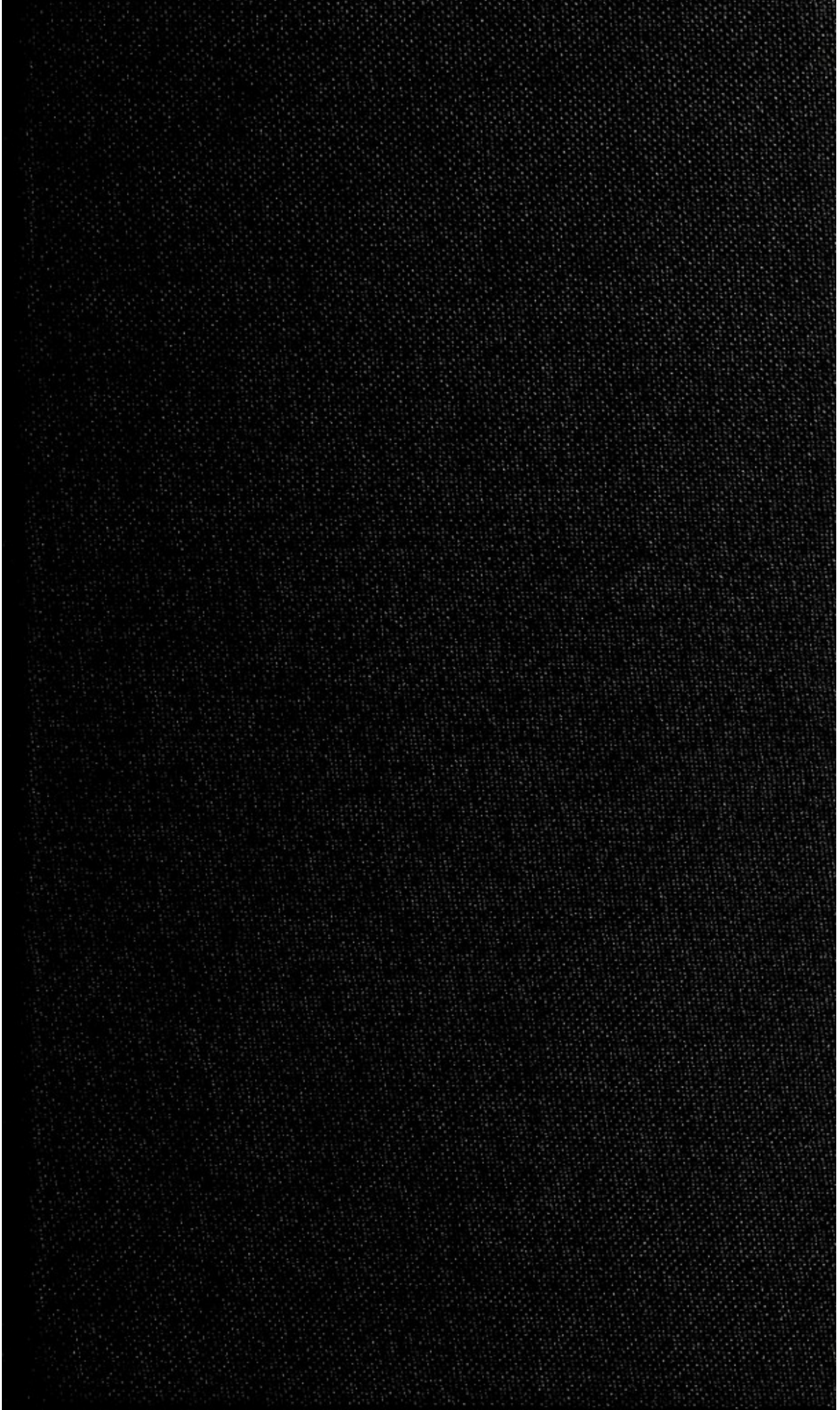
Diphtheria : its symptoms and treatment / by William Jenner.



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William Adams

DIPHTHERIA:

ITS SYMPTOMS AND TREATMENT.

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BY

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PREFACE.

The Two Lectures which form the greater part of this little book, were delivered to the medical clinical class at University College Hospital. Thinking that even an imperfect and incomplete account of the present epidemic of Diphtheria in London, by a practitioner who has seen most of its severer phases, would be acceptable to the profession, I determined to publish my experience. The symptoms of diphtheria, during the present epidemic, agree in all essential particulars with those observed in past epidemics. Indeed my study of the histories of epidemic and other diseases, leads me to the conclusion that diseases preserve their essential characters and natures from age to age, while the opinions of the profession respecting them and their treatment change from year to year. This change seems to be sometimes the result of the personal sway of

some influential teacher—sometimes the result of real advances in pathology and therapeutics.

The Lectures are dogmatical in tone, because they were addressed to students; and I believe dogmatism to be essential for successful student-teaching. I endeavoured to make them practical in regard of diagnosis and treatment, because they were delivered to a clinical class. The details of the cases are few, partly because the majority of the patients were seen in private, and partly because I have found that students are more confused than instructed, when copious details of a case are placed before them.

Since the Lectures were delivered, several other cases of Diphtheria have come under my observation. Some of these having presented special points of interest, or peculiarities illustrating general statements in the Lectures, I have added materially to the text, and slightly modified its arrangement.

8, Harley Street, Cavendish Square,
January, 1861.

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DIPHTHERIA.

LECTURE I.

GENTLEMEN:

On the table are several pieces of "false membrane," coughed up by a young gentleman twenty-one years of age, while suffering from diphtheria; also the pharynx, larynx, and lymphatic glands connected with those parts, from two children who died a few days since from the same disease.

Diphtheria is one of the acute specific diseases; that is to say, it is a general disease, runs a quick and definite course, and has a specific cause. Its anatomical character is—spreading inflammation of the mucous membrane of the pharynx, attended by exudation of lymph.

About three years since, diphtheria became epidemic in London. Since the early part of 1858, I have seen about fifty-eight cases, of which thirty-four have proved fatal.* And these cases

* From these numbers it is not to be concluded that half

have, with few exceptions, been scattered over the district bounded on the south by Holborn and Oxford Street, on the north by the Highgate and Hampstead hills, on the east by Hackney, and on the west by Shepherd's Bush: they may be considered to represent the general characters of the epidemic in its severer forms in the north of London. As several of the cases occurred within the last three weeks, and as they differed in no essential particulars from some of the cases I saw three years ago, I conclude that the epidemic preserves its original characters.

As in the other acute specific diseases, so in diphtheria, the general or the local symptoms may predominate, and give its special feature to the case. The patient may die from the severity of the general disease, or he may die from the severity of some one of its local consequences. In this particular, diphtheria bears a closer affinity to typhoid fever than to any of the other acute specific diseases; for in typhoid fever, as you know, the patient may die of the general affection:

the cases of diphtheria prove fatal, seeing that a very large proportion of the 58 cases came under my observation solely because of their extreme gravity, many of the patients being in a dying state.

i. e., of the fever; or, the symptoms of the general disease being trifling in the extreme, he may die of a local consequence of the fever, *e. g.*, perforation of the bowel. Diphtheria is by no means new to England. I have seen cases of it every now and then, as long as I have practised medicine, and the writings of the older English physicians prove that, from time to time, it has been epidemic, or very common, in many parts of England. You will understand, however, that I am to-day describing diphtheria as it presented itself in the cases from which the preparations on the table and under the microscope were obtained, and from the other cases of the disease which I have seen during the past three years. I have told you that the anatomical character of diphtheria is spreading inflammation of the pharynx, attended by exudation of lymph. It may be that the mucous membrane covering one of the tonsils is the primary seat of the exudation, or it may be that the arches of the palate, the posterior surface of the soft palate, the uvula, the nares, or the mucous membrane of the pharynx itself is the starting-point of the local lesion. At first there is redness and some swelling of the parts, and perhaps a little excess of mucus on them; then a white or grey patch, due

to the presence of a layer of lymph, is seen on the reddened surface. Usually the redness involves the whole mucous membrane within reach of the eye, posterior to, and inclusive of, the anterior arches of the palate, before any lymph is exuded. Sometimes you see at once many little points of lymph: sometimes only one. Thus starting from one or many centres, the exudation spreads anteriorly on to the soft palate, upwards to the posterior nares, and downwards to the upper surface of the epiglottis, and, if not arrested by nature or by art, it descends into the larynx, the trachea, and the bronchi. I have seen, though not during the present epidemic, the lymph extend into the œsophagus and stomach.

Tear off, during life, the lymph from the mucous membrane of the pharynx, and you expose a raw, bleeding surface, which in a few hours is covered by a new layer of lymph.

I have spoken of lymph, but included under the word lymph are a variety of very different looking substances. Sometimes the lymph has a granular appearance and very little consistence or tenacity; sometimes the part is covered with a thinner or thicker coating of a white or grey pulpy substance; so thin, soft, and separated

from each other may be the little particles which together form the coating of lymph, that we cannot apply to it, correctly at least, the term membrane; for no shred of lymph can be stripped from the surface. At other times the layer of lymph is very tough, elastic, and as much as one-eighth of an inch in thickness. In the one case, the lymph resembles cream in appearance and consistence; in the other, it resembles wash-leather. Between the two extremes we meet with all intermediate conditions as regards consistence and tenacity.

Pus, granular corpuscles, oleoprotein granules, and epithelium, constitute the bulk of the softer forms of the so-called lymph; such fibres as we see in the buffy coat of blood coagula constitute the bulk of the toughest varieties of "lymph." Now and then ulceration, and even sloughing, of a superficial layer of the subjacent mucous membrane occurs; and blood and pus, and semi-detached pieces of lymph may form fœtid shreds of some size.

As to the presence of vegetable growths in the diphtheritic exudation, no doubt they have occasionally been seen; but I am sure they have not been present in several cases I have carefully examined; consequently I feel satisfied that

epiphytes have played no essential or important part in the cases of diphtheria I have seen.

At the bed-side, and in this room, I have seized every opportunity of impressing on you the general fact, that when a part is severely or deeply inflamed, the lymphatic glands to which the lymphatics of the inflamed part lead, become the seat of active congestion, and ultimately of inflammatory exudation. In diphtheria we have an illustration of this general law, for the lymphatic glands, to which the lymphatics of the pharynx, &c., lead, are found to be larger, redder, and moister than natural; and, if the disease has continued long, to have that peculiar brittleness, and pale, but brightish red colour, which are characteristic of the presence of inflammatory exudation in the glands. During life we feel the enlarged lymphatic glands behind the angle of the lower jaw on either side, as well as down the neck by the sides of the larynx when that organ is involved in the inflammation. When the discharges from the pharynx are fœtid, and the mucous membrane is sloughy, not only are the glands behind the angles of the jaw enlarged, but the cellular tissue in which they are placed is the seat of effusion of serosity, and even of exudation of lymph, and

very great general swelling of the part is the result.*

After death from diphtheria, too, we find that the inflammation of the pharynx has not been limited to the mucous membrane, or even to it and the submucous tissue, for the deeper parts are thickened and toughened. The contraction of the exudation poured into those parts is sufficient, in many cases, to diminish considerably the capacity of the pharynx, its mucous membrane being thrown, partly from this cause and partly from its own swollen condition, into longitudinal rugæ. Acute pulmonary vesicular emphysema, the result of the obstacle to expiration produced by the imperfect occlusion of the larynx and trachea;

* Trousseau attaches much diagnostic value to the enlargement of the lymphatic glands of the neck in diphtheria. I cannot agree with him on this point. The enlargement of the glands has been—in the cases of diphtheria which I have seen—in proportion to the severity and depth of the local, nasal, pharyngeal, laryngeal, and tracheal disease. I have never seen it greater in proportion to the local primary mischief, than in other forms of cynanche pharyngea. In children generally, the swelling of the glands, other things being equal, is greater than it is in adults; and in strumous children the enlargement is always greater, other things being equal, than it is in ricketty or in healthy children.

collapse of lung tissue from the combined effects of lymph or mucus in the smaller bronchial tubes leading to the collapsed tissue, and of the impediment to deep coughing offered by the state of the larynx; pneumonia, lobar or lobular, primary, or, as is more commonly the case, secondary to collapse of lung tissue; some congestion of the spleen, of the liver, and of the kidneys, induced mechanically by the state of the lungs; and enlargement of lymphatic glands at a distance from and no ways related to the pharynx;—are all the lesions additional to those constituting its anatomical character, which I have found after death from diphtheria during the present epidemic.*

The specimens on the table illustrate much of what I have just told you.

In one (specimen 1) we see the reddened mucous membrane of the pharynx, larynx, trachea, and larger bronchi. On the mucous membrane of the pharynx and larynx is a layer of the granular or pulpy variety of lymph; as we reach the trachea, the lymph gains in consistence, so that,

* I have seen (though not during the last three years) the exudative inflammation spread down the œsophagus and the stomach, and the mucous membrane of those parts, as a consequence, covered with lymph.

towards the middle of the trachea, it can be raised as a distinct membraniform layer; where it can be so raised, its under surface is, here and there, crimson, from a little blood. The uvula is all but *gone* from sloughing, and there is a minute slough on one tonsil. On removing the lymph from the epiglottis, we see a little ulceration of its mucous membrane. The whole tract of mucous membrane covered by lymph is bright crimson and thickened. The microscope shows us that the softest lymph is composed of pus corpuscles—the pyoid corpuscles of Lebert, and other smaller and larger granular corpuscles, epithelium, and oleoprotein granules; and, though we have used re-agents to render the animal matter transparent, no vegetable growths can be detected.

