2. *Oral Sepsis in Relation to the Occurrence of the Secondary Angina.*—In 60 per cent. of the cases having this oral sepsis in which complications occurred, the oral sepsis was noted to be very severe. The last case I have described to you illustrates that very well. Here is my note of it. Rash, moderate; angina, moderate; adenitis, moderate. Yet the one fact noted in connexion with that is that there was the severest degree of oral sepsis, with an abscess round one of her teeth. The subsequent course of this case was the severest angina, the severest adenitis, and the severest cellulitis. She also had vomiting, and she had diarrhoea, denoting "septic gastritis" and "septic enteritis," and afterwards hyperpyrexia occurred and death.

3. *The Relation of Oral Sepsis to the Severity of the Complications.*—This is very striking. I have here notes of 7 cases. The 7 cases in which oral sepsis was noted to be severe were nearly all severe. Two had severe adenitis, severe septic enteritis, and septic rash; the third had angina of severe degree, rheumatism very severe, albuminuria lasting thirty-four days, gangrenous stomatitis, which gave the greatest trouble, septic gastritis, enteritis, and finally pyaemic abscesses in the hip, from which streptococcus was isolated. These were all in one case which eventually recovered. The fourth case had adenitis twice; the fifth case had rheumatism and albuminuria lasting nine days; the sixth case had severe angina, and the severest form of otitis lasting six weeks. In other words, 6 out of the 7 cases in which this condition of severe tonsillitis was noticed were actually very severe cases, both as regards the degree and the variety of the complications.

Now let me note another fact in connexion with oral sepsis in relation to complications as a whole. The actual frequency of the occurrence of complications of some kind or another is but little affected by the presence or absence of oral sepsis, but the number of complications met with in cases of oral sepsis is much higher than in those without it. And still more, the severity of the complications met with is much greater. In cases of oral sepsis, 66 per cent. had complications of moderate or severest degree, whereas only 35 per cent. had such complications in cases in which there was no oral sepsis. This is well brought out by taking any one complication, such as tonsillitis, to which the figures I have given you refer. With regard to the relation of oral sepsis to albuminuria, 30 per cent. of the cases had albuminuria. In the cases without oral sepsis the average duration of the albuminuria was 5.8 days. In cases with oral sepsis the average duration was 15.1 days. In cases with oral sepsis and cellulitis the figures are equally divided. Of rhinitis we had 13 cases. No oral sepsis in 7, and those 7 cases were of mild degree. Oral sepsis was present in 6, 2 of them of mild degree, 2 of moderate degree, 2 of severest degree. Next with regard to oral sepsis and otitis. There were 12 cases. No oral sepsis in 6 cases; 5 of them were of mildest degree. Oral sepsis in 6 cases; 2 of these were of mildest degree, 1 of moderate degree, and 3 of severest degree. Oral sepsis and rheumatism we will take next—20 cases. Without oral sepsis, 10 cases, all of them of mildest degree; with oral sepsis, 10 cases, the slightest degree in 7, severe or moderate in 3.

Time will not permit me to go further, but I hope enough has been said to bring out the fact that this class of work is of interest. We cannot deal directly with the scarlatinal factor, but with the septic factor we can deal; and these figures bring out the fact that there is a definite relation, as one would expect, between the actual existence of oral sepsis in a patient with scarlet fever and the severest complications. It must be remembered that in all these cases I removed the oral sepsis immediately, and did not leave them to, as it were, soak in their oral sepsis; and yet that is what has been done hitherto. Usually no care has been taken to remove this source of infection. So these figures do not bring out the true relation. To do that it would be necessary to compare this series of cases with a parallel series in which the oral sepsis had been observed and yet nothing done for it. Of this class I have no cases; for in all cases which have come under my care the condition has been immediately treated antiseptically by swabbing out, and carefully removing the sepsis from the mouth. Despite these precautions, the existence of oral sepsis at the time of contraction of the disease has influenced the primary angina, the

subsequent occurrence of tonsillitis, of adenitis, and especially has undoubtedly influenced the severity of the complications afterwards.

The practical outcome, irrespective of mere statistical considerations as to whether oral sepsis does or does not influence scarlet fever, is that it is absolutely necessary to remove even the chance of it doing so. Therefore it is to me a very important duty, in all cases of fever coming under my care, to endeavour to eliminate this factor as far as possible. So I do not wait to find out what it is going to do, but I remove it, as I should remove any other possible source of trouble, just as I should give the patient fresh air, good food, or see that he was kept properly clean. That is the general outcome of this work, and I think you will find that in the cases which come under your care you will derive the greatest possible satisfaction yourself and you will confer the greatest possible benefit on your patients by dealing with this as you would with any other possible element of danger in connexion with the case. The *prima facie* case for dealing with it seriously in scarlet fever is, I think, greater than in any other fever with which we have to deal.

As I showed in a previous communication,¹ it is no less important in enteric fever, in which disease, according to my observations, the septic factor is an important cause of the chief intestinal complications—perforation and haemorrhage.

