SCARLET FEVER - ITS TREATMENT AND COMPLICATIONS - A CLINICAL STUDY OF 550 CASES TREATED IN THE GROVE FEVER HOSPITAL, METROPOLITAN ASYLUMS BOARD, LONDON,

A Thesis submitted to the Senate of Glasgow University for the Degree of M.D.,

By

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Age Incidence

Total No.	Under 5	Over 5 & under 10	Over 10 & under 15	Over 15
550	219	183	85	63
	Percentage		Percentage	Percentage
	73.2		15.2	11.4

Sex Incidence

Total				
550	Male	254	or	46.2%
	Female	296	or	53.8%

The following observations are based on the study of a series of cases of scarlet fever, discharged from Hospital during a period extending from June till September, 1906.

The number of patients treated during that time was 550, and I propose to discuss the disease and its various complications from a clinical point of view, and to indicate shortly the method of treatment pursued. The number might readily be augmented from my clinical notes of subsequent cases, but the broad features of the disease are sufficiently indicated in the number chosen.

Age Incidence.

Scarlet fever is pre-eminently a disease of childhood. From the subjoined table it will be seen that 73.2% of all the cases are under 10 years of age. Of those over 10 but under 15, the percentage is 15.2% and of those over 15 the percentage is 11.4.

Its incidence in infancy is rare, only 4.3% of the cases being under one year of age.

Sex

It affects pretty equally both sexes. Of the cases tabulated, 296, or a percentage of 53.8, occurred among females.

Mode of Onset.

There are three cardinal symptoms, broadly speaking, of the onset of scarlet fever. These are headache, vomiting and sore throat. In a great many cases the scarla-

tiniform eruption appears synchronously with these symptoms, but there is much variation in this particular.

In almost 40% of the cases these occurred together - frequently as the only premonitory symptoms, but also in conjunction with others less common, for example, nasal discharge, ear discharge and adenitis.

A premonitory rigor is not uncommon.

Convulsions are very rare even in infants. Only one of the cases had a history of a convulsive seizure before admission to hospital.

Pains in the back and limbs or joints are frequently complained of, while abdominal pain is very rare and when it occurs is usually associated with diarrhoea,

Mild delirium at the earliest stage is quite infrequent and does not seem to bear any relation to the subsequent nature of the attack.

In the vast majority of cases the patient's chief complaint is of pain in the throat and of tender glands.

Throat.

The scarlatinal throat in its most typical form is one which shows a deep injection of all the palatal, faucial, and pharyngeal mucosa, with tonsils almost invariably enlarged and showing either follicular patches of exudate or continuous membranous-like plaques, usually of a cream-like colour. Troublesome mucoid secretion from the posterior pharyngeal wall is a source of much discomfort.

Tongue

The tongue is thickly furred as a rule, and varies much in its appearance - at times a thick white fur coats the dorsum and tip, while prominent little red papillae appear at various points on the surface. The margins are usually free from fur and of a deep red colour. The partially "peeled" tongue is very characteristic - in this case the papillae stand out very prominently from a smooth and often glazed-looking red base. In no other condition is this papillated and glazed tongue so evident and it therefore serves as a valuable diagnostic aid.

In Septic cases.

In very severe and so-called septic cases the condition of the throat and tongue is quite atypical. The fur on the dorsum of the tongue rapidly becomes brownish or black, and dried. Where much mucus has been secreted by the pharyngeal and palatal glands, it also becomes inspissated and may lead to adhesions between the dorsum of the tongue and the palatal roof which are only separated with difficulty and may be accompanied by slight degrees of bleeding over the separated area.

The tonsils may show much ulceration and this may even extend on to the palate, and in one or two cases I have seen small perforations subsequently at the junction of palate and anterior faucial pillar.

Where ulceration is a prominent feature there is often an aphthous condition of the lips and gums, especially in the labial fornices.

Nasal Discharge.

The distress of the patient is further aggravated by the constant out-pouring of septic discharge from the nostrils. This is occasioned by the blocking of the ordinary exit from the naso-pharynx owing to the swelling and oedema of the faucial and tonsillar regions. The pent up mucus and muco-purulent secretion then follows the line of least resistance and appears through the anterior nares, where it invariably leads to much excoriation and to the formation of nasal fissures, ulceration of the septal mucosa and of the vestibulum nasi.

Ulceration of the adenoid tissue on the posterior pharyngeal wall is part of the general ulcerative condition and aggravates the nasal discharge.

Adenitis.

In all but the very mildest cases there is a certain degree of sub-maxillary adenitis. This is undoubtedly related to the faucial and tonsillar hyperaemia or ulceration and inflammation, as the case may be.

Many of the patients complain of pain in the cervical glands, but even where no complaint is made, a palpable enlargement of these is perceptible. The degree in which the adenitis is present bears a direct relation to the severity of the faucial condition. In the septic type of case one may meet with a "collar neck" condition simulating what is more characteristic of diphtheritic throats. In the vast majority of cases only the submaxillary group of glands is affected, but not infrequently the submental gland or glands are tender and enlarged.

