The next and last day of her illness the temperature rose to 103.8° in the morning, respirations 72, pulse 140, and very weak. The face was flushed, the skin moist, and there was conjugate deviation of the eyes to the right. At 6 P.M. the respirations were 52, the pulse uncountable, the temperature in both axillæ 107.2°, and in the rectum 108.6°; the face was pale and the skin dry. At 6.30 she died, and there was no rise of temperature after death.

The *post-mortem* examination of the brain revealed extensive mischief. The surface showed nothing abnormal on the convexity, the vessels appearing patent and healthy, but at the bifurcation of the basilar artery was a patch of atheroma, and one or two small patches in the right posterior cerebral, while the left posterior cerebral was blocked a short distance from its origin for about three-quarters of an inch. On section, the brain substance was normal to a level with the roof of the lateral ventricles, but at that point it was distinctly softer on the left side and of a yellowish tint. The vessels of the choroid plexus on this side were congested and matted together with yellow lymph. The floor of the ventricle was one mass of softening involving the optic thalamus and corpus striatum, and rendering any distinction of detail impossible.

The area of softening was approximately 2 inches by 2½ and 1 inch in depth, and a small patch of it occupied the inner surface of the superior temporo-sphenoidal lobe. The other organs of the body showed nothing unusual, except that there were numerous bands of recent peritonitic adhesions binding down the intestines without any inflammatory condition of the gut itself, and accounting for the pain which was elicited on deep pressure over the gall bladder, though there was nothing else to point to existing mischief there.

The most noticeable points of interest in the case were the brief yet recurring attacks of paresis, more especially in the close connection they apparently had to the paroxysmal hæmoglobinuria to which the jaundiced appearance of the patient seemed evidently due. It could hardly have been caused by an excess of bile pigment, which would have shown itself in greater quantities in the urine, whereas traces of it were but once found, and then only to a slight degree. The effect would also have been more lasting had it been due to more than some altered condition of the blood, for a few hours sufficed to remove all discoloration both of conjunctivæ and skin, to reappear and disappear again and again a few hours later.

AN EXPERIENCE OF NINETY-SIX CASES OF DIPHTHERIA IN PRIVATE PRACTICE.*

By WALTER CHARLES AYLWARD, M.R.C.S., L.R.C.P.

Most of the information we possess in reference to diphtheria, particularly in reference to the treatment of that disease by the hypodermic injection of antidiphtheric serum, has been obtained from the isolation hospitals. The conditions which obtain under these circumstances of necessity differ somewhat from those which obtain in private practice, and I venture to hope that a record of results observed under the latter conditions may not be wholly devoid of interest. Moreover, as one-fourth of the cases were treated by non-serum methods and the remaining three-fourths with serum, an opportunity will be afforded of comparing the results of the two methods in the same outbreak and under similar conditions, and the fallacy of comparing one line of treatment in an outbreak of malignant type with another line of treatment in an outbreak of benign type will be avoided.

The outbreak as a whole must be regarded as a mild one, although there were some very severe cases in addition to those which proved fatal. The spread of disease was almost entirely due to personal contact with the sufferers. The first case of the whole series occurred in June, 1896, and was followed in five days by No. 2, who had been sitting next to No. 1 at school. No. 3 was the brother of No. 2, and slept with him. No. 4 attended the same school as Nos. 1 and 2, and No. 5 was the father of No. 4.

* Read at a meeting of the East Sussex District of the South-Eastern Branch of the British Medical Association.

In all these cases there had been obvious personal contact affording ample opportunity for the conveyance of infection from one to another, and this mode of infection was so marked a feature of the whole outbreak that upwards of two-thirds of the total cases were clearly traceable to it. A few examples of indirect personal infection occurred; by this I mean the conveyance of infection by an intermediate person without the intermediary contracting the disease. For example, Mrs. J. nursed Case 4, and washed him after his death, and did not contract diphtheria, but four days later her son had developed it. Again, Case 42 died, and was "laid out" by Mrs. F., who remained well, but a nurse child who lived with her developed the disease within a few days. In neither instance could any other source of infection be traced. On inquiry I elicited the information that after performing her offices for the dead child Mrs. F. had taken absolutely no precautions in disinfecting herself beyond the formality of washing her hands in a little ordinary water and using a little carbolic soap.

In reference to the position occupied by the false membrane, it is worthy of remark that in nearly 97 per cent. of the cases it was observed at some time or another on one or both tonsils, and these were the parts almost invariably first attacked. In 51 per cent. of the cases it did not spread beyond them, but in the remainder it spread so as to attack the various adjacent parts as follows:

The posterior part of pharynx	in 26 per cent.
The uvula	in 23 "
The soft palate	in 15.6 "
The nares	in 14.6 "
The larynx	in 9.4 "

In two cases the posterior pharynx was attacked, and the false membrane disappeared without spreading to the tonsils.