The sepsis associated with these two fevers and responsible for the chief complications is thus, in my experience and judgement, largely a preventable condition, and the question I now leave with you is: If preventable, why not prevented?

I drew attention to the subject at the Oxford meeting of the British Medical Association,² and this lecture is an addition to the facts then brought forward.

A Clinical Lecture ON WHITLOW AND ITS TREATMENT.

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THE subject I have chosen for this lecture may appear to be a very everyday one, but that is really the reason which led me to choose it. The subject of whitlow, as I shall deal with it to-day, is one which appeals to everybody who is in practice; every one who sees cases of all kinds will see many cases of whitlow in the course of twelve months, and if we can arrive at some understanding as to what is the best way of treating the several cases of whitlow as they appear I shall be satisfied with the results of this hour's lecture.

I do not think I can do better than start by reminding you of the customary classification of whitlow, and then I shall pass in review fairly rapidly what is considered to be the best treatment for each variety of the disease. Then I shall describe the extensions of the disease, which are very important, into the palm of the hand and so forth, and shall state, as far as it can be stated, what is the best method of treating cases which we will suppose have come before us.

THE VARIETIES OF WHITLOW AND THEIR TREATMENT.

The four varieties of whitlow are the subcuticular, subcutaneous, thecal abscess, and subperiosteal abscess. The subcuticular variety is that in which the inflammation is found underneath the cuticle, between the cuticle and the cutis vera; it is probably due to the poison having been introduced by inoculation through the cuticle. The second variety, which is perhaps the commonest, is the subcutaneous form, in which the inflammation occurs in the fibro-fatty pad, and this is the variety which one sees so often at the top of the finger. The third variety is not usually a primary one, but occurs secondarily as an extension from the last mentioned form, that is to say thecal abscess, or an inflammation which has extended

¹ Oxford Meeting, British Medical Association, BRITISH MEDICAL JOURNAL, November, 1904.

² BRITISH MEDICAL JOURNAL, November, 1904.

into the tendon sheath on the flexor aspect of the finger and involves that more or less rapidly from one end to the other. The fourth variety is comparatively uncommon; we do not so often see it, but any one may see 3 or 4 cases in the course of a year; it is the subperiosteal form, in which the inflammation has either started there originally, or has extended from a more superficial position under the periosteum of the phalanx. That is the most deep-seated form of all, and although fairly simple as regards treatment, it is nevertheless a form in which the affection lasts a considerable time before one is able to get a healed wound.

I will now mention a few points with regard to whitlow which may be taken to apply generally to all the forms. The inflammation in this condition is an acute inflammation. In the majority of instances it is started by the introduction of micro-organisms, generally a streptococcus, and it has a great tendency to spread rapidly to the deeper parts. If the infection is beneath the skin, the tendency for this inflammation to spread is greater than if the inflammation begins superficial to the cutis vera.

Now, I propose to discuss the treatment of each of the varieties of whitlow. The subcuticular form of whitlow is not so often seen, I imagine, because the patient does not consult a surgeon soon enough. If you had a typical case of this kind you would see some redness at the top of the finger; and if you looked at it very closely, and, better still, with a magnifying glass, you would be able to recognize that the inflammation was exceedingly near the surface. There is very little general hardness of the pad at the top of the finger. And a little later you would notice that there was a drop of pus forming in the centre of the reddened area of skin and cuticle. The treatment to apply here is to avoid making a deep incision for fear you should introduce the inflammation or the sepsis into the fatty pad under the skin. That should be avoided at all costs. The proper treatment is to soften the cuticle as far as possible by immersing the finger in hot water or any hot lotion, and, keeping the blade of the knife flat on the surface, thus to shave off the cuticle until one has opened the centre of the inflammation and let out the drop of pus which lies there. Following this plan of treatment, this variety of whitlow can be often brought to an end very quickly indeed.

The next variety is the commonest of all, the subcutaneous, and the treatment is early incision through the top of the finger, through the fibro-fatty pad, sufficiently deep to expose or incise the whole thickness of this pad, but not so deep as to run any risk either of incising periosteum of the bone or of opening the tendon sheath which ends over the front aspect of the terminal phalanx of the finger. With these two reservations, a free incision, which can be done without giving an anaesthetic, should be made in the middle line, directly through the fibro-fatty pad of the finger.