In the second specimen we have a good example of the thick, tough, elastic variety of lymph. In both these cases the local disease extended from the pharynx to the larynx, trachea, and bronchi. If you examine the lungs on the table, you will see that the mucous membrane of the first, second, and third divisions of the bronchi is coated with lymph. The largest piece of the tough lymph (specimen 2) is in the form of a hollow tube, and is evidently a cast of the inside

of the trachea. Extending from some of the larger portions are branches, which appear to have been formed in the bronchi. I have placed a little of this tough variety of lymph under the microscope, and you will note the imperfectly fibrous appearance it presents.

In the third specimen on the table, the lymph coats many even of the very smallest bronchi, as well as the larynx, trachea, and large bronchi. The presence of the lymph and mucus in the smallest bronchial tubes, dependent partly on the state of the larynx and trachea, preventing deep coughing, has led to the collapse of the lung tissue: pneumonia, lobar and lobular, has followed. The child from which this specimen was removed was the subject of rickets. Its trachea was opened during life. You will observe that there is neither collapse nor pneumonia of the lung in the first case; the false membrane, as it is called, does not extend beyond the larger bronchi, and the lungs are the seat of acute vesicular emphysema.

As the lymphatic glands connected with the pharynx and larynx are still attached, you see that they are considerably larger, as well as redder and more brittle, than they should be. In neither specimen are the tonsils much larger than

normal; but all the tissues of the pharynx and soft palate are thickened in the first specimen; while in the third specimen there is a point worthy of your note, of the highest importance, viz..— that, while the larynx, trachea, and bronchi are coated with lymph, there is but a small patch on the pharyngeal mucous membrane; that patch is limited to the posterior wall of the pharynx, and is not in the least degree continuous with the lymph in the larynx. There were here, then, two separate centres of exudation, and the laryngeal exudation occurred for some time before the pharyngeal. The exudative inflammation did not spread from the larynx to the pharynx. The laryngeal symptoms were urgent before the pharynx was in any way affected, and you see most clearly that there is no continuity between the lymph in the larynx and that in the pharynx; that the latter is situated at some distance from the former. In the first case the exudative inflammation began in the pharynx, and spread to the larynx; and we see that the layer of lymph in the pharynx is continuous with that on the larynx, the continuity being well seen on the aryteno-epiglottidean folds. Observe for yourselves the differences in this particular in the two specimens.

The most practical way of making you acquainted with the symptoms of diphtheria, including those which were present in the cases parts of which are before you, will be, I think, to group the cases I have seen, so as to constitute varieties.

First Variety.—*The mild form of diphtheria.*—There are cases in which the general symptoms and the local lesions are trifling, and no sequelæ follow. Of these mild, but unequivocal cases of diphtheria, I have seen only seven; viz., three out-patients at the Hospital for Sick Children, and four cases in private practice.

Here are the particulars of a case of this kind I saw with Dr. Hawkesley.

The patient was six years of age. She had long had chronic enlargement of the tonsils, and suffered occasionally from acute inflammation of the tonsils. In the attack of diphtheria, inflammation of the mucous membrane covering the tonsils and arches of the palate, but very trifling in degree, preceded for some days the exudation of lymph. When the exudation occurred, it was seated between the uvula and the tonsils, on the anterior arches of the palate. In addition to the exudation of lymph, trifling febrile disturbance, the least possible soreness of the throat in swallowing, and

a little more swelling of the glands near to the angle of the jaw that is always present in this child, were all the ailments in the case. Dr. Hawkesley examined the urine daily, but no albumen was present, and no affection of the nervous system followed.*

SECOND VARIETY.—*The inflammatory form of diphtheria.*—Symptoms of severe cynanche pharyngea precede the exudation of lymph in what

* This variety of diphtheria is doubtless more common than my personal experience would lead me to suppose. It is probable, also, that there are many inflamed throats which have their origin, when diphtheria is epidemic, in the diphtheria miasm, whatever that may be, just as many cases of diarrhœa originate in cholera miasm, when that disease is epidemic. And it is as difficult to say in some cases that an inflamed pharynx is not due to mild diphtheria, as it is to say that a serous diarrhœa is not cholera. Of course one or more members of a family having exudation on to the pharyngeal mucous membrane, and others at the same time having merely inflamed throats, would be strong presumptive evidence that the latter had diphtheria without exudation. As when two children of a family have scarlatina with rash, and a third, at the same time, just before, or just after, has sore throat without rash, we consider there is strong presumptive evidence that the latter was a case of scarlatina sine eruptione. In describing diphtheria in these lectures, however, I have drawn my description from those cases only in which exudation has occurred.

may be called the inflammatory form of diphtheria. There is, in this variety of the disease, redness, and swelling of the mucous membrane covering the arches of the palate, the uvula, and the tonsils. The redness is in some cases vivid, in others dusky. The swelling of the uvula is frequently considerable, and it often has, from effusion of serosity into the submucous tissue, a jelly-like transparency and aspect. The pain in the act of swallowing is great, so that occasionally deglutition is, from this cause, almost impossible. The febrile disturbance may be extreme, or moderate; the pulse is frequent, but soon becomes weak; there is considerable sense of weakness and of illness. From twelve to forty-eight hours from the first symptoms of throat affection, a layer, more or less extensive, of tough lymph coats the inflamed surface, and when death follows, it does so from extension of the exudative inflammation to the larynx, trachea, &c.

Let me give you an outline of some of cases of the inflammatory form of diphtheria.

Dr. E. called on me one morning, complaining that he felt extremely ill and weak, and that his throat was very sore. I found his pulse rapid, but not strong; his skin hot. On examining his

throat the arches of the palate and all the parts visible beyond were deep but dusky red and swollen,—the uvula was œdematous, the effort to swallow caused severe pain. In three days all the previously red parts were covered by a thick layer of tough lymph, having the colour and general appearance of wash-leather. The disease did not extend to the larynx, and Dr. E. recovered.

Mr. A., who expectorated the cast of the trachea on the table was a patient of Mr. Pearse, of Tavistock Square. Feeling poorly Mr. A. left home on last Thursday fortnight, for two or three days—on the Monday following Mr. Pearse examined his throat, found it dusky-red, and the uvula to have that peculiar gelatinous aspect which indicates submucous serous effusion. On the next day Mr. Pearse observed patches of lymph on the right tonsil and on the uvula. On Friday, not only was there a layer of lymph covering the uvula, arches of the palate, part of the soft palate, and the pharynx, but, by depressing the tongue, we could see the erect epiglottis covered with the same tough lymph. That the patient's larynx was affected was shown by his husky whispering voice, the necessity he was under of sitting erect in bed, the recession of the

soft parts of the chest walls when he inspired, the lengthened inspiration, the lividity of his lips. the fullness of his eyes, and the venous injection of his conjunctivæ.

His urine was loaded with lithates; it contained a considerable quantity of albumen, and a very few granular casts of tubes. There is a specimen of the urine on the table, and I have placed some of it under the microscope. A large number of crystals of uric acid have formed in it since it was passed. On Saturday night he coughed up the cast of the trachea on the table, with temporary relief to the breathing. Many large pieces of membraniform lymph were coughed and hawked up the next day, but on Sunday afternoon he died somewhat suddenly. His pulse on Friday was 120; on Saturday 130; and on Sunday midday as frequent. Of seven cases I have seen referrible to this variety, three proved fatal; one forty-eight hours from the first symptom, and one (Mr. A.'s) so late as the eleventh day of illness,* and all three by extension of the exudation to the larynx.

The following is a mild case of the inflammatory form of diphtheria:—Eliza R., aged 20, had been

* If the diphtheria began on the Monday, then Mr. A. died on the seventh day of illness, see page 15.

in constant attendance on Dr. E. On March the 13th, 1858, she begun to feel ill, with sense of weakness and general lassitude. Her throat at this time was slightly sore; her skin was hot, her pulse quick, her bowels confined; she was thirsty, without appetite, and had constant nausea. I saw her on the 18th, when there was, in addition to these symptoms, a patch of lymph on the left tonsil which was red and swollen. On the 20th she was admitted into this hospital. On this, the eighth day of illness, her skin was still hot, and her pulse frequent but not particularly weak. There was some swelling and tenderness just outside the angle of the jaw on the left side, the lymphatic glands down each side of the neck were enlarged and tender, deglutition was painful, and the voice was hoarse. The patch of lymph noted on the enlarged left tonsil on the 18th had increased in size; it was removed by a pair of forceps, and a raw, red, bleeding surface was exposed. The arches of the palate were very red; and the tongue was covered with a white fur; there was no albumen in the urine.

When rapidly convalescing from the diphtheria, she had, on the 24th of March, an attack of acute

rheumatism, from which she recovered in little more than a week, and left the hospital well.*

I must add yet one other case of this form of diphtheria, the constitutional disturbance in this case being even less than in Elizabeth R.

Thomas C., aged 33, a night railway-porter, a strong made and generally healthy man, was admitted into this hospital on Sunday, April 4th, 1858.

This man awoke at nine o'clock on the morning of his admission into the hospital (having felt quite well on going to bed a few hours before) with a sensation of "swelling in his throat." The effort to swallow caused intense pain. The surgeon, whom he at once consulted, touched his throat with nitrate of silver. At one o'clock he was seen by my assistant, Dr. Pougnet; the uvula was then so enormously enlarged, "as thick as the little finger," that he could not see into the pharynx.

I saw the man on Monday, *i. e.* the second day of his illness. The uvula was as large as on his admission; its anterior surface was covered with lymph, and when it was raised, on its posterior surface was found a transparent

* In one case several joints were swollen, hot, and tender during the attack. The patient recovered.

whitish layer of lymph which could be peeled off with a pair of forceps. There was a small patch of lymph extending from the uvula on to the soft palate, which was generally of a bright red colour. The pharynx and tonsils were free from lymph. The lymphatic glands at the angles of the lower jaw, and down the neck on each side of the larynx, were larger than natural, and tender. On the next day the uvula was unchanged in appearance, but the arches of the palate were very red, and dotted over with small patches of opaque white lymph. On Wednesday, *i. e.* the fourth day of disease, the uvula had diminished in size, but the exudation on it formed a thick tough layer. There was a small patch of lymph on the right tonsil. The pain in deglutition was still very great.

On the sixth day the man's general state and local lesion had considerably improved; he looked much better.

Up to this time his pulse had ranged from 88 to 96, and on the fourth day it was noted to be full and hard. The temperature ranged from 99° to 100° Fahrenheit, and on the fourth and fifth days the skin was noted to be hot and dry: before and after that it felt cool to the hand.

On the tenth day the man was almost well,

only his uvula was rather redder and larger than natural.

THIRD VARIETY.—*The insidious form of diphtheria.*—In the cases referrible to this head there is no severity in the general symptoms, no marked soreness of throat, no notable swelling of the lymphatic glands, but suddenly and, if the pharynx has not been examined, unexpectedly, laryngeal symptoms supervene, and death rapidly follows from suffocation. If the pharynx be not examined the disease is confounded with primary croup.

A child, aged about six years, living in a villa near the Brecknock Arms, had suffered for some days from slight sore throat, but was not thought to be sufficiently ill to require medical advice, or even to be kept in the house, when the sudden occurrence of "croupy" breathing excited alarm. Mr. Baly, of Kentish Town, was called to the child. He found that the pharynx was covered with lymph, and that the larynx was deeply involved in the disease. About two p.m., within an hour of Mr. Baly's first visit I saw the child with him; the friends declined to allow tracheotomy to be performed; the same afternoon the child died.

Ten days since I saw a similar case a few hours before death, with Mr. Noyce, of Brecknock

Crescent. Several children of the family had just suffered, and recovered without treatment, from sore throat. They had been, in the parents' estimation, worse than was our little patient (æt. 6), when her croupy breathing excited their alarm. The friends declined to allow tracheotomy to be performed, and the child died within forty-eight hours from the supervention of the first laryngeal symptoms.

A child, aged about six years, had suffered for two or three days from sore throat. The surgeon who saw the child before the father left home in the morning assured him that the disease was trifling. On the father's return, late at night, the croupy breathing excited his alarm. I saw the child, with the surgeon, about midnight. There was then rapid pulse, husky whispering voice, shrill respiration, and great dyspnœa. Before seven o'clock in the morning the child was dead.

The infant child, aged eleven months, of a surgeon, had for a day or two slight symptoms of sore throat. The father's fears, although he is an anxious parent and a most intelligent and experienced practitioner, were not excited till between ten and eleven at night when he noticed for the first time laryngeal breathing. The extreme

recession of the softer parts of the chest walls during inspiration proved the impediment to the passage of the air through the larynx. There was a little lymph on the pharyngeal mucous membrane when I saw the child about eleven P.M. Before morning it was dead. These cases will impress on you the importance of examining carefully the pharynx in every case, even the most trifling, of sore throat.

