The only method of sterilization of the throat which has proved satisfactory in my hands has been the local application of Mandl's paint, and it is extremely difficult to persuade large numbers of people to paint their throats daily. Furthermore, it would appear that the majority of convalescent patients still have a haemolytic streptococcus in their throats unless treated with painting during the course of the disease.

This, then, appears to indicate that the routine treatment of the infection by painting the throat will act also to some degree as a prophylactic measure. With this in view, I have endeavoured, where possible, to persuade convalescents to continue painting their throats as long after their recovery as possible. Gargling with hypertonic saline also is efficient to some degree. Isolation in a fever hospital has the disadvantage that there is a liability to contract infection with another type of the same organism there.

The chief causes of the continuation of the present epidemic would appear to be as follows.

1. The failure of patients to seek medical advice at the earliest opportunity, and hence the spread of infection before treatment has been commenced.
2. The fact that financial considerations compel the average man to return to work too soon, often with the throat still showing the presence of haemolytic streptococcus.
3. The present desire of the schools to maintain their attendance lists at the highest level, regardless of the fact that a child with a sore throat is a potential source of danger to the other children.

In hospital, the matter presents a far more serious aspect, as the introduction of an acute infection among persons whose resistance has already been lowered by other conditions is nothing short of a calamity. There is also to be considered the danger of contamination of clean wounds, with fatal results.

Several methods of prophylaxis suggest themselves.

1. A careful routine examination of the throats of all new admissions, with isolation and treatment if necessary.
2. A routine swab of all nurses periodically, with daily painting if positive.
3. A routine Dick test with immunization of all nurses on commencing hospital duty.
4. The wearing of masks for all dressings.
5. Immediate isolation of any nurse reporting with a sore throat, no return to duties being allowed until her swab is negative.
6. The daily examination of the throats of nurses and patients by the ward sisters.
7. Closure of wards during epidemic to all except acute cases, and cessation of operations for tonsillectomy or adenoidectomy.
8. The routine examination of all pus for streptococci, and in special cases administration of prophylactic doses of serum.

Summary

Although cases of scarlet fever have occurred locally during the last year, there has also occurred an epidemic, which has been more severe, of streptococcal tonsillitis, due to one or more types of haemolytic streptococci.

The majority of the cases showing complications have improved with treatment with polyvalent antistreptococcal serum and the other measures described.

Before concluding, one question appears extremely relevant: Are we any longer entitled to regard scarlet fever as a separate disease to be accepted by the public health authorities as a ground for notification and isolation?

I should like to express my appreciation for the help and suggestions given me by Dr. Frederick Griffiths and Dr. J. T. Whitley in the preparation of this paper.

TONSILLITIS AND ALBUMINURIA

BY

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The connexion between infections of the tonsils and upper respiratory passages and certain renal lesions is now universally recognized, but surprisingly little information is available as to the frequency of occurrence of renal damage in such infections, and still less as to the factors which determine its appearance.

Our first object in the present investigation was to determine the incidence of renal lesions in an unselected series of patients reporting for tonsillitis at the out-patient department of a general hospital.

The only extensive study of this subject known to us is that of Petersen and Schwab,¹ who in a series of 479 cases of tonsillitis found evidence of a renal lesion (Nierenerkrankung) in thirty-six (7.5 per cent.), such lesions occurring more frequently in patients with peritonsillar involvement. Their analysis of the type of lesion present in their cases is, unfortunately, complicated by the inclusion of ten other patients who had been admitted to hospital for a renal lesion following on a throat infection after a definite interval. Including these ten patients, they classify 28 per cent. of their forty-six cases of renal damage as suffering from acute glomerulo-nephritis, 34 per cent. as cases of focal nephritis, and 38 per cent. as instances of renal irritation; in these latter patients isolated red cells, casts, or renal epithelium made their appearance in the urine for a few days only, and no other evidence of renal damage was present. In a smaller series of 151 patients Lomnitz² saw two cases of febrile albuminuria and three instances of late post-infective albuminuria, which he classified as nephritic.

The incidence of late albuminuria and nephritis following scarlet fever in the hospitals of the L.C.C. was, at the time of our investigation, 4.1 per cent., but the upper respiratory infection of the scarlet fever patient is due to a specific organism, and the patient is hospitalized at an early stage of his disease. Such a figure is not, therefore, necessarily applicable to a group of patients suffering from varied infections and attending an out-patient clinic.

