the proper place for this work. I subsequently heard from him that his results continued good and were considered satisfactory by most of those who saw them. He is the only surgeon who has

communicated with me and with whom I have had the opportunity of speaking and making the meaning of the whole matter clear.

The next occurrence was a letter from A saying that he had collected a number of cases which had been treated with the paste with unsatisfactory results (by whom or how they were treated he does not say, nor whether the wounds were afterwards disinfected or not). He comes to the conclusion that “the results are certainly disappointing, and I am bound to say that I agree with the conclusion that the cresol paste and borsol are like other antiseptics in their inability to prevent sepsis in the wounds we get here.” The reference to “other antiseptics” is peculiar, because only a few weeks before he had said that “we get many good results from the carbolic and peroxide alone” (see above). The question arises what are considered at the Front to be “good results”? I should have said that the entire prevention of sepsis was the only thing that could be called a good result, and as such I interpreted his former letter.

A also enclosed a report from C, a major, R.A.M.C., and “specialist in operative surgery.” In his report he makes two statements as regards cases in which cresol paste (he does not mention borsol) had been applied and which had passed through his hands. “(1) Some of the cases have obviously been anæsthetized, the damaged edges of the skin wounds excised, the openings enlarged, good drainage provided, and the paste introduced. These have been on the whole satisfactory, but the results are no better – if as good – than in similar cases simply treated by provision for free drainage.” Here no history as to disinfection is given, and further it is not clear whether his remark as to the “results” refers to the condition of the wounds and the patients when they first came into his hands or to their progress after he had observed them for some days. This is a very important point, for it is quite easy for a case to go wrong, and I gather from a remark which he makes at the end of his report that he cleans the skin with methylated spirit, which will not seriously incommode the bacteria which are present on it, and that he uses aseptic gauze and wool, which will not keep an open wound with free discharge aseptic for twenty-four hours. His second statement is as follows: “(2) In cases which have been treated simply by external cleansing, injection of paste, and the application of protective dressing, the use of the paste appears to have a harmful effect. In cases of this latter group the wounds are commonly found plugged with a mass of coagulated blood and paste. When the plug is removed a profuse discharge escapes, the tissues are greatly swollen, and gas is not uncommonly present.” All this I fully believe; it in no way affects the question, and is only evidence of the fact that those who had to do with these cases did not understand the object of the paste and took no steps to disinfect the wounds. Further, I indicated in previous publications that the wound need not be filled with the antiseptic, but that small deposits in the blood-clot and over the wound about half an inch apart would probably suffice for the temporary purpose. Drainage of these wounds is, of course, a necessity, and seeing that I have fought for years for free drainage with tubes as opposed to plugging wounds with gauze under the impression that the wound is being drained, it strikes me as very curious that it should have been supposed that in any suggestion that I made I had meant to omit this very important item.

In acknowledging A’s letter and enclosure I expressed my great desire to go out to France and look into the matter with him, and said that if he would ask the Director-General to send me out I would get leave from the Admiralty and come in a few days. My aim in asking to go out was not to push or condemn any particular plan or paste,

but to investigate the whole matter to see what was good and what was bad, and to ascertain the best methods of procedure. Indeed, I mentioned in my letter that I had other antiseptics and materials which I wished to try, and which might quite likely displace the cresol paste, of which I had always seen the possible disadvantages. Although I have heard from A since, he has never referred to my request nor, so far as I know, taken any steps in the matter. I may say that I subsequently made the same request to a bacteriologist (D), and in reply he gave me to understand that disinfection of these wounds by antiseptics was not possible, and that so long as I held the opposite opinion no useful purpose would be served by my presence at the Front. There was, of course, no personal animus in the matter, and had I been an advocate of hypertonic salt solution I expect he would have welcomed me warmly! The reader may ask why I did not use influence in England to get sent out, but, apart from the fact that I have never tried to get anything in that way and not going to begin now, if I had been sent out from home it would have been very difficult for me to make any investigation, whereas if I had been invited by the men in authority already at the Front, I would naturally have had every facility for investigation placed at my disposal.