The next variety we come to is the thecal abscess, and I ask you to follow me for a minute or two as I pass in review the anatomy of the parts which are concerned in this particular kind of whitlow. There is, you will remember, on the front aspect of the finger, a fibro-osseous canal. This canal extends from the neck of the metacarpal bone to the base of the terminal phalanx of each finger, and it is formed over the head of the metacarpal bone by the special arrangement which the palmar fascia has with that fibrous plate or ligament which is called the anterior metacarpo-phalangeal ligament. It is the ligament which covers the front aspect of the head of the metacarpal bone, and forms the anterior ligament and capsule of the metacarpo-phalangeal joint. This, together with the palmar fascia in front, forms the commencement of the fibro-osseous canal along the front of the finger. Further down in relation with the phalanges we have special ligaments which belong to the phalanges themselves. That is to say, at the front of each phalanx, meaning now the first and middle phalanx in the case of the fingers, there is a ligament which arches from the one border to the other of the shaft of the phalanx; this is the ligament commonly spoken of as the vaginal ligament, because it forms a large part of the sheath of the tendons. Opposite the joints, you will remember, the fibrous wall of this fibro-osseous canal is considerably thinner. Instead of being formed of fibres which arch from one border of the phalanx to the other, it consists of

fibres which run obliquely in various directions, so as to admit of its being crumpled up when the fingers are acutely bent. The termination of this fibrous sheath forming the front wall of our canal occurs on the front aspect of the terminal phalanx of the finger, just beyond the insertion of the flexor profundus tendon. The fibro-osseous canal thus formed is lined by a serous membrane, which is likewise reflected on to the surfaces of the tendons occupying the canal. The serous membrane forms a closed sac, which is of equal extent with the fibro-osseous canal itself.

You will remember there are two flexor tendons in each finger, one only in the thumb, and that each of these has almost, but not quite, a complete covering from this serous membrane. It is the introduction into this serous sac, in this fibro-osseous canal, of some sepsis, or micro-organisms, we will say, which produces the thecal abscess, and it is in these conditions, when the inflammation has been started and has been increasing for some little time, that we mostly see it, for it is then that the patient comes for treatment. The treatment to be applied is undoubtedly very early incision. I think it is a mistake to wait even until we can be sure that there is pus present in the finger. The incision should be made before the pus forms, because that gives us the best chance of preventing the formation of pus at all. And the next point which I would like to insist upon is, that no one should attempt to open the thecal abscess without giving a general anaesthetic, and that no one should attempt to open a thecal canal without having previously rendered the part bloodless, because you want to do this operation with the greatest care. If you do too much it is sometimes worse than not doing anything at all.

The kind of operation I recommend is this. (Usually there is not much time to prepare the patient for operation.) He should be completely anaesthetized by a general anaesthetic, and the limb should be raised above the trunk for a short time, the surgeon or his assistant holding the arm by the wrist in such a way as not to compress the vessels, holding it by the bones between the finger and thumb, so that no pressure is exerted upon the vessels of the limb. For if the hand encircles the wrist, naturally a good deal of blood remains in the patient's hand. Having held the hand like that for three or four minutes, the surgeon applies an elastic bandage, that which we call Esmarch's bandage, round the upper arm, and it is generally sufficient to place six turns, one over the other, anywhere on the length of the arm below the deltoid to render the limb comparatively bloodless. And I think it would be a mistake if one put on the Esmarch bandage in the way that Esmarch himself advised it should be put on for other conditions; I mean by beginning at the fingers and winding it spirally up the arm, and then placing six turns round the arm, and subsequently unrolling a piece of the bandage from the fingers up to the top. That would be wrong, because there would be some risk of forcing material in the lymphatics of the limb, and septic material probably, higher up in the limb than it had already reached in the course of the disease. No one should start such an operation with the determination of opening the theca at all, because it is impossible to say whether or not it is necessary in any given case. One first makes an incision through the skin and subcutaneous tissues, and then discovers whether it is necessary to open the tendon sheath. You may find that the inflammation which is causing a very large swollen and oedematous finger is superficial to the theca, a fact which you cannot determine until you have exposed the surface of the theca and viewed it directly with the part free from blood. One often embarks upon an operation of this sort with a fixed idea in one's head of what one has to do, and then it is difficult to alter one's course of action at a moment's notice. So it should be an operation of exploration, not having determined beforehand what you will do because you do not know what has taken place, knowing only that the theca has to be exposed and dealt with as occasion requires. I advise that amongst the instruments prepared for this operation should be a hypodermic syringe, so that if there is any doubt as to what the contents of the theca are, one can easily draw off some of the contents in the syringe and view them in the glass barrel. If they are turbid I recommend you to open the theca; and if they are clear I recommend that, at any rate on that occasion, it should not be opened freely, but

that a small opening be made, sufficient to give drainage for the clear fluid.

