AN ANALYSIS

of

477 CASES OF SCARLET FEVER.

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Scarlet Fever with its varied complications forms a subject for study which is of absorbing interest. No part of the body is wholly exempt from its ravages, and although the number of its immediate victims may not be great, yet it often leaves important structures so maimed that the span of life is greatly shortened.

The cases about to be described were treated by me in the Manchester City Fever Hospital. The cases occurred during the months December 1902 to May 1903. They were consecutive so far as my wards were concerned, but not as regards the general admissions into Hospital.

Each Scarlet ward is divided into an acute and convalescent side. The patients were admitted into the acute side and after their temperatures had been normal for four or five days, they were transferred to the convalescent side. After being in the wards for a month, if no serious complications had arisen, the patients were transferred to wooden structures called "The Tents". These places had been erected at a former period for Smallpox cases during an epidemic in Manchester. The heating of the places was defective and the numerous seams in the wood formed favorable places for the collection of dust and made the proper cleansing and disinfection of the tents practically impossible.

Males 212.

0 - 4 yrs.	5 - 9 yrs.	10 - 14 yrs.
57	75	47
15 - 19 yrs.	**20 - 24 yrs.**	**25 yrs. upwards.**
19	12	2

Females 265

0 - 4 yrs.	5 - 9 yrs.	10 - 14 yrs.
76	137	36
15 - 19 yrs.	**20 - 24 yrs.**	**25 yrs. upwards.**
10	5	1

TOTAL

0 - 4 yrs.	5 - 9 yrs.	10 - 14 yrs.
133	212	83
15 - 19 yrs.	**20 - 24 yrs.**	**25 yrs. upwards.**
29	17	3

There were only two cases under one year which shows the comparative immunity enjoyed by infants.
There was a sudden rise to 19 in the second year of life. Children seem to be most susceptible during the ages, 6th & 7th years. 164 cases occurred in these two years. After the 10th year there was a sudden fall and after the 25th year there were only two cases. The number of females considerably exceed the number of males and this agrees with the general hospital admissions.
Onset of Illness. The most common symptom was vomiting This occurred in over 80% of the cases and was practically universal in children. Sore throat was usually complained of in those old enough to describe their symptoms. Headache was complained of in a number of cases. These three symptoms occurring together should make one suspicious of Scarlatina, especially in young children and more especially if accompanied by a rapid rise in temperature.

Chilliness and shivering were often complained of by the older patients at the onset. Convulsions did not occur in any of the cases and it would appear to be of rare occurrence at the onset of Scarlatina. Nasal discharge occasionally occurred at the onset but was never so marked as in Measles and was never accompanied by the croupy cough and by running of the eyes which are characteristic of the onset of the latter disease. Diarrhoea which occasionally ushers in an attack of Scarlet Fever, was only present in two cases.

THE RASH. As a rule the rash was fully developed or beginning to disappear by the time the patients were admitted into hospital. From the histories obtained from the parents, or from the patients themselves, it appeared in 61% within the first 24 hours and in 26.4% within the first 48 hours of illness. In the remainder it occurred up to the 6th day. Such a prolongation of the illness before the appearance of the rash is unusual in Scarlet. It may have been that the patients were ailing before they were infected by the Scarlatinal poison of the rash may have been missed for one or two days.

The percentage of cases, 12.6, occurring after the first 48 hours seems to me to be too large and to be accounted for by the above explanation and I am of opinion that in some of the cases of Scarlet Fever, the initial symptoms are prolonged for several days before the appearance of the characteristic rash.

The rash, as obtained from the histories, was first observed in the great majority of cases, on the chest. It then spreads to the trunk and limbs. In the severe

severe cases, the color of the rash was as a rule, much deeper than in the mild cases. The characteristic punctate appearance was practically always found. On the legs and on the arms, papules were found round the hair follicles. These usually persisted longer than the other parts of the rash and were often helpful in diagnosis. A blotchy distribution of the rash was occasionally found on the limbs but in these cases it was uniformly distributed on the trunk. There was one case, a boy of 13 years, in which no rash was found (except a slight erythema of the upper part of the chest) His brother had a well marked attack of Scarlatina and was admitted at the same time. The boy was supposed to have had Scarlatina 9 years ago. The appearance of the throat and tongue, and the history, and temperature, all pointed to Scarlatina. No desquamation was ever found. This was in all probability a case of Scarlatina sine eruptione. Difference of opinion seems to prevail as to the distribution of the rash. English textbooks, (Goodall & Washbourne, Clifford Albutt's System of Medicine) describes the rash as being present on the trunk and limbs and absent on the palms of hands and soles of the feet and also the face.

Jurgensen, (Nothnagel's System of Medicine) describes the rash as being present in all these situations and also on the scalp and on the ears. I have found that an erythema is generally present on the face (excluding the cicum oral ring) and also on the ears, palms of the hands and soles of the feet, but I have never been able to satisfy myself as to the existence of an erythema on the scalp. The punctate part of the rash is absent in the palms and soles and also on the ears and cheeks, but occ-

occasionally a punctate appearance is seen passing upwards in front of the ears and less often one sees the punctate appearance on the forehead. The difference of description seems to be due to the fact that the English writers do not consider the simple erythema as a true Scarlatinal rash. Circum oral pallor is, as a rule, easily noticeable in the early stages of the eruption, especially in moderate and severe attacks. In mild cases it is not so well marked. In children it is usually more pronounced than in adults. In only three of the cases was the typical Scarlatiniform rash, found in the circum oral ring, and in these cases it was irregularly distributed there. The history of the cases, and the appearance of the rash elsewhere made any error in diagnosis impossible. Circum oral pallor is not peculiar to Scarlet Fever. I remember distinctly of seeing a well marked circum oral ring at the onset of a relapse of Diphtheria. The child had a flushed face and a slight erythema on the upper part of the chest with a temperature of 104 on the first day of the relapse, also headache but no vomiting. The throat was cultured and gave a pure culture of Diphtheria Bacilli. Circum oral pallor was well marked at the onset of Smallpox in a vaccinated child of 6 years in the Typhoid Ward. At the onset of the illness, he complained of Sore throat. His throat was slightly congested and on the 2nd day an erythematous rash was present on the body and he had a flushed face with well marked circum oral pallor. The tongue was also somewhat coarsely papillated and the case looked uncommonly like Scarlatina, but on the third day of the illness, the

the characteristic eruption of Smallpox began to make its appearance. The rash as a rule faded quickly in the mild cases, but where the rash was well marked it often persisted for as long as a week. Occasionally in cases in which the rash had begun to disappear, it was found to have reappeared again during the night. Petechiae were found, on the chest especially, in a considerable number of the cases. They usually occurred in those with well marked eruptions but were of no prognostic signification.

THE THROAT. The appearance of the throat varied considerably in the different cases. In the mildest cases a slight congestion of the fauces and tonsils was all that was seen, and it resembled, in appearance, a simple catarrhal sore throat. The majority of the cases showed a well marked congestion of the posterior pharyngeal wall. The tonsils were congested and enlarged, the enlargement varying greatly and no doubt this depended to a considerable extent on the size of the tonsils before the onset of the Scarlet Fever. Covering the tonsils and pharyngeal wall was a greyish white exudate which was usually easily swabbed off, and in a large number of the cases, slight superficial ulceration of one or both tonsils could then be seen. Sometimes the ulceration was such that the tonsil presented a punched-out appearance. The soft palate was usually congested up to its junction with the hard palate and the uvula was also much congested and exudate was often present on it. This congestion of the surface of the soft palate is very characteristic of Scarlatina and is in marked contrast to the condition seen in Diphtheria, in which disease the anterior pillars and the soft palate (when not covered with membrane)

have a pale appearance. In other cases the tonsils resembled closely, the appearance seen in Follicular Tonsillitis. In other cases the exudate on the tonsils was thick and creamylooking, resembling in varying degree the false membrane seen in Diphtheria, but it was usually found to come off much more easily on swabbing, than does the thick fleshy membrane of the latter disease. In any case at all resembling Diphtheria, I took a culture from the throat and invariably found a Streptococcus. In no case was the Bacillus of Diphtheria found.

In cases where the rash was very brilliant, I usually found that the congested condition which was present over the surface of the soft palate had extended over the hard palate also, giving the mouth a very characteristic appearance. In the worst throat cases the exudate covering the fauces and pharynx was of a greenish yellow colour and a distinctive odour was often found.

In the ordinary cases, with the falling of the temperature, the throat began to clean, and with the onset of convalescence, the formation of exudate ceased and the throat gradually began to assume its normal appearance. In other cases the result was not so fortunate. The throat symptoms became more marked. Sloughing of the tonsils took place and sometimes was so severe that hardly any tonsillar tissue was left. The ulceration often extended to the soft palate and uvula. Here, it might be quite superficial but often in septic cases it went on to complete perforation and in a few cases to almost complete destruction of the soft palate. The latter cases were invariably fatal. A condition occasionally seen was the formation of a thin muslin like

membrane spreading from the margin over the soft palate. It was very adherent and on its disappearance left a raw ulcerated surface. Cultures from it invariably gave a Streptococcus

THE TONGUE. During the first two days the tongue was covered with a whitish fur. The amount of furring varied considerably. In the mild cases it was very thin with some enlargement and congestion of the papillae which could easily be seen. In others the fur was so thick that the whole surface of the tongue was hidden from view. Between these two conditions, varying grades were found. About the 3rd or 4th day, this fur began to peel off. This took place first at the tip and edges and spread in streaks over the tongue until it was entirely free. The appearance then seen depended on the amount of epithelium that was shed. If small, a smooth reddened surface was seen with a varying number of enlarged filiform papillae. If a large amount, a raw beef looking surface, which with its enlarged papillae presented an appearance seen in no other infectious disease. Quite commonly during the convalescence of Diphtheria, I have noticed a tongue which resembled in every respect the peeled tongue in mild Scarlet cases and which I have described, but I never saw one which had the "raw beef" appearance. The peeling of the tongue is thus the most typical stage of Scarlatina, and not the peeled tongue. Jurgensen says the peeled tongue is invariably dry, but I cannot agree with this statement, as I have observed a considerable number of cases in which the tongue remained moist throughout the illness. In the more severe

severe cases, a dry tongue was the rule and it gave to the strawberry tongue a peculiar glazed appearance. With the fall of the temperature to normal the tongue rapidly loses its typical strawberry appearance and often becomes furred again.

ADENITIS PRIMARY. During the first or second day, enlarged lymphatic glands in the neck can usually be felt. This is accompanied by more or less tenderness. Textbooks as a rule only mention the submaxillary lymphatic glands as being enlarged but a careful examination will reveal the fact that the Posterior Cervical glands are also slightly enlarged. Jurgensen points out that a general enlargement of the lymphatic glands takes place in all parts of the body. I have carefully examined the inquinal glands in a large number of cases and have always found them more or less enlarged and sometimes slightly tender. Enlargement of the axillary glands is not so easily found owing to their situation but here also I was often able to make out some enlargement. On doing Post Mortems on cases which had died early, I also found a general enlargement of the lymphatic glands of the abdomen generally. It would seem that the Scarlatinal poison is thus of itself capable of producing the enlargement of the lymphatic glands. The glands as a rule graduàlly return to normal with the decline in temperature. In the septic cases, instead of the glands becoming less at the end of the first week or during the second week, a further enlargement of the submaxilàary glands took place. This enlargement is not found in

in the other glands and the enlargement in these cases is undoubtedly due to direct infection from the throat along the lymphatic vessels. The amount of enlargement varied greatly and also on the two sides. In one case during the night the swelling rose so rapidly that in the morning the child appeared as if he had no neck. This is the condition called "Bull Neck" The child died during the day. Here the whole cellular tissue of the neck was involved. In less severe cases suppuration and sloughing ensued. This occurred in two cases. One of them recovered. The organism which was found was the Strepto-coccus. The temperature during the enlargement reached often 105 and was usually highest at night.

