

## **Local treatment of wounds and ulcers by oxygen / by George Stoker.**

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LOCAL TREATMENT  
OF  
WOUNDS AND ULCERS  
BY OXYGEN:

A LECTURE AND DEMONSTRATION GIVEN AT THE RICHMOND  
HOSPITAL, DUBLIN, FEB. 16, 1895, BEFORE THE PRESIDENTS OF  
THE ROYAL COLLEGE OF PHYSICIANS AND SURGEONS,  
IRELAND, AND A LARGE BODY OF THE  
PROFESSION

BY  
GEORGE STOKER, M.R.C.P.I., M.R.C.S.Eng., J.P.

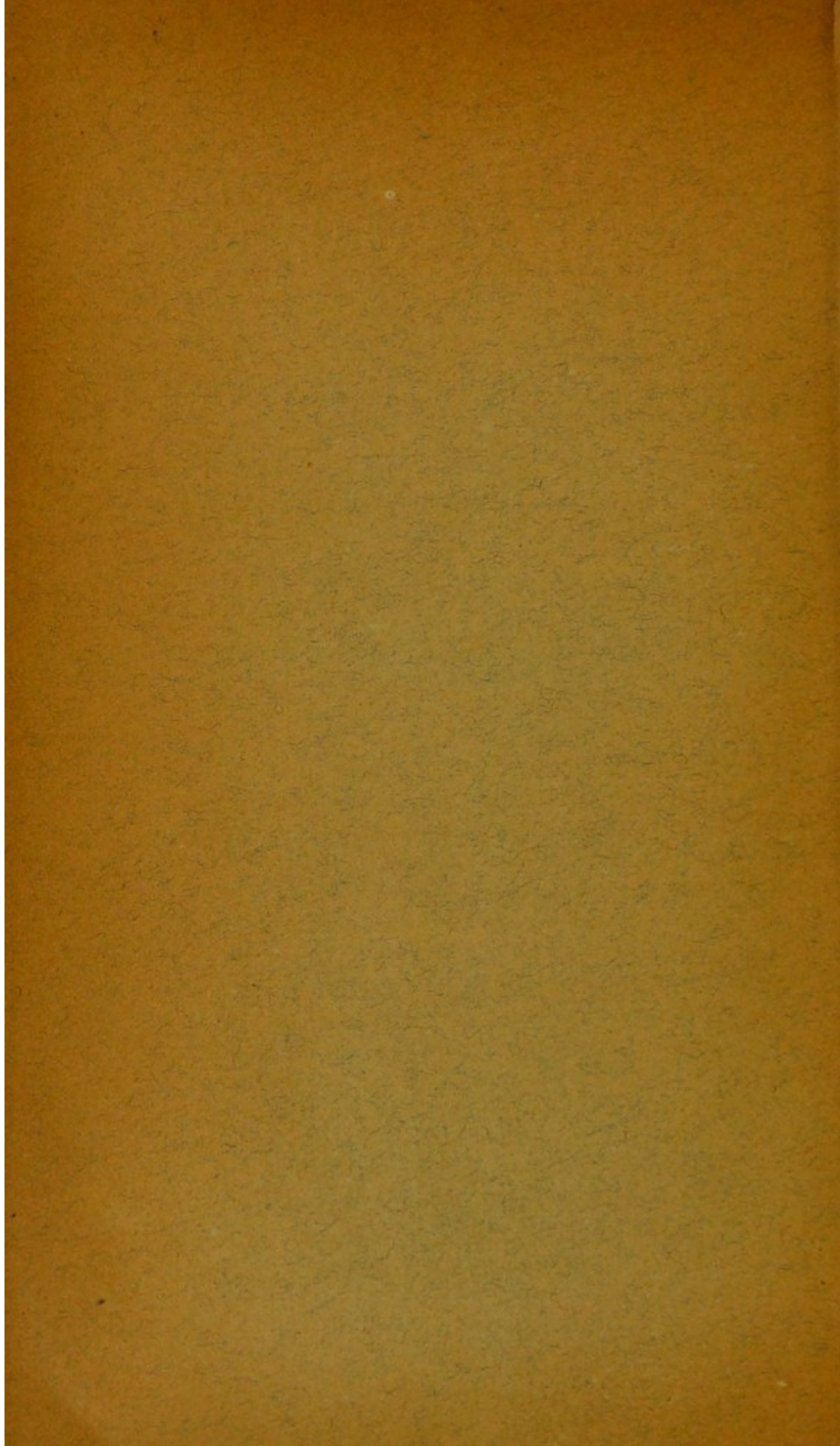
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STRAND, W.C.

1895.



