The important points noted as a result of this experiment are as follows:

(a) If a normal or leukaemic blood be placed in the chamber and irradiated as described, complete loss of all phagocytic power in the polymorphs is observed within about thirty-five minutes.

(b) This loss of phagocytic power appears to be quite permanent. The experiment was varied in different ways and samples of blood given time to recover before examination, but no return of phagocytic power could be detected.

(c) In passing, it was noted that in fresh unirradiated bloods phagocytic power was possessed only by the relatively mature forms of polymorphonuclear and hyaline leucocytes. It is of interest that myeloblasts, myelocytes, and transitionals appear to have no phagocytic power towards the usual types of bacteria.

(d) The lethal effect appeared to begin upon the polymorphs at about the same point, whether in normal or leukaemic bloods.

Thus the experiments with the paraffin block appeared clearly to demonstrate a directly destructive effect by the rays on the white cells, and also that this destructive effect was produced mainly, if not entirely, by the secondary radiations and not by the original hard rays.

Some success with this method *in vitro* at once suggested applications of the test for phagocytic power upon the white cells of patients undergoing deep therapy treatment.

Direct Tests upon Irradiated Patients.

In this respect the first fact to be observed was that if blood from a leukaemic patient be taken twenty-four hours after deep therapy treatment and, as already described, mixed with staphylococci, a considerable number of the polymorphs, although they stain quite normally, will be found to have lost their phagocytic power. The test was therefore systematically applied to patients during actual irradiation. It was found that, whatever part of the body was irradiated, within about twenty minutes the percentage of actively phagocytic polymorphs began to fall. If the test was repeated at intervals a few other important points could be noted—namely:

(a) After full irradiation of the spleen in, for example, a case of splenomedullary leukaemia, although the first treatment will result in loss of phagocytic power in a considerable number of the polymorphs, the percentage varying according to the dose given and the width of the field irradiated, the proportion of white cells which disappear from the circulating blood within the next few hours is much less than this, and it takes a few days for all these damaged cells to be removed from the circulation.

(b) While the damaged cells are disappearing, a number of new normal polymorphs are being produced, so that a point is reached at which production and destruction balance each other and the immediate fall in the white count ceases. In some cases it may rise again slightly, and a test of the phagocytic power of the cells then shows that the rise is due to fresh normal cells.

(c) If these irradiated cases be, however, further watched it will often be found that although all the damaged non-phagocytic cells have disappeared from the circulation and a secondary rise, as above described, may even have occurred, still the fall in the white count continues. At this stage all the cells are normal in their phagocytic power, and the falling count can be accounted for only by some directly depressant action possessed by the rays upon the source of the cells—namely, the reticulo-endothelial system.

In short, it is evident that we can account for most of the immediate fall in the white count of irradiated cases of leukaemia by the directly lethal effect of the secondary radiations upon the blood cells themselves. But the more gradual later fall probably arises from depression of the white cell producing mechanism. Much further work must be done to confirm and elaborate such points as these, but the initial facts are put forward to illustrate the way in which the methods described appear to throw some light upon the mechanism of the deep x-ray treatment of leukaemia.

Irradiation and Normal Blood.

Let us next consider the effect of deep therapy upon the cells of patients showing a normal blood picture. Here, again, according to the intensity of the irradiation which their lesions have required, there is also a fall in the phagocytic power of their polymorphs and a gradual removal of the damaged cells from the circulating blood. This effect lasts for a few days, until, reproduction of new

cells becoming gradually more effective, the white count slowly returns to normal.

It will at once be clear, however, that the ordinary methods of blood counting in any of these cases do not, at any particular moment, tell us how many of the patient's leucocytes are normal effective cells. Some such test as we have described must be applied before we can be sure they are functionally normal. We believe, therefore, that the test of phagocytic power in the polymorphs may have useful clinical application in the case of patients treated with deep therapy or other irradiation. Whether the results will be helpful in diagnosis and prognosis is at present under investigation. Meanwhile it may be worth while to note the following points.

The first concerns the known fact that actively septic patients, leukaemic or otherwise, are not usually favourable subjects for irradiation. The septic element often becomes more pronounced, and the demonstration of the rapid disappearance of phagocytic power in the leucocytes of these patients throws some light upon this antiseptic failure. If these patients must be irradiated, it is well to apply the test for phagocytic power so that this function of their white cells shall not be driven too low. For this purpose an ordinary white count is not sufficient.