DESQUAMATION. With the fading of the rash a characteristic brownish staining of the skin remained. A greenish tint was usually present. The staining was most marked as a rule, in the neck. The next stage was the onset of desquamation. In 286 cases, in which the date of commencement was carefully noted, the time of onset varied from the third to the thirtieth day. By far the greatest number from the seventh to the twelfth day of illness. (167 cases) The day on which most occurred was the 9th (45 cases) Very few cases occurred after the sixteenth day of illness (24 cases) In those cases in which the rash was most pronounced, the desquamation set in earliest. The amount of desquamation varied considerably and depended on the intensity of the rash and on the texture of the skin involved. Thick skinned individuals desquamated more freely than those whose skins were of a finer texture.

The most common seat of commencement was on the neck. What usually happened was that the tops of the remains of the punctate spots came off leaving small rings. These increased in size and by their fusion, peculiar serpentine figures were formed, and then a flaky desquamation was seen. On the hands and feet, the skin came off in large flakes as a rule. In others a branny desquamation took place on the chest, similar to what occurs in Measles. A fine desquamation was often noticed on the face and ears but it was very uncertain in its appearance. In mild cases, desquamation appeared to be confined practically to the hands and feet. These formed the late cases of desquamation. In two undoubted cases of Scarlet Fever, desquamation, although carefully looked for was never noted.

THE TEMPERATURE. In mild cases the temperature recorded was never above 101° F. and occasionally was normal on the third day, but more often on the fourth or fifth.

In the severe cases the temperature reached 103° - 104° F on the second or third day and usually came down by lysis to the normal on the seventh or eighth day. In some cases, the temperature, after reaching normal on the sixth or seventh day, would rise to 101° again, and then gradually fall to normal. In the Septic cases, the temperature often remained high till death, but occasionally before death, a subnormal temperature was recorded.

In two cases the temperature resembled very closely that of Typhoid Fever, and as other symptoms pointed to a possibility of Typhoid, a Widal test was made in both but with negative results. One of these cases was fatal.

The man, aged 40 was an alcoholic. In some cases a rise of temperature took place at night and was normal in the morning, nothing being found to account for the sudden rise. The temperatures in connection with the various complications will be described later.

THE PULSE. On admission the pulse varied in its rate from 130 - 150 per minute. This is a frequency which is greater than is usually found at the onset of the other infectious diseases, such as Measles & Diphtheria.

DELIRIUM. In the older children, and in adults, delirium was frequent in those with a sharp attack of Scarlatina. This was usually of the active type and very often they tried to get out of bed. It was always most marked at night and often absent in the morning, but in a few cases it persisted during the day. In younger patients extreme restlessness took the place of the active delirium described above. The delirium was most active during the height of the rash and gradually passed off with the fall of the temperature. It was seldom longer than two nights in its duration.

Treatment. The routine treatment for ordinary cases of Scarlet Fever was as follows:-

The throat was douched every four or six hours, according to the severity of the throat symptoms, by means of a douche can held several feet above the level of the bed and a long rubber tube with a clip attached. A separate tube nozzle was used for each child. The lotion was about 1 - 200 of a solution of Sanitas. The nose was douched with the same solution and nozzle when there was any sign of nasal discharge. The douching was

was continued till convalescence set in when it was reduced to twice a day. This was continued once a day after a month's stay in the hospital.

Sanitas was often found to aggravate the throat symptoms and for these cases I used a solution of the following strength:-

Boracic Acid	gr. X
Pot. Chlor.	gr. V
Glycerine	Drm. 1
Water	to an oz.

In sloughy throats, pure Izal was swabbed over them but I did not find much improvement from its use. Swabbing with 1 in 40 carbolic solution was much more effectual. A hot bath was given every day during convalescence to facilitate removal of the epidermis.

Milk was given till the temperature was normal. In cases with undigested curds in the stools, it was peptonised. Farinaceous foods were given after the temperature was normal and very soon white fish was added to the dietary. In ordinary cases, butcher meat was allowed at the end of a fortnight. For high temperature 103° or over, baths, temperature 90 – 95° F were used, and were found to be efficacious. If any danger of collapse was suspected, cold spraying was resorted to. For the delirium in adults, and for the older children, Trional gr. X - gr. XV was given in ½oz of brandy. It proved of great value and no ill effects were found after using it. In young children 2 drachms to ½oz of brandy was given in some hot water and was usually effective.

THE BACTERIOLOGY of SCARLET FEVER:-

No organism has been described so far which has been accepted by the Medical Profession generally as the specific organism of Scarlatina. Klein, in two epidemics of Scarlet Fever, caused by milk supplies, (in north of London in 1886 from cows in a dairy at Hendon, and in Glasgow in 1892, from cows in a dairy in Renfrewshire), isolated a Strepto-coccus from the lesions on the teats of the cows. This organism he believes to be the specific cause of Scarlatina. The chief difference culturally, from the Strepto-coccus Pyogenes, is the marked power it had of coagulating milk. It acted virulently on wild house mice and only slightly on the tame white mouse. In 1892 D'Espine and de Marignac, isolated from the blood of the finger of a Scarlatinal case, a Strepto-cuccus which curdled milk but was not pathogenic for mice.

I made a large number of cultures from throats of Scarlatinal patients on admission, (over 50) and in every one I never failed to find Strepto-cocci. In the same cases one often found different varieties of Strepto-coccus, varying in size and shape, and in staining reaction. Carbol-Fuschin was always used as the staining reagent and often times, some of the organisms refused to take on the stain. No experiments were made as to the power the different varieties had in causing the coagulation of milk. Whether or not a special Strepto-coccus is the cause of Scarlatina, there can be no doubt as to the important part they play in the complications of that disease.

Class, an American observer, has isolated a Diplo-coccus from the throat, blood and skin of Scarlet Fever patients and holds that this is the specific organism of Scarlatina. Its inoculation into pigs produces a disease which corresponds closely to human Scarlatina. The blood of Scarlatinous convalescents inhibits its growth. The injection of convalescent blood into the experiment animal apparently protected the latter from contracting the disease. Of this organism I have no experience.

Accompanying the Strepto-coccus in those cases which I cultured, I occasionally found the Staphylo-coccus Aureus and Albus, a diple-coccus, probably the Pneumo-coccus, and bacilli of various kinds, probably Saphrophytes. In no instance did I find the Diphtheria Bacillus.

COMPLICATIONS.

SIMPLE ALBUMINURIA. Under this heading are included those cases in which ~~the~~ albumen only was found in the urine for three days or more. All those cases in which a faint trace of albumen was found with high temperatures have been excluded. In the simple albuminuria, the amount of albumen varied from a trace to a slight deposit. The amount of urine was only slightly, if at all, diminished and no tube casts or red blood corpuscles were found by the microscope. 15 cases occurred in this series, 11 males and 4 females. The total gives a percentage of 3.14 The cause of albuminuria in most of the cases was quite obscure. In one case, a man aged 26 years, who had been out of doors during a shower of rain developed a double Adenitis the following day, and on the next, a

a cloud of albumen was found in the urine. The temperature rose to 104 on the first day and he had two rigors. His pulse was of plus tension and his face looked slightly puffy. The temperature was almost normal the next morning and the albumen was found in the urine. In the others no assignable cause could be given. In two of the cases, the onset of the albuminuria was ushered in by sickness and vomiting, but this was of a mild degree and was only present for one day. In the majority of the cases the pulse tension was not raised. (In four of the cases it was slightly raised.) A slight puffy appearance of the lower eyelids was seen in four cases but this condition only lasted for from 1 to 3 days. The time of onset varied from the tenth to the forty-ninth day of illness, the average being about the twenty-second day. The duration of the albumen varied from four to twenty-nine days and the average duration was twelve days. The age incidence was raised as compared with Nephritis.

Albuminuria.	Nephritis.
0 - 9 yrs. 7 cases	0 - 9 yrs. 23 cases.
10 yrs. upwards 8 cases	10 yrs. upwards. 9 cases.

The average age was ten years. In three cases there was a temperature at the onset of the albuminuria, two of these in conjunction with Adenitis. The description given resembles closely the onset of Nephritis and no very hard and fast line can be drawn between them. One case of Nephritis had simple Albuminuria for a considerable time

before the onset of the oedema with the presence of blood and tube casts in the urine.

TREATMENT:- It is advisable to put the patient to bed if they are up and walking about. Their diet should be somewhat restricted, white fish being substituted for butcher meat. A saline aperient should be given in the morning. In those with temperature and with the pulse tension raised, a hot pack once or twice a day was given. In none of the cases was the pack continued for more than three days. Patients are often quite able to get up at the end of a week. Some preparation of iron was given where there was much anaemia.

NEPHRITIS. This is one of the most common and one of the most fatal of the Scarlatinal complications.

32 cases occurred in this series giving a percentage of 6.7, 16 males and 16 females.

Percentage of males attacked 7.54%

" " females " 6.0 %

Males would appear to be slightly more liable to this affection than females and if the figures for albuminuria are included with those of Nephritis, the difference is more marked.

The age of incidence is considerably lower than in Albuminuria. Of the 32 cases, 7 died, but in 3 of these, death was due to other causes. 4 represents the true number that died from Nephritis. This gives a death-rate of 12.9% of the total deaths in this series.

In three of the cases Broncho-pneumonia was present and in the other one, a generalized Bronchitis.

It would thus seem that cases of Nephritis in which the lungs are involved are much more fatal than uncomplicated Scaraltinal Nephritis.

In three of the fatal cases Adenitis was also present. In only one of these cases was the throat of the septic type. The other three had mild throat symptoms at the onset and they were soon almost normal in their appearance.

The mode of onset varied considerably in the different cases. In a few of the cases, the first symptom detected was an irregularity in the rhythm of the pulse. In one case this irregularity persisted for almost a week before blood and albumen were found in the urine. In others, a slight rise of temperature, with some puffiness of the lower eyelids was the first warning one had that Nephritis had set in. The presence of a little blood and albumen in the urine was occasionally detected before any other symptoms had appeared, unless it was a slight rise in the pulse tension. Headache and vomiting also in some cases ushered in the mild cases The vomiting in the mild cases did not last long but in the severe cases it was often very marked and in two of the fatal cases persisted throughout the attack. In 43.7% of the cases the onset of the Nephritis was preceded by or accompanied by an Adenitis. In these cases the initial temperature was high (103 - 104 F) no doubt due in part to the Adenitis. In the milder cases of Nephritis the temperature reached the normal in a few days, but in the more severe cases the temperature remained for a week or ten days and in the fatal cases it remained high throughout. The

spiked character of the Nephritis temperatures was well illustrated in the above cases.

Epistaxis occurred in two of the cases and in one of them the amount of blood lost was considerable.

The URINE. In all the cases the amount of urine was diminished but this varied from a slight amount in the milder cases to an almost complete anuria in some of the fatal cases. The specific gravity was raised and urates were usually deposited on standing. The amount of albumen varied very greatly, from a trace to an almost complete coagulation of the urine on boiling. The amount of blood also varied considerably, from the merest trace to a condition in which the urine was quite red. The amount of blood did not correspond with the amount of albumen. In many cases where there was a considerable amount of blood, there would be only a trace or cloud of albumen and in others where the albumen was marked, there would be only a small amount of blood. As a general rule the amount of blood one finds in the urine as compared with the albumen in Scarlatinal Nephritis, is greater than one finds in ordinary Nephritis. The amount of blood and albumen was found to vary considerably from day to day, especially in the milder cases. This variation had nothing to do with any alteration in the treatment.

Microscopical appearance. Hyaline casts were found on the first day but in a day or two granular tube casts began to make their appearance and in some cases were present in enormous numbers. Red corpuscles and leuco-

leuco-cytes were found in varying numbers. Urates and uric acid crystals were found.

Uraemic convulsions were found in three cases. In one they were severe, in another they were well marked and in the third they were only found in a very mild degree. The following is a short history of the severe case.