# LOCAL TREATMENT OF WOUNDS AND ULCERS BY OXYGEN.

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DR. STOKER said :—Mr. Thomson, ladies and gentlemen—Having made what I believe to be a discovery in reference to certain surgical treatment, and having proved it in a private way to be an entire success. I now desire to bring it before your notice. After I shall have described shortly the apparatus and the method of procedure, I am perfectly certain that the first question which will suggest itself to everybody here is, “What on earth put this into your head”? I shall, therefore, anticipate that question by stating that the idea was first suggested to me by continuous observation of wounds which healed without any further treatment than washing with water twice a day, and which were exposed to pure air. These wounds came under my notice during and after the Russo-Turkish and the Zulu wars, especially during the Zulu wars. The Zulus are not in favour of surgical

progress from one point of view. Their practice was to go to the uplands where the air is extremely pure and to use no dressings, and the result was that their wounds healed in an extraordinary way. That first attracted my notice to this matter many years ago, and I am ashamed of not having developed the idea long ago, but the exigencies of life constantly prevent us from doing many things that we wish to do. First of all, the definition of this treatment is simply "exposure of the wounds or ulcers to the action of oxygen." The oxygen may be either pure or diluted with pure air according to the requirements of each case. I had conceived the idea that these results would be produced by the stimulating vitalising effects of the oxygen, but above and beyond that it has been unquestionably forced on my mind that some profound chemical change takes place in the surface of the wound in the nature of a process of oxydisation. In order that the wound may be exposed thoroughly, and if possible continuously—I do not say that the exposure must always be continuous, but it is better to expose it continuously because the case will then be treated without any interruption to the action of oxygen, pure or diluted, it became necessary to design some apparatus which would effect that object. And the first which I designed and made with my own hands were boxes such as you see. These are not absolutely necessary, as a simple india-rubber bag would do, but as they stand they are satisfactory for the purposes of treatment *plus* clinical observation. It is not in any way necessary for this treatment that you should bring about an absolute vacuum. If that were so the treatment would be practically useless, because an absolute vacuum is an extremely difficult thing to attain. When we have to apply the treatment to the extremities of the body it is

only necessary to have india-rubber bags of the simplest construction. If you want to apply the treatment to a knee-joint, what is required is an oval india-rubber receptacle open at both ends, larger at one end than at the other. The lower or smaller end of the bag embraces the limb below the knee, and the upper or larger end embraces the limb above the knee. In the cases in which boxes have to be used there is always a certain amount of leakage, and, therefore, it is more or less necessary to have a continuous stream of oxygen. But in cases where the limb is enclosed in an india-rubber receptacle it is not necessary to have a continuous stream, it is only requisite to fill the bag and turn off the tap, and after five or six hours to fill it again. The cap on the head of this boy was filled last night with pure oxygen, and he slept comfortably with it on. You have to apply a suitable apparatus to any other part of the body that it may be necessary to treat. Here (No. 2) is a bag enclosing a foot, and here (No. 3) is another enclosing an arm and hand. You will presently see apparatus for applying oxygen to the eye or ear. I conceive that the treatment might be very useful in ulceration or chronic diseases of the os uteri, but I have not yet had an opportunity of trying that. For such a purpose a ball pessary might be constructed with a tube through the centre of it for the injection of the oxygen to the part, an exit tube being provided through which the used-up gas could escape. I hope I may be able to make arrangements for applying oxygen to the bladder, which might prove a very effectual mode of treatment in cases of chronic cystitis. I think the treatment can be applied to the vagina and the uterus, as well as to the head or the eyes, and that by means of a silver tube it may be possible to apply it to cases of rectal fistula,

which are very difficult to heal. The method of proceeding to treat an extremity is as follows : First the wound is washed, then the india-rubber cap is passed along the arm so as to embrace the limb. The larger end of the bag is passed round the edge of the box and tied with tape, and through the india-rubber tube is passed the oxygen diluted with air. Only a few cases can stand pure oxygen, as it causes a great deal of pain when used in its pure state, but there are cases that will stand it. But suppose a case in which we use diluted oxygen—that is a fifty per cent. solution of it. First, in order to purify the dilutant air it is passed through two wash bottles before entering the gas-bag, the first containing lime water, and the second a strong solution of Condy's fluid. Then the oxygen is passed into it out of a cylinder supplied by Messrs. Brin. When the bag is filled it is connected with the receptacle by a small tube, the tap is turned partially on, and your treatment starts. It goes on according to the length of time that the bag is supposed to last. Of course, in cases where a very large box or receptacle is used, and where there is great waste, the emptying process takes place quicker than in ordinary cases where only a box for a hand is employed, in which latter case one filling lasts twelve hours. The caps I now show you are used for treatment of the eye and ear, and superficial ulcers on the surface of the body, including the breast. The edges of the cap are fitted with adhesive plaster to attach the cap to the skin, and the oxygen is passed in through the tube. Supposing the treatment to be started, there are a few points which I wish to mention in the order of their importance. First, as regards pain ; there is relief from pain at once. Some of these cases were extremely painful before this treatment, but the patients have