Secondly, it is clear that the initial fall in a patient's white count, following irradiation, is a function of the number of directly damaged cells. By noting the loss of phagocytic power, even while irradiation is actually taking place, we can make an immediate estimate of what the fall in the white count will be and control the dosage accordingly. Using ordinary methods of blood counting, this fall has actually occurred before we can estimate it. Furthermore, in patients whose white cell count is already low, and in whom it is undesirable to cause too great a fall, a useful method of controlling dosage and of forecasting the white cell loss is the application of the phagocytic test. Irradiation may well be stopped at a point where not more than 25 per cent. of the patient's polymorphs have lost their phagocytic power. Any future irradiation would depend upon the restoration or otherwise of phagocytic power.

Summary.

A method is described of estimating the phagocytic power of the polymorphs in patients undergoing deep x-ray treatment, and some possible clinical applications of the test in treatment control are put forward.

Some results with the test are discussed in relation to the theories concerning the effects of irradiation upon leukaemic and other patients.

TONSIL PUNCTURE: A NEW METHOD OF INVESTIGATION.

BY

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DISEASE of the tonsils, as a clinical entity, has been known for many centuries. Celsus, who was born in Rome about the time of Christ, devotes a whole chapter to the subject in his *De Medicina*, and makes many references to tonsillar diseases in other portions of the work.

In our day acute and chronic affections of the tonsils rank among the diseases which are frequently encountered. The work which follows is concerned with the modern viewpoint of the tonsil as a source of focal sepsis. Among such sources the tonsils occupy an important position. Our present investigations have convinced us that this importance has not been exaggerated and that hidden infection in the tonsils may be responsible for much ill health, both definite and indefinite. Irwin Moore¹ gives a list of fifty-one diseases which may result from focal infection of tonsillar origin. The results of such infection may reach and affect any part of the body by way of the lymphatics or the blood stream. Moore states that the general opinion is that after the age of 5 years nearly all tonsils are

useless and are in the majority of cases a menace to health.

The tonsils are examined in every case when a search is being made for a possible source of focal sepsis in a patient, and it is a common experience to discover a tonsil or tonsils which can only be described as "doubtful"—that is, it is difficult to say if we are justified in advising their retention or their removal. The tonsil may even be small and fibrosed, and yet may be a potent source of trouble.

Although much may be learned by an experienced observer from an inspection of the tonsils *in situ*, and from any history which bears upon them, the standards of assessment as to their normality or otherwise have been somewhat arbitrary hitherto, and the personal factor must of necessity play a part in the examining physician or surgeon. We have tried to arrive at a more accurate estimate by means of direct puncture into the substance of the tonsil, with subsequent investigation of the aspirated material on lines which have been standardized.

REASONS FOR THE PROCEDURE.

In order to make clear our reasons for this scheme it is necessary to refer briefly to the structure of the normal tonsil and its alteration in chronic inflammatory disease. A normal tonsil consists of a mass of lymphoid tissue covered on its free surface with the stratified epithelium of the mucous membrane. Its surface is pitted with apertures leading into crypts, which are lined by a prolongation of the stratified epithelium of the surface, and into them the ducts of numerous small mucous glands open. The lymphoid tissue of the tonsil is at intervals aggregated into nodules, in which the lymph cells are more closely arranged than elsewhere. In the centre of these nodules active multiplication of the lymph cells occurs. In the lymphoid tissue are numerous blood vessels and lymphatic channels.²

In chronic inflammatory disease the appearances are changed. We find that the chief histological differences are in the crypts and in the epithelium of the surface. The continuity of the stratified epithelium of the crypts is frequently broken at the base of the crypt. In some instances there is a band of fibrous tissue around the crypt, lying close to the surface of the stratified epithelium which lines the crypt—a protective phenomenon in response to constant irritation in the crypt—and this fibrous band, like the stratified epithelium, is frequently broken at the bottom of the crypt. The epithelium on the general surface of the tonsil is rarely intact in such cases, and sometimes there are small areas of ulceration on this surface. The significance of such solution of continuity in the stratified epithelium is obvious. Organisms can obtain a free entrance directly into the tonsillar substance, and they can escape easily in a reverse direction, from the tonsil into the mouth, and be swallowed with the saliva.