Female, aged 8 years. Had a moderately severe attack of Scarlatina. Throat was never dirty. On the 25th day of illness, slight puffiness of the lower eyelids and slight oedema of the legs noticed. Blood was found in the urine. Pulse tension was found to be considerably raised. Temperature 99.8°

On the 26th day temperature 100 F a.m. 101 F p.m. Urine diminished (24 ozs.) blood and albumen present. At 1 a.m. on the 27th, patient seemed dazed and on being spoken to did not answer. About 2 a.m. twitching of the eyes was observed. The convulsions then spread to the face and rapidly became generalized. At 3 a.m. when I saw the case, the convulsions were very marked. They were practically continuous, only ceasing for a few seconds at varying intervals. The patient was cyanosed and had noisy stertorous breathing. The lower jaw was fixedly clenched and could only with difficulty be forced open to clear out mucus in the pharynx. Chloroform was administered until the convulsions ceased. Before my arrival the patient had been put in a hot pack but with negative result. When the effects of the chloroform were beginning to pass off, the patient vomited up

up over a pint of clear fluid and seemed much relieved after it. She passed off into a natural sleep and wakened up quite bright and cheerful and apparently none the worse of her convulsion. She had complained of headache before the onset of the convulsion. The pulse during the attack was like a whip cord beneath the fingers. The temperature was raised to 103 F during the convulsive attack. The urine in the morning contained much more blood and albumen but the quantity was not diminished. The reason for the convulsions coming on so early and while the patient was still passing a considerable quantity of urine is not very clear. From this time onwards the patient made rapid progress, the urine being normal on the sixteenth day of the Nephritis.

2nd. case:- girl aged 9 years. The patient never had a dirty throat. The onset occurred on the 18th day with an accompanying Adenitis. On the 26th day the patient had improved greatly. On the 29th day a croupous-pneumonia developed at the left apex. On the 31st at 5 p.m. generalized convulsions of a slight degree occurred. Patient was put into a hot bath temperature, 105 F and after being put in the bath she speedily regained consciousness and the convulsions ceased. Had a slight attack again at 10 p.m. Put into a bath again and with the same result. The urine here had been greatly diminished the day before (only 4 ozs.) The attack of Pneumonia had apparently caused a relapse of the Nephritis. The patient had a temperature of 103 but this would be caused by the Pneumonia of itself. The pulse was bounding and of

of plus tension. The patient made a rapid recovery after the crisis of the pneumonia.

Case 3. girl one year. This was a mild case of Scarlet. The throat was only slightly congested and the temperature not above 101 F. The Nephritis commenced on the 14th day. Blood and albumen being found in the urine but no visible oedema. On the 15th day in the evening, twitching of the eyes and muscles of the face commenced. Patient had a hot pack and the twitching ceased. This case was complicated with Adenitis & Broncho-pneumonia. No further convulsions took place. The patient died on the 20th day. The amount of urine excreted could not be judged of owing to the age of the patient.

Meteorism occasionally complicates Nephritis. In one of my cases the distension of the abdomen was so marked that interference with the action of the heart and lungs took place. This was shown by the cyanosed appearance of the patient. It was quite refractory to treatment and the patient succumbed.

The pulse in Nephritis. The pulse in all the cases but seven, was increased in tension. Along with the increased tension, irregularity in force and especially in rhythm was common. The mild cases had the least rise in temperature and in them irregularity of the pulse was never very marked.

In three of the cases in which the pulse tension was not raised, a fatal result ensued, so that it would appear that in a severe case of Nephritis, a low tension pulse is a bad omen.

The heart, in a considerable number of the cases showed evident signs of dilatation, viz. apex beat diffuse and displaced directly outwards, with increased precordial dullness, and in a few cases a soft ventricular systolic murmur was heard at the apex.

Oedema. There was a well marked general anasarca in only one of the cases, a boy, aged 4 years. There was considerable oedema of the scrotum and penis. In the others it was confined almost wholly to the face and lower limbs. No appreciable ascites or Hydrothorax was found in any of them. That this absence of generalized oedema was due to the early treatment was proved by the fact that when patients were admitted suffering from Scarlatinal Nephritis, the oedema was as a rule general.

The skin takes on a white waxy appearance in Nephritis which is quite characteristic. In six of the cases no oedema was ever noticed. Three of these were fatal. With the onset of improvement the temperature reaches normal, the pulse becomes more regular and the pulse tension begins to fall. The amount of blood and albumen in the urine decreases and there is an increased secretion of urine. Anaemia which is a constant symptom of Nephritis persists for some time . In those cases which go onto a fatal issue, restlessness is usually a marked symptom. The urine instead of increasing, diminishes in quantity. Coma usually supervenes at the end and owing to the failure of the cardiac action, hypostatic congestion at the bases of the lungs results.

Uraemic convulsions which occasionally usher in death, were absent in all my cases.

Endocarditis was present in 4 of the Nephritic cases and rheumatism in three.

Of the twenty-five cases of Nephritis which left the hospital, seven of them left with more or less damaged kidneys. Four of these had from a trace to a small deposit of albumen and three of them had albumen and blood. One of these died, a short time after she left the hospital. I could obtain no further history of the other cases. The risk of a permanent chronic Nephritis is probably great in these cases. The duration of the Nephritis in the eighteen which entirely recovered from it, varied from the tenth day to the tenth week. The average was three to four weeks.

Predisposing Causes. The great majority of the cases occurred during December, January, February & March. Only two of the cases occurred during April and May. During the first four months, the weather was cold & damp. In April & May, although the weather was still rather damp the temperature was much higher. During January, in one of the wards in the convalescent side, the heating apparatus went out of order with the consequence that the temperature in the wards for some days was as low as 4o° F at certain periods of the day. During this time two cases of Nephritis developed in the ward.

Caiger (Clifford Albutt's system of Medicine) lays stress on the combination of cold and damp as predisposing to Nephritis. Cold alone does not seem to be

to be so important. Overcrowding. At no time was there any great over crowding in the wards, but from December to March they were always full and occasionally a few extra beds were required. During these months the cases of Nephritis were most numerous and greater in proportion to the number of cases admitted than what occurred in April & May. The severity of the attack of Scarlatina has apparently no say in the causation.

In my cases the opposite result obtained. No relationship to the amount of desquamation was found. The type of epidemic seems to play an important part. It appears to vary from 5% to 70% Steiner in Nothnagel.

Bartels and E. Wagner, in Nothnagel, have shown that in some epidemics it almost fails to appear. Family & Individual Susceptibility, probably plays a part. I had three belonging to the same family in one of my wards and all of them took Nephritis, two of them having it severely. This susceptibility is denied by Jurgensen. The immediate cause of Scarlatinal Nephritis is undoubtedly a toxine or toxines circulating in the blood. This is proved by the generalisation of the diseased condition in both organs. The organism which produces these toxines is still under a cloud. The Strepto-coccus has been isolated from the kidney and blood in Nephritis cases, but it was in severe cases in which in all probability a secondary infection from the throat had occurred. The analogy between the Neuritis of Diphtheria and the Nephritis of Scarlatina seems to me to be very close. In Diphtheria, you have a localized

disease with the production of toxines. These toxines seem to be retained in certain parts of the body and are then probably set free in such concentration that the nerves, which are peculiarly susceptible to their influence, are affected. May it not be a similar process in Scarlatina, only in this case the kidneys being the most susceptible tissues, are the parts attacked? In Scarlatina there is also this difference, that the organism of Scarlatina is not confined to the throat as in Diphtheria, but is present in the skin as shown by the power the desquamated epithelium has of giving rise to infection.

The occurrence of Adenitis, just prior to or with the Nephritis may have some connection with the etiology of Nephritis. It occurred in 43.7% of the cases and this percentage is so large that some close connection must exist between the two conditions. It may be that the growth of the organism in the glands may give rise to toxines which may affect the kidneys or it may be that the toxines which affect the kidneys may affect the glands. Whatever conjectures we may make, the real cause of Scarlatinal Nephritis cannot be clearly understood until the organism of Scarlatina is discovered and experimented with.

TREATMENT:- Whenever Nephritis was discovered the patient was immediately put on a milk diet and kept rigidly in bed. A hot pack was given once a day and this was increased to two in a few days. In those in

whom the hot pack did not act well, a hot bath temperature 105 F. was given before the pack. This usually caused profuse sweating. I employed the hot bath in the majority of my cases as I found it always to act well. Lemon water was given ad libitum to the patient but no other medicine during the acute attack.

In those cases which ended fatally, the pack had to be discontinued owing to the feebleness of the pulse. Brandy was given per mouth in these cases when there was no vomiting. Where the vomiting was very severe, peptonised milk and brandy was given per rectum but as diarrhoea was occasionally present the enema then was not retained. A saline aperient was given in the morning in all the cases unless profuse diarrhoea was present. With the disappearance of the blood and the oedema, farinaceous foods were given and if no ill result followed, white fish was added to the dietary in a few days. Butcher meat was added when the albumen had entirely disappeared from the urine. The patients were then allowed up. In those protracted cases in which blood and albumen persisted for many weeks, it was found that giving of a good nutritive diet after the first three or four weeks of the Nephritis had no ill effects, and allowing the patients up and giving them gentle exercise was found to be beneficial after a long period (six weeks) in bed. For those cases with much anaemia Iron was given. The Syrup of the Iodide of Iron was very beneficial in children. Tincture Ferri Perchlor. was given to the older patients.

OTITIS MEDIA. This is the most common complication of Scarlet Fever. In this series the number affected was 139, a percentage of 29.14. This is an unusually high percentage and as the type of Scarlet Fever cases admitted was on the average, omparatively mild, some special cause of such a large percentage probably existed. This will be discussed later. Fifty of the cases were in males, a percentage of 23.58, and 89 in females, 33.5% It would appear from these figures that females were considerably more liable to Otorrhoea than males.

Age is an important factor in the causation of Otorrhoea. This is well exemplified by the following figures:-

0 to 4 years	68	51.12%	see figures at the beginning.
5 to 9 "	63	29.71%	
10 to 14 "	6	7.22%	
15 to 19 "	2	6.88%	

No case occurred in those over 19 years of age. The younger the patient the more liable he is to an attack of Otitis Media.

The date of onset varied from the fourth day of illness to the sixty-seventh, the average being about the twenty-fifth day.

Of the 139 cases, 88 had discharge from both ears and 51 had discharge from one ear only giving percentages of 63.31 and 36.69 respectively.

Of the cases of single Otorrhoea, 30 occurred in the left ear and 21 in the right. Otitis depends directly

in a considerable number of cases on the severity of the throat symptoms and especially on the degree of involvment of the naso-pharynx. Thus in septic cases the onset was during the first or second week. In a large number of the cases no relationship could be established with the throat symptoms as the time of onset was in the fourth, fifth or sixth week when the throat to all appearance was normal. In a few of these cases Adenoids were found and may have kept up an inflammatory condition of the naso-pharynx. In those cases which had an old history of ear discharge, Otorrhoea almost invariably commenced again and often after a few days illness even in cases with a mild attack of Scarlet . In severe cases of Scarlet, if Otorrhoea was found it was as a rule in both ears. The path of infection is undoubtedly the Eustachian tube. Owing to the swelling of the mucous membrane the opening of the eustachian tube gets completely closed and the inflammatory products get pent up in the middle ear and as the tympanic membrane is the least resistant it usually gives way and so Otorrhoea commences.

In an attack of Otorrhoea there is usually an initial rise in temperature in those cases whose temperatures are normal. The amount of rise varies from one or two degrees to temperatures of 103° F.

Pain is often complained of and at times is very severe. With the onset of Otorrhoea the temperature usually drops suddenly and the pain vanishes.

In cases in which the temperature is already high, no increase may be caused by Otitis Media.

In a few cases no pain is complained of and the temperature may remain unchanged and the first symptom is the appearance of the ear discharge.

The amount and character of the discharge varies greatly in the different cases and at different times in the same case. At the onset especially in septic cases it is usually purulent but it may soon become thin and watery. In others again it may become thick and white and at times has almost a membranous appearance.