To resume my narrative. The next thing which occurred in France was the assembling of an imposing body of distinguished medical colonels and majors to sit in judgement upon me and my works. They had before them various cases of gas gangrene in which cresol paste had been applied, and they also brought B down from the Front with a number of cases which he had treated in order to contrast them with similar cases from elsewhere. But they apparently had none of the evidence which one would think was necessary for a careful judgement; no facts as to who had applied the antiseptics, how it had been done, how soon after the injury, at what time afterwards the wound had been disinfected, if indeed it had been done at all, in what way disinfection had been carried out, what the subsequent treatment had been, and so on; indeed, none of the data necessary for the most elementary judgement on the matter. Sufficient for them that cresol paste had been used and that gas gangrene, in some cases very acute, had occurred. I understand that they examined B's cases and had no fault to find with them, although they did not think they were any better than their own, but they showed him several cases of bad gas gangrene in which cresol paste had been used by other surgeons. As if they had never had bad cases of gas gangrene before or since! In short, they condemned pastes, powders, disinfection of wounds, &c., root and branch, stollenbosched B and sent him to a sand heap, where he could do neither harm nor good, and settled the whole question of antiseptics and disinfection to their entire satisfaction and comfort. One can imagine what a great relief it was to them to see that they had been right all along, and what a delightful evening they must have spent after this meeting.

It is interesting that in a letter which I had from D (a bacteriologist) subsequently to this great meeting he used the expression, "If you *really mean* that the paste is simply a temporary expedient, you would do better with a liquid," &c. This was apparently the first glimmer that he had of what I really meant and yet he had already sat in judgement on and condemned the whole thing! In another part of his letter he speaks of disinfection with carbolic acid and says that its effect is only transitory and that sepsis again appears in a day or two. From this it seems to emerge (to use his favourite expression) that some effect had been produced by the carbolic acid, though only transitory. Could it be possible that the wounds had really been disinfected at the

time and were again re-infected from the skin.? This might quite well be the case if the disinfectant used for the skin was methylated spirit and if aseptic gauze and wool were applied as dressings.

In one of the periodical notices in the newspapers (*The Times*) of the excellent work being done at the Front by the Army Medical Department, and especially of the bacteriological work, the statement is made that Sir Almroth Wright proposes to discover a method of treatment by vaccines which will solve all these septic difficulties. I should not be surprised if those who read this notice formed the opinion that this discovery had already been made and that any other methods, especially the use of antiseptics, could be finally dismissed, The fact, however, is that this discovery, like that of the physiological treatment of wounds, has yet to be made. I remember, in 1890, when Professor Koch brought forward his first work on tuberculin, that he told me that he thought he had also solved the question as regards the pyogenic organisms on the same lines. Nevertheless, he never got it right, although he had it always present in his mind for the next twenty years. I wonder if Sir Almroth Wright will be more successful! It is a big thing to undertake to raise artificially the immunity of a patient to such a height that anything like the massive doses of organisms which enter these wounds will be prevented from growing and establishing themselves in the wounds. So far none of the artificial vaccines, typhoid, &c., have succeeded to this extent. A considerable proportion of the vaccinated still get the disease, and some of them even die. Even vaccine lymph, which produces a higher degree of immunity than these artificial bacterial vaccines, does not prevent an occasional patient becoming affected with small-pox, and in animals most immunities (even natural ones) can be broken down by massive doses. I quite agree that if this discovery were made it would solve the whole problem, but till this is the case what are we to do? Are we to fold our hands and content ourselves with injecting hypertonic salt solution, which is of as much use in preventing these infections as a sick headache, or shall we not use means which previous experience has shown us to be of great value? I believe that the day will come when some means short of operation will be found to arrest the growth of cancer, but are we therefore to leave the cases alone in the meantime and wait till that day arrives? Do we not all agree in the advisability of operations, extensive, mutilating, sometimes fatal, and never certain of preventing recurrence? Why take up a different point of view when dealing with these very grave septic diseases? I shall not say more in case I should disturb the peace which these surgeons and bacteriologists hoped to enjoy after upsetting the antiseptic fetish, but shall pass on to the reports which I have received from the Dardanelles.