Other pathological points which we have noted are a thickening of the capsule of the tonsil; an increase in the interstitial connective tissue, especially in the immediate neighbourhood of the crypts; and sometimes an increase in thickness of the walls of the vessels, affecting chiefly the fibrous layer of the wall. In sections stained by Gram's method it was difficult to pick out organisms, but some short-chained streptococci were occasionally seen in the part of the tonsil near to a crypt; in some cases there were minute abscesses immediately under the capsule; no tonsillar calculi were found.

In view of these findings we repeat that an inspection of the tonsil leads us only part of the way along the track. Particularly if Eve's suction method is employed, it is not unusual to see a crypt or crypts filled with a yellowish mass of micro-organisms or food debris. Although this might be one of the points in favour of condemning the tonsil, it must not be forgotten that this crypt may be intact at its base and may be almost, if not entirely, impervious to the entry of micro-organisms. In fact, the onward march of the latter may actually have been easier in a neighbouring wide-mouthed but empty crypt. The bacteriological investigation of a crypt may therefore be rather a hindrance than a help in determining the true condition of the tonsil. Since it is recognized also to be

useless, from a bacteriological standpoint, to rely on cultural results from swabbing the surface of the tonsil, except in such conditions as diphtheria or Vincent's angina, we have adopted the plan of deep puncture into the substance of the tonsil.

TECHNIQUE OF TONSIL PUNCTURE.

(a) Apparatus Required.

A supply of Bonain's solution, which consists of cocaine hydrochloride, menthol, and pure carbolic acid, 1 gram of each; a probe or forceps for a small pledget of wool, with which this solution is applied to the tonsil; a tongue-depressor; an all-metal syringe with guarded handles, made for us for this purpose by Messrs. Allen and Hanburys, and a test tube containing 5 c.cm. of sterile bouillon.

(b) Procedure.

The operator, wearing a head-mirror, sits facing the patient, and a good light is reflected on to the mirror from a lamp behind the patient's head. The tongue-depressor is inserted and the tonsils are examined. The anterior pillar of the fauces may be pressed upon by another spatula held in the operator's left hand, as recommended by Irwin Moore, thus enabling a thorough inspection of each tonsil to be carried out. After selecting a spot for puncture, which should be preferably in the fleshy portion of the tonsil, away from a crypt, the tongue-depressor is withdrawn.

A pledget of wool is twisted on to the probe or forceps and dipped lightly into the bottle of Bonain's solution. Before withdrawal the wool should be squeezed gently against the side of the bottle in order to get rid of any superfluous solution, which might drip in the patient's mouth.

The tongue-depressor is reinserted and the selected portion of tonsil is swabbed with the pledget of wool steeped in Bonain's solution, the carbolic acid in which makes the surface of the tonsil as aseptic as may be possible. The syringe, with its needle attached, previously sterilized by boiling, is taken in the operator's right hand. The piston is withdrawn about one-eighth of an inch, and is pressed home as the puncture is made. The positive pressure thus obtained tends to dislodge any organisms which might find their way into the needle as it goes through the surface of the tonsil. The needle is pushed into the tonsil as far as it will go; the distance from the point of the needle to its guard is three-eighths of an inch. Once in the tonsil the needle is rotated in various directions, the operator meanwhile exerting gentle suction by withdrawing the piston slowly. After four or five seconds the needle is withdrawn from the tonsil, and care is taken that the needle shall not touch any structure in the mouth during its withdrawal.

The syringe, with the needle attached, is introduced into the test tube containing the sterile broth. The point of the needle should come to a halt about an inch above the surface of the broth, and the piston is then pressed home firmly and quickly. The result is a jet of air, with pus or debris, which is

deposited on the wall of the test tube. Sometimes a definite bead of thick pus is seen, in other cases a small spray of greyish-white material is all that is visible. This material on the wall of the tube is inspected with the naked eye, and the broth is then shaken up so that it becomes thoroughly impregnated with the material which has been shot from the needle.

In rare instances nothing appears to come from the needle when the piston is pushed home. If this is the case, the needle should be introduced into the broth, and some of the latter should be sucked into the syringe and then be ejected. It is advisable to investigate both tonsils, as we have occasionally found one to be sterile and the other to be infected.

The wool plug of the test tube is flamed and replaced; the tube is labelled and put into the incubator, or kept in a suitable warm atmosphere for at least twenty-four hours. A smear from the culture is then stained and microscopied.

RESULTS OF CULTURE.

We have examined 158 tonsils by this method of puncture, the ages of the patients varying from 5 to 51 years. Of these tonsils 17 were found to be sterile on culture.