The next question which arises is, Where should the incisions be made? I think there are undoubtedly two incisions which should be made; one should be an incision which traverses the site of infection, and since the site of infection is nearly always at the top of the finger, it follows that this incision traverses the fibro-fatty pad in that situation. It should be prolonged a little further up than the usual incision there which I have recommended for treating the subcutaneous form of whitlow, so as to open the termination of the theca if necessary. One would then see within the theca the insertion of the tendon of the flexor profundus digitorum. The other incision is also generally necessary, and it should be made at the other end of the tendon sheath. I have already said that this fibro-osseous canal in which the tendons lie begins at the neck of the metacarpal bone. The position of the upper incision should be therefore over the head of the metacarpal bone, and it will then divide practically nothing of any importance, so long as it is kept in a line with the axial line of the finger. The incision divides skin and subcutaneous fat, and underneath the fat you will see the strip of the palmar fascia, and if you divide this you open the thecal space. I recommend that when you have reached the theca the surface should be sponged clean, so that you can see what its colour is. If it obviously contains pus, an incision should be made freely in it about 1 in. long. But if there is any doubt as to what it contains, though you can demonstrate by the feeling which you get by touching it with your fingers that it contains fluid, some of the latter should be drawn off with the hypodermic syringe, and then, according to the character of the fluid, so you either make a long incision, say 1 in. long, or a short incision just sufficient to give exit to the clear fluid which you have found to be present in the sac. There are other positions which have been recommended for opening a thecal abscess, but I am bound to say I do not know of any two which are so useful as the one at the termination and the other at the commencement of the thecal sac. Sometimes if you can show that the suppuration within the theca is local, you can deal with it where you know it to be. If, for instance, there were no swelling in the palm, and the swelling were found to extend along a certain length of the finger, you might deal with it locally by making your incision through the thickest part of the swelling. The tendon sheath should never be laid open from end to end, for then the tendons stand out from the finger and invariably slough.

TREATMENT OF EXTENSIONS OF THE INFLAMMATION.

Now we come to another consideration, namely, that if we are dealing with a whitlow which has started at the top of either the index, middle, or ring fingers, the probability is that the suppuration within the tendon sheath will not extend, provided that the pus be not left unduly long in the finger. It will not extend beyond the level of the neck of the metacarpal bone, because that is the limit of the thecal space, and of the serous membrane in which the pus lies. But in the case of the thumb, and in the case of the little finger, one should look out for extension much further than that—extension, in fact, up to the wrist, and even above the level of the wrist, into the lower part of the forearm. I will make a few remarks with reference to these statements.

It was shown some years ago by Dr. Alfons von Rosthorn that in the majority of instances there was direct extension of the serous sacs within the tendon sheaths of the little finger and thumb upwards through the palm, so as to communicate respectively with two large serous sacs lying beneath the anterior annular ligament of the wrist, and the following diagram (Fig. 1) represents what he described as the typical arrangement of these sacs.

You will remember the upper border of the anterior annular ligament of the wrist corresponds almost exactly with the lower of the two creases across the front of the wrist. The upper crease is a slight one, while the lower is quite a deep crease, and if you follow inwards the course which it takes the upper end of the pisiform bone is reached, while following it outwards leads to the tuberosity of the scaphoid. These bony points are of

some importance, and may serve as guides to certain operations which I have to speak of presently. Of the two large sacs beneath the annular ligament one is considerably larger than the other. This one extends up into the forearm for $1\frac{1}{2}$ in. above the level of the upper

Fig. 1.—Showing the five distinct serous sacs usually found in the hand in relation with the tendons of the flexor longus pollicis and of the flexor sublimis and flexor profundus digitorum. The position of the anterior annular ligament is indicated by lines representing its upper and lower borders respectively. (After von Rosthorn.)

border of the upper border of the annular ligament, and is in relation with the tendons of the flexores sublimis and profundus digitorum. It is then somewhat constricted in its passage through the narrower space beneath the anterior annular ligament. (There is a fibro-osseous canal formed here by the annular ligament in front and by the carpus bent upon itself so as to form a deeply concave groove on this aspect behind.) But at the lower border of the annular ligament the sac expands again, and on its ulnar side is continuous with the serous sac which lines the tendon sheath of the little finger. The smaller sac beneath the annular ligament is in relation with the flexor longus pollicis, and does not extend so high above the ligament by about $\frac{1}{4}$ in. For all practical purposes there is no difference. The sac is constricted beneath the annular ligament and in the palm shows an expansion which I have indicated in my diagram. This expansion lies in the inner part of the thenar eminence, and is overlapped by the outer head of the flexor brevis pollicis muscle. Afterwards the sac is prolonged without a break down the course of the thumb, where it is continuous with the serous sac which lines the tendon sheath of that digit. I have indicated in my sketch the position of the serous sacs of the other digits so as to make the picture complete.

Fig. 2.—Showing a section of the wrist through the upper row of carpal bones. It indicates in particular the relation of the serous sacs to the tendons as they pass beneath the anterior annular ligament. S, scaphoid; C, cuneiform; Py, pyramidal; Pi, pisiform; f.c.r., flexor carpi radialis; f.l.p., flexor longus pollicis; m.n., median nerve; u.a., ulnar artery; u.n., ulnar nerve. The tendons of the flexor sublimis and flexor profundus digitorum are easily recognized. (After von Rosthorn.)

We have now to consider what steps are necessary if suppuration has started in the thumb or in the little finger, and has spread beyond the digit into the large sac in the case of the thumb, or into the still larger sac in the case of the little finger. There is usually a small

communication between those two at the upper end, which is effective for practical purposes; that is to say, you may easily get an extension of suppuration in one or other direction. We now want to know what relation these sacs have to the several tendons underneath the anterior annular ligament. If we know this, it follows that we have the exact relation of the sacs to the tendons above or below the anterior annular ligament. I can show this relation best by means of a diagram (Fig. 2), which is also after von Rosthorn.