### **Reports from the Dardanelles**

The following is the gist of various letters which I have received from Mr. Edmunds with regard to his work at the Dardanelles; this will show how far the “investigators” in France are justified in their conclusions as to the impossibility of disinfecting these wounds. Mr. Edmunds reached the Dardanelles on April 30, and joined the staff on the hospital ship “Soudan”, to which he had been appointed Staff-Surgeon. When he arrived the ship had just discharged a shipload of wounded, and several days elapsed before wounded began again to come on board. The first letter I have giving any detailed account of his work is dated May 24. Accompanying this letter he sent the following notes of seventeen cases from the officers’ ward as a sample of his work, and he mentions various other cases in addition. On this occasion the cases came

directly on board ship without any preliminary treatment except perhaps a field dressing, and he was therefore able to set to work to disinfect them at once on the lines which we have been accustomed to follow in civilian practice. Under the circumstances there was, of course, no necessity for the preliminary treatment with paste and powder, but after having disinfected the wounds he dusted them with borsol powder and introduced some cresol paste into them. The patients were all anaesthetized, the skin over a large area around the wound thoroughly scrubbed with soap and 1 in 20 carbolic lotion, the wound opened up, cleaned out, and all recesses washed with Lister's strong mixture (1 in 20 carbolic lotion, containing 1/500 part of corrosive sublimate, badly soiled tissues clipped away, the wound dried and powdered heavily with borsol powder, some cresol paste squeezed in, drainage-tubes inserted, and antiseptic dressings applied. As a good many cases were suffering from shock and loss of blood, continuous subcutaneous saline infusion was started as soon as the patient was under the anaesthetic.

In addition to the cases in the accompanying list he mentions various others which he had treated. Among them were six cases of wounds of the skull. "These I cleaned up with strong mixture,, shaving, clipping away all the dead tissue, removing the edges of the wound &c. As regards sepsis, they are all clean, but some died of the brain injury." With reference to cases of this kind he says in a later letter: "Head injuries have done well. I have had a lot of depressed fractures and perforating wounds and about 60 per cent. have lived; none of them have suppurred." As regards intestinal wounds he had done some laparotomies, and although there were some encouraging cases, "as a whole my results are bad". They don't die of peritonitis, but of shock."

Summing up his experiences of this first voyage in a later letter he says: "The results of the powder and paste are excellent, and it is nonsense to say that these wounds are hopeless from the point of view of disinfection." Speaking of the results in a ward which was under the joint care of my son (W.H.W. Cheyne) and himself, he says, after some complimentary remarks about my son: "There is only one case septic in his ward – a compound fracture – which there was the ghost of a chance of cleaning, and several are clean that have no right to be anything but fully septic." "We have had four cases of gas gangrene. Two Turks who had been left a long time, one smash of the os calcis, and one compound fracture. The latter had had paste put in on shore – not by me – the others had no paste applied." "We have simply lived in the theatre; one day from 5 a.m. till 2 a.m. next morning."

The following is the list which he sent:

Gutter wound of skull not involving grey matter.

Perforating bullet wound of shoulder not involving bone.

Bullet wound of hip. Small exit and entrance; might have healed anyway, but obviously no retardation of healing.

Severe laceration of forearm involving both bones. Question at the time whether it should not be amputated. Doing well.

Small wound in back; no retardation in healing.

Bullet wound of right knee, fracturing patella and probably going into joint. Now quite quiet and healing well after four days.

Bullet wound of right knee, fracturing patella and probably going into joint. Now quite quiet and healing well after four days.



Wound through lower jaw and hard palate; exit below ear on opposite side. External wounds quite free from inflammation.

Wound of right shoulder, bruising brachial plexus.

Bullet entering through maxillary antrum, passing across pharynx and causing large hæmatoma over shoulder. Three days later no trouble in track through the tissues.

Flesh wound of left leg.

Wound of right kidney.

Wound of shoulder probably involving neck of scapula.