In some cases, the discharge has a very fetid odour This is especially marked in cases in which necrosis of bone results. Blood occasionally is found in the discharge but it does not usually persist long.

Occasionally a case was found in which there was a slight rise in temperature with pain in the ear. This disappeared and no Otorrhoea resulted. No doubt in these cases the discharge was able to escape by the opening of the Eustachian tube into the Naso-pharynx, the inflammatory condition not being severe enough to completely close it up.

Enlargement of the glands immediately below the ear was occasionally observed, no doubt due to septic infection from the external auditory meatus. Swelling behind the ear is a common complication of Otitis Media. This occurred in 10 cases, a percentage of 7.1 The swelling may be caused in three ways. 1st by extension of the septic process through the bone from the mastoid cells.

2nd. by the escape of the purulent matter between the bony and cartilaginous portions of the external auditory meatus.

3rd. or extension of the inflammation upwards from the enlarged lymphatic glands.

Immediately a swelling appeared in this situation, an incision was made down to the bone. No pus was found on incising in eight out of ten cases, but as a rule it appeared in two or three days, and varied considerably in its amount. Any delay in incising may result in considerable necrosis of bone. A slight superficial necrosis occurred in two of the cases. In one of these, scraping was resorted to in order to facilitate the removal of the necrosed portion.

Facial Paralysis is not a very common complication of the Otitis Media. It occurred only in two cases and was limited to one side. The onset of the Paralysis occurred on the third and sixth day of the attack of Otitis. The patients were sisters. The paralysis is due to the pressure on the nerve in its canal, owing to the inflammatory condition of the bone surrounding the canal. It passes off gradually with the disappearance of the Otitis Media. Relapse is of very common occurrence Any other complication supervening is apt to bring it on again. Secondary sore throat is especially liable in causing a recurrence of the Ottorhoea. The duration of the discharge varied from a few days to three or four months and a few of the cases were dismissed from the

the hospital with chronic Ottorhoea. The bacteriology of the discharge in Otitis Media:- In all the cases a culture was taken immediately on the onset of the Ottorhoea and culturing was done once or twice a week till it ceased. This careful examination was due to the fact that the Diphtheria Bacillus had been found in the ear discharges of a large number of convalescents, during November. At first I only chartered my results as negative for Diphtheria Bacillus but later I noted the different organisms found in the discharge. In ninety-seven cases in which I have recorded the organisms, they occurred in the following proportions.

Strepto-cocci	27
Staphylo-cocci	73
Diplo-cocci	10
M. Tetragenus	1

The Strepto-coccus occurred ten times along with the Staphylo-coccus. The Staphylo-coccus was either the aureus or albus, the former predominating. In one case only the Staphylo-coccus Citreus was present. In a few cases the Staphylo-coccus was present in one ear and the Strepto-coccus in the other. A Diplo-coccus occurred alone three times and five times with the Staphylo-coccus.

The Micro-coccus Tetragenus was found in pure culture in one case. Other organisms soon made their appearance in the discharge. These were chiefly of the bacillary variety. The Bacillus of Diphtheria was one of the most common. It will be discussed later. Of the others, no attempt was made at isolation, but from the greenish

colour of the discharge, I have no doubt the Bacillus Pyocyaneus was present. The most of these organisms were probably Saprophytes derived from the air and directly contaminating the discharge, or ascending from the mouth and nose by the eustachian tube. Yeasts and Sarcinae were rare.

Blaxall, in an investigation of fourteen ear discharges found the following organisms

Strepto-coccus	12 times
Bacillus Striatus Albus	9 times
Staphylo-coccus Albus	8 times
" " Aureus	5 times
Bac. Acid Lactici	2 times

B. Pyocyaneus, Yeasts & Sarcinae, B. Subtilis, Tubercle, and moulds once each.

His conclusions were as follows:- "The strepto-coccus is the most potent organism in the causation of Otitis Media. (2) The less contamination by the outer air, the more the pyogenic cocci predominated, but the Saprophytes may ascend from the mouth. (3) After the Strepto- the Staphylo-coccus is the most important organism. (4) Apparently the Pneumo-coccus and the pneumo-bacillus do not play so an important a part in the Otitis Media of Scarlatina as they do in other causes of Otitis.

In my cases the Staphylo-coccus was by far the most important causation of Otitis. It was much more persistent than the Strepto-coccus, not being so easily crowded

out by the Saprophytes. The Strepto-coccus was most commonly found in those cases of Scarlatina in which Otitis occurred early in the disease. As to whether the Diplococcus found in the discharge was the Pneumo-coccus or not, I cannot say as I had no means of further testing it, but assuming it to be so it probably plays a greater part in the causation of Otitis Media in Scarlatina than Blaxall has indicated. The M. Tetregenus is a very rare cause of Otitis.

The presence of the Bacilli of Diphtheria in ear discharges. In no English text-book on the subject of Scarlet Fever, or in any papers on the bacteriology of the ear discharges in Scarlatina have I been able to find any reference to the Bacillus Diphtheriae, except by Dr Forbes, late Senior Assistant, Manchester City Hospital. From the ease with which it is found, and from its great prevalence in the hospital, one is almost forced to the conclusion that it is a condition which is peculiar to this hospital. It is very doubtful if the Bacillus Diphtheriae is ever of itself the cause of Otitis Media. In only one case out of at least 400 ear discharges which I cultured did I find it on the first day of discharge, and then almost in pure culture, and it was accompanied by the Strepto-coccus which was, in all probability, the cause of the Ottorhoea. In the other cases, it occurred from the second day till any period before the discharge ceased, and its presence may be accounted for in the same way as the other saprophytic organisms which are found in Ottorhoea. Dr Forbes was of opinion that the ears

were infected secondarily by the eustachian tube through infection of the throat or nose.

While undoubtedly this does take place in some cases, (e.g.) the case referred to above with B. Diphtheriae in the discharge on the first day, had it in the nose for a few days before the onset of the Ottorhoea) I am more disposed to believe that the most common mode is by direct infection from the air, or by means of the fingers of the nurse, or of the patients themselves. The following observations uphold the latter view. A case was admitted from another ward into one of mine. In this case I found the B. Diphtheriae in the ear discharge. On each side of this case were two others with double Ottorhoea. In a few days I discovered a few of the Diphtheriae Bacilli in both ear discharges of one patient and in one ear discharge of the other. This ear was the one nearest to the infecting case. Immediately on discovering the organism in the ear discharges, I took swabs and made cultures from the throat and nose in each case and failed to find any organism at all resembling the Bacillus of Diphtheria. As opportunities arose, I continued these observations but was unsuccessful in finding the Bacillus of Diphtheria in the throat or nose of any of the infected cases. From the above observations I am thus of opinion that the chief cause of spread is by direct infection. One point of great importance which ought to be noted is the rapidity with which other cases of ear discharge get infected in the wards. In order to prevent this infection as far as possible, all the Ottorhoea cases had their ears bandaged over, but in

children the difficulty of keeping bandages on is great and one often found the bandages anywhere but over the ears. The only effectual method of preventing its spread to the other cases with ear discharges is to promptly isolate all cases with infecting ear discharges as soon as the Diphtheria Bacillus makes its appearance there. This needless to say is what is done when this organism is discovered in the throat and nose and it should be as strictly enforced with infecting ear discharges.

Discharging ears should still be covered up in order to prevent dust of the ward getting into the external meatus, as it is extremely probable that the Bacillus of Diphtheria is present in the dust of practically all the Scarlet wards. The wards in which it was most commonly found were those in which the youngest children were found, but no Scarlet ward in all the hospital was exempt from it. Young children are the most liable to the infection. No case in this series had the Bacillus of Diphtheria in the ear discharge over ten years of age.

Doubts have been expressed as to whether it is really the Bacillus of Diphtheria but there can be very little question. Both morphologically and culturally it is indistinguishable from the above organism. Two specimens were sent to Professor Delepine who affirmed that they were so. In any case of doubt another culture was made and it was submitted to the Superintendent who had a large experience of the Diphtheria Bacillus.

The long form occurred in 30% of the cases and the short form in 70% The rapidity with which it grows when once it gets into the ear is very great. When first detected there may only be a few colonies found but if another culture be taken in another twenty-four hours, the organism may be found in almost pure culture. It would seem as if the conditions present in the ear were peculiarly suited for its growth. The time it persists in the ear discharge varies very greatly. In some it may only be present in one culture, in others it persists in the cultures from the ear discharge for months. It may not be found for a few days and then suddenly it is found in considerable numbers in the growth. Even when the ear has ceased discharging, one may be able to discover it in the dry exudate often found in the meatus. Its presence seems to have little or no influence on the character of the ear discharge. It does not influence in any way the progress of the patient and not one of the cases, in which it was found in the ear discharge, had Faucial or Laryngeal Diphtheria.

It would appear that the organisms are of low virulence and that the patients get immunized to ordinary Diphtheria. The cause of such a large percentage of Ottorhoea was, in my opinion, partly due to the large amount of douching. Douching was carried out during the entire residence of the patient in hospital. Young children objected to it strongly and struggled all the time of douching. The appearance of the douche can was usually the signal for an outburst of crying round the ward. Often times they

swallowed a considerable amount of the antiseptic solution. The method used was not so good as with a Higginson's syringe, as with thelatter it can be done suddenly giving intervals for the patient to breathe. With the douche can and long tube the nurses were very apt to continue the flow of fluid too long and this caused the child to struggle for breath with the consequence that the child swallowed some of the fluid and thus opened the inner ends of the eustachian tubes. As the head of the child was seldom held horizantally the mixed fluid and secretion would naturally gravitate to the lowest side and probably some of it would get entrance into the eustachian tube. The left side was most commonly lowest, but this depended on the nurse, and this was in all probability the cause of the larger number of ear discharges being on the left side. With due care on the nurses' part no doubt this danger could, to a great extent be avoided, but when a nurse had a large number of children to douche, she was apt to neglect all the necessary precautions. After the acute stage of the Scarlatinal throat has passed off I do not see much need for continuing douching of the throat. Unfortunately I did not get the opportunity of testing my views on this subject with a series of cases. The treatment of Ottorhoea. For the severe pain before the onset of the discharge, a few drops of Tr. Opii dropped into the meatus is, as a rule, beneficial. A 5% solution of cocaine is also in some cases efficacious. With a bulging tympanic membrane, puncture of it with a sharp knife is indicated and this at once relieves the pain, but

but in very young children this is almost impossible owing to the severe pain caused by the introduction of the speculum. After the discharge has commenced douching of the ear three or four times a day should be commenced. Very little force should be used in injecting the fluid.

The same solution was as a rule used, as was used for the throat. If this solution did not seem to act well, Zinc Sulphocarbolate was substituted and was often effectual. The ears of those cases with the Bac. Diphtheriae in the discharge were always syringed with 1 in 60 carbolic solution. After drying of the meatus, a plug of sterilised cotton wool was introduced. In the Diphtheria cases it was dipped in 1 - 1000 perchloride Solution The wool was changed frequently so as to prevent damming back of the pus and also to prevent Eczema of the ear.

Needless to say, all the solutions used were raised to a comfortable temperature. If after three or four weeks of this treatment, the discharge showed no signs of ceasing, I employed undiluted Methylated Spirits after the douching. Pain was seldom complained of and it often had a marvellous effect in checking the discharge. Ears which had been discharging for weeks, would cease doing so in a few days. Where much pain was complained of, a diluted solution was used (equal parts of methylated spirit and water). In the majority of cases after the cessation of the discharge, the tympanic membrane healed rapidly. A few cases were dismissed with chronic Ottorhoea. Any impairment of hearing was seldom noticed on dismission from the hospital.