one and all stated to me that the treatment gave them immediate relief from the pain they suffered, the only discomfort they experienced being a kind of little pricking pain which lasted only from the first half hour to the first hour of the treatment. Of course, if the oxygen is too strong the pain is very severe. Here is a photograph of a woman who had an ulcer of the leg for eight years, for which she had been continuously treated in hospital, both as an outdoor and indoor patient. At the end of twenty-four hours after the first application of the oxygen treatment, I asked her how she felt, and she said "it was the first night for eight years that she had been free from pain." With regard to the discharge, you know that many of these chronic ulcers are very dry and hard, but in the very worst of them after twelve hours of the oxygen treatment the discharge has been greatly increased and also considerably altered in character. During that time microscopic examination does not show any difference in the number or character of the micro-organisms present in the pus, but after twelve or fourteen hours' treatment the discharge begins to diminish, and then remarkable alterations are seen in the character of the micro-organisms which I shall presently mention. With regard to the healing process, several very interesting points are to be observed. First, the new tissue is not cicatricial but is similar and continuous with that of the surrounding parts. Another very important point as to the healing is this. We know that in many ulcers there is a tendency to redundancy of granulation; that has never been observed in any of the 13 or 14 cases I have treated. In some of the case, which were deeply excavated, the ulcer has come rapidly to the surface, and then stopped and waited patiently until the skin grew over it. Of



course, we are now only at the beginning of this business. We are just taking the first step. I think there is a great possibility in front of it, and I look to you, gentlemen, who have general surgical hospitals behind you, to try to develop this treatment. I think it is one which might be very successfully carried out with rodent ulcers and lupus. We have a case of lupus in this hospital which we only began to treat to-day, and I hope that we shall also be able to do something with epithelioma. I am now trying ozone also. We know that it is a very much more powerful oxydiser than oxygen itself. But there are difficulties attendant upon its use. It is so powerful an oxydiser that it destroys any fabric with which it comes in contact except such as are covered with pure paraffin. I have been so informed by Professor Dewar, of the Royal Institution, who is the greatest authority on the subject, and who has experimented largely with ozone; he states that paraffin is the only thing that will stand it. At present we are trying to make something covered with paraffin which will answer the purpose.

I propose now to say a few words about the cases you see here.

The first is that of a little girl. She has tuberculous disease in several parts of her body. Both ankles are affected. The right elbow-joint and the right wrist; she is now nine days under treatment. When we began she had an ulcer (tuberculous) on the back of her right hand which extended from the line of the fold between the thumb and first finger to the base of the little finger and engaged nearly all the dorsal surface of the hand. You can see it is now about the size of a threepenny piece. This case has been several months in the hospital and has resisted all the usual surgical methods of treatment. She was treated with

a 50 per cent. of oxygen, and suffered no pain whatever. The photograph shows the original size of the ulcer.

The second case is that of a tuberculous boy with extensive disease of the tibia. He has been five months in hospital, several operations have been performed and sequestræ removed. It has been found impossible to get the large cavity to granulate up; 80 per cent. of oxygen was applied. The measurements when the treatment was commenced were: length, 10 ccm.; breadth,  $4\frac{1}{2}$  ccm.; depth, 4 ccm. The measurements now are: length, 9 ccm.; breadth,  $3\frac{1}{4}$  ccm.; depth, 2 ccm. This is the result of nine days' treatment.

The third case is that of a girl with tuberculous syngovitis attacking the tendons on the back of the wrists; she has been seven months under treatment. Several plastic operations have been performed with a view of getting the ulcer covered; they have all failed and the usual methods of treatment did not promote granulation. The ulcer measured when we began 2 ccm. long by 1 ccm. broad; now after 3 *days' treatment* by oxygen the measurements are 1 ccm. long, by  $\frac{1}{2}$  ccm. broad.

The fourth case is that of a young man with tertiary syphilis. He has been eighteen months in hospital. He is an extremely bad case; he has lost his hard and soft palate. His head was covered with suppurating sores, and resisted the usual treatment. Now the cap is removed you can see that most of these sores are healed, and those that are not are now granulating in a perfectly healthy manner. He is treated with an india-rubber night-cap, which is filled with pure oxygen twice daily.

I do not propose to occupy your time any longer, but it is right and proper and entirely in accordance with my feelings that I should express my thanks to

the staff of this hospital, first, for their goodness in allowing me to introduce these cases here and giving me an opportunity of testing the treatment. I assure you that I feel highly honoured by your presence here to-day, and I deem it a great privilege that here in this hospital, where I passed many of my student days—and very happy days they were—I should be allowed after the lapse of a good many years to bring under your notice a system which I am sure, under your fostering care will extend far beyond the limits of this city. I believe also that it will reflect credit, not only on the medical schools which we represent, but on the country to which we have the honour to belong.

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