Shrapnel wound comminuting humerus. Wound opened up, and the fragments of bone, which were in the form of long splinters tied up with a piece of wire like a faggot. After disinfection with strong mixture, borsal powder freely introduced, and then some cresol paste. Wound sutured around a drainage-tube.

#### *Case Clinically Slightly Septic.*

Slight splinter wounds of various parts of body, some of which are superficially septic. Wounded by a bomb.

#### *Cases Definitely Septic.*

Lacerated wounds of forearm involving bone.

Extensive wound involving loss of right side of jaw from symphysis to ascending ramus, with large wound in neck. Patient is doing well, but, is of course septic.

Extensive laceration of scalp. Right arm amputated on the beach before reaching hospital ship. Is now dying.

Mr. Edmunds also sent the following list of cases treated by one of the other surgeons (Dr. C. Taylor). The exact method of treatment is not stated, but evidently powder and paste were frequently applied.

Shrapnel wound of left knee. Shallow punched-out wound just below patella. Skin swabbed well with 1-40 carbolic; cresol and borsol applied. Four days later wound dry and practically healed. Joint distended with fluid (blood removed by tapping) and very painful. (He has run a temperature up to 103°F, but has been better since he was tapped and about ii of blood removed.)

Bayonet wound of left calf. Incised wound about 1½ inches long. Cresol and borsol. Five days later wound dry and practically healed.

Bullet wound of right wrist. Compound fracture of radius. Anæsthetic. Skin cleaned with strong mixture; cresol injected. Some swelling, but wounds appear clean and healthy.

Bullet wound of right shoulder (shrapnel). Entry in suprascapular region; bullet lodged. Seven days later wound dry and scabbed over; projectile still *in situ*.

Shrapnel wound of right hypoc(h)ondrium. Shallow punched-out wound. Four days later wound clean.

Bullet wound of right shoulder. Entry through right deltoid, exit immediately below clavicle in outer third; hæmorrhage free. Anæsthetic. Exit wound opened up, torn vein ligatured. Both wounds filled with cresol, and borsol applied. Wound saturated and drained. Four days later no signs of suppuration.

Bomb wounds, right arm, right ankle, left buttock; all superficial; punctured wounds. Five days later wounds not quite healed but clean.

Bullet wound through left ankle. Skin swabbed with 1-20 carbolic, and cresol and borsol applied. Three days later wounds practically healed.

Bullet wound of right upper arm. Compound comminuted fracture of shaft of humerus at junction of upper and middle thirds. Anæsthetic. Skin scrubbed with strong mixture, cresol injected deeply, and borsol, dusted over wounds. Four days later no signs of suppuration.

Shrapnel wound of right shoulder. Six days later wound practically healed; fragment of shell still inside.

Bullet wounds of scalp and cheek. Small wounds of exit and entrance. Three days later wounds practically healed.

Bullet wound through left wrist. Wound of exit lacerated and about 1 inch in diameter with hernia of muscles. Three days later a good deal of swelling of lower third of arm, but wounds looked fairly clean.

Bomb injuries of chest and face; punctured wounds and scorching. Five days later mild suppuration only; no inflammation in tissues surrounding wounds.

Multiple shell wounds. Scorching of right cheek. Four days later cleaning up; mild suppuration only.

Shell wound of forehead, severe scorching of face and both legs, with occasional punctured wounds from shell fragments. Cresol all over wounded areas with borsol on lacerated areas as well. Four days later mild suppuration; scorched areas cleaning up very well.

Shell wounds of both thighs and scorching. Cresol spread over scorched areas and into wounds; subsequent dressing with Lassar's paste. Four days later mild suppuration in wounds; scorched areas look clean.

Bullet wound of left leg. Shrapnel bullet through upper third of leg, grazing tibia. Wounds healing five days later, with no marked suppuration.

Bullet wound of back; entry about 1 inch to right of mid-line at level of sixth dorsal vertebra and exit over angle of scapula. Seven days later entrance wound dry; exit suppurating but not violently.

Bullet wound of right thigh. Entrance on outer aspect about 4 inches below great trochanter and exit on inner aspect about 2 inches above adductor tubercle. Four days later suppurating freely; probably piece of cloth from trousers deep in wound.