Rhinorrhoea, is a common complication of Scarlet Fever. It may occur at the onset during the course of the fever or during convalescence. It occurred in 84 cases of this series, a percentage of 17.6 42 occurred in males and 42 in females. 11 of the cases occurred during the first or second day of illness. The discharge was thin and watery. In septic cases nasal discharge is of very common occurrence. In 14 septic cases the discharge was well marked. It was very profuse a d often had a thick yellow appearance. In others the discharge was thin and sanious and excoriation of the upper lip was often present. In any case with a profuse and sanious nasal discharge the prognosis is bad. 59 of the cases occurred during convalescence. The discharge as a rule was not very profuse and often consisted of thick glairy mucus. In other cases it was thin and watery. When it occurs at the onset it may be looked on as a part of the Scarlatinal process. In the septic cases the foul discharge is due to the grave involvement of the throat and naso-pharynx. During convalescence the reason for its occurrence is not so obvious. The throat may show nothing abnormal. In a few cases adenoids were found in the naso-pharynx. Rhinorrhoea, like Ottorhoea, occurred chiefly in young children. It varied in its duration from a few days to several weeks. The Bacteriology of Rhinorrhoea is very similar to Ottorhoea, with this exception, that the Strepto-coccus is present in greater percentage of the cases than is found in Ottorhoea. In the septic cases, and in early discharge

from the nose the Strepto-coccus was the organism most commonly found. In later cases of Rhinorrhoea the Staphylo-coccus aureus or albus or occasionally both were found. Diplo-cocci were found in a few cases. Bacilli and cocci of various kinds were as a rule present in addition to the above. In only two cases did I find the Bacillus Diphtheriae. This is an additional proof of my contention that ears are not infected from the nose or throat, but from the outside.

Treatment, As already mentioned this consisted in douching the nose with the same lotion as was used for the throat.

Scarlatinal Rheumatism. This complication, which seems to vary considerably in different epidemics, occurred in 11 of the series, a percentage of 2.3

7 girls were affected and four boys, so that the former seem to be more liable to it than the latter.

Very young children were not affected. The youngest affected was four years and the oldest twenty years, the average age being nine years. The wrists were by far the most frequently affected joints.

wrists	9	cases
ankles	4	"
knee	2	"
elbow	2	"
shoulder	1	case
finger joints	1	"

In all the cases but one the involvement of the joints was slight, there being very little swelling. The pain

on movement however was as a rule severe. In the case with the severe attack, the joints affected were the wrists and small joints of the hand, and the left shoulder joint. Associated with these, there was considerable pain and tenderness in the muscles of the arms. Relapse of wrist affection took place. The swelling was considerable. The Arthritis lasted two weeks. In the other cases they were all right within a week. Coincident with the pain and swelling there was a slight rise in temperature of two or three degrees in those with temperatures already normal. The earliest onset was on the fifth day and the latest on the sixty-third In one case the wrists were affected on the fifth and were all right on the tenth and on the twenty-ninth, the ankles were affected , but were all right in a few days.

In three of the cases Endocarditis developed during the course of the rheumatism and in one case it developed about a week after the attack of rheumatism had ceased. Text-books as a rule lay stress on the involvement of the small joints of the hand in Scarlatinal Rheumatism, but this was not common in this series. Scarlatinal Rheumatism differs from Acute Rheumatism, 1st in that the number of joints attacked are fewer and chiefly confined to the wrists and ankles. 2nd. The involvement of the joint is as a rule very much less 3rd. There is an absence of the profuse acid sweating. It resembles acute rheumatism in that it usually is beneficial to give Sodium Salicylate and in the fact that valvular lesions of the heart are apt to occur during the course of the

attack. There was little tendency for the disease to migrate from one joint to another. In the majority of the cases, the joints first involved remained so to the end. In some respects it would thus appear to have some resemblance to Gonorrhoeal variety of rheumatism.

TREATMENT. The affected joints were well wrapped in cotton wool and bandaged in such a way as to immobilize them as much as possible. Sodium Salicylate was given in 5 - 20 grs. doses three times a day according to the age of the patient and also to the amount of joint involvement. In the severe cases the Sodium Salicylate was useless and a combination of Potassium Acetate and Citrate was effective. In this case Ichthyol Ointment, 50%, rubbed over the joints seemed to ease the pain. The diet was restricted, white fish being substituted for beef. Vegetables and good ripe fruit are not contra indicated.

MYOSITIS. This occurred in four of the cases. Two females, aged 13 years and 20 years, and two males, aged six years and sixteen years. Adolescents would thus appear to be most liable to this complication.

In two cases the calves of the legs were affected, in one the left thigh and in one the muscles of the arms. The latter case also had rheumatism in rather severe form. Bruck (Nothnagle) considers that it is affiliated with Scarlatinal Rheumatism. A slight rise of temperature coincident with the Myositis was found. The onset occurred from the eighth to the forty-eighth day, the average being the twenty-ninth day of illness. Sodium Salicylate was found to be beneficial. The pain passed

away in a few days.

HEART CONDITIONS in SCARLATINA. At the onset and during the first week of Scarlet Fever, functional murmurs are of common occurrence, at the Mitral and Pulmonic areas. By far the most common is a Ventricular Systolic Murmur at these areas. In two cases, both females, a presystolic murmur was found at the Mitral area. That it was purely functional was proved by its disappearance in a few days and also by the absence of the other signs of Mitral Stenosis. The Systolic murmur at the Pulmonic is usually later in its onset and persists as a rule for a longer period than does the corresponding Mitral murmur. The following table shows the frequency of their occurrence.

Ventricular Systolic Murmur, Mitral Area	18 males.
" " " " "	16 females.
Presystolic Murmur Mitral Area.	2 females.
Ventricular Systolic Murmur, Pulmonic Area.	6 males.
" " " " "	16 females.

It will be seen from this table that the Ventricular Systolic murmur at the Pulmonic area is much greater in its incidence in females, while the Ventricular Systolic murmur at the Mitral area is slightly greater in males.

In six of the females and in five of the male cases, the Ventricular Systolic murmur at the Mitral & Pulmonic areas were combined. In six of the male cases with Ventricular Systolic murmur at the mitral area, some displacement of the apex beat outwards was observed.

In only one of the females was this displacement of the apex beat observed. The murmur was usually soft and blowing in character and as a rule localised and you can hardly confound it with the harsh loud blowing murmur of an old endocarditic lesion. That the Mitral murmur is due to dilitation in some of the cases is proved by the observed displacement of the apex beat and also by the slight enlargement of the precordial area of percussion dullness. Where these were not found it may be due to the altered condition of the blood forming the so-called Haemic Murmur. The greater frequency of the Pulmonic Systolic murmur in females is of interest as it is found much more commonly in females in other diseased conditions, such as Chlorosis. Its presence in Scarlatina is probably due to the same reason as its presence in Anaemic conditions generally. An accentuation of the second Pulmonic sound was found in nine of these cases and reduplication in ten. This was due, no doubt, to embarrassment of the right side of the heart due to the inefficient action of the left ventricle. A reduplication of the mitral sound occurred in three cases. Irregular rhythm of the heart (not due to complications such as Nephritis and Endocarditis) was found in eleven cases, a percentage of 2.2 Eight males and three females were affected.

The earliest onset was on the fourth day and the latest on the thirty-second, the average being the fourteenth day of illness. The age of the patients varied from two to forty years, the average being ten years. It is probably due to the action of the Scarlatinal toxines on the nerve

supply of the heart. Cardiac irregularity is much less frequent in Scarlatina than in Diphtheria. In two cases, Bradycardia was found during convalescence.

SCARLATINAL ENDOCARDITIS. is one of the most serious of the complications, not so much from its immediate effect, but from the frequency with which a permanent lesion of the heart is left behind. Fourteen were affected with Endocarditis in this series of cases, a percentage of 2.9 The ages of the patients varied from four to twenty years, being on an average nine years. ten females were affected giving a percentage of 3.7 and four males, a percentage of 1.8 Females seem to be more liable to Endocarditis than males. This greater susceptibility was also found in Scarlatinal Rheumatism. The onset varied from the tenth to the forty-eighth day of illness, the average being on the twenty-fourth.

No connection existed between the severity of the Scarlatinal attack and the occurrence of Endocarditis. In only two of the cases was the Scarlatinal attack severe. Season would seem to have some effect on its incidence as ten cases occurred in the three months, December, January & February and only four in March, April & May. During the first three months the weather was cold and damp and the admissions into the hospital were greater than in the other three months.

In six of the cases a secondary Adenitis preceded the attack. Rheumatism was associated with the Endocarditis in three of the cases and in another case, the Rheumatism preceded the Endocarditis by a week.

In two of the cases the cardiac symptoms were severe and in these two cases the rheumatism was also of a severe type, especially in one of them. It would thus appear as if there was some relationship between the two conditions.

The immediate cause of Scarlatinal Endocarditis is in all probability a micro-organism, but to which one it is due, it is difficult to say owing to the infrequency of death during the Endocarditic attack.

In one of my cases which died later from Meningitis, I isolated a Strepto-coccus and as I am of opinion that the brain was infected from the heart, if my supposition is correct, the organism in this case was a Streptococcus. The road by which the organism gains entrance to the blood stream is probably through the lymphatics of the neck. The preceding attack of Adenitis in six of the cases seems to support this view. In the great majority of the cases, the onset of the cardiac symptoms were insidious and unless careful examination of the heart is made from day to day in Scarlet cases it is very apt to be missed. In any case of Scarlatina in which there is a rise of temperature the heart ought to be carefully gone over. In the mild cases there was a slight rise of temperature of one or two degrees and this often persisted for some time in the evenings, but as a rule the temperature was normal in the morning of the second day.

In the severe cases the temperature rose as high as 104°F, the highest temperature always occurring at night.

The temperature was normal on the morning of the

fourth or fifth day. The evening temperature as in the mild attacks, was usually up for two or three days longer. On careful examination of the heart, displacement of the apex was noticeable in all the cases, the amount of displacement varying from ½ to 1½ inches. At the first, no distinct murmur might be audible but some alteration of the quality of the first sound was found on the second or third day. The Mitral valve was the one involved in all my cases and in nine, the murmur was Ventricular Systolic inrhythm. In only one was the murmur Presystolic. It was accompanied by a slight precordial thrill. A V.S. murmur followed it.

The pulse was increased in frequency and was soft: as as a rule easily compressible. Irregularity of the pulse was a common symptom. Pain over the Precordial area was occasionally complained of. An excited and heaving condition of the heart was often observable on inspection and in the more severe cases, if the patient attempted to sit up, he had a feeling of faintness. Facial pallor was present in all the cases and varied with the severity of the attack. A slightly livid appearance of the face was also observable in the more severe cases. In seven of the cases the murmur was completely absent on dismission (one of these cases died from Meningitis) In the other seven cases, the murmur was still present on dismission. In one of these dilatation was well marked and the patient was removed by his parents against the advice of the Superintendent. I believe he died shortly after.

In the majority of the cases some hypertrophy of the left ventricle was found, this being proved by the good condition of the pulse and in the increased precordial dulness. It is stated by Jurgensen (Nothnagel) that Endocarditis of the cardiac wall is more frequently present than valvular endocarditis. It offers practically no possibility of diagnosis. This may account for slight rises in temperature seen in several of my cases and in which nothing was found by physical examination. I never saw any sign of Mural Endocarditis in any Scarlatinal cases in which a post mortem was done. No case of Pericarditis occurred in this series and it appears to play an insignificant part as a complication of Scarlet Fever.

TREATMENT:- Absolute quiet and rest is essential. I usually kept my patients in bed for two or three weeks after the temperature was normal. With young patients it is advisable to remove all the pillows in order to prevent them sitting up in bed during the acute stage.

Sodium Salicylate in doses according to the age and severity of the attack was found to be of service. In one case it had to be discontinued and the alkalis substituted. No other medicine was required in any of my cases. The diet during the acute stage was confined to milk only and as soon as the stage passed off, farinaceous foods and white fish were added. During convalescence Iron preparations are indicated for the accompanying anaemia.