Facies

The aspect of a patient seen in the early stage of a typical attack of scarlatina is very characteristic. The forehead and cheeks are of a brilliant scarlet hue merging almost into purple in some cases, while the circum-oral region shows a very marked and distinctive pallor. The eyes are bright and the expression usually alert and intelligent. There is sometimes slight suffusion of the eyes.

In more severe cases, where there is a degree of toxaemia, the expression is dull and listless, the child is drowsy, and passive under examination.

Rash.

The scarlatinal eruption appears as a rule within a short time from the onset of the initial symptoms - as a rule within 24 hours. It appears first on the chest, neck and arms and rapidly extends downwards. As a rule it is fully developed within 3, or at most 4, days from the time of onset, and thereafter it rapidly subsides. The character of the rash is distinctive in two particulars; firstly, in its punctate appearance, and secondly, in the associated erythema. The latter imparts a dusky, rather yellowish-red tint to the skin - somewhat similar to brick dust - and it is usually quite uniform. When fully developed, and associated with the brilliant colouring above noted on the face and forehead, the appearance of the exanthem is quite characteristic. A marked difference between the condition of the face and trunk is the absence of punctuation on the former - the face only

shows a diffuse redness. The punctate characters are most pronounced as a rule on the arms, thighs and legs.

In general, the rash fades within the first week of illness and in the same order as its appearance.

Desquamation.

Before general desquamation commences, a very fine powdering of the face may be noticed, especially in children. With the deep red background of the cheeks and forehead, this powdering gives an appearance very characteristic of scarlatina.

Desquamation in general first appears in the flexures of the neck and over the clavicles in the form of very tiny rings, which gradually coalesce and thus lead to more extensive peeling. Gradually the process extends to the other parts of the body and is of a coarser type. "Pin-hole" peeling is characteristically present at an early period in the lower abdominal and pubic regions. Over the palms and soles coarse flakes make their appearance, these often coalesce and form large shreds of loose epidermis before the final separation takes place.

Desquamation goes on for a period of weeks often. As a rule within 6 or 8 weeks it is completed, but in many cases isolated desquamative areas may be seen after a greater interval of time than this. Particular attention should be paid to the various cutaneous flexures in looking for these and also at the finger tips and toes just in front of and encroaching on the bed of the nails.

The separation of the fur from the tongue and the subsequent papillation already referred to may be said to

be peculiar to scarlet fever. This process often begins as early as on the second day of disease. It commences at the tip and margins and gradually invades from these points the area of the dorsum. The ultimate appearance of the organ has been aptly compared to a piece of raw beef, and the red and glazed surface with the papillae projecting here and there over its whole extent is only to be seen in cases of scarlet fever.

Pyrexia.

The primary rise of temperature during the invasion period is a rapid one, but hyper-pyrexia is not very common. As a rule the thermometer registers from 102° to 104° F. and with very slight variations this may be maintained throughout the eruptive period.

A typical case will show a temperature of about 103° for about 4 days - a period coinciding with the full development of the rash, and will then fall by lysis to normal within from 7 to 9 days from the date of onset. It follows from this, that in a great number of the cases in the present series very short periods of pyrexia are recorded, this being due to the fact that at the time of admission three or four days had already elapsed since the onset of illness. A considerable proportion of patients are admitted who show only desquamation and in such cases, when no complications arise, the time of residence in hospital is marked by no pyrexia whatever.

In septic cases, however, the temperature curve is naturally of a very different type. Here, hyper-pyrexia is as a rule present and the daily variation may be con-

siderable. Toxic cases as a rule die without any sensible decline of temperature late in the first or early in the second week.

Pulse and Respiration.

The condition of the pulse at the onset of scarlet fever presents nothing characteristic. Its rapidity is noticeable and in young children may reach 160 - 180 per minute. Its tension is higher than normal. The rate rapidity subsides with the fall of temperature and in convalescence it may become inordinately slow.

The pulse respiration ratio is not much disturbed as a rule.

Urine.

During the pyrexial period the urine is of the ordinary febrile type - rather scanty and high coloured and often with increased degree of acidity. A trace of albumen is quite common while pyrexia lasts.

Period of Defervescence.

With the fall of temperature and the commencement of desquamation there is a very striking change in the aspect of the patient. There is complete freedom from pain, appetite for food returns, the tongue rapidly becomes moist and the papillae less prominent, the faucial and palatal injection quite disappear, the tonsils assume their normal appearance and the pharyngeal mucus is no longer secreted in superabundant quantity. The troublesome rhinorrhoea ceases in favourable cases along with the fall of temperature, the adenitis gradually subsides,

but the glands often remain faintly palpable for a week or two after complete subsidence of all throat symptoms. The patient feels perfectly well again and further confinement in bed soon becomes irksome. By the end of the third week in uncomplicated cases convalescence is fully established, and the only risks attaching to the patient are those of infecting others during the desquamative period.