No.	Time before treatment	Nature of injury and remarks
16	12 hours	Shell wounds of both thighs and scorching. Cresol spread over scorched areas and into wounds; subsequent dressing with Lassar's paste. Four days later mild suppuration in wounds; scorched areas look clean.
17	2 "	Bullet wound of left leg. Shrapnel bullet through upper third of leg, grazing tibia. Wounds healing five days later, with no marked suppuration.
18	4 "	Bullet wound of back; entry about 1 inch to right of mid-line at level of sixth dorsal vertebra and exit over angle of scapula. Seven days later entrance wound dry; exit suppurating but not violently.
19	8 "	Bullet wound of right thigh. Entrance on outer aspect about 4 inches below great trochanter and exit on inner aspect about 2 inches above adductor tubercle. Four days later suppurating freely; probably piece of cloth from trousers deep in wound.

I may say that I went out to Malta in June in the hospital ship "Rewa", and we brought home 548 wounded soldiers and sailors, among them a number of cases from the hospital ship "Soudan", and I was much struck with these cases, several compound fractures and other wounds having already healed as contrasted with other septic cases of compound fracture, &c.

### Second Voyage

Having discharged this load of wounded at Malta the ship returned to the Dardanelles, and the next letter I have is dated June 10. That and letters dated June 16 and 19 gave the results of this second voyage and his further experiences. The state of matters had changed considerably since his first voyage. On that occasion the wounded were transferred directly to the hospital ship as soon as possible with little or no previous treatment, but during the absence of the ship at Malta, dressing stations had been established on shore, the patients were often much later in reaching the ship and most of the wounds were already septic. On June 10 he says:

We have a cargo of wounded on board, and I will let you have a report of them when we discharge them. Paste or no paste, it is absolutely absurd to say that these wounds differ from civil wounds. It is true they are severe, but by the use of antiseptics you can get good results, and the pastes have certainly a role to play. This is the sort of case we get. A sergeant-major of marines was hit by the explosion of a 6 in. common shell. A big bit carried away his left arm near the shoulder-joint. His back was peppered with some wounds, one of which was extensive, and was badly burnt by a

lump of hot shell, the wound extending up under the lower angle of the scapula. His scalp was simply a lacerated bog. I got him eight hours after the injury. I amputated his arm, having the greatest difficulty in finding anything like decent flaps. While I was doing the amputation the anaesthetist shaved his head and powdered and pasted it all over. I only found the large wound in the back as I was doing up his arm, and he was not fit for anything but powder and paste. His head is now (date of injury not given) dry, the scalp moves freely and no bogginess. I think the amputation is going to be fairly all right, although the skin was so rocky. The back wound is excellent, just the simple hard clot, which, no doubt, will come away, with a good deal of serous discharge around it, and the man is quite comfortable.

In his letter of the 16<sup>th</sup> he says:-

The amputation has gone slightly septic, but only slightly – i.e., I have two tubes, one about an inch long and a smaller one two inches long, and the rest of the wound has healed; this is not bad considering the ghastly condition of the surrounding skin. As regards the back, after a week the clot began to come away, leaving a clean lymph-covered wound with no loss of skin or deeper tissues. I believe under normal conditions this would have been one of the stinking cavities with which I am now quite familiar.

The powder is very valuable for some big wounds – e.g., a man was shot through the buttocks, with what we do not know, but it is one of the largest superficial wounds I have yet seen; it goes down to the bone, and at the lower part opens into the rectum. It was freely powdered; there has been no sloughing, and it is healthily granulating, and no smell.

On the 19<sup>th</sup> he writes:-

This trip has not been good for trying the powder and paste, as we got all our cases from a base, and they were septic on arrival. I am getting fairly convinced that the real trouble is that most men have been so impressed by their teachers with the dangers of antiseptics that they are timid of using any. I think we can claim reasonable success in cleaning up wounds here, and I am absolutely sure that we have done a lot of good to them.

I have had one case of malignant oedema – a compound fracture of tibia and fibula with maggots in it. I amputated high up, but it spread to the trunk, and he died twenty-four hours afterwards.