SECONDARY TONSILLITIS. This complication occurred in

in twenty-five cases, a percentage of 5.24 thirteen were females and twelve were males. The incidence was thus practically alike in both sexes. In the males, the onset varied from the twelfth to the thirty-eighth day of illness, the average being the twenty-second. In the females, the onset varied from the eleventh to the hundred and nineteenth day of illness. The latter case is unusually prolonged and leaving it out, the average day was the twenty-eighth. Of the twnety-five cases, ten were on the one side only. Suppuration occurred in three cases In another case considerable sloughing of the tonsils and soft palate took place. The ages of the patients attacked varied from one to twenty-four years, the average in both males and females being nine and a half years.

It would appear to be most liable to occur in adolescents and adults. The great majority of the cases occurred in December, January, February & March. Cold combined with damp seems to predispose to it. During these months the wards were full. Overcrowding of the wards, especially if there are a considerable number of cases of severe sore throat predisposes the patients to it. Those cases with a severe attack of Scarlet are more liable to secondary Tonsillitis than cases with a mild attack. The size of the tonsils also had a predisposing effect, those with large tonsils being more liable to Tonsillitis. Exudation was usually found on the tonsils. This exudation was as a rule, easily swabbed off but in a few cases it was fairly adherent. In some of the cases the appearance was that of an ordinary

follicular tonsillitis. Sore throat was complained of and also pain on swallowing. Headache was common at the commencement of the attack. The temperature rose to 102 to 102.5 F in the majority of cases. In a few the temperature was only raised one or two degrees and was normal the following morning. In the severe cases and in those with suppuration the temperature reached 104 F. The suppuration was confined to one tonsil in the three cases. The Lymphatic Glands in the neck (submaxillary) were usually enlarged and tender.

The Strepto-coccus was found in the throat in all these cases with the exception of one in which the Staphylococcus was isolated. In one case they were both found. In those cases which resembled Diphtheria a culture was taken at least twice in order to avoid missing the Bacillus Diphtheriae.

TREATMENT:- The throat was douched three or four times a day with Sanitas solution. Tr. Ferri Perchloridi applied directly to the tonsils was found to be of use. Incision greatly relieved those cases which suppurated. When the glands were very painful hot fomentations relieved the pain.

ADENITIS SECONDARY. Included under this heading are all cases of swelling of the cervical glands which appeared without any recurrence of throat symptoms. Those in which the swelling of the glands were probably due to Otorrhoea have also been left out. This complication was found in fifty-three cases, a percentage of eleven. twenty-eight were males and twenty-five, females.

Those with a moderate or severe attack of Scarlatina were more liable to secondary Adenitis than those in which the attack was mild. The numbers affected at the different age periods were as follows:-

0 - 4 years.	5 - 9 years.	10 - 14 yrs.	15 - 19 yrs.	20 - 24 yrs.
1 4	27	8	3	1

Taking the percentages from the numbers given at the beginning of the thesis for the different age periods, it is found that the age period 5 - 9 yrs. was most liable to Adenitis. The age periods 0 - 4 yrs. 10 - 14 yrs. 15 - 19 yrs. were almost alike. The age period 20 - 24 yrs. was much less affected by Adenitis than the others. The percentages were as follows:-

0 - 4 yrs.	5 - 9 yrs.	10 - 14 yrs.	15 - 19 yrs.	20 - 24 yrs.
10.5%	12.3%	9.6%	10.3%	5%

The predisposing causes of Adenitis are practically the same as those for secondary Tonsillitis, as in the latter the greatest number occurred during December, January & February. The actual cause is in all probability a micro-organism which has reached the glands from the throat along the lymphatic vessels. It was noticed that cases of Adenitis occurred in rushes and some wards seemed more liable to have cases of Adenitis than others. The association of Adenitis with Nephritis and Endocarditis have already been described in these sections.

The glands affected were those at the angle of the jaw but occasionally glands further forward in the sub-maxillary triangle were affected. In twenty-nine of

of the cases the glands on one side of the neck only were affected, a percentage of 54. 7 The amount of glandular swelling varied greatly in the different cases. This was the case also with the tenderness. As a rule the greater the enlargement the more tender it was. The temperature rose just before or coincident with the swelling. It varied from a rise of one or two degs. up to 105°F In a few cases no temperature was registered. In the great majority of cases the temperature was normal within three days. Even when the temperature reached 104 or 105, it might be normal the next morning but in these cases there was always a rise of temperature for two or three nights. Suppuration occurred in only three of the cases, a percentage of 5.6

Caiger (in Clifford Albutt's System of Medicine) gives the percentage as 33%

The glandular enlargement disappeared in the majority of cases in a week. Relapse of the swelling after it has gone down considerably is quite common. A recurrence of the Adenitis took place as late as the sixtieth day, the primary onset having been on the thirtieth day of illness. A reappearance of blood in the urine took place along with the Adenitis. This again emphasises the close connection between the two.

TREATMENT. Hot fomentations were applied every three or four hours and this considerably relieved the pain. When suppuration was detected, a small incision was made into the skin, & a small piece of gauze introduced to keep the incision open and allow of drainage.

Boracic fomentations were applied every four hours till the discharge had ceased. It then usually healed up rapidly.

RESPIRATORY COMPLICATIONS.

BRONCHITIS. This complication was present in twenty-one cases, a percentage of 4.4 thirteen were females and eight were males. In the great majority of the cases it occurred during the first week but it also occurred during the second and third weeks and in one case it was as late as the twenty-fifth day. The great majority of the cases occurred in young children, but in one case the patient was twenty-three years of age. The average of all the ages was five years. The amount of it varied considerably but in only one of the cases was it very severe. This patient was a girl aged two years, although she had not had a severe scarlatinal throat, she was in a toxaemic condition as shown by a very small and rapid pulse and by the depressed state of the general nervous system. On the fourth day a troublesome cough commenced and the breath sounds were harsh all over both lungs. On the fifth day the cough was very troublesome and the lungs were full of Bhonchi. She died on the sixth.

Two other of the cases died but in them the bronchitis was mild. The fatal result was due to other complications. The great bulk of the cases required no treatment and the bronchitis disappeared with the approach of convalescence. Inthe more serious cases and in those which occurred during convalescence ordinary expectorant mixtures were given. A troublesome cough was found in a few cases of this series and nothing was found in the

in the lungs on auscultation. In these cases the trachea only appeared to be affected. An ordinary expectorant mixture containing Tr. Camph. Co. was found of value in allaying the irritating cough.

LARYNGITIS. This complication occurred in eight cases, four males and four females. The ages varied from eleven months to forty years. It occurred in four during the first week of illness. In three of these a hoarseness of the voice was all that was present. The fourth case was in a girl aged one year with a septic throat. The Laryngitis commenced on the sixth day of illness. There was a curious noise produced during inspiration. There was no obstruction during expiration. On the second day there was no impediment to breathing. On the eighth day there was again difficulty in respiration and slight cyanosis was present. On the ninth day there was considerable retraction and tracheotomy was done. The patient never rallied much after the operation and died on the eleventh day. A case occurred on the tenth day. Great hoarseness was all that was found. The other cases occurred on the twenty-fifth and forty-second day respectively. There was some difficulty of inspiration and there was exudate on the tonsils. The onset was sudden and they presented a considerable resemblance to Post Scarlatinal Diphtheria.

The temperature rose to 101.8 in both on the first night of the complication. No albumen was found in the urine. Cultures taken from the throat were negative for Diphtheria.

In both the Strepto-coccus was found in pure culture. The Strepto-coccus was also found in the septic case.

TREATMENT. The majority required none. In the three described most fully, Antitoxin was given at the commencement in case it should be Diphtheria. Local treatment of the throat was carried out in the way already described.

Tracheotomy had to be performed in one of this series of cases owing to the great enlargement of the tonsils. The patient, a girl four years of age was admitted on the seventh day of illness. On the ninth day there was difficulty in breathing. The tonsils were found to meet in the middle line of the mouth and along with the accompanying pharyngeal swelling, they almost completely blocked up the respiratory passage.

Slight cyanosis was present. On the tenth day there was well marked retraction and the cyanosis was much greater. There was no laryngeal obstruction. Tracheotomy was performed. On the eleventh day the tube was removed. There was no dyspnoea and the voice was good.

PLEURISY is a comparatively rare complication of Scarlet Fever. It occurred in two of this series. Both cases were males. The first case, a boy aged six years, on the forty- seventh day, complained of pain on the right side of the chest. Pleuritis friction was heard and also jerky breathing sounds and some impairment of resonance and vocal fremitus. On the fiftieth day the pain and friction had gone. During this attack he was suffering at the same time from Endocarditis and Nephritis.

The second case was a boy aged 9 years. He was admitted on the fourteenth day of illness. Patient had a cyanotic appearance, his respirations were greatly increased, his pulse was small, very rapid and of low tension. He had a short croupy cough but no expectoration. Delirium was marked and he often tried to get out of bed. On examination, well marked signs of fluid were found in the right side. Also at the axillary region well marked tubular breathing was found. He was tapped and 4 ozs. of fluid were withdrawn. On percussion, a tympanitic note was found at the front of the chest, evidently due to the entrance of air. He died on the 18th day of illness. Post mortem. Gas was found in the right pleural cavity and about a pint of yellow, slightly turbid fluid. The whole lung was very collapsed. There was a small patch of Pneumonia at the lower anterior part of the upper lobe and at the opposed part of the middle lobe. On separating the two pleural surfaces an ulcerated spot was found from which air could be squeezed. I thought that the entrance of air was due to the puncture of the lung by the tapping needle, but this opening was in such a situation that it was impossible for it to have been so caused.

BRONCHO-PNEUMONIA occurred in 7 cases, a percentage of 1.4 Four were in males and three in females. The age of the patients varied from one to seven years, the average being three years. The onset of the Pneumonia varied from the fifth to the seventh day of illness.

In all there was a preliminary bronchitis. Of the seven cases only two recovered. Three of the others died from Nephritis, one died from the broncho-pneumonia alone and the remaining one died of Tubercular Meningitis, the pneumonia in this case being of tubercular origin.

Lobar pneumonia is an occasional complication of Scarlatina. It occurred in two cases, a girl aged 6 years and a boy aged 16 years. In both it occurred during an attack of Nephritis and in both, it was apical. The onset was on the 33rd and 34th day of illness respectively. A true crisis occurred in each case on the sixth and seventh day of the pneumonia. In the girl the onset of the pneumonia caused a marked recrudescence of the Nephritis & Uraemic convulsions supervened. These have been described under Nephritis. In the boy the Nephritis was hardly affected by the pneumonia. A marked feature in both cases was the absence of expectoration. No rusty sputum was ever seen. By asking the boy to spit up when he coughed, a very small amount of sticky yellowish sputum was obtained. On making a film and staining it, a diplo-coccus was seen but not in the large numbers usually present in Pneumonia. There was no appearance of a capsule. A culture was made and a diplo-coccus was also present along with a large number of ~~the~~ other organisms. In the girl nothing was obtained for examination. Both cases made an uninterrupted recovery, the Nephritis in each case also rapidly disappearing. It will be seen that the two cases presented a remarkable similarity in almost every clinical feature.

TREATMENT No special treatment was required for the

for the lobar pneumonia. For the Broncho-pneumonia, brandy in drachm doses was given every four hours for the failing pulse. The entire chest was covered with a cotton wool jacket to prevent any sudden change in temperature. As a rule there were other complications and treatment had to be carried out for these also.

POST SCARLATINAL DIPHTHERIA. This occurred in 11 cases of this series, a percentage of 2.3 The age of the patients varied from two to seven years, the average being four years. It is thus clearly evident that the younger the patient the more liable is he or she to Diphtheria. Seven of them occurred in "Tents" Of the other four, three occurred in the same ward and all about the same time. They were not in close proximity to one another. The other case occurred also in an acute ward and was of special interest owing to the part affected, being an ulcerated surface surrounding the anus.