Such is the course of a simple and uncomplicated case of scarlatina.

Septic Type.

In the septic type there are many variations from this. Here, as a rule, there is a very grave condition of the fauces, tonsils and pharynx and a correspondingly deeper and more extensive glandular involvement. Many of these cases show much ulceration of all the mucous membrane involved, and this may lead to extensive necrosis and gangrene of the tissues before death supervenes. The foetor associated with these cases is at times almost unbearable and treatment with all varieties of deodorants and antiseptics of very little avail in controlling the condition. In such cases the occurrence of petechiae and purpuric areas of varying extent is to be looked for. These may appear along with the primary eruption, which is usually of a very dusky and at times almost livid tinge. Haemorrhages into the buccal and alveolar mucosa may also occur. In none of my cases have I noted any melaena, however.

As already noted the glandular condition in this type of case is a particularly distressing one. Deep seated necrosis and septic mischief may very quickly ensue, but very rarely does the process advance sufficiently rapidly to involve the cutaneous structures before death releases the patient.

Sanious and strongly irritant discharge pours constantly from the nostrils. This is extremely difficult to control, and is very apt to lead to septic complications in the eyes and in other parts, e.g., the fingers, which are often the seat of onychiae. The uvula is very often completely ulcerated away in such cases, but I have rarely seen much involvement of the palate itself.

On the rare occasions when such extremely toxic cases ultimately recover, convalescence is prolonged for many months and is associated with numerous complications, the most common of which are persistent discharges from nose and ears, suppurative adenitis, albuminuria and nephritis, and mastoiditis.

These complications will be dealt with presently.

The so-called fulminating type of case, in which death is said to occur within 24 or 36 hours from the initial onset, I have not yet met with.

Diagnosis.

The punctate rash in conjunction with the symptom complex above mentioned - headache, vomiting and sore throat - admits of no doubt in the diagnosis of scarlet fever. In many of my cases, the patients on admission had only fading rashes, but the condition of the tongue

in such is a great aid to diagnosis. The raw tip and margins, the prominent papillae, and the commencing separation of the fur are all very characteristic and if associated with the early desquamation on the neck or chest already described, are quite confirmatory of the diagnosis.

Tonsillitis.

To differentiate the disease from tonsillitis may be extremely difficult. Here there is the same faucial injection, the tonsils may be exactly in the same condition as in scarlet fever, more especially where the exudate is of a general as contrasted with a follicular type. An evanescent erythematous rash may be associated with the onset of tonsillitis, but the absence of the punctuation so characteristic of scarlatina is of value as a distinguishing feature.

Hyper-pyrexia, so common in tonsillitis, should favour the suggestion of this disease rather than of scarlatina.

Also in tonsillitis the condition of the tongue is never so characteristic as in scarlatina, the fur is more persistent and does not clear up in the same way, nor does it leave the organ smooth and glazed-looking as scarlet fever does.

Measles.

The rash of measles may at times be confused with that of scarlet fever. The tendency of the measles rash to invade the face and forehead and the back of the ears, its macular and blotchy character, and the almost in-

variable presence of lachrymation and other catarrhal symptoms, together with absence, as a rule, of anything but slight faucial hyperaemia, the less frequent occurrence of vomiting as an initial symptom and the absence of papillation from the tongue, are the chief differentiating features.

Rubella.

The rash of German measles approximates much more closely to the measly type than to that of scarlet fever. It has the same tendency to invade the facial region as has ordinary measles, but the distribution is everywhere of a more discrete kind than is the case with scarlet fever or ordinary measles. Absence of vomiting and sore throat are also noteworthy and the child may not feel much indisposed. The glandular involvement in German measles tends to be out of all proportion to the other features of the disease. One invariably finds the posterior cervical and occipital glands enlarged - a condition not nearly so characteristic of scarlatina.

Diphtheria.

In the diphtheritic throat there may be comparatively little hyperaemia or injection - the membrane may be entirely confined to one side and is usually of a different character from the tonsillar exudate in other conditions, being whiter, or greyish-white as a rule. The constitutional symptoms may be very slight and although a faint erythema may occasionally be seen on the abdomen or chest, this is usually quite evanescent and is never punctate in

character. The degree of pyrexia in diphtheria is also, as a rule, lower than in scarlet fever.

Prodromal Rashes of other Diseases: Small pox.

Prodromal rashes of small pox may cause difficulty in diagnosis. Their site of election in the lower abdominal region and thighs, the almost invariable pain in the back and loins and the frequency of an initial rigor serve to distinguish small pox from scarlet fever .

Chicken-pox.

Prodromal erythemata occur in varicella and may be confused with an early scarlatinal eruption. The absence of vomiting and sore throat should suggest doubt of the diagnosis of scarlatina.

A true prodromal rash of scarlet fever itself I have not seen. If such does occur it must be excessively rare.

Prognosis.