We will imagine we have cut across the carpus transversely, so as to show in front the anterior annular ligament. There are nine tendons in the fibro-osseous canal so formed. On the outer side the flexor longus pollicis tendon, a tendon which is in relation with the smaller of the two sacs. There are placed upon the floor of the space four tendons, those of the flexor profundus digitorum. In front there are the four tendons of the flexor sublimis; and of these the middle and ring finger tendons lie a little in advance of those of the index and little finger. The relation of the serous sacs can now be shown to the several tendons underneath the anterior annular ligament. Their position is mainly what we should expect. Each sac shows two layers: the parietal and the visceral layers, if we may so term them. The parietal layer lines the space in which the tendons lie, and the visceral layer is reflected on to the tendons. And the way in which it is reflected is peculiar. A series of pouches are formed which pass between the several tendons, and so give to each tendon either a complete covering or almost a complete covering. It is a closed sac which surrounds or nearly surrounds the space in which the tendons are, and is so arranged with reference to each tendon that it gives almost a complete covering to each. In the case of the smaller sac of the two the same arrangement holds. The parietal layer lines the outer portion of the space underneath the anterior annular ligament, and the visceral layer is reflected on to the tendon. It is a closed sac again which either completely or almost completely surrounds the tendon of the flexor longus pollicis.

We now pass on to describe the operations that become necessary when suppuration has extended into either of these sacs. Let us take the case of the thumb first, as that is the simpler, because we are there dealing with one tendon only. When a whitlow starts at the top of the thumb, becomes secondarily a thecal abscess and spreads upwards under the annular ligament into that portion of the serous sac which lies above that ligament, it becomes necessary to deal with it somewhat energetically. One has to institute as complete drainage as possible for the whole of the length of serous sac involved. It is probable that one would make, if not quite at the beginning of the operation, quite early, an incision through the fibro-fatty pad of the thumb, because that is the site in which the infection was first inoculated. One would then make an incision into the upper end of the serous sac; that is to say, an incision would be made in the lower part of the forearm above the wrist, so as to evacuate the pus which lies there, and so as to give us an opening at the upper limit of the sac for the purpose of free drainage. Opinions differ as to where exactly this incision should be made. The question is as to whether you should make the incision on the outer side or on the inner side of the flexor carpi radialis. One can demonstrate on one's own wrist the position of the flexor carpi radialis. It lies one-third of an inch internal to the radial artery, and about the same distance external to the palmaris longus tendon. Should the incision be made on the outer or the inner side of it? Each position is equally good as regards the facility of reaching the tendon of the flexor longus pollicis, which lies underneath the flexor carpi radialis tendon.

Now on the outer side of this tendon is the radial artery; and since you will probably be putting a tube into the wound and because the wound will become intensely septic from the character of the material which you will evacuate, you are exposing the artery to very unfavourable conditions, in that, if you use a drainage tube, and sometimes even if you are able to do without a tube, you may get ulceration of the vessel where the tube or dressing lies upon it. I know of two instances in which this occurred, in which the radial artery ulcerated, and in both instances a tube was being used. In one case, though the patient was in hospital, she died from

the severity of the haemorrhage which resulted, and in the other case the bleeding was arrested only by ligaturing the brachial artery at the middle of the arm. When the incision is made on the inner side of the flexor carpi radialis tendon that brings you very near the median nerve, and if you are going to use a tube for drainage, and sometimes without it, you may create a neuritis of the median nerve which will damage the hand either permanently, or at any rate for a great length of time. My own preference is to make an incision on the outer side of the flexor carpi radialis, but I should protect the radial artery, either by covering it with gauze, or, if I felt that that was not sufficient, I should remove a piece of the vessel, that is to say, I should cut out about 1½ in. of it, and wipe over the surface of the wound with some strong antiseptic solution, such as chloride of zinc lotion (40 gr. to the oz.), and then pack a piece of gauze into each end of the wound so as to shut off completely the ligatured ends before evacuating the pus. Having thus disposed of the radial artery you stand very little chance of getting any trouble from it. That, I believe, is a better course than placing the nerve in jeopardy, and it is certainly a better course than running the risk of secondary haemorrhage from the radial artery by leaving it in its normal position. Only the other day I saw a case in which the incision had been made on the inner side of the flexor carpi radialis tendon, and the median nerve had suffered terribly; the patient had absolutely no tactile sensation over the flexor aspects of the thumb, index, middle, and radial side of ring fingers, and this was some six months after the operation had been performed. There had been not only neuritis, but the nerve was included in the scar that had formed, and was certainly very considerably damaged.