The following is a list of the organisms obtained from the remainder:

Streptococci were present in pure culture in 111 cases, and with other organisms in 26 cases. Using fermentation tests on the lines suggested by Mervyn Gordon, 81.2 per cent. gave the reactions for *Streptococcus pyogenes* and 18.8 per cent. gave the reactions for *Streptococcus viridans* or *mucosus*; 56.5 per cent. of the streptococci were facultative anaerobes, and 78 per cent. gave a haemolytic reaction on haemoglobin agar.

Diphtheroids were present in 4 cases; staphylococci in 18 cases (3 in pure culture); pneumococci in 5 cases (1 in pure culture); *B. influenzae* in 1 case. One patient who showed staphylococcal infection of the tonsil was suffering from sties and from a pustular eruption on the ear.

It is of interest to note that in two of the cases which were found to be sterile on puncture the patients had suffered from an acute inflammation in the tonsil about three weeks before the puncture was made. The inflammatory process had evidently acted as an efficient, though perhaps temporary, sterilizer of the tonsil.

We have found that little, if any, useful information can be obtained by direct examination of a smear obtained by tonsil puncture. Pus and epithelial debris are frequently present, but it is rare to find organisms in the smear itself.

THE BLOOD IMMUNITY TEST.

If after thorough exploration with a needle in the manner which has been described there is no growth of organisms in the broth it appears to be reasonably probable that the tonsil in question is not a source of danger to the patient. But even if organisms grow in profusion in the broth, this is no proof that they are harmful to their host. We therefore pass on to the second stage of the investigation. The work of Solis-Cohen and of Cronin 'Lowe' has emphasized the importance of testing the immunity of the patient's own blood towards organisms obtained from some site of possible infection in his body.

Given accurate standards, with due care in obviating the effects of mass, it appears reasonable that a man's own blood should contain sufficient immune bodies to deal with a small number of organisms from his tissues. In order to obtain correct comparisons with which to work, the following plan was adopted.

A broth culture of streptococci was diluted with more broth until its opacity, after shaking up, was equal to that of a 2,000 million vaccine, and this standard is the one which we always use; 5 c.cm. of supposedly healthy human blood were run into each of five sterile test tubes. The blood in the first test tube was inoculated immediately with three platinum loopfuls of the above culture. The blood in the second tube was inoculated with 0.01 c.cm. of the culture; in the third tube with 0.02 c.cm.; in the fourth tube with 0.1 c.cm.; and in the fifth tube with 0.2 c.cm. Subcultures into broth were made from each tube the next day. It was found that the first tube, inoculated with three platinum loopfuls of the culture, was sterile; but the other four tubes showed a growth of streptococci on subculture. In them the effect of mass was felt.

We have adopted the three loopfuls standard, using a loop of the size shown , in testing the effect of his own culture on the resisting power of the patient's blood. We realize that such a standard is not infallible and that it may vary, temporarily or permanently, both as regards the immunity of the "normal" blood and the virulence or otherwise of the strain of organism used in testing. If growth occurs the supposedly normal individual may himself be harbouring, for example, a streptococcal infection. But we have found the three loopfuls to be a good working basis, since, as will appear later, a certain number of patients with infected tonsils can inhibit this strength of their own culture.

To sum up, the broth tube containing the material obtained by tonsil puncture is incubated for twenty-four hours. A film is then stained, and the organisms, if any, are identified. After taking the usual precautions in sterilizing the skin, a sterile needle is inserted into the median cephalic or median basilic vein of the patient, and 5 c.cm. of blood are run into a sterile test tube. This blood is inoculated immediately with three platinum loopfuls of his previously diluted culture; it is then incubated for at least twenty-four hours, and three platinum loopfuls of it are then subcultured into sterile broth. If the organisms originally present in the culture from the tonsil are found

to have grown in this subculture, it is presumptive evidence that the resisting power of the patient's own blood is defective as far as the tonsillar organisms are concerned.

It happens not infrequently that more than one organism is present in the tonsil culture. In such cases the blood sometimes exercises a selective power, destroying one organism but failing to inhibit the other. The whole procedure which has been described is in reality quite simple, and can be carried out by any practitioner who is possessed of a suitable syringe, a supply of sterile broth, a platinum loop, and an elementary knowledge of bacteriology. Far from objecting to the investigation, we find that patients welcome it when its objects are explained to them. They realize that a thorough examination has been made, and for this reason they are more willing to submit to a subsequent operation if this is found to be necessary.