Our second object was to study certain factors which might determine the appearance of a renal lesion in the individual patient. Among such factors are an infection by a specific organism, a peculiarly severe infection by any organism, an indeterminable susceptibility on the part of the patient, some extraneous factor, or a combination of any of these.

The two possible factors to which we have directed our attention are: first, the connexion between renal lesions and the predominance of haemolytic streptococci in the infected throats; and, secondly, the influence of the external temperature on the incidence of renal damage—since exposure to cold has always been regarded as conducing to the production of nephritis. In the epidemic of trench nephritis, for instance, which affected the British Army in France, the disease showed a maximum incidence during the winter months, and was most frequently met with among the infantry, who were especially exposed to the inclemency of the weather. It does not, however, follow that cold was the determining factor, since the incidence of infection among the troops during summer and winter was not determined. There is no reason to suppose that "trench nephritis" was not primarily the result of an infection, as is the acute glomerulo-nephritis of civilian life, though, in the experience of one of us, a history of preceding tonsillitis was rare. Slight infections

of the upper respiratory passages and of the skin were, however, frequent among the troops, and their part in the production of nephritis was not, perhaps, sufficiently emphasized. It is possible that seasonal variations in the incidence of such infections, rather than exposure to low external temperatures, determined the marked winter rise in the nephritis curve.

The haemolytic streptococci may reasonably be regarded as suspect, since the diffuse glomerulo-nephritis of scarlet fever follows on an infection by an organism of this group, and since the examination of septic foci in cases of developed nephritis frequently shows the presence of such streptococci. Streptococci, too, are among the organisms which have been implicated in the production of focal nephritis.

Methods of Investigation

Patients reporting for tonsillitis in the casualty department of the hospital were transferred to our clinic on the same or the following day, all cases of scarlet fever and suspect diphtheria being excluded. All throats were swabbed as soon as seen, and the patients were asked to bring up a sample of the morning urine on the following day, when the throat was again examined. If progressing satisfactorily they were asked to attend with a sample of morning urine a week later, and once more at the end of a fortnight.

In a patient transferred to us on the third day of the disease, the urine would therefore be examined on the fourth, eleventh, and eighteenth days of the infection, a period which should cover the early and late renal lesions. Cases in which albuminuria occurred were followed until the albumin disappeared or the patient ceased to attend. Blood pressure determinations were at first made at each attendance, but were soon discontinued in the case of children under 10 years of age, owing to the great difficulty of obtaining readings which could be regarded as basal in young subjects in an out-patient clinic.

The urine was tested for protein with salicyl sulphonic acid, and the centrifuged deposit was examined for formed elements. The throat swabs were stirred in a tube of sterile broth and plated on human blood agar. The plates were examined on the following day and were divided, according to the proportion of haemolytic streptococcal colonies present, into five groups, varying from an almost pure culture of haemolytic streptococci to a complete absence of the organism. Only cases in which the plate showed an almost pure culture of haemolytic streptococci, or a grossly predominant growth of that organism, were classified as indicating a haemolytic streptococcal infection.

More detailed and frequent examinations of the patients were considered inadvisable, as it was hardly to be expected that out-patients suffering from what they regarded as a trivial complaint would be prepared to waste much time and energy on repeated attendances at the clinic. Even under the conditions detailed above the wastage considerably exceeded 50 per cent.

Material Examined

In all, 798 patients were seen at the clinic during the thirteen months July, 1932, to July, 1933, inclusive, but only 354 completed the course of attendances detailed above. Of these 354 patients 224 were 10 years old and under, 101 were 11 to 20 years of age, and twenty-nine above 20 years of age. It is on these 354 cases that our conclusions are based.

It is by no means easy to determine the significance of the presence of protein in the urine of the patient suffering from tonsillitis. Among possible causes of such albuminuria we have to consider febrile albuminuria, focal nephritis, and acute diffuse glomerulo-nephritis; in addition, the albuminuria may be the expression of a benign or cyclical albuminuria, or the patient may already be

suffering from a chronic nephritis, the albuminuria being in no way related to the incidental tonsillar infection.