There is one other point, and that is that to complete the treatment of this serous sac of the flexor longus pollicis, one should have an incision in such a position in the palm as to open the dilatation of the sac of which I spoke. This incision is best made along the inner border of the outer head of the flexor brevis pollicis. By making the incision here you avoid injuring the digital branches of the median nerve which go to the thumb, and the incision is in the best position for reaching the serous sac, and in a position in which nothing of importance is likely to be divided—except, perhaps, one thing. If you carry the incision too far up you will divide the branch of the median nerve which goes to the small muscles of the thumb. But since you are doing the operation bloodlessly, you are viewing the parts almost as in the dead subject; you can see the nerves distinctly, and you will be on the look-out for the motor branch of the median nerve which goes to the three outer muscles of the thenar eminence. So by looking out for it you can avoid dividing it. In that case which I referred to just now, in which the median nerve was involved in the scar on the front of the wrist, the branch of the nerve to the three thenar muscles had been cut right through also by an incision which had been placed too far out, over the prominent part of the thenar eminence. One should make the incision on the inner side of the eminence so as to reach the inner border of the flexor brevis pollicis.

With regard to the bigger of the two sacs a few more remarks must be made. Here, again, we will imagine that we have a case in which the disease started originally as a subcutaneous infection at the top of the little finger. It has become a thecal abscess, and since the serous lining of the tendon sheath is continuous with the larger sac beneath the annular ligament, which is in relation with the two sets of four tendons, of the flexor sublimis and the flexor profundus digitorum muscles, suppuration has spread through the palm and is involving those portions of the sac which lie above the annular ligament in the lower part of the forearm.

For practical purposes you will find that what is necessary in order to evacuate the pus when it occupies this big sac is to open up the space between the two sets of tendons, though that would appear to be rather contrary to what I have shown (Fig. 2) with regard to the relation of the sac to the several tendons, but not necessarily so. Probably by the time that you have got the case for treatment, or are making your incision, this sac has given way, and has done so in one or more of those processes which project between the adjoining tendons;

either of the superficial or of the deep set, as the case may be. So when you make your incision, the position in which you will probably find the pus is between the tendons, those of the flexor sublimis in front and those of the flexor profundus behind. The incision should be made along the broad ridge which indicates the inner border of the flexor sublimis digitorum. This is $\frac{1}{2}$ in. external to the tendon of the flexor carpi ulnaris, and the incision should be carried from the upper border of the annular ligament $1\frac{1}{2}$ in. to 2 in. or more along the forearm. You make the incision with the limb bloodless, as before, and then you see what you are doing. Divide the skin, the subcutaneous fat, and the deep fascia, and then see the border of the flexor sublimis tendon. You will probably see the border of the ring finger tendon first, and looking further inwards you will see the surface of the little finger tendon. Pull both these tendons outwards, and you now look into the space between the two sets of tendons, the flexor sublimis and the flexor profundus digitorum, and it is there that you will probably find the pus. You may find pus before you reach this level; you may find pus superficial to the flexor sublimis tendons. If so, it does not mean that you must stop; you must go deeper and look underneath the sublimis tendons, because there may be a larger collection of pus in the more usual situation between the sublimis and the profundus tendons; and it is usually wise to look deeper still, namely, between the flexor profundus digitorum and the surface of the pronator quadratus; because it occasionally happens that pus is found there also—that is to say, pus may be found in either of these situations which I have indicated. If you find pus in the last situation mentioned I should recommend that another opening should be made in addition to the one which you have made in front, because you can then make a very direct drainage of the space underneath the flexor profundus tendons by an incision along the ulnar border of the wrist just behind the tendon of the flexor carpi ulnaris. It may be a long incision, but it need not come down lower than the pisiform bone. Nothing can be harmed there, unless, perhaps, it is the dorsal branch of the ulnar nerve at the upper end of the wound. You will see this nerve, and then you pass deep to the flexor carpi ulnaris, deep to the ulnar nerve, and deep to the ulnar artery, into the space (now full of pus) beneath the flexor profundus digitorum. You should place the forearm midway between the prone and the supine position, so as to obtain the best position of the wound for drainage.

There are two other things I want to say. When making the incision above the annular ligament to deal with the larger sac, one should make another incision below the annular ligament also, and likewise a third incision through the top of the little finger. The incision below the annular ligament so as to open the large dilatation of the sac there, is not very easy to place; the reason being that you have to place it in such a position that you shall not injure the nerves. I take it that it does not matter what you do with the arteries; you are doing the operation bloodlessly. You will see the superficial palmar arch, you will tie it on either side of the wound and cut out as much as there is between the two ligatures. You want to place your incision so as to injure the nerves as little as possible. The best place for the incision from that point of view is distinctly between the digital branches of the median and ulnar nerves—that is to say, to the inner side of the fifth digital branch of the median nerve and to the radial side of the outer of the ulnar branches. The only nerve which you will find here is a little cross-communication from the median to the ulnar nerve, or a twig in the opposite direction; but it is very small, and if all the damage which you do to nerves is confined to injury to that cross branch you will have done very little. This incision should be made in the palm in the line of the axis of the ring finger beginning at the lower border of the anterior annular ligament. In both these instances, (a) where the infection is from the thumb, and (b) where it is from the little finger, having made your three openings into the serous sac you can use your openings from either end for irrigation of the abscess cavities. You should pass through the abscess daily, or twice a day if you like, a considerable quantity of an antiseptic fluid, say a weak solution of biniodide of mercury or of perchloride of