The submaxillary glands were observed to be enlarged in 72 per cent. of cases, and sometimes the enlargement of these and the cervical glands with the surrounding oedema was so great as to suggest at first sight a combination of lower alveolar abscess and mumps.

The age incidence of those attacked was approximately as follows:

Under 1 year	1	per cent.	1	fatal case.
Between 1 year and 2 years	5.2	"	0	"
Between 2 years and 5 years	10.4	"	1	"
Between 5 years and 10 years	38.5	"	3	"
Between 10 years and 15 years	23.0	"	1	"
Above 15 years	21.9	"	0	"

In 11.1 per cent. only of total injected cases has a rash been observed. This appears to be considerably below what is usually experienced, and it would be interesting to know to what cause or causes this difference may be reasonably attributed. On looking through my notes with this object specially in view, I found that while a rash followed in 25 per cent. of 12 cases in which fluid serum was used, it only followed in 8.33 per cent. of 60 cases in which the dried serum had been used. Although the numbers are too small to carry much weight, this marked difference seems to point to some causal relationship, and rather suggests that in the process of drying the serum loses some of its irritating properties upon the skin. So far as I have been able to judge, there is no difference in its effects upon the disease.

The rash usually appeared some eight to fourteen days after the injection. It was usually of a measly appearance, and attacked the lower extremities first, then the upper extremities, and afterwards the trunk, if at all. One marked exception to the measly type of rash occurred in Case 18, in which fluid serum was used. In this case the rash was markedly urticarial, with raised flat-topped wheals as large as a five shilling piece. There was much general subcutaneous oedema, and the face was so swollen that the eyes were nearly closed. The heart's action was very feeble, and much accelerated—pulse 170 per minute, while the temperature rose to 103°. There was no albuminuria.

In Case 26, although the rash was of the usual measly type, the distribution was peculiar. From the middle of the thigh downwards both lower extremities were well peppered with the rash, both on the flexor and extensor aspects, while the only other part of the body attacked was a circular patch 10 inches in diameter, having for its centre the point of injection between the scapulæ.

Albuminuria was observed in 18.7 per cent. of 16 cases exa-

mined. These were all serum cases, and as this is below the average percentage in ordinary cases, the evidence afforded is, so far as it goes, dead against the idea that serum injection causes or increases albuminuria as some have supposed.

Paralysis followed in 8.3 per cent. of 24 non-serum cases, and in 18.0 per cent. of 72 serum cases. In all of them the soft palate was attacked; in some other parts were also affected. In most the primary diphtheritic attack had been severe, and 2 proved fatal, but to this general rule Case 2 was a marked exception. In him the primary attack seemed most trivial; he could scarcely be persuaded that he was ill at all; his eating and sleeping were unimpaired. The only false membrane ever observed were two patches, each as big as a pea, one on either tonsil. Yet, in a month's time, all the usual symptoms of palatal paralysis appeared; walking or standing became impossible, while the movements of arms and hands were much impaired. The knee-jerks were absent, although curiously enough the abdominal and cremasteric reflexes were unusually well marked.

The instrument used for injecting has in all cases been an ordinary aspirating syringe of 3ij capacity. In no case has the whole of the elaborate ritual sometimes prescribed for disinfecting the skin been carried out, but the following precautions were always taken:

First, the injecting needle was boiled, and the syringe filled with phenol (1 in 20) half an hour before use. If dried serum were used the dissolving water was boiled at the same time. (In the earlier cases the syringe was boiled too, but this practice was discarded because of damage to the washers.)

Secondly, the patient's skin was prepared by rubbing with phenol (1 in 40), and immediately after applying a very small amount of pure phenol to the spot selected for injection.

In addition to the destruction of any germ that might be lurking about this had the advantage of slightly anæsthetising the part. A thin scab was commonly formed, which seemed to give rise to little, if any, inconvenience. In no case have I seen abscess or other untoward result from injection unless the previously mentioned rashes be deemed such.

There was generally some complaint of pain during the first twelve hours after injection, and it was more commonly referred to the point of shoulder of same side than to the point of injection.

The effects of the serum not only upon the false membrane but upon the patients generally, were as a rule astonishing. When I began its use some seventeen months ago I had a most healthy scepticism as to its value, and was quite prepared to find it little better than many other much belauded modes of treatment. Experience in its use has made me a grateful enthusiast.