In uncomplicated cases, the prognosis is good.

In the present series of cases only 5 deaths occurred and from causes which will be discussed later.

The mortality is most pronounced in the first 5 years of life. The 5 fatal cases above mentioned were all under 4.

Complications

Taken in order of frequency the complications of scarlet fever as evidenced in this series of cases are, albuminuria, otitis, adenitis, rheumatism, nephritis, mastoiditis and endocarditis.

Table showing incidence of Complications amongst 550 Cases of Scarlet Fever.

Complication		
Total cases	550	
Albuminuria	62 =	11.2%
Nephritis	16 =	2.9%
Otitis	58 =	10.5%
Mastoiditis	6 =	1.1%
Adenitis	30 =	5.4%
Rheumatism	28 =	5%
Endocarditis	6 =	1.1%
Retropharyngeal abscess	1	
Tonsillitis	1	
Laryngeal ulceration and oedema	1	
Dacryo-cystitis and ulcer of cornea	1	
Relapse of disease	3	

Intercurrent Diseases

Measles, 6 cases

Whooping cough, 8 cases

Diphtheria, 1 case

Varicella, 1 case

Bronchо-pneumonia, 1 case

Pneumonia, 1 case

Jaundice, 1 case.

From the accompanying table the relative frequency of those various complications may be noted and also the occurrence of other less usual complications. Each of these will now be discussed seriatim, and subsequently an account will be given of the treatment adopted and of the results obtained.

Albuminuria

Under the heading of Albuminuria I have included all cases that showed a trace of albumen at any stage of the disease from the time of admission until the time of discharge, but excluding 10 cases of true nephritis which developed without any premonitory albuminuria.

The total number of patients who suffered from albuminuria was 111 - approximately 20%, and it is noteworthy that only 6 out of the 111 acquired a true nephritis. Under the term nephritis are included only such cases as showed haematuria, tube casts and occasionally slight oedema.

Taking the albuminuric cases first it is important to recognise the time of onset of the symptoms.

I have put in a separate class all cases in which the albumen was manifest within the first 7 days of illness. These numbered 49 - about 44% of the whole, while between the end of the 1st week and the end of the third, 43, or a percentage of about 38, showed albuminuria.

Cases of albuminuria occurring for the first time beyond the end of the third week numbered 19, a percentage of 17 of the whole of the albuminuric cases.

Complications of Scarlet Fever.

Albuminuria. Total No. of cases 111 = 20%

Albuminuria of Convalescence. Total No. of cases 62 = 56%

Albuminuria on admission, Total No. of cases 49 = 44%.

Time of Onset

Between 7th day and 21st day of illness 43 = 38%

After end of third week 19 = 17%

Age Incidence.

Age 1 to 10 No. of patients 70 = 63%

10 to 15 No. of patients 27 = 25%

Over 15 No. of patients 13 = 12%

The albuminuria occurring within the first week of illness cannot be considered as altogether characteristic of the scarlatinal invasion, it is merely part of the general febrile process, and may be met with in all acute invasions. Especially is this the case where its occurrence is merely transient - over a period of 2 to 7 days - but, as will be observed later, a certain proportion of those early cases show a persistent albuminuria. And in these there is no doubt that the scarlatinal toxin finds in the kidney a site of election.

Excluding, then, the ordinary febrile cases, that is, those occurring within and limited to the first week of illness, the number of scarlatinal albuminuric cases is shown to be 62, and the percentage of the whole 550 cases so affected is 11.2.

From the 9th to the 21st day is the critical period, over two-thirds of my cases showing symptoms within that time.

Age Incidence.

The great majority of cases of albuminuria occur between the ages of 4 and 10. About 25% occur between 10 and 15, and about 12% in those over 15.

These figures are given shortly, on the accompanying table.

Sex does not seem to affect the incidence markedly, males and females being practically equally affected.

Duration of Albuminuria.

Turning to the duration of the albuminuria, a wide range of variation is evident - from an evanescent cloudi-

ness of one day's duration to the more or less permanent deposit - permanent, that is, as regards the period of residence in hospital.

Over the whole series of cases the average duration, however, is only 4.3 days. This is due to the large number of cases which only showed the transient condition lasting for one day, Of these there were 19.

Contrasted with these are 10 cases which were admitted to hospital with albumen in the urine which persisted for periods varying from 16 to 40 days, and two others which also were admitted with albuminuria, but in which the condition remained permanent. These obviously need not have been due to the scarlatinal toxin.

The latest period at which albuminuria was noted to occur was in one case on the 57th day, and the condition persisted for 12 days and then apparently cleared up. In another, occurring on the 55th day, the condition still persisted when the patient was discharged from hospital.

The degree of albuminuria in all these cases varied from a faint cloudiness to a distinct deposit of varying density, the testsused being those of heat and acetic acid, nitric acid in the cold, and more rarely picric acid.

A very frequent associated symptom of the albuminuria is cervical adenitis which will be discussed more fully later, under the term secondary adenitis. I have only, however, in 7 of the present series of cases noted its occurrence.