mercury, beginning with a solution of 1 in 5,000 or of 1 in 4,000, and, if necessary, gradually increasing the strength. I am of opinion that more good will be done by using large quantities of weak solution than by using one of greater strength in flushing out the suppurating tracks, and thus bringing about the removal of the septic material. If the suppuration extends higher into the forearm than we have yet mentioned, you will always find the pus between the flexor sublimis and the flexor profundus digitorum, and I would remind you of the kind of case one sees. A patient comes to you with suppuration in his hand, and you find that he has developed an oval swelling over the upper two-thirds of the front of the forearm. The latter is prominent, hot, red, extremely tender, and oedematous, and the summit of the swelling is in the middle line of the forearm. It may require some little restraint to prevent oneself making an incision into the middle of it, though in reality that is the worst possible thing to do. If you make an incision into the middle of the swelling you have to traverse the superficial layer of muscles; you have to traverse at least the whole thickness of the flexor sublimis digitorum, and you will remember that on the deep surface of that muscle is the median nerve. It sticks there, either because it has passed through the upper part of the muscle, or because it is held there by the median artery; and it will be a matter of sheer good luck if you make this incision into the big swelling in the middle line of the limb and do not divide, split, or otherwise injure the median nerve. As a matter of fact, the incision should not be made there at all. The proper position for the incision is along the ulnar border of the forearm, as if you were going to tie the ulnar artery at the junction of the upper and middle thirds of its course. You can make an incision in a line—placing a string on the forearm for the purpose if necessary—from the outer border of the pisiform bone to the back of the internal humeral condyle. After dividing skin and subcutaneous fat you look for two white lines in the deep fascia; you choose that one of these two which is nearest to the guiding line of the incision. Make an incision in that line in the deep fascia and so open the interval between the flexor carpi ulnaris and the flexor sublimis digitorum; and you find almost at once you are in the cavity of the abscess which lies deep to the last-named muscle. The only thing which interferes with this operation is the ulnar artery. You will remember the ulnar artery comes from the middle line of the limb, and only reaches the line of the ulnar nerve at the junction of the upper and middle thirds of the length of the limb, and if you are using a drainage tube it may lie across the ulnar artery. The nerve is under cover of the flexor carpi ulnaris, and is protected, but the ulnar artery may be injured; and a similar accident may happen to it as the one which I described as likely to happen to the radial artery in the outer incision at the wrist. I should be disposed to deal with the ulnar artery in the same way as I suggested with regard to the radial at the wrist, and before opening the abscess, to cut a piece out of the ulnar artery sufficiently long to give you plenty of room to place your tube comfortably, and then proceed to open an abscess and to give it perfect drainage.

One other point is, that besides this last extension which I have mentioned, the commonest is an extension of the suppuration into the wrist joint. When the suppuration has involved either of the sacs beneath the anterior annular ligament the distance into the articulations of the wrist joint is no greater than the thickness of the ligaments on the anterior surface of the carpus, and the extension now spoken of is not therefore a matter for surprise. It is perhaps commoner than extension into the forearm; and, of course, it is a state of affairs which is about as bad as it can be. The case is, however, not hopeless, but you will need to make one or more incisions on the back of the carpus, and perhaps to remove the carpal bones. Sometimes these bones are lying loose, just as if they had been macerated ready for an anatomical demonstration. They can then be scraped out through one or more incisions on the dorsum of the wrist, and, by putting the limb on a suitable splint—Lister's wrist splint, for instance—you may obtain a hand which is moderately useful.

The after-treatment of all these cases is manipulation and massage; passive and active movements of the joints

should be begun as soon as possible, before the wounds are healed. You should try and induce the patient to help in every possible way and in particular in movements of the fingers. Of course there will be sure to be many considerable adhesions, and the sacs may be to a large extent obliterated. Still, even then, some small parts will remain, and you may obtain a very large degree of movement if these attempts at movement are begun soon enough, before the parts are fixed by firm cicatrization. One knows this because one sees the good results which occur in those cases of tuberculous disease of these serous sacs after one has removed by dissection every bit of synovial sac which can be found. In such cases, if the dissection be done carefully, you can obtain a remarkably good result with free movements of fingers and of the wrist, if you will begin the movements early—passive first, and then active movements—and continue them for a very long time indeed. I do not think that one can put any limit to the length of time during which such movements are likely to prove beneficial in these cases.

The treatment of the fourth or subperiosteal variety of whitlow is comparatively simple. It consists in making an incision through the fibro-fatty pad at the top of the finger down to the bone. Care should be taken not to cut so high as to endanger opening the tendon sheath. This incision gives free drainage; about a month later one is able to remove so much of the ungual phalanx as has necrosed. With few exceptions the base of the bone with the attachments of the flexor and extensor tendon survives and the wound heals without further trouble. Lead and spirit lotion (3ss of each to 1 oz. of water) is the best application I know of for all forms of terminal whitlow.