In trying any new method mistakes have to be rectified and alterations in technique have to be made. We propose, therefore, for the present, to refer only to the last 50 instances in which this procedure of blood inoculation has been carried out. All the cases showed signs or symptoms which justified an exploration of the tonsils. In these 50 instances the blood was sterile in 11, and grew organisms from the tonsil culture in 39. Neither the age of the patient, nor the sex, nor the type of organism appeared to have any effect as regards the immunizing power of the blood.

If the tonsil is found to be infected, and the patient suffers from such a condition as an arthritis for which no other focal cause can be found, and yet his blood possesses sufficient immunizing power to destroy the organism from the culture, we have had good results from the use of an autogenous vaccine, prepared from the tonsil culture. In this case, of course, the result may be due to non-specific protein shock.

DISCUSSION OF THE METHOD.

It will be noted that the relation of adenoids to focal sepsis is outside the scope of our present investigation, which deals only with the method of tonsil puncture. If the tonsils have been found to be diseased and have been removed, the question of the results of the operation is also hardly germane to the present thesis, though it is tempting to record in detail the relief of symptoms and the mental and physical improvement which have almost universally followed the operation. To those patients in particular who have been just within the borderline of ill health for many years, with an absence of *joie de vivre*, and with a mental and physical state which was easily fatigued, as well as to those with more definite ailments, such as backache, joint pains, or skin affections, it comes as a surprise to hear that their tonsils have been found to be diseased. Their scepticism has frequently been followed by pleasant relief after operation. The hitherto uninvestigated tonsil has much to answer for.

We do not wish it to be thought that our interest in the investigation of the tonsils has led to any loss of perspective. We realize the importance of, and deal frequently with, such other sites of infection as the teeth, the nasal sinuses, the genito-urinary tract, and the alimentary tract. As regards the teeth, our profession passed through a phase in which wholesale extraction played a not inconspicuous part. Time brought radiography and saner judgement. We hope that the method of tonsil puncture, especially when it is developed and improved, may save unnecessary tonsillectomy on the one hand, and lead to highly necessary tonsillectomy on the other hand.

An interesting question has been put to us by a colleague: Is it possible that the organisms which are hidden in the tonsil may serve a purpose in the production of antibodies and thus help to immunize the individual by a process of auto-inoculation? This question was introduced by Good many years ago in relation to the crypts. If this is so, removal of the tonsils might be undesirable. Such a process may possibly occur in those cases in which the blood is found to be sterile after inoculation with the organisms. But in other cases, where the blood is not able to resist the organism, we believe that removal of the diseased tonsil is sound in theory and in practice.

Although the tonsil may be the chief source from which the organisms and their toxins pour into the blood stream, the other structures in Waldeyer's ring are frequently found to be infected also, as witness the pharyngeal discomfort which may not clear up for weeks or even months in an adult after the tonsils have been removed and the tonsillar fossae are firmly healed.

In view of Rosenow's work on the selectivity of various strains of streptococci, it would be interesting to know if there is any association between hitherto hidden streptococci in the tonsil and streptococci in the appendix, which, from its structure, has been called the abdominal tonsil, and also if such hidden tonsillar infection may be associated with gastric, duodenal, and jejunal ulcers. The occasional occurrence of the latter after gastro-jejunosomy has never, to our knowledge, been explained satisfactorily. In making such a suggestion we are assuming that the teeth and other possible foci of streptococcal infection have received due attention.

At the risk of reiteration we wish to stress once again the fact that a mere inspection of the tonsils in such cases may lead to an error of judgement, whereas tonsil puncture and thorough investigation may throw light on what has hitherto been obscure in the matter of a cause.

USES AND POSSIBILITIES OF TONSIL PUNCTURE.

We hope that this method of investigation may be of use to the physician who is endeavouring to trace a focal sepsis, which may be chronic in its manifestations, giving rise to such conditions as fibrositis, arthritis, and neuritis; or acute, in the form of a streptococcal septicaemia whose origin may be baffling. It may be useful to the aurist and laryngologist, both in assessing the condition of the tonsil *per se*, and in relation to affections of the ear and larynx which may spread from hidden tonsillar infection; to the general surgeon, for whom the effects of focal sepsis are also important; to the ophthalmic surgeon, since tonsillar infection plays a part in many eye conditions; to the dermatologist, in helping to solve the problem of certain skin affections; to the neurologist and psychiatrist, since it is becoming increasingly evident that many psychoneuroses and true psychoses may be associated with focal sepsis; and to many other branches of our profession.