I have found a few cases on board who have had powder and paste put in on the beach with fairly good results; they are on the enclosed sheet with the others. One case which looked as if the paste had been put in, but not very thoroughly, came on board, the wound stinking, with gangrenous skin, simply from loss of vascular supply; the discharge contained *B. tetani*. I opened up the wound thoroughly, clipped away all the gangrenous skin and sloughing muscle, slit up some cavities of pus under the skin, and cleaned up, covering the wound with the powder. One bottle (1oz.) covered a wound about 6 in. by 3 in. Next day it was inodorous, and is doing well (antitetanic serum was used as well).

I have been very pleased with the borsal in stinking, sloughy wounds; it deodorizes and cleans them up rapidly.

I enclose report of a number of cases – very unsatisfactory as regards statistics, as so many were foul and septic; but you will see the general conclusions remain. I am more and more convinced that military wounds are like other ones, and that the injection of bacteria by the bullet is nonsense; if it were not so, why are not the high-velocity bullets the worst instead of shrapnel and shell? Of course some wounds are past praying for. The fact is that practically no one ever sets to work to clean up wounds deliberate under an anæsthetic. They dress wounds, but that is all, and even when cleaned they pass through such a number of hands that they are pretty certain to go wrong.

### **Cases Treated on the Beach**

*Case 1* – Age 20. Wounded on June 5. Paste put in five minutes after he was shot; redressed and more paste five minutes later; dressed again half an hour later. Dressed again on ship on June 6. June 18: Healed. The wound was a blind wound of the muscles of the thigh.

*Case 2* – Small bullet wound over anterior superior spine, track passing upwards to a wound of exit the size of a crown piece just below the ensiform, not affecting viscera. Wounded on June 10 at 11 p.m. Removed from trenches next morning at 8 a.m. and paste put in at 8.30. Quite comfortable, “no pain to speak of.” June 19: Wound of entry healed; wound of exit granulating nicely; no smell; watery discharge; being dressed with 78 per cent. NaCl on cyanide gauze. General condition excellent.

*Case 3* – Age 28. Wounded on June 12. Bullet entered arm, passing through and entering trunk, emerging on buttock. Track marked by much subcutaneous ecchymosis. Paste in half an hour. Wounds 1,2, and 3 now dry; wound 4 suppurating slightly.

*Case 4* – Age 22. Wounded through the region of knee; joint swollen, but moveable; joint perhaps opened. Wounded on June 10 at 10.30. Powder put on at once in communication trench; dressed again at dressing station, and finally at base on the beach he was shaved, washed and painted with iodine. Dressed daily since on transport and this ship. June 18: scabbed over.

*(Cases practically all Septic on Arrival, except Case 21.)*

*Case 5* – Age 30. Shrapnel wound of back. Paste, &c., (24 hours later). Slight sepsis first week; now flabby granulation.

*Case 6* – Age 19 Shrapnel of head (12 hours). Local sepsis.

*Case 7* – Age 18. Torn wound of thigh, wound of penis (72 hours). Cleaned up by me, drained, plastic on glans with removal of prepuce. Penis held well. Wounds in thigh dusted with powder; cleaned up rapidly.

*Case 8* – Age 18. Shell wound of abdominal wall (72 hours). Septic and offensive on admission; now cleaned up well under dusting with powder.

*Case 9* – Age 29. Shrapnel wound of both legs; compound fracture of right tibia and fibula (72 hours). Slight sepsis.

*Case 10* – Age 19. Compound fracture of right tibia and fibula (24 hours, I think more). Free suppuration; now cleaning up.

*Case 11* – Age 19. Extensive shrapnel wound of chest wall (72 hours). Septic when received.; now improving rapidly, but still discharging much pus. Some blebs on skin from powder (?). This man has made a very remarkable recovery. At first I did not think he had the slightest chance.

*Case 12* – Age 17. Bullet wound in back and shoulders (80 hours). Granulating slowly.

*Case 13* – Age 19. Shrapnel wound of face (8 hours). Wounds granulating briskly.