I hope I have interested you in what I have said. My own feeling is that all the operations which I have described this afternoon can be performed successfully by any surgeon provided the few conditions which I have laid down are accepted and followed out—namely, that operation on the affected parts should be undertaken as early as possible; that the operative measures should be carried out after the limb has been made as nearly bloodless as can be, and that if one is uncertain of the intimate anatomy of the region involved, one should take the trouble to look up the subject before the operation, so as to be well aware of the position and relations of the several structures with which one may have to deal in the course of the operation. Seldom can one hope to obtain such a result as will give entire satisfaction to the patient, but it is no small thing to be able to say that the result obtained is the best possible in the circumstances of the case. And this should be the aim of our treatment.

PLUMBISM FROM THE INGESTION OF DIACHYLON AS AN ABORTIFACIENT.

BY

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OBSERVATIONS BY DR. HALL.

DURING the last few years outbreaks of lead poisoning of varying extent and severity have occurred in different localities which could not be traced to the ordinary sources of plumbism, such as water contamination or dangerous occupation. The cases were always limited to women of child-bearing age, and eventually the source of the poisoning was traced to the custom of taking diachylon as an abortifacient.

In a paper read before the Yorkshire Branch of the British Medical Association at Bradford in January, 1904,* I recorded 30 cases of this kind, and referred in detail to the numerous articles which have appeared in various journals from time to time on this subject (vide Bibliography at end of paper).

This custom of taking diachylon, instead of diminishing, has spread over such a large area of country, and assumed such serious proportions, that steps must be taken to check it, or if possible to stop it altogether. How this may best be done remains to be settled, but it is not so simple a matter as might at first sight appear.

The subject is a somewhat delicate one, which cannot

easily be ventilated in the public press, or by the circulation of warning notices. Moreover, there is the fear that publication might tend to spread the evil, instead of reducing it.

History and Extent of Spread.—The first cases were observed at Leicester and were reported in 1893 by Dr. Pope.

After that the practice seems to have been less prevalent for a while, or at least to have spread but very slowly, for I can find no further record of cases until 1898, that is, five years later, when cases were reported in the neighbouring city of Birmingham. In 1899 it had reached Nottingham in considerable vigour, where it has remained ever since.

At that time it had certainly not reached as far north as Sheffield, nor did it do so to any extent until some two or three years later, since when the number of cases has steadily increased in the locality. Inquiries which I have made from all the neighbouring centres show that it has reached various smaller or larger towns still further north, such as Barnsley and Doncaster, and that a few cases have occurred in Leeds, including one death, but this seems to be its northern limit. So far as I can ascertain, it has not been recorded in any of the other large Yorkshire towns, Bradford, Halifax, Huddersfield, Hull, York, etc.* It has not affected the Manchester or Liverpool districts.

Further north at Newcastle-on-Tyne it appears to be quite unknown.

To the east of this affected Midland area I cannot hear of any cases, either at Lincoln, Gainsborough, or Retford.

To the south of Leicester a certain number of cases, with one death, have been reported to me by the courtesy of Dr. Horace Savory of Bedford.

Inquiries from various hospital authorities in London point to its not occurring there.

The area over which the practice of using diachylon as an abortifacient has spread is thus bounded on the north by the upper part of South Yorkshire, on the south by Bedfordshire, and on each side by the width of the counties of Leicester, Warwickshire, Notts, and East Derbyshire. This area comprises a large number of manufacturing towns, each containing thousands of the working classes, together with a country between largely occupied by mining populations.

Local Statistics as to Prevalence of the Custom.—Dr. Ransom has attempted to obtain some details as to the extent of this custom in and around Nottingham—that is, in the southern half of the area; whilst I have attempted to do the same in and around Sheffield.

A circular suggested by Dr. Ransom has been forwarded to every medical man within an area of some twenty or thirty miles of Sheffield, asking for information.

About 200 have replied. Of these 50 have had such cases of plumbism under their care during the last two years (vide Appendix A).

From their replies one can account for one or two hundred cases in this district during the last two years.

One may add to these the large number of women who come to our hospitals suffering from plumbism every month, and even then get a very modest estimate of the extent of the practice.

And this for two reasons: In the first place, a considerable number of medical men have told me they have had such cases but have not answered my circular for fear of making a breach of professional secrecy, whilst the fear of being found out prevents a large number of sufferers from going to their medical men at all.

I believe we shall not be far wrong in saying that several hundred women have taken diachylon in this district alone during the last two years.

From the previous statement one is warranted in saying that this abuse of diachylon is a grave public scandal; for, apart from the social and moral questions connected with it, there is the added evil of the harmful effects of the drug itself.

Unfortunately this is not limited to the severe abdominal pains and headache which immediately follow its use—themselves a cause of sufficiently serious suffering—but there is the prolonged anaemia, with complete inability to carry on the duties of a household for many weeks or months after the drug has been stopped.

* Since writing the above I am informed that the practice is not unknown to chemists in some of these towns, and that even in Dundee chemists have recently been asked for diachylon, apparently for this purpose.