

ART. II.—*A Study of the Complications arising in Five Hundred and Fifty Consecutive Cases of Scarlet Fever treated at the Grove Hospital, Tooting, London, S.W.^a*

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THE entire subject of scarlet fever has filled many volumes, and has absorbed the attention of many investigators of its pathology and bacteriology; so that it would be impossible to condense it into one paper. For this reason it is my intention to confine myself to a study of the complications met with in the cases, mentioned in the title, which were discharged from one of the Metropolitan Asylums Board's Fever Hospitals during the months of August, September, and October, 1906, and which represent about a fourth of the cases treated there during the year.

Among the acute infectious diseases to which man is liable scarlet fever stands out as being one of the most fatal. Indeed, at one time it caused the highest death-rate of all the infectious diseases among the inhabitants of Great Britain.

In the decennial period from 1871 to 1880 the death-rate from this cause alone was 716 per million of the living population. This high rate of mortality has diminished markedly during recent years—falling to 182 per million in the period from 1891 to 1895, and to 135 from 1896 to 1900.

In spite, however, of this decrease in the number of deaths due directly to this disease it is still a source of danger to the community on account of the seriousness of certain of the complications which are of common occurrence among those who suffer from it—namely, nephritis, endocarditis, and pericarditis, adenitis, with often subsequent abscess formation, and otitis media, which, fortunately, does not very frequently lead to in-

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fection of the lateral sinus, and other neighbouring parts. Rhinitis and the other more trifling conditions due to the local infection of sores or wounds with pus-forming organisms are of less serious consequence.

As the admissions of scarlet fever cases increase rapidly during the autumn, reaching the annual maximum towards the latter part of November, there is a great demand for beds. To cope with this a large proportion of the patients are transferred to one of the Board's Convalescent Hospitals in Kent. Of course, only those who are free from complications, with the exception of nasal or ear discharges, are removed, and these only towards the end of the fourth week of the disease.

Of the 550 cases, 414 were transferred, the remaining 136 being treated during the full period of their illness and convalescence at the "acute" hospital. Among the former, 49 were not transferred until the end of the fifth week, and several even as late as the twelfth week, owing to various complications.

There were no deaths among those transferred, but of those not transferred there were eleven, giving a mortality of 2 per cent. of the total.

Five of these were of a severe septic nature, the chief local symptoms being confined to the mouth, fauces, and submaxillary and cervical glands; one developing an ulcer of the soft palate, which became perforated, while another suffered from arthritis.

Three died from nephritis, one suffering from whooping-cough as well. One child of a year and nine months died of broncho-pneumonia. Another developed general septicæmia with double otitis media, followed by mastoiditis, which was treated by operation, but without success. The eleventh, an infant of five months, succumbed to otorrhœa, pneumonia, and enteritis ten days after admission to hospital.

The importance of the complications of scarlet fever has already been referred to, and amongst these nephritis is the most likely to affect the after-health of the indi-

vidual, and to seriously interfere with his ability to contend with the stress of labour subsequently.

It is met with in this disease in degrees varying from the presence of the merest trace of albumen in the urine, detected, perhaps, but once during the entire course of the illness, to the most severe forms of renal inflammation, resulting in the death of the patient, or, in those who survive, damaging the renal filter to such an extent as to make those feeble and delicate who would otherwise have been robust and of service to the community.

In discussing this subject and dealing with individual cases one must draw an arbitrary line of distinction between those which only show a temporary albuminuria and those which are of the more severe type of true nephritis, with hæmaturia, anæmia, and the other classical signs of the disease.

This line, though arbitrary (when one considers that the presence of albuminuria, even to a slight degree, is evidence that the kidney has been somewhat damaged, and is really in a mild state of inflammation), is, nevertheless, very distinct when one takes the clinical aspect alone into consideration. Further, Professor G. Dieulafoy,¹ of Paris, describes what he calls "*la dissociation des actes morbides du rein.*" Speaking of scarlatina he says, "Here, again, we find the dissociation of the morbid acts of the kidney; on the one hand albuminuria lasting for years without the coincidence (*adjonction*) of any other symptom, and, on the other, symptoms of Brightism (*brightisme*) with or without the coincidence of albuminuria.

Looking over those cases which showed albuminuria only, and of which there were 89, or 14.36 per cent., one may divide them into those which passed traces during the acute febrile stage and those which developed the condition later in the disease.