The last two possibilities have been so far as possible excluded by directing the patient to collect the urinary sample on rising in the morning and by inquiry as to the past history. Albuminuria occurring during the acute stage of the infection, in cases in which the centrifugized urinary deposit shows no appreciable number of red blood cells, and no casts other than occasional hyaline, we regard as "febrile."

There remains the more difficult problem of distinguishing between focal nephritis and acute diffuse glomerulo-nephritis. Broadly speaking, focal nephritis occurs during the acute stage of the infection—that is, at a period corresponding to the first urinary examination in our scheme—while acute diffuse glomerulo-nephritis is post-infective, occurring at a definite interval after the subsidence of the acute infection. The presence of hypertension and, in many cases, of oedema also serves to distinguish the diffuse from the focal lesion, but it is impossible to attach much significance to minor variations of blood pressure in an out-patient clinic, where readings are not taken under basal conditions, and transitory rises in pressure may be easily missed if readings are not taken almost daily. We have therefore divided our cases of albuminuria into two groups: *early* and *late*. In the early group albumin was found in the urine at the first urinary examination, in the late it appeared for the first time at the second or third.

Results

Of 354 patients 131 showed albumin at the first examination, and in fifty-one (14.4 per cent.) more than a faint trace was present. In thirty-five of these (10 per cent.) it is probable that focal nephritis had resulted from the tonsillar infection, since ten showed appreciable numbers of red blood cells (the haematuria in one case being recognizable macroscopically), twelve showed casts other than hyaline, and four both casts and red blood cells at the first examination; in nine others albumin was present at the first examination, and casts and blood appeared later.

In one case in which albumin and casts were present at the first examination, nephritis had been diagnosed a year before, and in another with similar urinary findings definite diffuse glomerulo-nephritis with oedema and hypertension developed later and necessitated admission to hospital: this latter patient was first seen on the eighth day of the tonsillar infection, and was in all probability an instance of diffuse glomerulo-nephritis occurring at a somewhat early date in the post-infective period.

Excluding these two patients, a diagnosis of focal nephritis was suggested by the urinary findings in no fewer than thirty-five of the series: apart from the urinary findings the patients presented no symptoms, and, as far as our data go, no rise of blood pressure; oedema was invariably absent. It is generally accepted that the immediate prognosis in this condition is excellent, and our findings are in accordance with this view. In eleven cases casts and red blood cells were only present at the first examination, and were not found a week later: in twenty-three of the thirty-five the albumin had disappeared within a fortnight, and in a further five at a somewhat later date: in seven albuminuria was still present when the patients were last seen, a fortnight or longer after the first urinary examination.

No correlation could be found between a predominance of haemolytic streptococci in the throat swab and this early urinary lesion. Of the whole series of 354 patients ninety-one (25.7 per cent.) showed a heavy haemolytic streptococcal infection: of the fifty-one patients showing more than a trace of albumin in the urine at the first

examination twelve (23.5 per cent.) showed such an infection, and of the thirty-five cases in which focal nephritis was believed to be present eleven (31.4 per cent.) were heavily infected with this organism.

In fifty-seven cases albuminuria was first found at the third or fourth attendance—that is, from about the tenth to the twentieth day of the disease. In twenty-two of these patients (6.2 per cent.) more than a trace of albumin was present, and in five casts other than hyaline were found. In two of these latter confirmatory signs of diffuse glomerulo-nephritis were noted—in one oedema and in the other a transitory rise of blood pressure; in the three others no confirmatory signs of diffuse nephritis were present. In one of these an active infection (cervical adenitis with abscess formation) was present at the time when the albuminuria and casts appeared, and the patient was probably suffering from a focal nephritis. Adding the case of definite diffuse glomerulo-nephritis alluded to above—in which the albuminuria was detected on the eighth day of the infection—we have in all three undoubted cases of diffuse glomerulo-nephritis in our series of 354 patients suffering from tonsillitis: of these, two cleared rapidly under observation. Of the remaining twenty cases of late albuminuria ten are known to have cleared.

Of the twenty-two cases of late albuminuria nine (41 per cent.) showed a heavy haemolytic streptococcal infection, a figure rather above that of the whole series: of the three cases which we have regarded as suffering from diffuse glomerulo-nephritis only one showed such an infection.

It must be admitted that in the majority of our cases of late albuminuria the appearance of albumin in the urine remains completely unexplained.