We ourselves wish to stress its possibilities in connexion with two outstanding diseases—namely, puerperal septicaemia and carditis. Space will not allow us to go fully into this question, but we should like to outline our views.

We believe that many cases of puerperal septicaemia result from auto-infection, wakened into activity by the stress of labour. The teeth, the urine, and other possible sites of infection in a pregnant woman are now examined as a routine, and we suggest that the tonsils should receive more attention in this respect. If, by puncture, they are found to be infected, particularly by a member of the streptococcus group, and if the woman's immunity is found to be deficient on blood culture, we suggest that an autogenous vaccine should be prepared from the tonsil culture and administered at intervals throughout the pregnancy in order to raise the general resistance as far as possible.

In relation to the prevention of carditis we have high hopes of the usefulness of the method.

It will be seen from the figures we have given that the streptococcus is the organism most commonly found on tonsil puncture. This finding may have some bearing on the question of person-to-person infection in rheumatism, since the streptococcus may be air-borne, especially under crowded and insanitary conditions.

In the report of the Subcommittee of Inquiry into Rheumatic Heart Disease in Children⁴ we find that "it is universally recognized that the portal of entry of the infecting organism is, in the majority of cases, through the nasopharynx in general and the tonsils in particular." And again, "In spite of certain difficulties, there is no rival to the streptococcal theory of acute rheumatism." Although the additional question of environment as a predisposing cause must not be forgotten, it seems to us

that, from the all-important point of view of prophylaxis, it is essential to know if the tonsils of a child are harbouring a member of the streptococcus group.

Another significant fact is the age of onset of acute rheumatism. "First attacks of the severer types occur most commonly about the seventh or eighth year of life," and the tonsils appear to lose their usefulness after 5 years of age. From that time it seems that they cease to be defenders and become attackers. We urge, therefore, that the tonsils of children, particularly those over 5 years of age, should receive due attention from the point of view of exploratory puncture. The procedure is not a difficult one and should require only the same degree of tactful handling as is shown by the school dentist, whose visits, at first a source of apprehension, are now tolerated freely. In the case of a very nervous child we would go so far as to suggest that an anaesthetic should be given for the purpose of tonsil puncture.

If the tonsils yield no growth on culture, they are free from suspicion for the time being, though, of course, the question of adenoids must be borne in mind. The lapse of one or two years, or an attack of sore throat in the meantime, are indications for further tonsil puncture. Should the tonsils be found to harbour streptococci, the child is a potential sufferer from rheumatism, and the removal of the tonsils is a wise step, even without testing the resistance of the child's blood to the organism obtained by puncture, since it is not always easy to obtain blood from a child's vein. If the tonsils are found to be infected we can put the position clearly before the parents of the child.

Although tonsillectomy may not entirely prevent rheumatism, the results of the operation are eminently encouraging, and the report⁴ states that "in no case did permanent heart disease show itself for the first time in a rheumatic attack after operation."

We hope that if this method of investigation is adopted, with a wide spreading of the net, it may do much to prevent heart disease in childhood. As regards adults, many sufferers from heart disease acquired such disease in their early years. In the future such early acquisition may be avoided, and it may be possible to reduce the general incidence of heart disease in later life if the tonsils receive due attention by puncture, remembering, of course, other foci of infection also. Heart disease, when once it is established, is an end-result. Our plea is for the efficient investigation of one of the principal sources from which it is known to arise, and for the eradication of such a source when necessary as a measure of prophylaxis.

SUMMARY.

1. Hitherto the condition of the tonsils has been judged chiefly from external appearances.
2. A simple method of tonsil puncture has been described. If the tonsil is found to be sterile removal is probably unnecessary.
3. Should the tonsil be found to be infected, the organisms can be tested against the patient's blood and some idea of the resisting power of the latter to the organism can be obtained.
4. If the immunity of the blood is found to be impaired, removal of the tonsils is probably desirable, other things being equal.
5. Uses and future possibilities of the method are discussed, particularly in relation to puerperal septicaemia and to rheumatic carditis in children.

We wish to express our thanks to our colleague Dr. J. M. Wishart, assistant ophthalmic and aural surgeon, Blackburn and East Lancashire Royal Infirmary, for his interest in the investigation and for allowing us to examine suitable cases; also to Mr. H. W. Floyd, of the laboratory staff, for his help in technical matters.

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