As a rule when albuminuria and adenitis supervene at the same time, there is a slight degree of pyrexia,

Nephritis

Total No. of Cases 16 = 2.9%

Age Incidence

Age 1 to 10	No. of cases 11	= 69%
10 to 15	No. of cases 4	= 25%
Over 15	No. of cases 1	= 6%

Sex Incidence

Females	9 = 56%
Males	7 = 44%

Mortality

No. of deaths 2 = 12.5%

the thermometer registering from 101° to 102° F., but this is not maintained beyond two days frequently, and in cases where simple albuminuria occurs an elevation of temperature above normal is comparatively rare.

Nephritis.

The nephritis of Scarlet Fever is probably only a more severe expression of the morbid influence of the toxin on the renal tissue than that which we associate with albuminuria. It was present in 16 of my cases - a percentage of 2.9.

I have included in this category 2 fatal cases, in which there was almost complete suppression of urine before death, but in which no albuminuria occurred. As already noted 6 out of the 16 had albuminuria before the nephritis asserted itself. The albuminuria period varied from one to three weeks.

Onset.

The onset of nephritis is invariably accompanied by pyrexia, malaise, and as a rule vomiting and headache. The temperature may reach 104° or even higher, and generally it is maintained, with frequent intermissions of 2° or 3° F., for several days. There is a marked diminution in the urinary output and the urine is of a deep smoky tint, and as a rule shows a heavy granular deposit and contains much albumen. Numerous blood and hyaline casts are visible on microscopic examination. In none of my cases has there been any anasarca - and rarely anything more than slight oedema of the eyelids and general "puffiness" of the face. This was of quite a transient

nature.

The mortality was high - 2 out of the 16 succumbed, one of them to uraemia and the other to broncho-pneumonia.

Age Incidence.

With the exception of one patient, an adult male of 24, all were under 15. 11 were under 10 years of age.

Sex.

Females predominated in the proportion of 9 to 7.

Date of onset

With the exception of the cases already referred to as being admitted with kidney mischief, and of one which developed symptoms of nephritis on the 4th day of disease, all of the cases developed this complication after the 3rd week. The earliest day of onset was on the 21st day, and the latest on the 87th - in the latter case the patient died from uraemia.

Duration.

7 out of the 16 cases show a duration of less than 14 days - that is to say, all trace of both blood and albumen had disappeared and the urinary excretion had again reached its normal.

5 cases left hospital with still active renal mischief in the form of slight albuminuria, but with no haematuria.

One case persisted for a period of 91 days before albumen finally disappeared. In one the albumen and blood were dissipated by the 24th day, and the remaining two were fatal cases already referred to.

Otitis.

Total No. of cases 58 = 10.5%

Age Incidence

Between 1 and 10 Total No. 56 = 96.6%

10 to 15 Total No. 2 = 3.4%

Both ears affected in 17 cases = 30%

Right ear only in 24 = 40%

Left ear only in 17 = 30%

It is worthy of note that in none of these cases was there any evidence of organic cardiac mischief, and articular pains which frequently accompany such attacks were also absent throughout.

I have dealt with the complication of nephritis along with albuminuria owing to the evidently close relationship between the two.

The clinical history of the cases does not suggest any close relationship between the degree of severity of the primary illness and the subsequent development of nephritis. The mildest types of the disease seem to be as prone to renal weakness during convalescence as the more severe.

Otitis.

Of all the complications of scarlet fever otitis is probably the most formidable, viewed both as an immediate source of danger to life and also as the forerunner of many of the chronic inflammatory conditions affecting the auditory passages and neighbouring tissues in later life. Its occurrence is very common. 10.5% of the present series of cases developed it. It is essentially a complication affecting children under 10 years of age. Only 2 were over 10, their ages being 12 and 13 respectively.

There is no doubt of the close relationship between the severity of the throat symptoms and the development of otitis. Usually within the first week and often within the first three days, the child complains of earache, fresh glandular enlargement and tenderness supervene, and within 24 hours, or sometimes less, a purulent discharge

may flow from the meatus. In a minority of cases only otalgia occurs. As a rule, once otorrhoea appears, it continues intermittently throughout a great part of the convalescent period and indeed many of the cases of necessity leave hospital with discharge, very small in amount certainly, but significant of septic mischief in the tympanum. A number of the cases cease to be troubled with discharge, on the other hand, within a week or 10 days from the onset of the otitis, the ruptured tympanic membrane heals up satisfactorily and an apparently spontaneous cure results. There can be no doubt, however, that many of these cases must subsequently come under medical treatment - small dormant foci of disease may persist as such for years, and during a period of diminished resisting power through other illness or from traumatism a general septic condition may start afresh, involving not only the tympanic cavity but also the mastoid antrum and cells.

Mastoiditis.

It is well to discuss the occurrence of mastoiditis along with otitis as the two diseases are so intimately associated with each other.