The onset of the Diphtheria varied from the 12th day to the 90th day of illness, the average being the 49th It would thus appear that the greatest liability to Post Scarlatinal Diphtheria is when convalescence has been well established. Two of the cases died, giving a death rate of 18% This was 10% lower than the death rate in the ordinary Diphtheria wards.

The parts primarily affected were as follows:-

Throat	in	6 cases
Nose	"	2 "
Trachea	"	1 case
Larynx	"	1 "
Ulcer round anus		1 "

In one of the nasal cases the throat was secondarily affected. In the laryngeal and tracheal cases the throat was also secondarily affected. In two of the throat cases no exudate was seen. The patient complained of sore throat and on examination congestion of the tonsils were found. A culture from them showed the Diphtheria Bacillus. This demonstrates the importance of culturing all cases of secondary sore throat in Scarlatina. In one of the nasal cases, the only symptom was the rhinorrhoea. There was no formation of membrane and no temperature. Various conditions are said to be the cause of Post Scarlatinal Diphtheria. Overcrowding, bad drainage, close proximity of grass to ward, unrecognised cases of Diphtheria, etc. are found in the various text-books. These causes may play their part, but in Mohsall Hospital Diphtheria cases cropped up when all these conditions were absent. During my residence in the hospital I never saw a case of double infection although I was always on the look-out for it and invariably cultured any throat which was at all suspicious looking.

What then was the cause of the Post Scarlatinal Diphtheria in the hospital? The answer to the question, was to my mind, the presence of the Bacilli of Diphtheria in the ear discharges. In no single Scarlatinal ward in the hospital were infective ear discharges absent. Even in the isolation wards ear discharges occasionally became infected with Diphtheria Bacilli. As noted above, the majority of the cases occurred in the "Tents" These tents have been described at the beginning of the

of the paper. Why was it that they did so?

1st. The children in the "Tents" mixed much more freely together than in the wards and so actual contagion was more liable to take place.

2nd. In the wards the douching of the throat and nose was more frequent and so the Bacilli were much much liable to be washed away from the fauces.

3rd The "Tents" formed a much better place for harbouring infective dust. and,

4th It is probable that the Scarlatinal throat is more liable to infection during the convalescent stage than in the acute stage.

As already mentioned, of the four cases which occurred in the wards, three were in the same ward.

The following seems to me to be the explanation of this fact. This ward was utilised for five months for nothing else than Diphtheria infected ear discharges. It was then closed and cleaned by men who had never done this kind of work before. On the ward being reopened cases from one of my wards were drafted into it. None of these cases had Diphtheria Bacilli in their ears or throats. Within two weeks three of these patients had Post Scarlatinal Diphtheria, and direct infection from one case to another could not account for it as they were at different parts of the ward and they were all confined to bed. Diphtheria Bacilli also began to show themselves in the ear discharges. Within six weeks there were sixteen cases in which the Bacillus of Diphtheria was found, three in the throat, two in the nose and eleven

in the ear discharges. This was more than half the patients in the ward. There was no over-crowding, the ward being little more than half full.

That the ward had not been properly cleaned one could easily see by looking at the ceiling. The accumulated dust of the last six months was still present. The ceiling had evidently never been touched by the cleaners. My theory of the outbreak is, that the ceiling, or other parts which had not been properly cleansed gave off infected dust. The number of bacilli would naturally be in much greater numbers in this ward than in the other wards, owing to the length of time infected ear discharges were confined to this ward. At this time also the number of Post Scarlatinal Diphtheria cases were occurring with more frequency generally, in the hospital, than had been the case for the last three or four months. This was, in all probability due to the fact that infective ear discharges were not being isolated as before, but were kept in the wards and in the "Tents". These facts point to a close connection between Diphtheria Bacilli in the ear discharges and Post Scarlatinal Diphtheria.

It has been argued that the Bacilli which have been described as Diphtheria Bacilli are not so, but that they may be the Pseudo variety. The corroborative evidence of Professor Dalepine is of great value in proving them to be the true Diphtheria organisms. I have preparations of Diphtheria Bacilli from the throat and also preparations from the ear discharges and their appearance in those with long bacilli are exactly alike.

I suggested to Dr Forbes that he should test the virulency of some of these cultures from the ears on guinea pigs. I understand experiments are to be carried out on these lines.

PRIMARY TRACHEAL DIPHTHERIA is so very rare that the case I had merits a short description.

The patient was a boy aged 3 years. He had a comparatively mild attack of Scarlatina and was transferred at the end of a month to one of the "Tents" On the thirty-ninth day of illness he had a convulsive attack and his temperature rose to 103.6 Nothing was to be found anywhere on examination to account for his convulsions. The next morning, the 40th, the temperature fell to 101.8 and the patient appeared quite bright and cheerful A trace of albumen was found in the urine and the convulsions were thought to be due to the onset of Nephritis.

The was no enlargement of the submaxillary glands At night the temperature was 99.4 On the 42nd day the patient had thick exudate on both tonsils and the submaxillary glands were considerably enlarged, the temperature rose to 102.6 On the 43rd day, on swabbing the throat, a complete cast of the trachea and large bronchi was brought up. His voice was slightly croupy but this was the first time it had been affected. The child had a rather cyanosed appearance and the pulse was rapid and feeble. He died at 4 p.m. His temperature was 97.2 F

In this "Tent" there were three cases with ear discharges containing the Bacillus of Diphtheria.

The case of infection of ulcer round the anus

occurred in a boy aged three years. This boy had double Otorrhoea and in one of the ears Diphtheria Bacilli were found but they only persisted for a short time. On the thirtieth day of illness, the patient had a sore throat with exudate. Cultured and Strepto-coccus found. On 33rd, still dirty exudate on tonsils. Cultured and Strepto-coccus and Staphylo-coccus found. A sore was discovered surrounding the anus. It had a yellow sloughy looking surface with erythema round it. 34th sore spreading in all directions. 35th still spreading. Child becoming very weak. Culture was taken. On 36th culture was found to contain Diphtheria Bacilli and Staphylo-cocci. These were the two organisms found in ear discharge on one side. Patient is bleeding considerably from the mouth and nose. Some subcutaneous haemorrhages are present in the skin of the trunk, arms and legs. Died very suddenly at night apparently of heart failure.

The patient had no doubt inoculated a small sore by scratching with his infected fingers. He had a most profuse ear discharge. This was the only case in which Diphtheria developed in a patient with the Diphtheria Bacillus in the ear discharge. The immunity which infected cases of ear discharge enjoy has already been commented on.

TREATMENT Antitoxin was given at once in any case which at all resembled Diphtheria. When given early the patient practically always recovered. In the two cases of mine which died, the antitoxin was delayed in

the first owing to difficulty in diagnosis and in the second it was not given at all as Diphtheria infection of the ulcer was not suspected. The lower deathrate of Post Scarlatinal Diphtheria was no doubt due to the earliness with which anti-toxin was given.

COMPLICATIONS in the ALIMENTARY SYSTEM.

As a rule constipation is found during an attack of Scarlatina, but occasionally Diarrhoea developed and especially during the first week. In two cases, Diarrhoea occurred at the onset. Three other cases occurred during the first week. All these cases had a severe attack of Scarlet Fever. One of these cases died on the sixth day of illness. The stools in all these cases were of a greenish colour and contained undigested milk. Vomiting accompanied the diarrhoea in one of these cases. Diarrhoea was found in one case on the 23rd day of illness. The patient was suffering from a severe secondary Tonsillitis at this period. Another case occurred on the 59th day but the diarrhoea was probably due to bad milk.

APHTHOUS STOMATITIS. Ulceration of the tongue occurred in five cases. The date of onset varied from the ninth to the fifty-ninth day. Four of them occurred in the first weeks of illness. The ages varied from five to thirteen years. In one ulcers were present on the gum and palate as well as on the tongue. Before the ulceration occurred, raised white patches were seen on the tongue. At this stage it closely resembled Thrush. Gradually the thickened epithelium was shed and an ulcer made its

appearance. Jurgensen says that the Thrush fungus is common in Scarlatinal cases. Cultures from these cases gave a Strepto-coccus and Staphylo-coccus.

Oidium Albicans was never found. Caiger mentions that the Staphylo-coccus is often found in pure culture in Aphthous Stomatitis.

Alveolar Abscess was found in four cases. In all these cases there were bad teeth. The septic condition of the Scarlatinal mouth would undoubtedly be favorable to the formation of abscesses in connection with the teeth.

JAUNDICE. occurred in one case. The patient a boy, four years, was admitted on the 15th day of illness. His skin had a yellowish green colour. The conjunctivae were also affected. The liver projected downwards 1½ inches in the vertical nipple line. His stools were clayey and constipated. Bile was found in the urine. The jaundice passed off gradually and his urine was normal on the 42nd day. This was an obstructive jaundice, due to catarrh of the bile duct, the inflammatory condition having spread upwards from the duodenum. That an inflammatory condition is present at least in some cases of Scarlatina in the intestine is proved by the diarrhoea occurring occasionally at the onset. The boy suffered from a mild attack of Nephritis. The jaundice, by throwing extra work on the kidneys had probably a predisposing effect.

TREATMENT For the diarrhoea no special treatment is as a rule required. Peptonized milk was given. For the Aphthous Stomatitis an antiseptic mouth wash was

employed and then the tongue was smeared frequently with Mel. Boracis. Prompt removal of the offending tooth cured the alveolar abscess.

For the Jaundice, small doses of Calomel were given, just enough to keep the bowels loose.

COMPLICATIONS OF THE EYE. Injection of the conjunctivae occurred in several of the severe cases at the onset. This is probably part of the Scarlatinal condition. Conjunctivitis was found in 13 cases, a percentage of 2.7 A slight conjunctivitis occurred early in the disease in 9 cases. In two of the cases, the conjunctivitis was severe. They were septic cases and in both, the eyes were infected by the nasal discharge which was very profuse. In the mild cases the discharge was slight and never at any stage resembled the profuse running from the eyes seen in Measles. All these cases occurred before the tenth day. In two cases the conjunctivitis came on late in the disease, on the 40th and 65th day respectively. In the latter case a corneal ulcer developed in the right eye.

KERARITIS In both the septic cases Keraritis occurred The cornea became opaque and roughened on the surface owing to the displacement of the superficial epithelium. The iris was affected in both eyes, in one case, and if the child had lived longer, it is very likely that Panophthalmitis would have occurred.

BLEPHARITIS was found along with conjunctivitis in one of the mild cases. Erysipelas of the lower eyelid occurred in one case.

SECONDARY ERUPTIONS. in SCARLATINA. Eczema is one of the most common of the secondary eruptions. The upper lip and the ear are the places most frequently affected, owing to passage of discharges over them.

Children in Scarlatina are very apt to pick their noses and ears with their fingers and this is the chief cause in the spread of the eczema. Whenever one was seen picking its nose or ears, a piece of lint was put over each hand and tied at the wrist. This is an excellent prophylactic measure. In one of the cases there was a generalized pustular eczema. The child was an inveterate picker and infected his body generally by his fingers. Eczema was practically confined to young children.

HERPES occurred in five cases, one male and four females. It was difficult to tell the exact time of onset as they all had the eruption on admission. It occurred on the 1st or 2nd day of the attack of Scarlet. In four cases it was confined to the lips. In one of these cases it was also present on the chin. In the fifth case, the eruption was on the cheek and side of the nose. The age of the patients varied from 5 years to 20 years. Females are apparently more liable to Herpes than males.

URTICARIA was found in six cases. The onset varied from the 7th to the 56th day. In all but one the rash came out before the end of the 2nd week and taking the average of these, it was the 9th day. The ages of the patients varied from 2 to 12 years. Six were females. As with Herpes, Urticaria appears to occur most frequently in the female sex.

No connection with the severity of the Scarlatinal attack was found. Four occurred in January, one in December, and one in March. The cold weather would appear to have some predisposing influence.