To give one instance of this type of case, a female child, 6 years of age, was seen on the third day of the infection. The tonsils were engorged, but no exudate was present; no haemolytic streptococci were found in the throat swab. On the fourth day a slight follicular exudate was present; the urine was free from albumin. On the eleventh day the throat was clear and no albumin was present in the urine. On the eighteenth day, the throat still remaining clear, a considerable quantity of albumin appeared in the morning urine, but no casts or red blood cells were present in the centrifugized deposit. On the twenty-fifth day the urine was again completely clear. No oedema was noted at any time, and the child appeared to be in good health after she had recovered from the initial tonsillar infection. The albuminuria undoubtedly appeared at the time at which a nephritic lesion is to be expected, but in default of formed elements in the urine, and of other symptoms, a diagnosis of diffuse nephritis can scarcely be made.

The seasonal incidence of early and late albuminuria is shown in the following table, from which it is obvious that there is no relation between such variations of external temperature as our patients are exposed to at different times of the year and the frequency of albuminuria. The incidence of focal nephritis would appear to be somewhat higher during the winter months. Such a finding does not, of course, exclude the possible effect of extremes of temperature in the production of renal lesions, but merely indicates that such degrees of exposure as are met with in a city population are not an important factor in determining the appearance of albuminuria after tonsillitis.

	Total Cases	Early Albuminuria	Late Albuminuria	Focal Nephritis
July-Sept., 1932 ...	100	16 (16.0 %)	5 (5.0 %)	9 (9.0 %)
Oct.-Dec., 1932 ...	102	14 (13.7 %)	7 (6.8 %)	11 (10.7 %)
Jan.-Mar., 1933 ...	59	10 (16.9 %)	3 (5.1 %)	9 (15.2 %)
Apr.-July, 1933 ...	93	11 (11.8 %)	7 (7.5 %)	6 (6.4 %)

It may be mentioned that of our 354 patients thirty complained of "rheumatic" pains in the limbs after the tonsillitis had subsided. The patients thus affected were mainly young children, and frequently showed some degree of anaemia. The incidence of haemolytic streptococcal infection in these patients was 30 per cent., and corresponded therefore to the average for the whole series. In two cases chorea occurred, and in two erythema nodosum. No other complications were noted except the purely local, such as peritonsillar infiltration, cervical adenitis, and otitis media.

Conclusions

Of 354 cases of tonsillitis 14.4 per cent. showed definite early albuminuria and 6.2 per cent. late albuminuria.

From the urinary and clinical findings it would seem probable that focal nephritis occurred in thirty-five (10 per cent.) and diffuse glomerulo-nephritis in at least three (0.8 per cent.).

No correlation was found between predominance of haemolytic streptococci in the throat at the time of the acute infection and the incidence of focal nephritis.

Seasonal variations of external temperature did not appreciably affect the incidence of early or late albuminuria.

The incidence of predominant haemolytic streptococcal infection in the throat was not greater in those patients who afterwards complained of "rheumatic" pains than in the general series.

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SPIROCHAETAL JAUNDICE IN A LONDON SEWER WORKER CONFIRMED BY LABORATORY EXAMINATIONS

BY

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In view of the number of cases of spirochaetal jaundice reported recently in sewer and canal workers, the following case occurring in a London sewer worker, fully confirmed by laboratory tests, may be of interest.

Case Record

The patient was a well-developed, unmarried man of 29, who had always worked as a labourer and bricklayer. Two months before the onset of his illness, for the first time in his life, he started to work in a London sewer, near the Elephant and Castle. There were no other sewer workers in the family. The duties consisted in carrying new bricks to men working on the wall of the sewer and carrying away the old ones which had been removed. The removed bricks frequently had a layer of slime on their surface, and the patient had to lift them by hand into a truck. Abrasions on the hands were frequent, but, on questioning, he stated that he had cut his hand more severely than usual approximately one week before the onset of the illness. He was taken ill on October 10th, 1934, and the subsequent course of the illness was as follows:

October 10th.—The onset was sudden, but the patient was able to work during the whole of the first day of the illness, and went to bed on the second. He had a severe headache and complained of pains all over, especially in the muscles and joints of all four limbs. He had a sore throat and sore eyes, and vomited everything for a week. In view of the sore throat he was believed to have diphtheria. A swab taken on October 12th was said to be positive, and he was sent to Acton Fever Hospital four days after the onset with this diagnosis.