Of the former class there were 25 cases, or 4.54 per cent. of the total. Amongst these the albuminuria was of a very transient nature in 17, lasting for one or two

days only, and not reappearing during the remainder of the illness. In two the urine became normal in two days, and subsequently showed traces, which again passed off as convalescence advanced. One continued to pass small quantities of albumen up to the nineteenth day, when the urine became free, and did not show any during the subsequent weeks. The remaining five continued to pass albumen, which increased in quantity, and in a few days developed the definite clinical picture of scarlatinal nephritis.

This albuminuria of the febrile stage of scarlet fever is not to be considered as a condition belonging only to this disease, but must be looked upon as being of the same nature as that which one sees during the fastigium of any acute febrile condition, and which passes off with the cessation of the fever. It has been ascribed to slight changes in the protoplasm of the glomeruli interfering with the power of the epithelium to prevent the passage of albuminous substances through it from the bloodstream.² These changes being brought about by the pyrexia itself pass off when this exciting cause ceases.

Such cannot be considered the cause of albuminuria in the second class of cases—namely, those in which albumen appears in the urine later in the disease, as this generally occurs at a time when the temperature is normal. It is most frequently seen during the second and third weeks and early in the fourth.

There were 61 of these cases. In 53 only traces were present in the urine, which became normal within six days of the first appearance of the condition, no further signs of renal mischief being noted.

One occurred first on the sixth day, two on the seventh, twenty during the second week, fourteen during the third, and twelve during the fourth. The greatest daily incidence was on the eighth day, when six began to pass albumen; five on the eleventh, four each on the sixteenth and seventeenth, and three each on the twenty-third and twenty-fourth days.

The most persistent of these was a boy of eleven. Albumen first appeared on the twentieth day, but only traces were observed. This lasted until the forty-first day, that is, for three weeks, when it cleared up, the urine remaining normal until his discharge on the sixty-fourth.

It is interesting to note that 45 of the 53 cases, or almost 85 per cent., began before the twenty-fifth day, while only 4 occurred later than the fourth week; and also, that this incidence corresponds to a marked extent with that of true nephritis, for after the twenty-fifth day one comparatively seldom meets cases of either albuminuria or nephritis in scarlet fever commencing. It also points to the fact that in all probability the minor condition is but a very mild form of the latter, or else that it is due to a condition of the kidneys which renders the individual more susceptible to the cause, most likely of a bacterial nature, of true scarlatinal nephritis, to which I shall refer later.

There were seventeen cases of nephritis, or 3.1 per cent. of the series. Thirteen of these showed definite hæmaturia. The remaining four I have classified along with them, for, although blood could not be demonstrated, the general condition of the patient, and the presence of marked albuminuria, with a coincident pyrexia for a considerable time, warrants my so doing in each case.

A prominent feature in most of these was severe adenitis. In thirteen it preceded the actual onset of albuminuria by one or two days, but in some it did not appear until after this had occurred. In eight there were severe congestion and œdema of the fauces and tonsils on admission. In other words, there was more local inflammation than is usually seen in simple uncomplicated cases.

From nephritis there were two deaths. The first, a girl, aged ten, was admitted on the second day of the disease with very severe faucial inflammation, stomatitis, great glandular enlargement, arthritis, and nasal discharge. This is what is frequently described as a

"septic" case, implying the presence of a secondary septic infection superimposed on the scarlet fever itself, or what used to be called "scarlatina anginosa."

A faint trace of albumen appeared on the fourth day, and increased in quantity up to the sixteenth day, when she died. There was considerable pyrexia throughout her illness.

The second case, a boy, aged seven, was admitted in a very neglected condition late in the disease, probably about the end of the third week, desquamating freely. No definite history could be obtained. The eyes were puffy and the face swollen. The fauces were normal, and there was no marked glandular enlargement. Albumen was present on admission, and persisted till his death, two days later.

Blood was not detected in either of these cases, but, as Dickinson,³ in his monograph on the "Pathology and Treatment of Albuminuria," says, in reference to scarlatinal nephritis:—"The worst cases are those in which no blood makes its way into the urine."

Of those who survived, one, a man of twenty-four, developed nephritis on the sixteenth day, and considerable adenitis on the seventeenth. Blood was present from the twenty-third to the thirty-second, when it was no longer detected, but albumen was still present on his discharge on the sixty-seventh day.