Only 6 out of the 550 cases developed mastoid trouble while in hospital, and all of these suffered first of all from otitis and otorrhoea. One of the 6 died from general septicaemia. The other 5 recovered without further complication.

Simulating the condition one may get suppurating glands in the region of the mastoid process and suppurative

adenitis in the posterior triangle of the neck is not an uncommon complication of these cases.

Secondary Adenitis.

Under this term are included only such cases as develop glandular swellings during the period of convalescence. The aetiology of the condition is obscure. There need be no local inflammatory condition whatever. The occurrence of the condition is most common in the second and third weeks and although frequently associated with other complications, e.g. albuminuria or articular pains, just as frequently the adenitis is the only symptom present. There is slight pyrexia only during the first 2 or 3 days - rarely more than 101° - and the swellings very rapidly subside under treatment. The condition is, like otorrhoea, almost entirely confined to those under 10. 5.4% of the series of 550 developed this complication. The actual number was 30, and of these 9 became suppurative. I have included in this number 2 cases which were admitted with suppurative adenitis and which ran a very chronic course. All of the cases ultimately recovered.

Only two developed adenitis beyond the 28th day of illness.

None of the patients were over 12, and only 4 were over eight years of age.

25% of the adenitis cases had associated albuminuria.

Males and females are equally affected.

Rheumatism.

Scarlatinal rheumatism occurred as a complication in 5% of the whole series. There is a striking difference

in the age incidence as contrasted with that of other complications. Only 11 out of the 28 who suffered from rheumatism were under 10 years of age. The others ranged between 13 and 26.

As a rule the date of onset is at an early stage of convalescence - most commonly after the termination of the first week and before the fourth week.

The disease is a mild one, and is particularly prone to attack the small joints of the extremities - wrists, ankles, metacarpal joints and phalangeal joints are the sites of election. More rarely the elbows, knees and shoulders are affected, and in one case there was generalised articular pain, but no swelling over any of the joints.

The evanescent character of the pain and swelling is a striking feature of scarlatinal rheumatism. In several of my cases it was troublesome only on one day, in others a duration of 3 to 5 days was frequent. The pain has a tendency at times to flit from one joint rapidly to another, but on the whole it is more characteristically present in the primary seat of attack and there only.

In none of the cases was there very marked oedema and where such occurred it was even more evanescent than the pain.

In only one of the cases was there any associated cardiac mischief. This was in a boy, aged 6, who developed articular pain in the right knee only, on the 11th day from the time of onset of fever. On the day following this a well marked systolic mitral murmur was

detected, with a slight but perceptible degree of dilatation of the left ventricle and some irregularity of rhythm. This patient left the hospital 2 months later with well marked auricular systolic and ventricular systolic murmurs, but with compensation well established. In all these cases, with the onset of the pain there was slight and transient pyrexia.

Endocarditis.

Of endocarditis as a complication in scarlet fever I have seen very little. In only 6 cases out of 550 has it been noted. I exclude from the category all cases which failed to show definite and constant murmurs some time after the pyrexial period was over. A large number of patients during the progress of the disease develop cardiac murmurs of inconstant character, murmurs which early disappear, which are unassociated with any other signs and which leave the heart, so far as physical signs can guide one, absolutely undamaged, Mild myocardial involvement is a probable source of such murmurs and the fact of their early appearance and of their early disappearance would tend to confirm the suggestion that they are merely an expression of the influence of the febrile process on the whole cardiac mechanism and are not due to particular injury of the valvular apertures.

The early appearance of a cardiac murmur, however, may be significant of a gross valvular lesion.

A child, aged 6, was admitted with scarlatinal desquamation only and with a history of 16 days' illness. A faint auricular systolic murmur was present on admission,

there was some degree of irregularity and of dilatation, and these symptoms persisted for some weeks. In this case there is very little doubt that the lack of precautions during the period of invasion and in the time which elapsed before admission to hospital, predisposed the child to a condition of this kind.

In only one of the six cases was the patient an adult - a female of 19. 2 were aged 6, 2 were 4, and one was 13.

Taking these cases seriatim, the first was a boy, aged 6, already referred to in connection with scarlatinal rheumatism. In him the cardiac condition seemed to bear a direct relationship to the rheumatism - it developed on the day following the articular pain, and this patient left the hospital with a definite valvular lesion (mitral)

The second case was that of the child above referred to as coming to hospital after 16 days' illness at home. This patient had also a mitral lesion and she also had a trace of albumen in the urine for one day, but was otherwise quite free from complications.

The third case, a child of 4, was admitted with an ordinary attack of scarlatina, with moderate throat symptoms which rapidly subsided. On the 10th day after admission she developed a well marked mitral systolic murmur. She had no other symptoms or complications, the temperature was at no time elevated, but the murmur persisted, and after 5 weeks' residence in the acute hospital, she was sent to the Convalescent Hospital with the cardiac condition unaltered.