FOURTH VARIETY.—*The nasal form of diphtheria.*—Another set of cases constitute what has been termed the nasal form of diphtheria. After some febrile disturbance of low type, a sanious discharge from the nose attracts attention; then the glands about the angles of the jaw swell; the arches of the palate and the tonsils are found to be red and swollen; muco-purulent fluid bubbles in quantity from the narrow isthmus faucium, and prevents you obtaining a clear view of the pharyngeal mucous membrane. After a few days the disease subsides, and you remain in doubt as to its nature; or it spreads to the larynx, and the diagnosis becomes easy, and death enables you to verify it; or some other member of the family or an attendant sickens with unmistakeable symptoms of diphtheria. Or the disease begins with trifling sanious

discharge from the nares; the lymphatic glands are scarcely at all affected, and the nature of the disease is not even suspected till death is imminent from suffocation; or again, when the exudation reaches the pharynx, the pharyngeal symptoms may be most distressing, and lead to inspection of the part and the detection of the disease.

In November, 1859, I saw, with Dr. Carlill of Berners Street, a very interesting case of nasal diphtheria, remarkable especially for the difficulty of the diagnosis, even at a time when serious symptoms were present. The patient was a girl aged two years. The parents first observed that the child had a little sanious discharge from the nose, and was very decidedly out of health. The discharge from the nose had ceased when I saw the child. There was no enlargement of the lymphatic glands of the neck. The great feature in the case at that time was frequent vomiting. Almost every attempt to swallow was followed by efforts of vomiting, and the forcible ejection of fluids through mouth and nose. As the vomiting seemed sometimes to come on before the fluids could have reached the stomach, the throat was inspected by both Dr. Carlill and myself; nothing wrong in it could, however, be detected. Although

the nature of the case was obscure, the whole group of symptoms present led us to the opinion that they were the consequence of disordered innervation from cerebral disturbance, rather than the result of any throat affection. "Two days," Dr. Carlill wrote me, "after you visited her, I saw a thin pellicle partly covering the velum pendulum palati, and partly detached and hanging down into the mouth. She died the next day, never having been able to swallow more than a small part of what was given her for about six days." The immediate cause of death was the extension of the exudation to the larynx; the child died from suffocation, as in primary croup.

The following case of nasal diphtheria possesses special interest from the chief evidence in favour of the diagnosis being the communication of the disease to another—just the kind of evidence which we consider conclusive in regard of the nature of some obscure cases of scarlet fever.

Master P., aged about two years, suffered some febrile disturbance of low type, and profuse mucopurulent discharge from the nares, and redness and swelling of the velum pendulum palati, uvula, arches of the palate, and tonsils; the posterior wall of the pharynx was not very clearly to be

seen, in consequence of the large quantity of muco-purulent fluid that bubbled in the pharynx. Dr. Carlill, whose patients this little one and his brother, less severely but similarly affected, were, thought the cases were true diphtheria. I had considerable doubt on the point. At any rate, as we could see no lymph, and the larynx was not affected, I hesitated to admit it. Dr. Carlill was in attendance from the 15th to the 28th of March, 1860, and a lotion was injected into the nares and throat by Dr. Carlill daily, from the 15th to the 25th. On two occasions Dr. Carlill remembered distinctly that the child coughed some sputa into his face. On April 2nd, Dr. Carlill was himself attacked by diphtheria.

Had the child whose case I am now about to relate recovered, and had not the child in the next bed suffered within a few days from unquestionable diphtheria, doubts as to the nature of the disease under which it suffered might have been felt.

William W., aged two years and three months, a delicate child, the subject of rickets, was admitted into the Hospital for Sick Children on the 31st of December, 1860, the rash of measles having appeared on that day. The rash came

out full and well; from the first there were abundant sonorous and mucous ronchi audible over the whole chest. On the 3rd of January, that is, the fourth day of the eruption, there was much discharge from the nose, and a little ulceration of the orifice of the nares. His appetite was good, there was no difficulty in swallowing; the skin was very hot.

By ten o'clock the same night a marked change had taken place in the child, and the following notes of its state were made by Mr. Sydney Ringer, the very able Medical Registrar to the Hospital:

"Child prostrate; pulse 160, weak; respirations hurried but not laborious; no lividity of the face or body. Abundant dirty muco-purulent discharge from the right nostril. Fauces, uvula, and tonsils red, and very much swollen, and covered with thick tenacious mucus. No exudation can be seen, but then the thick mucus in the pharynx prevents a perfect inspection of the parts." At nine A.M. the fifth day of eruption, the child was weaker, but could still swallow solids and fluids, and apparently without difficulty. The eruption was well out.

About one P.M. the nurse raised the child's

head, in order to give it some food—it fell back and died without a struggle.

The body was examined the next day. The lungs were the seat of extensive acute emphyema, and of a little collapse. The lymphatic glands along the trachea were not enlarged; those behind the angles of the lower jaw were only just perceptible to touch before the integuments over them were divided. The whole substance of the *velum pendulum palati* and uvula was considerably thickened and toughened. The cavity of the pharynx was smaller than natural, the mucous and sub-mucous tissues thickened; the mucous membrane was bright red, and elevated into rugæ. Here and there, on the surface of the mucous membrane at the upper part of the pharynx in the vicinity of the posterior nares was a little lymph, granular in form, very soft, and easily removed by scraping with the knife, nowhere forming a continuous layer. The *aryteno-epiglottidean* folds were greatly thickened, the epiglottis also decidedly but less thickened. The mucous membrane of the larynx was less smooth and polished, and at the same time redder than it should be, and the *chordæ vocales* were more spongy looking than natural. The

abnormities of the larynx were all insignificant in degree—perhaps such as are often present in measles. The lesions of the upper part of the pharynx were decided, although still trifling; they were the result of nasal diphtheria complicating the measles. The child probably died at so early a period of the diphtheria, in consequence of the weakness resulting from the severe attack of measles under which it was suffering at the time the diphtheria supervened, and its natural delicacy of constitution (it was not only ricketty but also tubercular). The cause of death was asthenia.

As if to prove to us the nature of this case, the child in the next bed sickened with well-marked diphtheria within twelve hours of William W.'s death. In twenty-four hours from the first symptoms of illness, its trachea was opened by Mr. Berkley Hill, death by suffocation being imminent. I shall describe this case at some length in my next lecture when speaking of the value of tracheotomy.

Fifth Variety.—*The primary laryngeal form of diphtheria.*—I have seen three cases in which the exudation seemed without doubt to occur first in the larynx, the pharynx being subsequently affected. We may call this—primary laryngeal

diphtheria. In one of these cases the patient was a medical man, about forty-five years of age. The disease began with pain in deglutition, and redness and swelling of the mucous membrane of the pharynx, arches of the palate, uvula, and soft palate. Laryngeal symptoms rapidly supervened; then a little lymph was seen on the arches of the palate, the exudation being more abundant at the base of the arch than above, and equal on the two sides; it looked as if it had spread upwards from the larynx. The patient would have died from apnœa had not the larynx been opened on the third day of illness. During the second week of illness, he almost died from asthenia.

Another case was that of the child whose pharynx, larynx, trachea, &c., are on the table (Specimen 3). I described the parts to you early in the lecture.

In all the varieties of diphtheria I have described, the disease when fatal proved so in consequence of exudative inflammation affecting the larynx. The patient dies in such case from the impediment to the entrance of the air into the lungs. In the variety of which I am now about to speak the patient, when the disease proves fatal, dies from the general disease.

Sixth Variety. — *The asthenic form of diph-*

theria.—In this form the disease begins sometimes with general and local symptoms of moderate severity. Soon, however, the pulse is rapid and feeble; the sense of weakness and of illness extreme; the skin is not very hot, but there is a peculiar feverish pungency in its heat as appreciated by the touch; the complexion has that dirty-looking, pallid, and opaque aspect which we see in so many general diseases. In some cases, from an early period of the disease, the brown tongue, the sordes on the teeth, &c., and the muttering delirium which are characteristic of the so-called typhoid condition, are present. On examining the throat, more or less lymph is seen on the pharyngeal mucous membrane. The lymph in these cases has always, in my experience, been of the granular, pulpy, or softer form. The patient may swallow with perfect facility and the throat symptoms be trivial in degree, and this even when the pharyngeal mucous membrane is covered with lymph. In other cases the pain in deglutition is extreme. The extension of the exudative inflammation to the larynx, when it occurs, is shown by a little huskiness and want of power in the voice, and imperfectly marked laryngeal breathing. The patient usually dies in about ten

or twelve days, death being the result not of apnœa, but of asthenia. It is failure of the heart's action and not want of breath that causes death.

I saw a case referrible to this head with Dr. Turle, of St. John's Wood. The patient, a little girl aged eight years, lived at the extreme verge of London in that direction. She had been poorly for a few days when seen by Dr. Turle. The friends said there was only slight sore throat and weakness.

Dr. Turle noted, on the 6th of October, 1859, "skin not only hot, but feverishly pungent, slightly furred tongue, some enlargement of the glands behind the angles of the jaw, and all the parts of the pharynx visible to the eye covered with lymph." On the 12th the urine contained a good deal of albumen. On the 15th I saw the patient; there was then evidence of extension to the larynx, but the laryngeal symptoms were not at all urgent. On the 18th death occurred, as Dr. Turle says in his notes of the case, "from exhaustion, and not from asphyxia."

The following case is remarkable for the rapidity with which the disease ran its course, the early delirium, and the severity of the general symptoms. Although the larynx was severely

affected, it was manifest that its lesion played but a small part in causing death. Had the general derangement been less, no doubt the affection of the larynx would soon, however, have formed a prominent feature in the case, and even have led to a fatal termination in another twenty-four hours.

Henry M., aged 17 years, was in good health on Friday night, February 12, 1858. He had spent the evening in society, and sung a good deal. The next morning he had sore throat and difficulty in swallowing; slight cough; he vomited, and felt cold and shivered. By noon he was unable to swallow; at night his breathing became difficult, his breath offensive, and he was delirious. On the 14th he was still unable to swallow, could not get out of bed without assistance, and was delirious. At two P.M. on the 14th, he was carried to my ward in this hospital.

Soon after his admission, Dr. Pougnet found him in a very prostrate condition, lying on his back, and muttering deliriously. He could not be made to answer questions, or to protrude his tongue; and as he resisted all attempts to open his mouth, the state of his pharynx could not be seen. But as there was swelling about the angles and under the rami of

the jaw and down the neck, the breath had a gangrenous odour, and there was profuse discharge of yellowish offensive fluid from the mouth, and no rash on the skin, and as he had not been exposed to the scarlet fever poison, the diagnosis of diphtheria, although not absolute, was highly probable. His face was puffy, his lips blue, his pulse frequent, small, and weak. He died the same night; thirty-six hours only from the first symptoms of disease.

After death the mucous membrane of the pharynx was found dark crimson grey in colour, and covered over its greater extent by a layer of the granular variety of lymph. The capacity of the pharynx was less than natural, in consequence of œdematous thickening of the submucous tissue and corrugation of the mucous membrane. The *velum pendulum palati* was greatly thickened, and the posterior surface of the uvula was covered with lymph.

The upper and under surfaces of the epiglottis, the aryteno-epiglottidean folds, and the mucous membrane covering the larynx above and below the vocal cords, the trachea, and the first division of the bronchi were covered by the soft form of lymph. The lungs were the seat of acute emphysema.

In a case I saw with Dr. Part, of Camden Road Villas, the young lady, about 18 years of age, exhibited no laryngeal symptoms. When Dr. Part first saw her on December 17, 1858, there was very trifling sore throat, with little or no constitutional disorder. The febrile disturbance throughout was extremely trifling, and although the mucous membrane of the pharynx was soon covered with a creamy-looking layer of lymph, the patient swallowed both liquids and solids without difficulty. The pulse was from the first very rapid and weak. At our last visit, on the afternoon of the 26th December, Dr. Part and myself were accompanied by a surgeon who had seen little of the disease in this epidemic. The patient had eaten some chicken for dinner; she sat up in bed, and, though very anxious about her own state,* laughed, and talked to us without difficulty.

Dr. Part and I agreed that she had not many hours to live, so rapid and so feeble was her pulse, notwithstanding the quantity of support she was taking. The surgeon, who had not felt her pulse, and judged alone from her aspect and voice, said, "I should have had no idea she was in great

* Her sister had died just before of diphtheria.

danger." In twelve hours she was dead. The illness in this case lasted ten days.

There is yet another set of cases in which death appears to result from the evils consequent on the absorption of fœtid matters from the pharyngeal tissues. The pharynx is covered with lymph, the mucous membrane below sloughs, the breath is very offensive, the glands about the angles of the jaw swell extremely, the cellular tissue in which they are imbedded is the seat of the effusion of serosity, the skin assumes that dirty-yellowish tint which it has in septicæmia, the mind wanders, and the patient rapidly sinks.

I trust you will not fail to understand that although I have described to you several varieties of diphtheria, there is no sharp line of distinction between them, any more than there is any sharply-defined line of demarcation between scarlatina simplex, scarlatina anginosa, and scarlatina maligna. You may say this is a case of inflammatory diphtheria, and this of nasal diphtheria, and this of asthenic diphtheria; but you will meet with all intermediate shades of the disease; cases which you cannot refer with certainty to one or the other variety. So we meet constantly with cases of scarlet fever which can-

not be referred to either variety, but which combine in themselves the essential characters of two. The acute specific diseases are really different one from the other. Each variety of each acute specific disease passes insensibly into the other varieties of the same disease; and these several varieties of each exhibit the most protean combinations. Still, for those who desire to draw a picture of these diseases for others' use, the division of each acute specific disease into varieties is a necessity, however artificial and imperfectly defined the varieties may be.