A boy, aged ten, who was admitted with severe adenitis, and developed nephritis on the tenth day, was still passing albumen in small quantities when transferred to the Convalescent Hospital on the fifty-second day.

With the exception of these two, and three cases to be described later, all the 539 surviving patients left hospital having passed urine free from albumen for some time previous to their discharge.

Having now dealt with the cases of transient albuminuria and nephritis let us turn to those of a more permanent nature, which do not strictly come under either of these heads.

There were three of these. One, a boy, two and a half years of age, developed pertussis late during convalescence. He began to pass albumen on the eighty-seventh day after the onset of scarlatina, when a thick deposit was found to be present. This continued until the one hundred and sixth day, when he died.

The next, a boy of fifteen, was admitted—so far as one can judge—on the thirteenth day. Albumen appeared on the seventeenth day, and continued until the forty-fourth, when it disappeared, not returning during the remainder of his stay—some ten days.

The third was a boy of seven and a half, who was admitted on the second day of the disease, with a considerable quantity of albumen in the urine, which continued constantly until his discharge on the one hundred and third day. Probably, in this case, the albuminuria was due to some condition from which he had suffered before developing scarlatina.

With regard to the microscopic examination of the urinary sediments of cases of acute nephritis I have found that in the acute stages blood corpuscles and epithelial and blood casts were present, as might be expected. Later hyaline and granular casts were seen with isolated epithelial cells and leucocytes.

In cases of transitory albuminuria I have not found casts in those which showed but traces. But where a heavier deposit has been thrown down on boiling and acidulation there were hyaline and granular casts in a few.

The microscopical appearances of the sediments are much as one would find in similar conditions of the kidney, apart from scarlet fever.

The comparative frequency with which severe pharyngitis and adenitis accompany or precede nephritis in scarlet fever suggests that there is some connection between the causes of these conditions, or that they arise from a common cause; and the theory that scarlatinal nephritis is bacterial in origin is supported by it.

Forchheimer⁴ says:—"For the present the observation holds good that in all those cases in which there exists an extensive streptococcic infection we are more liable to have nephritis than in those in which the scarlet fever is alone operative."

Streptococci have, in fact, been found in the kidney in scarlet fever by Raskin, Guinon, Babes, and Gordon. Out of 10 fatal cases the last-mentioned investigator found streptococci in the kidneys of 6, giving pure cultures. In one, two cultures of *Staphylococcus aureus* were present, and in another a few streptococci could be demonstrated *in situ*.

These facts, considered along with the frequent streptococcic infection of the fauces, lead to the supposition that these organisms enter the lymph stream through the tonsils and other adenoid tissues in the pharynx, infect the glands in the submaxillary and cervical regions, causing the severe adenitis so often seen, and thence are carried to the blood stream, by which they reach the kidneys.

For this reason the adenitis of convalescence from scarlet fever must be looked upon as a danger signal, and a line of treatment must be followed which will assist the kidneys to deal with toxic substances in the blood, while reducing the adenitis as speedily as possible.

With the former object in view the patient should be kept at rest in bed, and given regular doses of salines in order to keep the bowels open and prevent the absorption of the products of bacteria from the intestines.

The local condition is best treated by fomentations, applied at short intervals, say four-hourly, till the inflammation subsides, or, as sometimes occurs, an abscess forms. If applied early they give immediate relief, and do not increase the tendency to abscess formation, as is the case if they are left till later, when the inflammation has reached the stage of stasis and subsequent thrombosis and necrosis set in, and when the usual treatment for abscess must be carried out.

As stated above, the percentage of cases of nephritis was 3.1, and that of albuminuria 14.36.

These figures approximate to those of the Asylums Board for the past three years—namely, 5.37 and 13.01 in 1903, 4.27 and 11.78 in 1904, and 3.25 and 9.23 in 1905, which show a regular diminution in the incidence of renal troubles.

At the same time the percentage of cases of simple cervical adenitis was 6.18 in my own series, and diminished from 7.58 to 6.36 per cent. in the Board's statistics.

It will be seen that with the exception of albuminuria the percentages are below the average for the three preceding years.

This exception is of interest in regard to a statement by Owen Fowler, as most of my cases were admitted during the warmest months of the year.