The fourth was a female, aged 19. She came into hospital on the day following the first symptoms of illness. She had a severe attack of scarlatina - an intense rash, abundant tonsillar deposit, and much adenitis. On the 4th day after admission, corresponding with the time of subsidence of pyrexia, examination revealed a mitral systolic murmur, well conducted towards the left axilla. This persisted unchanged until the transfer of the patient to the Convalescent Hospital. She developed no other complications and the temperature never rose after the primary fall on the 4th day.

The fifth case was that of a boy, aged 4, with a mild attack, who, on the 6th day of illness and without pyrexia, developed a mitral systolic murmur. He was transferred to the Convalescent Hospital 4 weeks later, the cardiac condition being unaltered.

The last case was that of a girl of 13, who, 2 days after admission and on the 4th day of illness, developed a mitral systolic murmur and albuminuria. There was much irregularity of rhythm and considerable dilatation. The albuminuria only lasted for 3 days, the dilatation disappeared within a fortnight, but the mitral murmur persisted, and was present on discharge of the patient 7 weeks later.

From this small number of cases one concludes that the occurrence of endocarditis need not depend on any initial severity of attack of scarlatina.

No case of pericarditis has occurred in my experience and the same holds good for pleurisy.

Rare Complications.

Among rare complications may be mentioned retro-pharyngeal abscess, of which I had one case. Tonsillitis one case. Laryngeal ulceration and oedema one case, which necessitated the performance of tracheotomy. Ulceration of cornea and dacryo-cystitis one case, Broncho-pneumonia one case. Pneumonia one case. Jaundice one case - the symptoms only persisted for 5 days.

Intercurrent Diseases.

Measles occurred in 6 cases, whooping cough in 8. There was one case of scarlet fever and diphtheria - the child, a boy of 4, showing very little membrane in the throat but with laryngeal symptoms, and with a typical punctate erythema on the trunk and limbs.

There was one case which developed varicella.

Relapses.

Cases of true relapse of scarlatina are rare in my series of cases. They number 3.

In the first of these, a girl of 8, the relapse occurred on the 18th day after admission to hospital. The primary attack was quite typical and desquamation had occurred before the relapse ensued.

The next was in a child of 3, who also had had an ordinary attack and who had desquamated before the relapse occurred on the 30th day after admission.

The third was a child of 3, admitted with general punctate erythema, tonsillar deposit and adenitis, and with a history of headache and vomiting. The fever ran

a normal course and desquamation followed. On the 38th day, while desquamation was in progress, a relapse occurred with pyrexia, faucial and tonsillar injection, and adenitis, and the patient was transferred to the Convalescent Hospital 4 weeks after the relapse, desquamation being then still in progress.

Mortality

The mortality rate is low - only .9%, and the fatal cases occurred in children all under 4 years of age.

Causes of death.

Two died from uraemia.

One from pneumonia.

One from septicaemia.

One from septic scarlatina and whooping cough.

One from nephritis and broncho-pneumonia.

Treatment.

The treatment of uncomplicated scarlet fever is very simple and aims at two chief objects, firstly the maintenance of an equable temperature, and secondly the regulation of the diet.

In the Grove Hospital, under the Metropolitan Asylums Board of London, all patients during the febrile stage are given a purely fluid milk diet. The bowels are regulated by simple aperients and in such cases as show a degree of pyrexia above 103° tepid sponging is found not only to minister much to the comfort of the patient but to hasten the subsidence of the pyrexia and to induce rest and sleep.

As a rule on admission some treatment of the throat condition has to be adopted, and in the case of children there is almost invariably troublesome rhinorrhoea which must be controlled as far as possible.

Throat.

For the throat, local irrigation or gentle syringing with warm water or some mild antiseptic, e.g. boracic lotion, or alkali, tends to prevent troublesome accumulation of mucus. For the pain, which is usually very troublesome during the first 48 hours, fomentations applied to the neck and behind the angles of the jaws are most efficacious.

Rhinorrhoea.

The rhinorrhoea is a much more troublesome symptom to treat. Emollient ointments of various kinds must be constantly applied to the nostrils and lips if excoriation and fissures are to be avoided. The influence of syringing the nasal passages cannot in all cases be said to be satisfactory, as regards the control or limitation of the discharge. In very young children it has been my custom to avoid syringing and to limit myself to the use of small pledgets of absorbent wool dipped in boracic lotion. This, with the application subsequently of ointment, prevents troublesome infection elsewhere, and this object is still further promoted by the confinement of the arms and hands in cardboard splints of such children as are too young to voluntarily aid the nurses in the carrying out of the treatment.

In most cases a short period of treatment for these

two conditions is necessary, but where the throat is much ulcerated or where sepsis is more pronounced it may be necessary to continue treatment for a period of a week or 10 days. In those septic cases I have found the use of chlorinated soda solution very efficacious both in clearing up the local sepsis and in controlling the extreme foetor which is so often present.

Mouth.