The duration of the cases of diphtheria I have seen has varied from forty-eight hours to fourteen days. When fatal within a week from the first symptoms of illness, death has always been preceded by extension of the exudative inflammation to the larynx. I have never known laryngeal symptoms commence after the expiration of the first week of the disease. As I have pointed out to you, laryngeal symptoms are sometimes present from the outset; at least they are now and then the first symptoms to attract the attention of the patient and his friends. I have twice seen death occur within twelve hours from the time the laryngeal symptoms were first noticed, and I have

never known death delayed more than five days from the time when symptoms indicated clearly that exudation had occurred in the larynx. In rather more than half of the fatal cases of diphtheria I have seen, death resulted directly from the disease of the larynx; and in rather more than half of the remainder, laryngeal disease was present, although death resulted apparently from asthenia. When death has occurred from asthenia the fatal result has usually taken place during the second week of the disease, unless the patient has been greatly weakened by previous disease; thus, I have just seen diphtheria occur in a girl aged ten years, who had long suffered from hip disease with profuse fœtid discharge, &c. She died from asthenia with rapid feeble pulse on the 5th day of the disease. In the very remarkable case of Henry M., aged seventeen years, you will remember the disease terminated from the severity of the general affection in thirty-six hours after the occurrence of the first symptoms of illness.

The specific disease in the not-fatal cases I have seen has terminated between the eighth and fourteenth day of illness.

NOTE.—An examination of the cases recorded in Bretonneau's Memoirs on Diphtheria, fully confirms the conclusions

I have arrived at from my own experience, as to the proportion of fatal cases in which the larynx suffers so as to lead to death; as to the period of the disease at which the larynx becomes affected; and as to the duration of the fatal cases when death occurs from laryngeal complication. Thus, in Bretonneau's 1st, 2nd, and 4th Memoirs, are contained the details of forty-five cases; of these, four are wanting in data, or have no bearing on this subject. In twenty-nine of the remaining forty-one cases, the larynx was the seat of disease, and three only of the twenty-nine ended in recovery.

Of the twenty-six cases—fatal from the laryngeal complication—one terminated on the second day of illness, one survived till the sixteenth day of illness—tracheotomy having prevented death on the fourteenth day. In no case did the patient survive the sixth day of the laryngeal symptoms unless an operation retarded death, and in five only of the twenty-six cases did the patient survive the third day of the laryngeal symptoms.

In all of the twenty-nine cases, excepting one, the laryngeal symptoms supervened before the end of the first week, and in sixteen of the twenty-nine cases on or before the third of illness.

The emphysema of the lungs seen after death from diphtheria, is that which is so commonly found in young children. It is a mere over-distention of healthy air vesicles. Gluge terms it Insufflation. We can produce it by inflating the lungs after their removal from the body; or, by compressing one part of a lung, we can drive enough air to other parts to over-distend their air vesicles, and so produce a condition identical with acute vesicular emphysema. As there is no damage to the texture of the lungs in this form of pulmonary emphysema, the air vesicles recover their

normal size when the over-distending force is removed. Bretonneau describes a case of diphtheria in which, not only were the air passage and the air vesicles over-distended, but one or more gave way, and air was found extravasated into the subcutaneous tissue. Trousseau has recorded a similar case. The latter distinguished pathologist attributes the subcutaneous emphysema to violent inspiratory efforts. This is manifestly an incorrect explanation of the facts. There is no power brought into play during inspiration to draw the air into the subcutaneous tissue. It is during the expiratory efforts that the air, unable to escape freely through the larynx, is driven with such force into the least compressed and least supported parts of the air passages and vesicles as to overdistend them, to rupture them, and to inject the air into the cellular tissue. The same accident, as is well known, sometimes happens, from the same cause, during the violent efforts of parturient women. Doubtless the extreme inflation of the lungs when false membrane exists in the larynx and trachea, is partly the result of accumulation of air in them; the false membrane acting, as Bretonneau says, as a valve, permits air to enter but none to escape.

LECTURE II.

GENTLEMEN,

In a certain proportion of cases after the termination of the diphtheria, symptoms of a very remarkable kind occur, referrible to deranged innervation. There can be no doubt that the latter are the consequence of the former—that the patient would not be suffering from the nervous symptoms if he had not just had diphtheria.

I will briefly describe the various kinds of deranged innervation consequent on diphtheria, which have fallen under my observation during the present epidemic. I mentioned, you will remember, in my last lecture, the case of Dr. E., who suffered from the active inflammatory form of diphtheria, accompanied by the exudation of wash-leather-like lymph. On recovering from the diphtheria, he was annoyed to find that his voice was singularly snuffling—he talked through his nose, as it is called. He was troubled very

soon after by occasional irregular action of the pharyngeal muscles causing fluids to return through the nose, there was also now and then while swallowing solids a choking sensation, accompanied by violent irregular action of the pharyngeal muscles.

This condition of voice and of impaired power of deglutition continued for several weeks; gradually, however, the voice regained its normal quality, and the pharyngeal muscles their healthy action.

This is the most common form in which derangement of the nervous system shows itself after diphtheria. Trousseau has shown, that in these cases there is loss of sensibility in the *velum pendulum palati.*

The organ which next in frequency to the pharynx gives evidence of disordered innervation is the heart. Treasure this case in your mind; it is an instructive one:

In July last, I twice saw with Mr. Adams, of Harrington Square, a young gentleman about ten years of age. There was nothing to excite alarm in one less aware than Mr. Adams of the grave nature of even mild cases of diphtheria. The local and general symptoms were very

slight. The exudation on the pharyngeal mucous membrane was limited in extent; deglutition was easy; the general symptoms were, with the exception of a feeble pulse, trifling. The local disease quickly improved. On one day only was there even a trace of albumen in the urine, and even on that day, so small was the quantity that its very presence was not beyond doubt. The intellect was unaffected throughout.

The boy was considered by his friends convalescent, when vomiting occurred—still there was nothing to alarm the bystander. But Mr. Adams, at his visit, found the heart's beats, which had been falling in frequency for two days, thirty-six in the minute, and at the same time weak. He at once appreciated the gravity of the boy's situation. When I met Mr. Adams an hour after, the lad's countenance was not indicative of any very serious affection; it spoke only of a sense of languor; vomiting was said to be frequent, but the tongue was scarcely furred; the mucous membrane of the throat looked healthy; there was no albumen in the urine; the air entered freely to the bases of both lungs (we could not of course sit the boy upright, but we turned him on to his side); the heart's beats were

rather feeble, the first and second sounds free from murmur, and of normal duration ; the period of rest—the long silence—was longer than it should be, that is to say, the heart's beats were infrequent, not slow.

The infrequency and the feebleness of the heart's beats and the vomiting alone told that the boy's life was in danger. The next morning Mr. Adams informed me the pulse, notwithstanding the freest use of stimulants, had fallen to thirty-two, in the afternoon it was twenty-four only, and soon after he died apparently from cessation of the heart's action.

The return of fluids through the nose, the fall in the frequency of the pulse, and the vomiting, sometimes occur before the local and general symptoms have subsided. Thus, in one of the two fatal cases I saw with Mr. Jay, in July, 1858 : some days before the little girl's death, which occurred a fortnight after the first symptoms, Mr. Jay noted that there was stertorous breathing, diminution in temperature, relaxation of the skin with free perspiration, return of fluids through the nose, with so great a fall in the frequency of the pulse, that for some time before death, there were not more than sixteen beats of the heart in

the minute. The heart's sounds were natural. At no time was there any notable quantity of albumen in the urine.

That a fall in the frequency of the heart's beats before death is not constant, is proved by the case of the child whose pharynx, larynx, &c., are on the table. Its pulse, five minutes before it breathed its last, while it was yet conscious, was 140 in the minute.

There are again a class of cases in which the nervous symptoms are far more striking, the paralysis more widely spread, not limited, as in the cases I have hitherto mentioned, to parts to which the par vagum is distributed. Here is the brief outline of a family group of cases of diphtheria, some of which I saw with Mr. Adams.

On the 26th January, 1859, Master Cl., aged three years and six months, died of diphtheria, having been ill thirteen days. Two days before his death, his sister, aged eight years, sickened with the same disease; in her case the local lesion was not grave, and was confined to the pharynx; and the general symptoms were of moderate severity. At one time there was a little albumen in her urine. I saw her on the 31st of January, and for the last time on the 9th of February,

when she was considered convalescent, though weak. Mr. Adams informed me, that instead of gaining she lost power. She was removed to the country on the 23rd, but grew less and less able to support herself, and died, so far as Mr. Adams and I could gather, from general loss of nervous power on the 4th of March. The day before her death, she had been taken out of doors.

On the 1st of March, another boy of the same family, aged five-and-a-half years, began to suffer with his throat; he died on the 6th of March from extension of the exudative inflammation to the larynx. This boy was attacked, and died in the country, where he had been sent with his elder sister on the 31st of January.

Miss Cl., aged twelve years, the eldest of the same family, sickened from diphtheria, on the 8th of February, while with her brother in the country. She was considered to be convalescent on the 22nd, and returned to London March 7th. At this date her parents thought her quite well. She gradually, however, fell into the state in which I saw her on the 17th of March; at that time she looked in tolerable health; there was no emaciation, and only moderate pallor of the skin and mucous membranes. To walk, however, a

step, she required the aid of two persons. She had very little power in her lower extremities, and still less control over their movements. There was some loss of power in the hands and arms, so that she could not cut her food.

Solids were swallowed without difficulty, but fluids frequently returned through the nose. It was manifest that she exercised very little control over the muscles of the pharynx. Her mind was perfect, her tongue clean, her appetite good; she was taking most nourishing diet; there seemed to be no derangement of the digestive organs. I saw her again on the 23rd,—there was no improvement; and Mr. Adams informs me that she became more and more powerless, and died shortly after her visit to me on the 23rd.

The following interesting case I saw with Mr. Sillifant, of Thornhill Square, last September. Master S., aged one year and ten months, began to suffer from diphtheria on August 16th, 1860 (his brother having died shortly before of the same disease). In three weeks the child had recovered, ran about, resumed its usual habits, and seemed well.

On the 16th of September, his mother noticed that he staggered in walking. Paralysis gradually increased, until he was in the state I saw him

with Mr. S. on September 26th. I then noted:—"He is very pale, anæmic-looking, thin, muscles small and flabby; but he is not emaciated to any extreme degree. He is intelligent, and eats and sleeps well. There is no evidence of paralysis of any of the muscles of the face, tongue, or eyes. When in his mother's arms, his head falls on one side,—backward or forward, according to the position in which he is accidentally placed. When he sits, there is posterior and lateral curvature of the spine, such as occurs from want of muscular power, *e. g.*, in rickets. The arms can be moved at pleasure, though their movements are performed slowly and languidly. The legs are almost powerless; he is quite unable to stand, but when sitting in a chair, supported by pillows, he can move his legs a little. His voice is weak. The respiratory movements are performed feebly. He swallows without difficulty. Fluids do not return through the nose. His pulse is weak—seventy-eight in the minute. There are no evidences of rickets, albuminoid disease, or tubercle. Mr. Sillifant had tested the urine,—it was free from albumen."

Mr. Sillifant informed me that the child lived only two days after I took these notes.

"He grew weaker each day; and while sitting propped up in his chair taking some nourishment, he suddenly fell back, apparently in a fainting condition, and died."

He lived thirteen days only from the supervention of the first noted symptoms of deranged innervation.

For an opportunity of seeing the following case I am indebted to Dr. Baly, who kindly sent the patient to me, knowing I was interested in the subject. It affords an example of another form of deranged innervation.

Mr. M., aged 22, a medical student, had an attack of diphtheria while staying in Bedfordshire. The exudation of lymph was limited to the pharynx. The disease began on the 12th of January, 1860. He was ill three weeks. At the end of the illness part of the fluids attempted to be swallowed returned through the nose.

He recovered; was in health for a fortnight; then he had recurrence of the sore throat, and fluids again returned through the nose, and his voice was snuffling. To relieve these symptoms, part of his uvula was removed, and he thought with benefit to his powers of deglutition and voice. Loss of vision of the right eye followed,

and he fancied the eye was more prominent than the other : he regained his sight while taking quinine. As the power of vision returned, he began to suffer from tingling and a slight want of power in the feet, the right foot being first affected. I saw Mr. M. first on the 1st of May ; the upper extremities below the elbows were then chiefly affected. He had a difficulty in cutting his food, and experienced a constant tingling in the hands, and a sensation as if something were placed between the fingers and the objects they touched.

There was no albumen in his urine ; no manifest derangement of his circulatory or digestive organs. He was strong and healthy-looking, only he had, perhaps, a little less colour in his mucous membranes than he should have had.

This gentleman, Dr. Baly informs me, regained his health after some months.

The symptoms of disordered innervation have commenced in the cases I have seen within three weeks from the date of convalescence. Where the disorder has been limited to the parts supplied by the branches of the par vagum, it has supervened earlier than when it has been more generally diffused. The longest period after the first symptoms of diphtheria at which I have

known death occur from disordered innervation is about two months.

Before considering the pathology of the disease —its nature, as it is called—there are some points connected with its etiology and progress which the cases I have seen have strongly impressed on my mind.

1st. That the disease is infectious.

2nd. That the infection-element does not require for its development any of the ordinarily considered anti-hygienic conditions.

3rd. That it is very doubtful even if any of those anti-hygienic conditions favour its development, or give to it a more untoward course when it occurs.