According to Forchheimer,⁵ Fowler "has shown that kidney troubles are most common in the summer months, and states positively that nephritis does not seem to be produced by catching cold."

That the first part of this statement is correct is highly probable, and may be compared with that of Notter and Firth,⁶ who say that rheumatism, puerperal fever, and erysipelas, which are also of a septic nature, are most prevalent in "years of small rainfall."

With regard to the latter part of the statement, in which it is implied that cold has nothing to do with the production of nephritis in scarlet fever, my own experience points in the opposite direction; but as I have no statistics giving the incidence of nephritis with the coincident air-temperatures, I cannot disprove it at present. Still, it is quite possible that Fowler's wards were more uniformly heated and ventilated in winter than in summer, in which case there would be more likelihood of patients suffering from chills in summer than in winter.

Apart from this, although my statistics show a higher

incidence than those of London for the last three years, as regards albuminuria the percentage is low as compared with the experience of some years ago, and even fairly recently on the Continent.

For instance, Dickinson⁷ quotes the late Dr. Hillier, who found albumen in about half the cases of scarlet fever under his care at the Hospital for Sick Children, while his own experience would fix the ratio higher. And Girard,⁸ of Paris, estimates it at "more than half of his cases," though he found nephritis in only 4.55 per cent., which approximates more nearly to the London experience of the latter conditon.

As, however, the type of scarlatina itself seems to have become milder of recent years, it is not to be wondered at if the renal complications should at the same time occur with less frequency and severity.

The rarity of an appreciable laryngitis, apart from co-incident diphtheria, in a disease in which pharyngitis is one of the most constant features, is worthy of note. As Trousseau⁹ has said:—"La scarlatine n'aime pas le larynx." In view of this the following case is of much interest:—

An infant, of twelve months, was admitted on the ninth day of the disease with a definite history of vomiting, headache, sore throat (*sic*), and a general rash. On admission no rash was evident, but desquamation was seen on the neck. There was slight faucial injection with some muco-purulent deposit on the tonsils. Bilateral adenitis and profuse purulent nasal discharge were also present. Cultures were made from the throat and nose, but no diphtheria bacilli were found.

On the twelfth day (that is, the fourth in hospital) there was some retraction of the neck, and a fairly typical "hydrocephalic" cry; but no other signs of meningitis, all reflexes being carefully examined.

On the sixteenth day she had some stomatitis, which improved.

On the twenty-sixth day there was considerable hoarse-

ness with occasional stridor. This became more marked on the thirty-fourth, and on the thirty-fifth intubation was resorted to, as she was very cyanosed, and there was marked recession of the intercostal spaces.

No improvement occurred, and two days later tracheotomy was performed, when the larynx was seen to be acutely inflamed.

After this her condition improved. A smaller sized tracheotomy tube was inserted a week later, and finally removed on the forty-ninth day, or twelve after the operation, the patient leaving hospital on the sixty-second day, well.

As a rule, laryngitis in scarlatina is due to a coincident attack of diphtheria, which is sometimes also a sequel to the former. But in the present series there were no such cases.

Several were sent in, certified as diphtheria, and others with ulceration simulating that condition, were examined bacteriologically, but none showed the Klebs-Löffler bacillus on admission, and only one developed the disease later. The most frequent position for the membrane to be found, in my experience, is in the anterior nares, especially in young children.

Among the remaining complications rhinitis and rhinorrhœa occurred most frequently, being seen in 122 cases, or 22.18 per cent. Nearly 69 per cent. of these were in children under eight years of age.

This condition, although not of serious import to the individual, apart from the presence of nasal diphtheria, is liable to become troublesome if not properly looked after, and must be taken into consideration in deciding when a patient is free from infection and may be discharged. For there is no doubt that discharges from the nose and ears are important factors in causing the so-called "return cases" of scarlet fever.

Cameron¹⁰ has shown that "in 688 cases of secondary scarlet fever which he investigated rhinitis or nasal discharge was present in 52.3 per cent. of the infecting

cases, and otorrhœa in 8.3 per cent. after the patient's return from hospital, and Simpson found these conditions present in 76.6 and 14.4 per cent. respectively in 90 cases which he examined.