The condition of the mouth and of the teeth must be constantly watched throughout the illness. It is only by rigorous attention to simple but necessary hygienic measures that troublesome septic conditions here are avoided.

When an aphthous spot appears on the buccal or alveolar mucosa painting with a 10% solution of $AgNo_3$ thrice daily and the regular use of a mouth wash, as a rule, lead to its early disappearance and in such cases as show a generally spongy condition of the gums and in which carious teeth are numerous the daily use of a much weaker solution will prevent ulceration and will lead to a firm and healthy condition of the alveolar mucosa.

Apart from these local conditions very little calls for treatment in scarlet fever.

The use of antipyretic drugs has been avoided in all uncomplicated cases. With the fall of temperature to normal the patients are given light diet, which includes bread and butter, milk and milk puddings, custard and eggs.

If after 4 days the temperature is still normal and

no complications have arisen, boiled fish and light soups are added and, finally, about the third week when patients are allowed up for a short time in blankets, mince and vegetables are given,or, in the case of adults, meat of various kinds.

In the case of adults the length of confinement in bed need not be so great as in children. If the temperature is normal within 3 days after admission and no complications have arisen they may be allowed out of bed on the 12th or 14th day. In none of my adult cases was there any unfavourable result from this earlier freedom.

Otorrhoea.

The treatment of otorrhoea cannot be said to be very satisfactory. Once an otitis media arises there is a great tendency for it to recur, and in the case of children leaving hospital after having had otorrhoea, one can never guarantee that the inflammatory condition in the tympanum has disappeared. This is so even in those cases which apparently recover spontaneously, and after a period of only 3 or 4 days' active ear discharge.

The onset of an otitis media is, as a rule, associated with slight pyrexia and malaise and with pain on the affected side.

Paracentesis of the tympanic membrane has not been practised in this hospital for the relief of these symptoms. Fomentations applied to the affected side give immense relief from pain, and the common occurrence is for the ear discharge to appear on the day following the otalgia. Often, however, the discharge itself is the

first indication of ear trouble. The measures adopted for the control of the discharge are syringing gently or irrigating the meatus with boracic lotion at frequent intervals during the day, and subsequently drying the ear thoroughly and either plugging with a little absorbent wool or applying a little emollient ointment with the same object in view as was discussed under rhinorrhoea.

Septic adenitis, which may accompany this condition, must be treated on ordinary surgical principles - free evacuation of pus and subsequent drainage being provided for.

Mastoiditis.

In all the cases of mastoiditis which I had, there was otorrhoea previous to the onset of the symptoms of mastoid trouble. On two occasions the only treatment adopted was that of incising the skin and periosteum and of stripping the latter off from the underlying bone, thus allowing free exit for the pus which had formed subperiosteally. These two cases rapidly improved, discharge very soon ceased both from the wound and from the meatus, and the children were discharged from hospital apparently well.

In one case the mastoid antrum was exposed and no pus was found, nor any diseased bone. The wound healed rapidly, but ear discharge persisted for some weeks. There was no ear discharge when the patient left hospital.

In the three other cases pus was evacuated from the antrum along with small pieces of necrotic bone, and subsequent healing, though slow, was uninterrupted.

Adenitis

The treatment of secondary adenitis consisted merely of confinement to bed during the persistence of glandular enlargement and tenderness, limitation to light diet and the application of 4-hourly fomentations. The rapidity with which the glandular swellings disappear under fomentations is very striking - within two days a visible enlargement may become but faintly palpable.

In cases where suppuration supervenes, which is a rare occurrence in adenitis unassociated with inflammatory mischief elsewhere, free incision and drainage are essential.

Rheumatism

The exhibition of sodium salicylate in 10 grain doses,4-hourly to adults and in 4 grain doses 4-hourly to children, was invariably followed by amelioration of the articular pains.

A very good result was also obtained from aceto-salicylic acid in 10 grain doses to adults.

The affected joints were wrapped in cotton wool, the patients being confined to bed and to light diet.

No case of salicylism occurred.

Albuminuria and Nephritis.

So long as albumen persists in the urine it is advisable to restrict the diet to fish and milk, and in cases of nephritis to give nothing but fluid nourishment. It is the practice in this hospital to confine to bed all patients with albuminuria, except such cases as show merely a faint cloudiness of albumen which has persisted for

weeks. If chills are avoided and all other precautions adopted, many of these cases get rid of their albuminuria while allowed this liberty. The patients must be clothed in woollen material and should sleep between blankets without sheets.

Strict attention is given to the action of the bowels, kidneys and skin.

No drugs were exhibited in any of my cases, other than purgatives.

I have found hot blanket baths of service on a few occasions.

Cardiac Complications.

Only where there is evident failure of compensation is treatment directed towards cardiac complications. Digitalis in small doses, with aromatic spirits of ammonia and 1 or 2 minims of liquor strychninae hydrochlor. have on such occasions been administered with markedly favourable results.

Absolute rest in bed is essential so long as there is any sign of failure of compensation.