4th. That family constitution is one of the most important elements favouring the development of the disease, and determining its progress.

1st. Dr. E. lived in Euston Road. He was attending a child ill from diphtheria, when he sickened with the same disease. As he recovered, his attendant was attacked with it, and admitted into ward 3. No one in his house, although there were other inmates, suffered, excepting Dr. E. and the young woman who was in constant attendance on him. The child from

whom Dr. E. appeared to have caught the disease resided some distance from Euston Road.

Mr. B.'s infant had diphtheria; three of the other five children and the nurse who held the infant in her arms the greater part of the time it was ill took the disease. The nurse was the only adult in the house who suffered.

Miss C. had diphtheria. She went to the country a fortnight after the commencement of her attack, and within a fortnight after her arrival, her brother, some time resident in the country, had an attack.

Miss and Master B. visited at a house where a child was ill from some disease of the throat, of which she died shortly after. Miss and Master B. sickened with diphtheria a few days after their visit.

A boy, aged about five years, was sent from home in consequence of two members of his family having diphtheria; shortly after a third suffered from the same disease. Two of the three who had diphtheria recovered; they were sent to the country, but to a residence some miles distant from that of the little boy. Three weeks from the time the boy left his home, he was allowed to go to the house to which his sisters had been removed on their recovery, and where

they were still staying. Ten days after his arrival there, the boy sickened with diphtheria. In this case either the poison was in the child's system when he left London, and remained latent for a month, a supposition highly improbable, or he caught the disease from his sisters after they met in the country.*

2nd. Of the cases of diphtheria I have seen the last three years, twelve only occurred in hospital practice. Now of all other diseases I have seen many more in hospital practice than in private practice. And, speaking generally, it may be said that people who seek medical assistance at an hospital are placed in much more unfavorable hygienic conditions than are private patients. These facts are strong evidence in favour of the opinion that the ordinarily reckoned anti-hygienic conditions are not especially favourable to the development of diphtheria.

3rd. As to the influence of these conditions unfavourable to health in inducing a fatal termination. Of my hospital patients, half died; of my private cases, rather more than half. With reference, however, to this point, I should observe that as the large majority of the cases I have seen in

* See also the cases of Wm. W. and G. O., pages 25 and 82.

private houses have been in consultation, they indicate a greater mortality than the average in the rank of life in which they occurred, a second opinion being sought usually because the case is severe.

4th. As in all the other acute specific diseases, the influence of family constitution in favouring the occurrence of the disease, and in disposing to a fatal termination, is very remarkable. You attend a case of typhoid fever, the patient dies; other members of the family sicken, your anxiety for them should be the greater because one of the family has already succumbed. For we often meet with families who have lost several members from typhoid fever, or from scarlet fever, from hooping-cough or from measles, and that not only during the same epidemic and in the same locality, but at long intervals and at far-off places. There seems to exist in some families, though to appearance healthy, an inability to resist the injurious influences of certain specific poisons. This influence of family constitution in favouring the occurrence and determining the ending of diphtheria has, I think, been manifested during the present epidemic.

Thus I have seen one or more of four cases in one family of four children, of which two proved fatal;

of two in another family of three children, both fatal;
of two cases in another family of small size, both fatal;
of five cases in a family of six children, one fatal;
of four cases in a family of six children, all fatal;
of two cases in a family of small size, both fatal;
of two cases in a family of (I think) five children, both fatal;
of two cases in a family of (I think) four children, one fatal;
of two cases, an uncle and nephew, one year between, and in different localities, both fatal;
of two cases in a small family, both fatal;
of two cases in a family of six children, both fatal.

In all these cases the hygienic conditions were good; there was nothing patently bad in regard of drainage, ventilation, overcrowding, water supply, food, or work. All the patients were in the middle rank of life, and resided in good-sized houses, and in fairly open situations.

These facts, of course, speak strongly in favour of contagion, as well as in favour of the influence of family constitution.

As to the pathology of diphtheria; the want of

relation in severity between the local and general symptoms, the differences in the characters of the general symptoms, the albumen in the urine,* the definite course, the nervous symptoms which follow in some cases, the specific origin, and the frequency with which it occurs as an epidemic, all point to the same conclusion, viz., that diphtheria is primarily a general disease. On the more intimate nature of the disease, my cases throw no light, they afford no clue to its blood or nerve origin.

Diphtheria has been supposed to be modified scarlet fever, but the fact that it attacks indiscriminately those who have and those who have not had, proves that it is altogether a different, though it may still be a closely-allied disease.

The child I saw with Dr. Turle, at St. John's Wood, as well as his sister, subsequently attended by him, had both suffered from scarlet fever two years and a half before.

Of five children in one family at Kentish Town, who were attacked by diphtheria, I had

* For a knowledge of the highly important fact that albumen is present in the urine of the great majority of fatal cases of diphtheria, we are indebted to Dr. Wade of Birmingham.

attended three a year before, when they were suffering from scarlet fever. A child I saw, a few hours before it died from diphtheria, with Mr. Baly, had been attended nine weeks before by that surgeon for scarlet fever. A second child in the same family, who had had scarlet fever at the same time, sickened from diphtheria a few days after the first died.

Diphtheritic inflammation of the pharynx sometimes complicates scarlet fever. I have seen two well-marked cases of this during the present epidemic. One of the patients was a child whose sister, shortly after, was under my care for scarlet fever without the diphtheritic inflammation of the throat—the other was a man aged 22, a patient in the Hospital. In neither case was the throat affection very severe ; both ended favourably.

The diagnosis of the scarlet fever rested in both cases on the presence of rash ; desquamation followed in both.

Are diphtheria and croup essentially the same disease? I think not; because there is no evidence to show that croup is anything more than a local disease, that it is contagious—that it occurs as a wide spread epidemic—that it affects

a large proportion of adults—that there is albumen in the urine—that symptoms of disordered innervation follow recovery from the primary affection. We must not confound diphtheritic exudations with diphtheria, any more than we must confound the acute specific disease erysipelas, such as the physician sees, with erysipelatous inflammation of the skin so common in the surgical wards.

A girl named O'Brien, five years of age, was lately an in-patient at the Hospital for sick children. She was suffering from severe chronic pemphigus. She had been in the hospital several weeks, when a large excoriated surface on the side of her chest was noticed to be covered with a thick layer of the wash-leather-like variety of diphtheritic exudation; in a day or two little patches appeared on the conjunctivæ. The child died suddenly and unexpectedly the day after the conjunctivæ were observed to be affected. The parents were Irish, and no examination of the body could be obtained; there were no pharyngeal or laryngeal symptoms. In scarlet fever it is not uncommon to have a little diphtheritic exudation on the tonsil and arches of the palate and pharynx; and I have seen it extend to the

larynx. In my first lecture are the details of a case of diphtheria supervening towards the decline of measles.

There were lately in the hospital two cases of ulcer of the leg, when several cases of diphtheria were admitted. The ulcers became covered with diphtheritic exudations. No severe constitutional disturbance accompanied the exudation, and local remedies (nitrate of silver) sufficed for the cure.

Of the pathology of the disordered innervation we know but little. In some of the cases it is probable that the par vagum is chiefly affected. This is shown by the irregular action of the pharyngeal muscles, by the vomiting, and by the failure in the heart's action. I need only mention Weber's experiments, to recall to your minds the influence that nerve exerts on the frequency of the heart's beats. Let the par vagum be exposed and divided in the neck, and then the poles of a galvanic battery be applied to the cut extremity of its distal portion, the heart's action is instantly arrested; remove the wires from the nerve, and the beating of the heart is resumed; re-apply the wires, and the action of the organ ceases; and so, for some time, you can at plea-

sure stay and set going again the action of the heart.

The only other acute specific disease in which I have noted such fall in the frequency of the heart's beats is relapsing fever. In that disease, however, the singularly infrequent beating of the heart, which follows the profuse critical perspiration, indicates the return of health; in diphtheria it tells of approaching dissolution, and that even when the mind is clear and the senses acute.

Diagnosis.—You will have gathered from all I have told you, that the absolute diagnosis of diphtheria in any given case must rest on the detection by the eye of lymph on the mucous membrane of the pharynx. But you may often suspect that the disease is diphtheria before the exudation occurs; and sometimes may be almost certain that it is so; just as in measles or scarlet fever, you may venture on a diagnosis before the anatomical character of those diseases, *i. e.* the eruption, has appeared.

Thus, when diphtheria is epidemic or prevalent in the neighbourhood, or has recently occurred in the same house, and the whole mucous membrane of the pharynx is red and swollen, the uvula thickened, and the parts covered with

tough mucus, and the glands behind the angles of the jaw enlarged, you would have strong reasons for apprehending the disease to be diphtheria, and especially so if there was epistaxis or sero-purulent discharge from the nose. Bleeding from the nose is occasionally an early symptom of diphtheria. The general aspect of the patient in some cases, adds weight to the local evidence. For in a few cases of diphtheria, the skin has a dirty opaque appearance, and in many a pallid pasty aspect, very peculiar, though by no means diagnostic. If the patient has had scarlet fever, or if the papillæ of the tongue be neither enlarged nor redder than natural, the probability is still higher that the case is one of diphtheria. When the inflammation has spread to the larynx, all doubt ceases in regard of diagnosis.

French writers describe an herpetic eruption on the mucous membrane of the pharynx, which may be mistaken, they say, for diphtheria. It is commonly associated with herpes of the lip; and, as a rule, is much more painful than diphtheria, the pain being limited to a single spot in the pharynx. Several cases of this kind have fallen under my observation; in none has there been any great difficulty in separating them from cases of diphtheria.

Prognosis.—No case of diphtheria is unattended by danger. However mild the case may seem at the commencement, death may end it. Never be off your guard.

During the first week of the disease, the great danger to life is from the extension of exudative inflammation to the larynx. If it does reach the larynx, death is the result in a vast proportion of cases. There cannot be in diphtheria the least laryngeal quality in the respiration heard at the bedside, without there being grounds for the greatest anxiety as to the final result. Suppose the first week of illness to have passed without the inflammation extending to the larynx, then death is to be apprehended from exhaustion and loss of nervous energy; and I beg you to bear in mind that death from these causes may follow even when the pharyngeal inflammation and exudation has been trifling in degree and extent.

An extremely rapid and feeble pulse is of grave import; a very infrequent pulse is of fatal significance. Vomiting is another unfavourable symptom, especially if repeated many days in succession. Bleeding from the nose and other organs not only weaken the patient, but are indi-

cations of profound blood change; if profuse, the patient's life is in great jeopardy.

Even a trace of albumen in the urine is an unfavourable symptom; when very abundant, a fatal termination of the case is most probable. The albuminous urine probably indicates rather an abnormal state of the blood than disease of the kidney. At least, after death, I have never seen more than congestion of the kidneys. When the albumen is abundant and the urine scanty, some of the symptoms of uræmia may be conjoined with those of exhaustion; *e. g.*, extreme drowsiness, a little wandering of the mind, and a rapid and feeble pulse. All the cases in which I have known delirium occur have ended fatally.

My experience not only justifies the conclusion that diphtheria is more common in childhood than in adult age, but also that the danger is in proportion to the youth of the patient: thus, while seventeen of twenty-two cases ten years of age and under proved fatal, only six of thirteen cases fifteen years of age and over proved fatal.

In the child, death is generally the result of the extension of the disease to the larynx; after puberty, death more often occurs from the general affection: thus, of the seventeen fatal cases ten

years of age and under, twelve died from exudation of the larynx; while of the six fatal cases fifteen years and over, only one proved fatal from the laryngeal complication.

Treatment.—We have no specific remedy for diphtheria. It is to be treated on the same general principles as the other acute specific diseases. We have no specific remedy for any of the acute specific diseases. We save by medical aid many lives that would be lost from scarlet fever, from typhoid fever, from typhus fever, from measles, &c.* We save such lives, however, only by from time to time averting special modes of death. The specific disease is not cut short—it is not cured by our remedies; it runs its course, do what we may to prevent it.

To avert death in any given acute specific disease, we must know and bear in mind how it kills. Thus scarlet fever kills first, by the severity of the general affection; secondly, by the

* "Tendencies accompany or conditions survive the fever," says the most judicious English writer on medicine of the present day, "which remedial measures, opportunely and judiciously applied, avail to oppose and control. Our object must be, when the fever is once established, to conduct it to a favourable close, to 'obviate the tendency to death.'"—*Lect. on Princ. and Pract. of Physic.* By T. Watson, M.D. 4th ed. Vol. ii., p. 843.

local throat disease and its consequences; thirdly, by the kidney affection and its consequences; fourthly, by accidental complications, as pericarditis, pleurisy, &c. And in treating a case of scarlet fever, we are always on the watch lest any one of these should attain a fatal degree of severity. And by treatment we can do much to moderate the severity of the general disease, and still more for the throat affection, &c. In the present epidemic of diphtheria, I have seen patients die from the general disease—from the local throat disease and its consequences—from derangement of the nervous system.