Also, out of over 4,000 cases discharged from one of the Convalescent Hospitals (Gore Farm) the percentage of "return cases" was 1.6 in cases free from discharges and 2.4 in those suffering from these conditions, and notified to the medical officers of health for supervision, showing that "return cases" are more frequent where mucous discharges are present.

The treatment of nasal discharge by simple application of zinc ointment to the anterior nares gives good results. I have tried nasal douches or syringing with boric lotion with and without saline and alkaline solutions, but found that, although the discharge becomes clear, where it has been purulent, it continues for a longer period than when the local application of ointment was alone used.

Otorrhœa occurred in 7.63 per cent. of the cases, and was treated by syringing the ears regularly with warm boric lotion, thus removing, or encouraging the escape of, septic matter, which would otherwise collect and decompose, tending to set up fresh inflammation.

Only two of these gave rise to mastoid trouble. One, as has been already mentioned died after operation. In the second antrectomy was performed, the patient leaving hospital on the one hundred and twenty-eighth day, free from discharge

Vulvitis occurred in two, and was treated by rest and local application of zinc ointment, recovery being rapid.

There were five cases of pneumonia, and the same number of bronchitis. Two of the former proved fatal, being accompanied by other complications.

Sixteen patients complained of joint pains, more or less swelling and redness being present. Salicylates gave relief in several, and I have found aceto-salicylic acid of use where the former have failed.

Endocarditis was present in seven, and pericarditis in one—the treatment adopted being that usually followed in these conditions.

Stomatitis was seen in four, being accompanied by ulceration of the gums and buccal mucous membrane. So far as my short experience of this condition goes, it confirms the words of Burney Yeo,¹¹ who says that “potassium chlorate appears to exert almost a specific influence over this disease.” Given internally up to twenty grains four-hourly for two or three days it cuts short the duration of a complication which otherwise tends to spread and may even cause necrosis of the jaw and loss of teeth.

Six cases were admitted shortly after suffering from surgical diseases or undergoing operations. One had a crural abscess. Another had his hip joint scraped for morbus coxæ two days before admission. The third, a girl of fourteen, was admitted with a psoas abscess and tuberculosis of one knee-joint, and had had a colotomy performed six weeks before the onset of scarlet fever. The fourth had a recent burn on his hand.

A girl of three and a half had been operated on for empyema, and the last had undergone appendicectomy six days before developing scarlatina. All had mild attacks, and recovered without further complications, and all cases of a similar nature that I have seen since compiling the statistics for this paper have had but slight attacks. There have been no relapses amongst them, and there has been no reason to suppose that any misdiagnosis has been made.

CONCLUSIONS.

1. Scarlatinal albuminuria may be transient or permanent, but is most frequently transient.

2. Febrile albuminuria in scarlet fever is quite distinct in nature and origin from the albuminuria of convalescence.

3. Those who suffer from septic inflammation of the fauces and lymphatic glands are more likely to develop renal complications than those who do not.

4. Complete recovery from albuminuria and nephritis in scarlet fever is of frequent occurrence under suitable treatment and in favourable surroundings.

5. Scarlatinal infection, occurring as a complication of surgical lesions, appears to be often of a mild character.

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⁴ Forchheimer. *Twentieth Century Practice of Medicine*.

⁵ *Ibid*.

⁶ Notter and Firth. *The Theory and Practice of Hygiene*. Second Edition. 1900. P. 683.

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¹⁰ A. G. R. Cameron, Medical Investigator to the Metropolitan Asylums Board. Report *re* Return Cases of Scarlet Fever and Diphtheria from 1901 to 1902. M. A. B. Annual Report, 1904. M. F. Turner. Report of Return Cases of Scarlatina and Diphtheria for the three years 1902-3-4.

¹¹ I. Burney Yeo. *A Manual of Medical Treatment or Clinical Therapeutics*. Vol. I. P. 9. Edition 1903.

LITERARY NOTE.

At the present time, when the terrible wastage of infant life is attracting so much attention, a volume which the Caxton Publishing Company announce for immediate issue will appear very opportunely. The work is by Professor Budin, the famous obstetrician of Paris University, and describes, in elaborate detail, with numerous coloured graphs, a method of treatment which has already attained marvellous results in France in reducing infant mortality. Every statement in the work is based on actual personal experience. The work is translated by Dr. W. J. Maloney, and Sir A. R. Simpson contributes an introduction.