The trunk was the part most affected, the eruption being most marked on the abdomen. The face escaped in all the cases. The knees were often covered with the eruption. As a rule the eruption disappeared at night and reappeared in the morning. It only continued for two or three days. During the time the eruption was out the patients were irritable. Itchiness and burning were usually complained of.

Dermatography was found in all the cases. No treatment was given except a saline purge in the morning to clear out the bowels. The diet was restricted for a few days.

SECONDARY ERYTHEMATOUS RASHES occurred in 10 cases, 4 males and 6 females. The age varied from 2 to 20 years and the onset from the 14th to the 52nd day of illness. The amount and variety of distribution varied considerably in the different cases. In one case so intense was the erythema especially in the lower limbs, that on pressure over the tibia slight pitting occurred. In three of the cases there was secondary tonsillitis at the same time. In one the rash was probably caused by an enema. In another case patches of erythema came out on the body after douching. The douching fluid was changed but the changing of the solution had no effect. No cause could be assigned in the remainder. The rash lasted from a few hours to 3 days. A slight rise of temperature was noted in those cases with the most profuse eruption.

In one case it rose to 101.4 The temperature was always normal the following morning.

Psoriasis occurred in 3 cases, 2 males aged 7 and 10 years and one female aged 9 years. The onset varied from the 26th to the 42nd day, the average being the 33rd day. The eruption was generalized in all the cases and was most extensive on the extensor aspects of the knees and elbows. In one case the eruption was very profuse. No history of previous Psoriasis was found. The general health of the patient was not disturbed.

TREATMENT:- Potassium Iodide internally, and Chrysarobin Ointment externally caused the eruption to disappear very rapidly. Hot baths were given to facilitate the removal of the scales. The most severe case under this treatment was entirely free of the eruption in 12 days.

A Haemorrhagic rash occurred in 2 cases, one in a boy aged 3 years. This rash came out on the 15th day concurrently with an attack of tonsillitis. It consisted of small petechiae, confined to the neck and chest. The other was in a girl aged 10 years. The rash came out on the 22nd day. It consisted of a papular rash on the arms and legs. The papules were formed round the hair follicles and into the papules haemorrhage had taken place.

A pustular eruption ~~on the cheek~~ appeared on the cheek in two cases, on the 8th and 10th day. Both patients were boys aged 8 years and 10 years.

Erythema Nodosum occurred in a girl aged 17 years on the 41st day. There were three painful red spots on the front of the right leg, midway between the knee and ankle.

Sodium Salicylate in 10 gr. doses proved effectual in this case.

An eruption resembling Lichen Planus occurred in a girl aged 9 years on the 14th day of illness. It consisted of groups of fine papules with smooth, flat, shining surfaces It was present on both legs.

ERYSIPELAS of the face occurred in 2 cases. In both it was mild and passed off in a few days. The infection was from the eyelid in one case and from the nose in the other

SEPTIC RASHES These occurred in 7 cases. The date of onset varied from the 4th to the 14th day, the average being the 9th day.

The age of the patients varied from 9 months to 10 years The average age was 3 years. All of the cases but one were under 4 years of age. This is due to the fact that septic cases of Scarlatina are chiefly found in young children. The rash as a rule was confined to the trunk and limbs. In only one case was the face affected. The rash was always morbilliform in type. The colour of the rash varied considerably in the different cases and at different times in the same case. It had usually more of a brown tint that the ordinary Measles eruption. The rash often almost entirely disappeared only to reappear again in a day ot two and more profuse than before. In some of the cases the rash was chiefly confined to the limbs especially on the extensor aspect. In others the whole trunk and limbs were covered by a profuse eruption. The buttocks as a rule were thickly covered with the eruption On fading, the eruption left

a brownish stain on the skin. 6 of the cases died, a mortality of 85.7% The appearance of a septic rash must be looked upon as a grave symptom. In all the cases profuse nasal discharge was observed.

A morbilliform rash appeared on the trunk and limbs in two cases on the 22nd and 31st day of illness respectively. The appearance was very similar to the septic but there was no temperature or septic throat to account for it. The rash was absent from the face. It disappeared very rapidly and left very little staining of the skin.

RINGWORM when it was once introduced into a ward was very apt to spread. This was no doubt due to the ease with which the organism could implant itself on the new formed epithelium after the Scarlet desquamation.

RELAPSE OF SCARLET FEVER. A true relapse was found in 6 cases, a percentage of 1.25. 2 were males and 4 were females. The ages of those affected varied from 3 to 12 years. The average age was 6½ years. This age period is the age at which children are most liable to Scarlatina The onset varied from the 20th to the 59th day. The average was the 35th. The primary attack in all the cases was of a mild type but that it was true Scarlet Fever was proved by the appearance of typical desquamation. In the relapse in the majority of the cases, the attack was of moderate severity, the temperature reaching 103F In four of the cases vomiting was present at the onset of the relapse. In all the typical strawberry tongue, punctate rash and sore throat were present. Desquamation again occurred. Owing to the mildness of the first attack

complete immunity does not seem to have been established. The patients are probably reinfected by a more virulent Scarlatinal organism from one of the severe cases in the ward. In one of the relapse cases, post nasal adenoids were very marked and this may have predisposed the patient to reinfection of the throat. In another case the relapse occurred after an attack of Post Scarlatinal Diphtheria

MENINGITIS This complication is a comparatively rare complication of Scarlatina. It occurred in three cases, two males and one female. Needless to say they were all fatal. In the first case a boy aged 3 years, the condition was found at the post mortem. He died on the 37th day of illness and no well marked clinical symptoms of Meningitis were present during his illness. It was a well marked case of septic Scarlet Fever. Unfortunately I was incapacitated at the time of his death and a bacteriological examination was not made of the meningeal exudate. In the 2nd case, a boy aged 5 years the onset of the Meningitis was on the 43rd day of illness. The patient died on the 48th. On the 27th day the patient developed a general bronchitis. On the 35th broncho-pneumonia patches were discovered scattered over both lungs. A tubercular condition was suspected at this time. On the 45th considerable abdominal tenderness. The symptoms of Meningitis were well marked. At the post mortem a general tubercular meningitis and miliary tuberculosis of both lungs were found. A large caseous mesenteric gland was found on opening the abdomen. This no doubt, was the cause of the abdominal tenderness. Tubercle Bacilli were

found in the caseous matter. Evidently an old tubercular lesion in this gland had recommenced owing to the depressed condition of the system due to the Scarlatinal poison and the blood stream had become infected. The 3rd case was a girl aged 7 years. The patient had not a very severe attack of Scarlet Fever, the primary temperature not having gone beyond 103 F On the 9th day she had rheumatism of both wristsjoints. On the 10th the first sound of the heart was not clear and the apex beat was displaced to outside the nipple. On the 14th a Pre-systolic and Systolic murmur was heard at the apex. On the 17th Rotorrhoea commenced. On the 20th no murmur at the mitral area. 22nd vomited after milk. Left Otorrhoea commenced. 34th frontal headache complained of on left side. 42nd Headache intermits but is always on the same spot. 44th headache still present. Patient getting very thin. Temperature still up. 48th temperature normal. Blood in urine (small amount only) Pulse not plus. No noticeable oedema. 49th Suspicion of puffiness, pulse slightly harder. Not much blood in urine. Quantity not much diminished. Still has headache at times. 50th vomited again this morning. Complained still of left frontal headache which is now constant. Very little blood or albumen in urine. Pupils equal but react to light and accomodation rather sluggishly. Vomited this afternoon. No relationship to taking of food. Very drowsy. 52nd Felt sick during the night but did not vomit. Heart negative. No blood in urine, still has left frontal headache. 53rd Still pain in head, cried

out with it at times yesterday. Vomited twice yesterday. Does not sleep well but dozes at times. Pupils react sluggishly. Cerebration slow. 54th on trying to examine the eyes she turned her corneae under the upper eyelids. 55th Vomited three times yesterday. Patient very emaciated. Still cries out at times with frontal headache. Worse this morning, somnolent at intervals. Pulse rapid, small and feeble. 56th vomited once during the night, did not sleep. Twitchings of face commenced at 9 a.m. Movements now present on left side of body. Cries out when touched or when a light is brought near her. Pupils react sluggishly. 5 p.m. the twitchings are noticed on right side. now. Pulse almost gone. Corneal reflex present. 5.30 p.m. much the same. The twitchings have now developed into convulsions and occur about 12 times per minute. 6 p.m. trephined over right side in parietal region. Immediately the dura was cut there was bulging of the brain. Exudation was seen along the course of the vessels. The veins were distended. 57th died this morning at 10 a.m. From the 29th the temperature was always raised at nights 101 F to 103 F. From the 50th the temperature varied from 104.2 at night to about 100 F in the morning. The pulse was about 150

At the post mortem the whole meningeal surface of the brain was covered with a yellow exudate and over the left frontal region it was much thicker than elsewhere. No focal lesion was found. It had no connection with the middle ear. The valve of the heart affected had healed up. Slight parenchymatous Nephritis was found. The spinal canal was not opened but there is not much

doubt but that the spinal meninges were also affected.

It looks as if in this case a small thrombus had been detached from the heart and had been carried by the blood stream into a small artery in the left frontal region. Occurring in this region, there would be no marked symptom at the onset. Gradually the inflammatory condition extended until a septic meningitis was established.

Staining of the meningeal exudate revealed a short chained strepto-coccus. There were never more than six organisms in one chain and often times four and occasionally only two. A culture on blood serum gave a pure culture of a strepto-coccus. If the supposition is correct that it was from a thrombus from the mitral valve, in that case the Endocarditis must also have been due to a strepto-coccus.

Suppurating fingers are frequently found in Scarlatinal patients. The fingers are inoculated from the septic nasal and ear discharges. Not infrequently suppuration occurs under the nail.

In one case there was an inflammatory condition of the Glans Clitoridis and in another case an abscess was found in the Labium Majus.

THE TREATMENT In all these cases incision and then the application of wet antiseptic dressings was found to be effectual. When suppuration occurred under the nail, the latter was removed.

The formation of bed sores during a scarlatinal attack

is a very infrequent occurrence. It was found in only one case, a girl aged two years. This was a well marked septic case. She lingered on for six weeks before a fatal issue ensued. The bed sores were found over the sacrum and both great trochanters and on the left elbow. They commenced during the fourth week of illness.

MORTALITY 27 of the cases had a fatal termination. This gives a death rate of 5.6% The numbers that died in the different age periods were as follows.

0 - 4 yrs.	5 - 9 yrs.	10 - 14 yrs.	40 yrs.
19 cases	6 cases	1 case	1 case

The death rate in young children is much higher than at any other period. The patient aged 40 years, who died, was a very alcoholic individual. One of the fatal cases belonged to the Malignant type of Scarlatina. The patient was a girl aged 8 years. The throat symptoms were not severe and the temperature reached 101 F. There was marked nervous prostration and the pulse was very rapid and feeble. She died on the 3rd day of illness apparently of cardiac failure. Half of the fatal cases belonged to the septic type of Scarlatina.

The septic cases were practically confined to young children and hence the high death rate.

The causes of death in the other fatal cases have been already described under the various complications.

Since writing the above paper I have had the opportunity of investigating an epidemic of Scarlatina in a small village in Fifeshire. The total number of cases was thirty. One case was fatal, the child dying

in twenty hours from the onset of illness. This case belonged to the malignant type of Scarlet Fever. Two had Scarlatinal Nephritis, a percentage of 6.6 On careful enquiry at the parents as to discharge from the ear, in every case the answer was negative. This seems remarkable when compared with the cases in Monsall Hospital. What are the causes which produce this difference? They are probably the following:-

1. Difference in the type of Scarlet Fever.
2. The patients not being crowded into the wards of an hospital.
3. The treatment.

In none of these cases was douching done. When the throat was treated at all it was painted with an antiseptic. This absence of Otorrhoea in undouched cases seems to prove my belief, that douching has something to do with such a large percentage of cases with Otorrhoea in Monsall Fever Hospital.

Andrew Mair.

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