With reference to the general disease, I would advise you to be guided by the same rules that would guide you in treating a case of erysipelas or of typhoid fever, modified only by your knowledge of the special tendency of each to be complicated by certain local lesions of structure, *e. g.*, you would not purge in typhoid fever. So long as there is heat of skin and firmness of pulse, you should abstain from alcoholic stimulants, and give simple febrifuges, as they were once called, *viz.*, saline medicines, which exert a slight action on the skin and on the kidneys, or on both. Acetate of ammonia and citrate of potash are agents well

suited for the purpose. At the same time, the bowels should be well cleared out by a dose of calomel and jalap, or calomel and colocynth pill, followed in the inflammatory form of the disease by a saline aperient, *e. g.*, infusion of roses and sulphate of magnesia. In this stage of the disease the inflammation of the throat should be treated by warm fomentations externally, and the inhalation of water vapour with acetic acid. A wine-glass full of vinegar to a pint of boiling water is a good proportion—Squire's inhaler is the best I am acquainted with. You may frequently see it in use in the wards. A lead gargle—one dram of the solution of the diacetate of lead to eight ounces of rose water—may occasionally be useful; but if gargles cause inconvenience or pain from the muscular exertion of the throat in gargling, their use should never be persisted in. The patient should be confined to bed, the temperature of the room kept at about 68° Fahr., and its atmosphere made moist by placing a kettle with a long spout on the fire. The form of kettle devised by the late Dr. Pretty is very good for the purpose,* and very simple. The young child can

* This is a tin kettle, with a small aperture at the top

neither gargle nor inhale, and at this stage of the disease painting the throat with nitrate of silver, &c., is worse than useless. But you can envelope the young child in a warm moist atmosphere much more perfectly than you can an adult; make a tent with blankets over its little bed, and pass the spout of your kettle under the covering of the tent. The kettle need not be on the fire; fill it with boiling water, and then keep it boiling by spirit-lamps. The diet, so long as the febrile disturbance lasts, should be mild. At the same time do not forget that diphtheria, like erysipelas and typhoid fever, is a disease of low type.

When the disease begins with marked feebleness of pulse, dusky redness of throat, and extreme sense of general weakness, wine in full quantities is required at an early period. From

closed by a screw instead of a common lid. From the front of the kettle project two spouts of about three feet in length, one spout springs from the upper part of the kettle and passes forward in a straight line,--the other spout springs from near the bottom of the kettle and passes obliquely upwards. The lower spout ends in a spoon-like projection, just under the slightly curved down open mouth of the upper spout. The steam passes out of the upper spout, and the condensed vapour drops into the little spoon, and is returned by the lower spout to the bottom of the kettle.

six to eight ounces of sherry or port for an adult, and as good a diet as the patient can take must be given from the first. In the course of the disease, much larger quantities of wine, or a proportionate quantity of brandy, may have to be given. Of course the quantity of stimulant must be regulated by the age and habits of the patient, as well as by the character and the stage of the disease; but remember that, as a rule, young children bear and take with advantage, in diseases of depression, much larger quantities of stimulants than you would probably suppose. A child of three years of age now under treatment at the children's hospital for diphtheria, is taking with apparent advantage one to two drams of brandy every hour, *i. e.*, from three to five ounces of brandy in twenty-four hours. Under all general conditions attention must be paid to secure efficient action of the bowels, and the urinary and intestinal secretions examined daily.

The presence of blood or of albumen in the urine shows that diuretics are contra-indicated. Mustard poultices, followed by warm linseed-meal poultices, may be applied to the loins under such circumstances. The presence of a large amount of lithates in the urine should cause

us to weigh the propriety of giving a mercurial aperient; that is to say, to inquire into the state of the biliary excreta.

As to the value of local applications after the most acutely inflammatory stage has passed, when exudation is occurring, I have formed, from the cases I have seen treated by others, and have treated myself, two decided opinions:

1. That the single efficient application of a strong solution of nitrate of silver—a scruple to a dram of water—frequently stays the spread of the exudative inflammation; but that, on the whole, hydrochloric acid and water in equal parts more frequently attain that object.

2. That the repeated application at short intervals of these strong local remedies is injurious; I think I have seen serious evil result from their application two or three times a day.

To apply any substance efficiently to the throat of a child, the little one must, before any attempt even to look into its throat is made, be firmly fixed, so that all sudden movements of its hands and head are completely prevented, and held so that the light may fall directly down its throat. Then the moment must be seized when the child in crying opens its mouth, and a

firmly made tongue depressor, or a broad-handled table-spoon be passed to the back of the tongue. Having the spoon or depressor in that situation, it is your own fault if you do not have a full view of the pharynx, and, unless much mucus be present, of the epiglottis. Depress the further extremity of the instrument and bring the tongue at the same time a little forward, and all the parts are within sight. If you use a small tea-spoon or a very weak instrument, or do not fix the child firmly, or put the extremity of the instrument on the centre of the dorsum of the tongue, the result will probably be that after a struggle, more or less prolonged according to your own, the child's, and the parents' temper, you will fail altogether in attaining your object, or attain it most incompletely.

Having a good view of the part, the exudation, but especially the surface around the exudation, is to be painted with a camel-hair pencil dipped in the solution, the brush being passed over the surface two or three times in quick succession. The efforts to vomit, which your manipulations may excite, offer no real impediment to your proceedings. The application having been effectually made, you are to wait till

the consequences of the application have passed away. Bear in mind, that both the acid and the strong solution of nitrate of silver produce white discoloration of the parts to which they are applied, and do not confound this discoloration with the spread of the diphtheritic exudation. I am sure I have seen severe inflammation of the pharynx kept up by the repeated daily application of irritants, used to cure the disease which they themselves were occasioning. The discoloration from the acid passes away in about thirty-six hours; that from the nitrate of silver somewhat quicker. The ordinary sponge probang is a very clumsy instrument for the application of powerful agents to the pharynx. You know not where the fluid from it goes; but a curved piece of whalebone, with a *very* small piece of sponge attached, must be used when you desire to apply fluid to the pharyngeal openings of the posterior nares and back of the *velum pendulum palati.*

The solid nitrate of silver carefully applied around the spreading diphtheritic patch, has appeared to me in some cases to have at once arrested its spread. I have never seen these powerful topical remedies of use while the parts

were much swollen, bright red, and covered with mucus. Nay, under such conditions I have seen them do harm. In a case I saw with Dr. Schulof the frequent injection of cold water into the pharynx, which he had employed before I saw the patient, seemed to afford much relief: the patient recovered.

Do not tear off the false membrane; to do that is to commit a decided blunder. I have seen it done repeatedly, but never with good effect, and sometimes with decidedly bad results.*

Chlorate of potash, in doses of four grains dissolved in two drams only of water, has seemed to me of some use in allaying the laryngeal inflam-

* "The authors of the sixteenth century agree in reprobating the forcible removal of the false membranes, and also scarifications, together with all roughness of frictions and applications. I have had occasion several times to convince myself of the justice of these precepts, and I have seen the pellicular inflammation aggravated by all kinds of mechanical irritation. When the disease is not arrested in its progress by two energetic applications made at intervals of twenty-four hours, and the signs of the affection of the air passages begin to be manifested, this local treatment offers very uncertain chances of recovery."—*Dr. Simple's Translation of Bretonneau's "Memoirs on Diphtheria,"* *p.* 106. The accuracy of these statements of Bretonneau is confirmed by my experience.

mation. I have had no experience of powdered alum, of which Trousseau speaks very highly.*

In treating the local pharyngeal disease, you will note that the objects to be attained are the prevention of the spread of the exudative inflammation to the larynx, and the prevention of the occurrence of such an amount of local mischief as may lead to septicæmia; the latter is infinitely rare, the former is very common. By topical applications you do no good to the general disease, *i. e.*, to the diphtheria. The end you have in view in the employment of the acid and nitrate of silver solutions, is merely to avert death by the extension of the disease to the exudative inflammation of the larynx, and death by septicæmia.†

On the table are the pharynx, larynx, trachea, and lungs of a child who died recently in the Hospital for Sick Children. You will note that the exudative inflammation has extended low into

* Fifteen grains of powdered alum are mixed with a little sugar, placed on the end of a straw, and blown from it into the pharynx several times a day. Tannin and other astringents have been applied in the same way.

† Trousseau, the most recent, and, after Bretonneau, the best writer on diphtheria, expresses a very different opinion as to the value of local remedies in diphtheria. See note, p. 103.

the bronchi; that there is extensive collapse and scattered pneumonia of both lungs; and that the pneumonic solidification is of that kind which so often follows on collapse. You will see that there is an opening in the trachea; this was made, and well made, during the life of the child by my friend and former pupil Mr. Berkeley Hill, lately house-surgeon at this hospital, and now residing at the Hospital for Sick Children.

With reference to the propriety of performing laryngotomy or tracheotomy, when the larynx is invaded by the exudative inflammation, there can be no doubt that some lives have been saved in this country by an opening being made into the larynx or trachea, when death from suffocation in croup and in diphtheria was imminent.

A most unequivocal case of this kind was that of Dr. C. There is not a shadow of a doubt on my mind that he would have been dead in two minutes, had his larynx not been opened at the moment it was by Mr. Quain. I never saw any one so manifestly brought back from the threshold of death. His complexion had that bluish palor that precedes immediate dissolution. My hand was on his wrist. I felt his pulse failing under my finger, until at last it was imperceptible.

His eyes closed, and his diaphragm was making those convulsive contractions which indicate that respiration is about to cease, when the knife entered the larynx, and the air was drawn by what really seemed the last effort of the diaphragm into the lungs. The natural hue of his face returned; his pulse was again perceptible; his eyes opened; consciousness was restored; and the patient was alive again. He finally recovered. Now a thousand failures of the operation in saving life cannot, after seeing this case, prove to me that tracheotomy ought not to be performed when suffocation is imminent from the presence of lymph in the larynx or trachea; for here is a man, whose life was invaluable to his family and most useful to society, restored to health, who, but for the operation, would have been dead.

In France, tracheotomy in children—putting aside those cases in which it is unnecessarily performed—is more successful than it is in England. Why is this? It is said that the operation in England is performed too late; that the patient is allowed to be weakened to an extreme degree before tracheotomy is resorted to. I doubt the correctness of this explanation. I have seen too many children die who were operated on before

they were worn out by disease, to admit it. To answer the question, we must examine the facts bearing on it a little more closely. What lesions of structure, not directly due to the operation, do we find after death where tracheotomy has been performed, and what symptoms, explicable by these lesions, are noted during life?

Muco-purulent fluid, in quantity in the bronchial tubes, collapse of lung-tissue, and solidification of lung-tissue from inflammation—the inflammation being commonly secondary to collapse—these are the lesions we find to account for death after tracheotomy in cases of diphtheria and croup. These are the lesions to be seen in the lungs on the table, to which I just now directed your attention. During life we hear mucous and sub-mucous râles over the lungs, and it may be that we find here and there a little dullness on percussion. The increased difficulty to the entrance of the air into the lung-tissue, occasioned by the mucus accumulating in the bronchial tubes, may be measured from hour to hour almost, by the increasing recession of all the softer parts of the thoracic walls during the inspiratory efforts.

The sequence of events then seems to me to

be as follows:—formation of irritating muco-purulent fluid in the trachea and largest bronchial tubes; the advance of the mucus, at each inspiration, further and further into the ramifications of the bronchial tubes; irritation by its presence of the bronchial mucous membrane, and the pouring out of fresh muco-purulent fluid. There is, as a rule, no active inflammation of the bronchi, there is little swelling, little tenacious mucus; hence there is during life little or no sonorous ronchus. But why, you may ask, does not the patient get rid of the muco-purulent fluid by coughing? The answer is easy. He can cough but imperfectly, on account of the state of his larynx and trachea.

Remember the mechanism of cough and of expectoration. How often have I, and how often shall I again recall it to your mind? To cough freely and deeply, so as to remove obstructions from the bronchial tubes, you take a deep inspiration and then close the glottis; next you compress the air-distended lungs by violent expiratory effort, and then suddenly opening the larynx you drive out of the bronchial tubes by the force of the expelled air all matters contained in them; you expectorate. The child who has a tube in

his trachea, or whose larynx is so diseased that he cannot close it firmly, is necessarily unable to cough deeply. He cannot compress the air-containing tissue of the lungs with force enough to drive out by the current of expressed air any excess of mucus, or other matters, from the bronchial tubes. You may excite cough as often as you desire by closing the tube for an instant, and some expectoration will follow; but unless a deep inspiration has preceded the closure of the tube, the quantity of air driven out by the expiratory effort must be small, and the force of its current feeble, consequently the cough will be ineffectual for the clearance of the bronchial tubes; the next inspiratory effort draws the mucus and the secretions from the larynx, trachea, &c., still lower into the tubes. After a short time collapse of lung tissue necessarily follows, and too often the collapse has for its sequences congestion and exudation, *i.e.*, pneumonic consolidation. In diphtheria there is irritating and abundant secretion from the larynx and trachea. In order to cough effectually, you understand, a preliminary full inspiration is essential. Whatever, therefore, prevents such an expansion of the chest-walls or lungs as shall perfectly distend

the air cells of the latter with air, prevents effectual cough, and so favours the accumulation of mucus, and of the acrid secretions from the larynx, trachea, &c. in the bronchial tubes, and therefore favours the occurrence of pulmonary collapse, congestion, and inflammation.

Flexibility of the chest walls is a condition which prevents full inspiration of air when there is the least obstruction to its free passage through the bronchial tubes. The greater the flexibility of the chest walls, the greater is the mechanical difficulty to the inspiration of air. It is because of the flexibility of their chest walls that little children, constitutionally healthy, more often die from an attack of bronchitis than do adults, and that children whose ribs are softened from disease commonly die from pulmonary collapse when they are the subjects of trifling catarrh.