*Case 14* – Age 26. Shrapnel wound of left forearm and knee (24 hours). Slight local sepsis of knee; arm clean.

*Case 15* – Age 24. Shrapnel wound of chest (12 hours). Clean.

*Case 16* – Aged 20. Bullet wound of left ankle and right thigh (30 hours). Slight suppuration after three days; now dry and healed.

*Case 17* – Aged 19. Bullet wound of forearm, fractured ulna, large laceration and septic (time uncertain). Now granulating and clean.

*Case 18* – Age 39. Shrapnel wound of buttock, very septic (72 hours). Granulating well.

*Case 19* – Aged 25. Shrapnel wound of left shoulder (24 hours). Clean.

*Case 20* – Aged 23. Penetrating wound of apex of lung, with wound of exit in posterior triangle (18 hours). The patient was collapsed on admission and there was a fair amount of oozing. I put in paste and powder, and for several days the wound kept fairly dry. The clot has now come away and the wound is granulating. The discharge about soaks the packing in the wound in 24 hours. The wound is a peculiar one in that it is held open by the pull of the pleura and the surrounding skin. It was as if a pyramidal piece of tissue had been pulled out of his shoulder and the space it came from left open. There is no spreading sepsis. No other disinfection was possible except paste and powder. The pleural fluid, which had to be drawn off, was darkly blood-stained. He is doing only fairly well generally, but his wound is healing rapidly.

*Case 21* – Age 44. Seen about 8 hours after wound (see above). Extensive wounds of trunk and head; arm blown off. Head wounds treated by paste and powder have kept very clean. Severe wound on back has kept clean, and is granulating up well. Arm amputated. Here it is hard to describe the condition, as he was peppered all over, with

the skin burnt &c. I expected the scalp to slough in big patches, but it is quite healthy, with heaps of little granulating wounds.

*Case 22* – Age 22. Bullet wound of thigh (18 hours). No anæsthetic. Clean after 10 days; discharges serous material, and granulating well.

*Case 23* – Age 20. Blind wound of back. Spent bullet entering base first. Paste after 18 hours. Clean.

*Case 24* – Age 35. Perforating wound of sole of foot received while standing up. Paste after 12 hours. Clean and healed.

### *Third voyage.*

After reaching Malta on the last voyage Mr. Edmunds joined the hospital ship “*Rewa*” and went back to the Dardanelles. I have a short note from him written on July 4 after the ship had been filled up with wounded and was on her way back to Malta. This is not accompanied by any details. He says:-

I have nothing of interest to add to what I have already written about the powder and paste, nor have I anything to retract. I have had the officers to look after, but none of the cases were early ones and they were unsuitable for the treatment. I have seen one or two cases which were treated on the beach with paste which have done pretty well, but these cases have been dressed by many people so that the results are of no value for statistical purposes. I had one case with a compound fracture of the skull who had been pasted. I cleaned away the paste and did an extensive elevation of skull and removal of fragments. There is absolutely no difficulty in cleaning out the paste. I helped another surgeon with a similar case. We have lost about a dozen gas gangrene cases (not pasted). When this gets a real hold it spreads like a fire in a straw yard, but there are quieter cases which can be saved, and we had some of them.

Mr. Edmunds makes the following remarks about cresol paste and borsol:-

Cresol paste may block a wound, but why not open it up and put a tube in? I have done so with good results. Cresol paste has a distinct antiseptic action and for superficial wounds, *e.g.* shell wounds, is admirable. Cresol paste does not burn the skin, *i.e.* I have not seen any trouble of this sort. Borsol is invaluable used alone or with the paste, especially in wounds where it can be dusted in. It is very useful for gaping wounds which are sloughing and stinking, and will generally clean them up almost at once.

Towards the end of his last letter he says: “The men on board were much impressed with the antiseptic you gave them and want more of it. I hope you will also have some for the “*Soudan*.” I omit the name of this antiseptic for the present in case they should “investigate” it in France.

I may also refer the reader to a short note in the third number of the *Journal of the Royal Naval Medical Service*, by Fleet-Surgeon John Martin, R.N.