Its effect upon the false membrane seems to depend mainly upon the length of time that membrane has been formed. If recent, it seems to be disintegrated and almost dissolved away. If it has been in existence some days the absence of spread will be the main indication of the effects of the serum. There may be some slight tumefaction at the edges of the false membrane, which may look as if it were curling, but the thick layers take from two to seven days to become completely detached, even then leaving a raw bleeding surface exposed. In recent cases some observable effects upon the false membrane can usually be noticed within six hours, and in only 3 per cent. of the 72 serum cases was any spread observed after the lapse of twelve hours from time of injection. In these, which were among the earlier cases, only a very small initial dose had been given, namely, 200 Behring units. In the majority of cases, including a baby of 13 months, 1,000 Behring units were injected.

As a general rule the temperature rose for a few hours, but was soon followed by profuse perspiration and a considerable drop in the temperature. This was well exemplified in Case 33, where the temperature recorded twelve hours after injection was 105° F., and twenty-four hours later was 99.2° F.

One common result or, at any rate, sequence of injection, especially in children, was a long comfortable sleep.

The mortality in 24 non-serum cases was equal to 12.5 per cent., and in 72 serum cases was equal to 4.16 per cent. Of the fatal non-serum cases No. 14 died of asphyxia just

four and a-half hours after first being seen. His parents declined tracheotomy. This case, apart from the history, might very well have been diagnosed as primarily laryngeal, as no false membrane was visible about any part of the pharynx. There was, however, a history of sore throat during all the previous week, when he had been with diphtheritic children. Case 19 died suddenly of cardiac paralysis. Several days after all false membrane had disappeared. Of the fatal serum cases it is worthy of note that all three had been suffering for from four to six days before medical aid was sought. No. 4 died during tracheotomy from the combined effects of the diphtheritic poison, asphyxia, and chloroform. No. 22 died of asphyxia and exhaustion nine hours after injection. No. 79 died of cardiac paralysis several days after all false membrane had disappeared.

Most of what has gone before has had reference more or less directly to the use of serum in the treatment of diphtheria, and this has been so intentionally, because I have become fully convinced that this is the treatment *par excellence* of the disease. In addition to this the usual hygienic measures were adopted, the details of which it is not necessary to burden you with. All get-atable false membrane was painted with perchloride of mercury and glycerine (1 in 1,300).

It is most important that injection be performed at the earliest possible moment after a definite diagnosis has been made, and it is specially in connection with this point that I believe better results will be obtained in private than in hospital practice. Even in the best organised ambulance service some hours must usually elapse after the diagnosis has been made at home before treatment can be commenced at hospital, and under unfavourable circumstances the time might be longer. This delay in a disease like diphtheria may in some cases prove to be the death warrant. This view is strongly supported by the fact that all but one of the fatal cases had been neglected for several days, and this solitary exception was one of the earlier cases, in which, to my lasting regret, I failed to use the serum treatment. The same truth is further exemplified by the fact that only one death occurred in the last 58 cases—mainly, I think, because the people began to realise the importance of seeking advice early. Moreover, in by far the great majority of cases the disease begins in the tonsils and spreads from these glands to more dangerous regions. Early injection will in most cases prevent this spread. A very considerable proportion of the 51 per cent. in whom the false membrane did not spread beyond the tonsils were those who were living in the same rooms or houses with the fatal or more severe cases, and were consequently seen early—often before the false membrane appeared at all.

The small percentage of laryngeal cases may be similarly accounted for.

One word in reference to immunising injections. It is strongly recommended by some to use them for all members of a household where diphtheria appears. I have never done so, nor have I as yet injected a suspected case of diphtheria before false membrane has appeared. My reasons for not doing so are: (1) That in every case of this series in which the serum was used in a full dose on the first appearance of false membrane, the arrest of disease has been prompt and efficient. (2) Considerable pain is often caused by injection. (3) Although the risk is probably very small, it cannot be said to be absolutely *nil*. (4) It is open to question whether it is prophylactic at all.

The serum used in every case was that prepared by Messrs. Burroughs, Wellcome, and Co., and generally the dried form. The latter variety eighteen months ago had a considerable practical advantage in point of bulk, as a full dose could readily be dissolved in 3ij of water or less, whereas the fluid serum was about 10 c.cm. (3ij). Since, however, the serums have been more highly concentrated this advantage has disappeared.

THE late Mrs. Alicia Ellen Renton has by her will bequeathed £500 to the Hospital for Diseases of the Chest, City Road; £200 to the Consumption Hospital, Brompton; and £100 each to the Hospital for Convalescent Children, Highgate; the Alexandra Hospital for Sick Children, Dyke Road, Brighton; St. John's Hospital, Leicester Square; and the Hospital for Diseases of the Skin, Stamford Street.