Trousseau remarks that he has seen only three children under two years of age recover after tracheotomy for croup. The principal reason for the mortality in children of this age is, that their chest walls are so flexible that mechanical power is wanting to draw air beyond the fluid which from any cause finds its way into the bronchial tubes. Supplementary causes are the sus-

ceptibility of young children to capillary bronchitis, and to the supervention of pneumonia or pulmonary collapse.

But why do a larger proportion of older children die after tracheotomy in England than in France? The cause of this difference is, I think, to be found in the greater frequency of rickets in England, and consequently in the greater flexibility of the chest walls in proportion to the age of the children. You will observe that many children who are not decidedly ricketty are still the subjects of slight softening of the bones. There is no sharp line of demarcation in regard of consistence between the bones of a healthy child and the bones of a ricketty child.

As to the early or late performance of tracheotomy in diphtheria, be sure before opening the trachea, first, that the exudative inflammation has extended to the larynx, and secondly, that it is advancing in severity. In judging on these points do not omit to look at the chest, and be guided to a considerable extent by the degree and increase of the recession of the soft parts of the parietes during inspiration. Being satisfied on the two points I have just mentioned, the

sooner the operation is done the better. The mortality under any treatment is frightful, but tracheotomy will save a small proportion of cases —then why refuse life to those few? As you grow older you will know the satisfaction it is to have a well-founded conviction that in even a single case you have been the means of saving life. In the adult, laryngotomy is to be preferred to tracheotomy; the larynx is large enough to admit a tube; in children it is too small, especially when narrowed by swelling of its mucous membrane and exudation on its surface. In children then you must open the trachea; open it, however, as near to the larynx as possible. It is said, open below the seat of disease; I think the reverse should be the rule. If you open into the healthy part you establish a new centre of irritation and inflammation.

The child, whose trachea, &c., is on the table, and of which I have before spoken, was only a year and ten months old, and the subject of ricketty softening of the ribs. Observe that there is no increase of the disease at the spot where the opening was made, though Mr. Hill opened into the diseased part. Had such a case as this occurred in private practice, the friends of the

child should have been informed that death was certain unless an operation was performed; that an operation would give no more than the shadow of a shade of a chance of recovery. And even under more favourable circumstances, *i. e.*, when the patient is older, and not ricketty, you should fully explain to the friends the small proportion of operations that terminate in ultimate recovery. In all the cases, save one, that I have seen operated on, temporary relief and prolongation of life has been the result.

After tracheotomy, I have seen children die from two lesions of structure, directly due to the operation. One is injury (ulceration, &c.) to the trachea, from the mechanical irritation of the tube, and the other, suppuration in the anterior mediastinum, inflammation extending downwards from the lower border of the wound in the neck, through the cellular tissue in front of the trachea to the loose cellular tissue in the anterior mediastinum.

Against these as well as other dangers you must guard. I will describe to you a case lately under my care in the Hospital for Sick Children; and from that description you will learn the symptoms which I consider indicate the propriety of opening

the trachea, and all the precautions I thought desirable to favour a successful termination of a case of tracheotomy for diphtheria.

The child (George O.) was three years and two months old; its ribs for its age were remarkably firm; its mother had had homoptysis.

This child was in the hospital, rapidly convalescing from measles, accompanied by very severe bronchitis, for which ammonia and brandy had been required. When about *one a.m., January 5th*, 1861, *i. e.*, twelve hours after the death of William W.,* who lay in the next bed, it was observed by Mr. Hill to be hoarse, and breathing rapidly and stridulously. The cough had assumed a croupy character. There was no lividity of the surface, no recession of the soft parts of the thoracic walls. The mucous membrane of the fauces was very red and swollen. There was no lymph on it. The child had been seen by Mr. Hill at ten p.m. in his ordinary round, and at that time the breathing was not noisy, in fact, the boy seemed to be progressing towards health most satisfactorily.

The child was at once placed in a bed, to each corner of which is attached a rod, three feet

* See p. 25.

in height; the four upright rods being connected at their tops by four transverse rods. Blankets were thrown over this framework, and into the circumscribed space so formed, hot water vapour was introduced from a long-spouted kettle. At the same time the bed was drawn near to the fire, and bottles of hot water placed in and on the bed; the object being to envelope the child in a pure, moist atmosphere, having a temperature of about 70° Fahrenheit; subsequently a current of hot dry air was passed in a tube through the tent. Fifteen minims of tincture of sesquichloride of iron in water were ordered to be given every two hours, and half a dram of brandy every hour. The child slept at intervals during the night, and at nine o'clock on the morning of the 5th, Mr. Ringer noted the child lying on its back asleep; in breathing it made a loud snoring noise. On waking, the child coughed; the cough was hoarse, metallic, and ringing in character; it was followed by stridulous inspiration, the ordinary breathing had the laryngeal quality, the voice was thick. The child swallowed without pain or difficulty, it did not look oppressed, its skin was warm and free from lividity. The pulse was frequent and weak.

There was, during inspiration, considerable recession of the lower part of the sternum, and of the margin of the thorax, as well as deepening of the supra-sternal and supra-clavicular regions, and of the intercostal spaces.

At two p.m. of the same day I made the following notes:—

"The inspiratory and expiratory sound as heard at the bedside are both laryngeal in quality.

"The pulse is 132, small and weak.

"The respirations are 48 in the minute.

"The child breathes through its open mouth, at the same time the nares dilate during inspiration.

"There is occasional cough, laryngeal in quality.

"The recession of all the softer parts of the thoracic parietes during inspiration is considerable, the lateral regions being flattened.

"On percussion both sides of the thorax are hyper-resonant.

"On auscultation the inspiratory murmur is very faintly audible. No abnormal sounds are heard in any part of the chest.

"The tonsils, uvula, arches of the palate, &c., are red and swollen. Much mucus obscures the view of the pharynx. The mucous membrane of

the nose is dry. The lymphatic glands behind the angles of the jaw and down the sides of the larynx are somewhat larger than natural, but not tender."

The dose of the brandy was increased from half a dram to a dram every hour. I expressed a wish that the trachea should be opened, in case the impediment to the entrance of the air into the chest increased.

At ten p.m. Mr. Ringer noted that the child looked more oppressed, that the lips were slightly livid, that inspiration was more difficult and prolonged, that the sound accompanying inspiration was more strongly laryngeal, that the soft parts of the chest walls fell in very greatly during inspiration. It was obvious that the impediment to inspiration was rapidly increasing. The pulse was frequent, but of pretty good power. No time was to be lost, every quarter of an hour was of moment, and therefore tracheotomy was at once performed by Mr. Berkeley Hill. I again use the notes of our accurate and able Registrar, Mr. Sydney Ringer.

Much blood was lost in the operation (this is sometimes unavoidable); the trachea was opened as near to the larynx as possible. After the

tube* was introduced there was some blood and mucus in the trachea, which caused the child much annoyance and excited frequent efforts to eject it. In about an hour these efforts ceased, and the child fell into a calm sleep, lying on its back and breathing quietly. There was now no falling inwards of the softer parts of the chest walls during inspiration. The colour of the lips was good, there was no pallor of the face, no lividity. There was still a little dilatation of the nares during inspiration. When the tube became clogged, but then only, was there recession of the softest parts of the chest walls. The pulse was 108, and of tolerably good power. The respirations were 42 in the minute, but very irregular.

The skin, as judged by the hand, was of normal temperature and moist. There was much moist râle at the bases of both lungs.

On January 7th, the second day from the operation, and the third day of the disease, the breathing was very tranquil, but occasionally hurried. There was no lividity of the surface.

* The tube used was a common double silver canula, as large as the trachea would receive. The canula, with an aperture on its dorsal surface, seems to me, however, better than that here used.

The boy had some colour in his cheeks, he looked calm. The pulse was 132, soft, not particularly weak.

On January 8th, the pulse was 132. The respirations were 38; there was no lividity, the lips were of good colour.

Mr. Hill placed his finger on the tube, then in a second or two withdrew it; the child necessarily took a deep inspiration. Seizing the moment when the chest was distended by air, Mr. Hill again placed his finger on the tube, waited until effort to cough was made, and then suddenly withdrew the finger; by this manœuvre he succeeded in making the boy expectorate much muco-purulent fluid.

The wound was freely cauterised with nitrate of silver.

On January 9th, the fourth day from the operation, the child's general condition had greatly improved; he sat up in his bed and played with his toys. The nurse reported that he had slept well at night. The bowels had acted once during the last twenty-four hours, as they had daily from the outset of the disease. The urine had been tested daily, but *on this day, for the first time, it was found to contain albumen. The albumen was*

always to be detected in the urine from this date till the child's death.

Some muco-purulent fluid was coughed past the tube through the larynx into the mouth. The child ate a little dry sponge-cake. Mr. Hill took out the tube in the evening and closed the aperture in the trachea with his finger, to test the child's ability to breathe through the natural passages. The child struggled so much for breath that the finger was soon removed; a good deal of dirty-looking, fœtid, muco-purulent matter escaped from the trachea through the wound. The tube was reintroduced.

On January 11th, *i.e.*, the seventh day of disease, the child's general condition was very good; the pulse 136, the respirations 42. It ate and slept well, and displayed more irritability of temper than it had previously done. The wound, however, looked in a bad state, its edges being sloughy and offensive. Mr. Athol Johnson, who saw the patient with me, advised that the wound should be washed with a solution of chlorinate of soda.

On January 12th, *i.e.*, seventh day after the operation, the child at the time of my visit in the afternoon was sleeping so tranquilly that its respirations were inaudible, the frequency was only

to be determined by the hand placed on the abdomen. The respirations were 40, the pulse 136. The skin was soft and normally cool. The wound was looking more healthy, but the opening into the trachea was wide and ragged looking. In the evening the child sat up in bed and played lustily with a drum.

In the course of the evening Mr. Hill removed the tube for a few minutes, a violent fit of coughing was the result, during which some mucus was ejected through the opening in the trachea, but it hung around the wound, so that it was drawn into the trachea again at the succeeding inspiration. When the tube was in the trachea the mucus was expelled from the tube, and so removed from the influence of the next inspiration. As the child became livid and the pulse very feeble from the obstruction to the ingress of air offered by the mucus drawn into the trachea, the tube was replaced.

On January 13th, the pulse was 138 and rather irregular in force and frequency. The child breathed calmly, and was cheerful. Its skin was cool, its appetite excellent.

Every day, however, that anæmic pasty look so often seen in diphtheria had increased.

From the day of the operation the child had not been allowed to drink, but all his food had been soaked in milk, wine and water, or beef tea. The importance of giving all fluids in the form of sop is to be impressed on the nurse, because two or three days after the operation the glottis has been observed to lose some of its irritability, and fluids have passed into the larynx and even caused the death of the patient. A friend of mine told me that he lost a very promising case, apparently from this accident, on the fourth day after the operation.

The boy having declined the tincture of the sesquichloride of iron on the second day, it was omitted, and a few grains of the ammonio-citrate of iron were given in its place.

From the 13th to the 17th January, the pulse rose daily in frequency. On the 16th it was 160 in the minute. All this time, however, the child continued cheerful.

On the 18th January, *i.e.*, the fourteenth day of illness, the child took its breakfast as usual; at noon it was evidently sinking; its pulse was 176, its respiration 76, and there was great recession of the chest walls during respiration.

At five p.m., the pulse was too rapid and feeble

to be counted, and the respirations were 86 in the minute. At nine p.m. the child died.

The child had never been removed from the bed for the purpose of examining its chest from the time of the operation. Much injury might have resulted to the child from the exposure and exertion, while no good end could have been attained by the knowledge that a little mucous or sub-mucous râle, or a little fine crepitation existed here or there.

After death, the wound showed no signs of attempt at repair. It was sloughy looking, and at places on it was some granular lymph. The lungs were acutely but highly emphysematous, so that they met in the middle line and almost covered the heart. The most depending part of the inferior lobe of the left lung was collapsed. The collapse affected about one third of the lobe. The bronchial tubes leading to the inferior lobe contained a large quantity of very thick airless purulent fluid. The smallest tubes running through the collapsed tissue, were filled with fluid of the same character. The collapsed portion broke down too easily on pressure, and was less flabby than is merely collapsed lung-tissue; it was evidently the seat of incipient secondary

pneumonia. On cutting across the emphysematous parts of the lung, *i.e.*, all the lung not collapsed, a good deal of aërated muco-purulent fluid escaped. The inferior lobe of the right lung was scarcely if at all collapsed. The posterior third of the superior lobe was solid, chiefly from pneumonia. Here and there, around and mingled with the lobules, solid from pneumonia, were little portions of collapsed lung-tissue, and the small bronchial tubes running through the collapsed and solid-from-pneumonia lobules, were filled with thick airless purulent fluid. The lymphatic glands behind the angles of the jaw, down the neck, beside the larynx, and at the bifurcation of the trachea were large, red, moist, and brittle.

The uvula and the velum pendulum palati were thickened. On the posterior surface of the velum was a patch of tough lymph about the size of a sixpence, and from this a layer of tough lymph extended upwards, even into the posterior nares. The coats of the pharynx itself were thickened and somewhat contracted. The epiglottis seemed healthy, except that its under surface was covered with thick mucus. The aryteno-epiglottidean folds were scarcely thicker than natural. Below the root of the epiglottis, the mucous membrane,

as low as the bifurcation of the trachea, was covered with a continuous layer of tough lymph. On removing this, the mucous membrane beneath was found to be intensely red. The opening from the trachea into the larynx was completely blocked up by lymph.

The wound internally looked healthy. Over the ring of the trachea next below the opening, the mucous membrane to a small extent was abraded or superficially ulcerated. The kidneys and other abdominal viscera contained an excess of blood, but seemed otherwise healthy.*

You will note in the account I have given you of this case, as especially worthy of remembrance in regard to the operation for tracheotomy—

1. That the operation was performed as soon as it was evident that the laryngeal disease was progressing, and was seriously interfering with the entrance of the air into the thorax; the excess in the falling in of the chest walls over that of health during the child's ordinary inspirations, being regarded as the measure of the impediment to the passage of the air through the larynx.

2. That the opening into the trachea was made

* They were examined with the aid of the microscope.

near to the larynx. It was so 1st, in order that there might be as little chance as possible of the inflammation extending to the cellular tissue of the anterior mediastinum; 2ndly, in order that the air might have as long a passage as possible to pass through before reaching the lungs; and 3rdly, and especially, in order not to excite inflammation lower down the trachea than already existed when the operation was performed.

3. That no fears respecting the evil consequences of opening the diseased part of the trachea exercised any influence in determining the spot for the operation.

4. That the tracheal tube was of good size.

5. That the edges of the wound were freely cauterised after the operation.

6. That the air the child breathed was kept as nearly as possible at 70° Fahr., and was moist. These conditions were secured by the arrangements of the bed I have described to you, and by covering the openings of the tube by a neck comforter.

7. That measures were taken from time to time, to excite deep cough, and so to favour expectoration of the morbid matter drawn into the bronchial tubes from the trachea, and formed in

the bronchial tubes from the irritation of that matter, &c.

8. That the child was well supported by food and stimulants from the first. Fluids being always supplied by soaking sponge-cake, bread, &c., in them; baked apples and grapes were given freely.

At the time of the operation two facts were in favour of the child's recovery, *viz.*, it being more than two years old, and its ribs being firmer than is usual at its age. But then, on the other hand, the child was weakened by the attack of measles and bronchitis, from which it had scarcely recovered when it began to suffer from the diphtheria; it was still at an age when capillary bronchitis, collapse, and peneumonia, secondary to collapse, are very common; and the diphtheria, the general disease, had yet to run its course.

The death of the child was the consequence of the general disease, hastened probably a little by the state of the lungs.

The operation was successful so far as concerns the attainment of the object for which it was performed. The child would have died on the 5th of January, had the trachea not been opened;

it lived till the 18th. Slow suffocation is one of the most distressing modes of death; death from asthenia one of the least. So that twelve days of life were gained and much suffering was avoided by the operation.* You will remember that I told you, that the laryngeal affection all but always kills within a week from its outset, and usually within three days, and that

* If tracheotomy did no more than substitute the easy death from collapse and pneumonia, or from asthenia, for the painful death from obstruction in the larynx, it would in many cases be a justifiable operation. Trousseau has drawn, with a master's hand, so faithful and graphic a picture of the terrible suffering in death from slow suffocation, in acute laryngeal inflammation, that I cannot refrain from quoting his words and his description at length:—

"Cependant les accès se rapprochent en devenant de plus en plus violents; et jusqu'au moment de l'agonie il n'y a bientôt plus entre eux d'intervalles de tranquillité; le sifflement laryngo-trachéal est continu. De temps en temps, les pauvres enfants, dans un état d'agitation impossible à décrire, se dressent brusquement sur leur séant, saisissant les rideaux de leur lit qu'ils déchirent dans leurs mouvements de rage convulsive; quelquefois ils écorchent avec leurs ongles les papiers tendus sur les murs; ils se précipitent au cou de leur mère et des personnes qui les entourent, les embrassant, et cherchant à s'accrocher sur se qui se trouve à leur portée pour y prendre un point d'appui. Dans un autre moment, c'est contre eux qu'ils tournent leurs efforts impuissants, portant violemment leurs mains à

the general disease more commonly causes death during the second week.

The sequence of events in this case, and the relation and importance of those events, seem to me to have been as follows :—

Diphtheria late in the night of January 4th ; the exudative inflammation affecting the larynx

la partie antérieure de leur cou comme pour en arracher quelque chose qui les étouffe. La face bouffie, violacée, les yeux hagards et brillants, expriment l'anxiété la plus pénible et une profonde terreur ; puis l'enfant tombe accablé dans une espèce de stupeur durant laquelle la respiration reste difficile et sifflante. La face, les lèvres sont alors pâles, les yeux abattus. Enfin, après un effort suprême de respiration, l'agonie commence, et la lutte se termine sans qu'il y ait eu, à partir de ce moment, autant d' accès de suffocation qu'auraient dû le faire prévoir ceux qui ont eu lieu jusque-là. Chez l'adulte, le tableau est plus effrayant encore. La violence des accès de suffocation, l'espèce de rage qui s'empare du malheureux mourant, étranglé par cet obstacle dont il ne peut se débarrasser, sont impossibles à dépeindre. À la fin, lorsque les lèvres sont devenues livides, lorsque le visage est bouffi, violacé ; au dernier terme de l'asphyxie, l'adulte tombe, comme l'enfant, dans cette sorte de stupeur et d'enivrement, et meurt ordinairement dans un état de prostration." — *Clinique Médicale*, 1861, p. 322.

Those only who have witnessed the sufferings so described, and the instant relief from them that follows on the opening of the windpipe, can appreciate fully the palliative value of tracheotomy.

and pharynx. Exudation of lymph into the larynx early on the 5th. Death by suffocation averted on the night of the 5th by opening the trachea.

Continuance of the diphtheria. Extension of the exudation downwards to the bifurcation of the trachea; and upwards to the posterior surface of the velum pendulum palati, and thence forward to the anterior nares.

Diphtheritic inflammation of the wound. Expectoration through the opening in the trachea, facilitated by the firm state of the ribs and the management of the tube, and thus death by collapse averted.

The progress of the general disease shown during life by the occurrence, for the first time, of albumen in the urine on the fourth day of disease, and the continuous and gradual rise in the frequency of the pulse, and, after death, by the exudation on the pharyngeal and nasal mucous membranes.

The little collapse and the small amount of pneumonia probably supervened during the last day of life, the patient no longer expectorating the irritating matter drawn into the bronchi from the trachea.*

* It will be gathered from the account I have given of

Death from asthenia at the end of the second week of the disease.

With regard to the remedies that have been praised as specifics in diphtheria, or as all but meriting that high name, I have seen nothing like unequivocal specific good from any of those of which I have had experience. I have either given myself, or seen given by others, the tincture of the sesquichloride of iron, in doses of twenty drops every two or three hours; sesquicarbonate of ammonia, in doses of four or five grains every two or three hours; bark in various forms, with and without ammonia; and calomel; but by none of these have I seen any specific influence exerted. From all, some benefit has accrued, when their exhibition was specially indicated,—just the kind of good we see from them when judiciously administered in other diseases.

As the septicæmia results from the absorption of fœtid matters from the throat, local applica-

this case, that I cannot agree with Trousseau in the following statement:—

"It seems as if the disease, having reached the air-passages, exhausted there all its force, and *if by giving passage to the air into the respiratory apparatus by tracheotomy we prevent the patient dying, the cure will occur naturally.*"—*Clinique Médicale*, 1861, p. 424.

tions are indicated—solid nitrate of silver should be applied freely to the fœtid surface, as soon as the glands behind the angles of the jaw begin to increase quickly in size, and to become tender, and gargles or washes of chloride of soda, or of Condy's fluid, used; by cauterising the surface from which the infection is proceeding, and by the use of these antiseptics, we may prevent that which, when fully established, we are impotent to cure.

With reference to the treatment of the nervous disorders which follow diphtheria, as all the symptoms of those disorders indicate loss of power, and are accompanied by pallor and other anæmic symptoms, nourishing animal and stimulating diet, fresh air and exercise, and steel and quinine, seem especially to be indicated. Where the paralysis has been limited to the pharyngeal muscles, to tingling in some parts, to affections of the special senses, or to slight want of power in the extremities, those measures have proved successful; but when the paralysis has been widely spread or extended to the heart, the cases have ended fatally, notwithstanding the employment of the remedies I have mentioned. In any case of the kind I again see, I shall certainly

give strychnine, in small doses, a fair trial, in addition to general tonic remedies. Perhaps stimulation by blisters over the upper part of the spine might be of use.

In the treatment of the diphtheritic throat affection, I have seen blisters applied, and it has seemed to me that, their effects were injurious.

The vomiting is best allayed by iced stimulants internally, and mustard poultices to the epigastrium. Vomiting often continues notwithstanding all our remedies, and by exhausting the patient hastens the fatal termination. Restlessness and delirium are to be treated by opiates. The doses of these remedies must of course vary with the ages of the patients.

To conclude, the great facts I desire to impress on your minds are—

1st. That diphtheria is a general disease, having exudative inflammation of the pharyngeal mucous membrane for its anatomical character.

2nd. That it attacks persons of all ages, from early infancy to old age; but is most common and most fatal in childhood.

3rd. That it is contagious, but requires for its propagation either complete exposure to the contagious principle, or predisposition on the part of

those receiving it, and that the latter is probably by far the more important of the two conditions of development.*

4th. That the general disease varies in its character from sthenic febrile to typhoid febrile, but always has a tendency to assume an asthenic type.

5th. That the local nasal, pharyngeal, and laryngeal disease is inflammatory in nature, the inflammation varying in character from sthenic to asthenic, but always showing a tendency to become asthenic.

6th. That, as we have as yet discovered no specific remedy for the general disease, we must treat it in accordance with general principles, bearing in mind its tendency to assume an asthenic character.

7th. That *all* we are to expect from the topical employment of active agents, such as nitrate of silver, is the arrest of the exudative process before it has extended to the larynx, and the prevention of the absorption of fœtid matters.†

* There is not the shadow of ground for the belief that the disease can be carried by the clothes, &c., from one house to another.

† Trousseau thinks that the general disease is curable, or

8th. That in opening the windpipe, the sole object we have in view is the prevention of death by suffocation; that by so averting death, time is gained for the general disease—the diphtheria—to run its course.

9th. That the muco-purulent fluid in the smaller bronchial tubes, which by its presence in them necessitates pulmonary collapse, is partly drawn into them from above and partly secreted in them; the secretion being due chiefly

at least that it is capable of being arrested by remedies applied to the throat.

"There is, however," he says, "an essential difference between diphtheria and the diseases I have just named (*i.e.*, small pox, measles, syphilis), *viz.*, that greater account is to be taken of the local affection in diphtheria than in those diseases. If in small pox, for example; we do not occupy ourselves with the pustules, if we occupy ourselves with them, at least only for diagnosis and prognosis; if we do not occupy ourselves with them in regard to treatment, it is not so in diphtheria. We may compare, indeed, what happens here with what happens in malignant pustule, where, in attacking directly the local affection, we check (*enrayons*) *the progress of the general disease* of which that affection was a first manifestation. *So in diphtheria, by interposing energetically to combat the first manifestation, we may sometimes arrest the progress, prevent the ulterior manifestation.*"—*Clinique Médicale*, 1861, p. 363.

The doctrine taught in the text, founded on my own experience, is quite opposed to these views.

to the irritation of their mucous membrane by the morbid matter drawn into them from the trachea, &c.

10th. That death so often follows tracheotomy for diphtheritic inflammation of the larynx and trachea, because of the mechanical facility which exists for inspiring the morbid secretions of the larynx, trachea, and larger bronchial tubes into the smaller bronchial tubes and air cells, and of the mechanical difficulty of expectorating matters from the smaller bronchi when there is an opening in the windpipe, or when the chest walls are very flexible.

11. That death from the laryngeal complication occurs, with very rare exceptions, during the first week of disease; that death from asthenia more commonly occurs during the second week of disease, and that the youth of the patient is a predisposing cause of the laryngeal affection.

12. That in exceptional cases (as in the lad M.) diphtheria proves fatal in a few hours from the severity of the general disease, just as happens now and then in scarlet fever.

13. That disordered innervation is an occasional consequence of diphtheria; that the parts

of which the innervation is most commonly disordered are some of those to which the par vagum is distributed, *viz.*, the pharynx, the stomach, and the heart; that the disorder may affect all or some of the motor and sensitive nerves, or the motor or the sensitive nerves of the trunk or of the extremities, as well as the nerves of special sense.

14. That these disorders of the nervous system are to be treated on general principles, and that as anæmia (sometimes even a high degree of it) is a common concomitant, restoratives, including steel, are indicated.*

15. That an extreme fall in the frequency of the heart's beats during the disease, or as a result of one of the nervous derangements succeeding it, is a fatal sign; and that decidedly diminished power in the inspiratory muscles is probably of equal significance.

16. That delirium, frequent and uncontrollable

* I have not had an opportunity of examining after death, a case in which disordered innervation was a prominent symptom; but, judging from the character of the symptoms, I should not expect to find any appreciable change in the structure of the brain, spinal cord, or nerves. In the few cases that have been examined by others, no change has been detected.

vomiting, considerable hæmorrhage from the nose or other parts, a very rapid and feeble pulse, and albumen in the urine, are most unfavourable symptoms.

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