Diphtheria : a lecture delivered at the Norfolk and Norwich Hospital / by W.H. Ranking.

DIPHTHERIA.

A LECTURE

DELIVERED AT THE

NORFOLK AND NORWICH HOSPITAL.

BY

W. H. RANKING, M.D. CANTAB.,

SENIOR PHYSICIAN TO THE HOSPITAL.

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PREFACE.

The following pages are based upon a lecture on the subject of Diphtheria recently delivered at the Norfolk and Norwich Hospital, at the special request of the medical pupils, and subsequently published in the 'Lancet.' Having been urged by some influential medical friends to give this lecture further publicity in a separate form, I have considered myself bound to do so, but have felt it equally incumbent upon me to make such additions as further experience has made requisite. It would have been easy to have added greatly to the bulk of the present pamphlet, by entering into such literary and historical details of the disease as any tolerably industrious student might readily accumulate; but my object was not so much to produce a complete monograph on the subject, as a concise resumé of what personal experience has led me to believe to be its true characteristics and its most rational treatment. And, indeed, had I been disposed to enlarge upon the mere literary portion of the subject, this has been so well and fully accomplished in

the report of the "*Lancet* Sanitary Commission," as to render such an attempt entirely a work of supererogation.[1] I have subjoined a coloured illustration of the state of the throat in the earlier and in the more advanced stage of the disease. The drawings were taken from two patients seen in consultation with Mr. Dix, junior, of Smallburgh.

In reference to the disease itself, further study of its phenomena has tended to strengthen the opinion before expressed, that it is a disease *new* to this country, though well known since 1826 in France and other parts of the Continent; that it is essentially distinct from the commoner forms of sore throat, under whatever term they are known, whether as "scarlatinous," "erysipelatous," "putrid," or "malignant;" that it is only allied to scarlatina incidentally, as it may be to measles, and even to some acute but not true "blood" diseases; that it is contagious within certain limits; and that it requires an energetic tonic treatment, conducted on sound general principles, and not tinctured by a blind faith in particular remedies.

W. H. R.

Norwich; *Feb.*, 1859.

[1] 'Lancet,' January and February, 1859.

ON DIPHTHERIA.

PUBLIC attention has rarely of late years, excepting perhaps in the case of cholera, been more forcibly arrested by the contemplation of any disease, than by one which has been very prevalent and fatal during the last two or three years, and which is known even to unprofessional persons under the name of "Diphtheria." This is scarcely to be wondered at, when we consider either the sad fatality by which, in many families, child after child has been carried off, in spite of every attention which medical skill could devise, or the distressing nature of the symptoms, and the insurmountable difficulties which too often oppose themselves to the treatment. Cause enough, indeed, has there been, that the word diphtheria should conjure up in every family a vision full of dismay, and that every trifling discomfort in the throat should give rise to the most painful forebodings.

Epidemic sore throat is an affection which has long been familiar under different aspects. It has been known to practitioners of all ages and degrees of experience as an attendant upon scarlatina, and also under the titles of "angina maligna," "putrid sore throat," "malignant sore throat," but there is much reason to

believe that the variety of throat-affection with which we are now more immediately concerned is a disease till the last few years practically unknown to the profession of this kingdom, though familiar to the continent from the time that Bretonneau described it under the title of "diphthérite." Some writers, however, it should be said, are disposed to doubt the novelty of the disease in this country, and profess to have discovered a record of it in some of the older authors; but it is not difficult to show that there are no good grounds for such an opinion, and that the description of the appearances in the throat supposed by these writers to refer to that peculiar membrane which I believe to be pathognomonic of the disease, is in fact a description of the ash-coloured sloughs seen in gangrenous affections of the throat, and can in no way be regarded as a portraiture of the adventitious exudation of true diphtheria. Certain it is that the surgeons of this district, with several of whom I have been in correspondence on the subject, either by letter or in consultation, have unhesitatingly admitted that they had to deal with a disease which to them was perfectly new. Such was my own impression also, for with no inconsiderable familiarity with anginous affections as they are seen connected with the eruptive fevers, and in their idiopathic forms, the aspect of the diphtheritic throat was to me a new experience.

In speaking of the mode in which an attack of diphtheria commences, instead of drawing upon the stereotyped descriptions to be found in the works of Bretonneau and other French writers from whom most of our acquaintance with the disease has until recently been drawn, I shall take as the foundation of my remarks,

the phenomena as they have been witnessed in various parts of this county. The intensity with which the child (for the great majority of its victims are children) is attacked is very variable. In some instances he appears to ail so little as to blind the eyes of the most anxious parent to the storm which is hovering over his hearthstone; he makes but little complaint, beyond some slight difficulty in swallowing, and in the intervals of transient dulness and apathy will occupy himself as usual with his toys or ordinary occupations. In other cases, the patient suffers more severely at the very outset; he is seized with feverishness and vomiting, and is prostrated at once; and the lapse of a few hours only is sufficient to manifest to an ordinary observer that the system has succumbed to some overpowering morbific agency. In either case the complaint which first calls attention to the throat is a slight embarrassment in swallowing, with a sense of heat and fulness, but the dysphagia and pain are trifling compared with that of the early stage of acute tonsillitis. On inspecting the throat at this time, its condition will be found to vary in appearance according to the early period of the attack and its absolute severity. In some cases the tonsils, soft palate, and uvula, are seen to be simply red and œdematous; and on a casual view nothing more would be noticed, so that the case might be erroneously set down as one of simple tonsillitis. But if true diphtheria exists, even a few hours after the first feeling of uneasiness, a more careful examination will disclose one or more white patches of variable size on the tonsil or elsewhere (see fig. 1), not larger, perhaps, than a split pea, but enough to warn any one who has previously seen

the disease that he may have to arm himself for a conflict which the inexperienced would scarcely anticipate. This apparently insignificant patch or patches is, in fact, the diagnostic sign of the malady, and unless speedily checked by appropriate treatment, is destined to spread over the whole soft palate, and too often to invade with fatal effect the trachea and larger bronchial tubes.[1] In speaking of this peculiar appearance, the small patch of diphtheritic exudation, it is necessary to call attention to the possibility of mistaking for it either pieces of inspissated mucus, or those masses of caseous looking matter which exude in strumous subjects, from the surface of the tonsils. I have reason to believe that this mistake is not uncommonly made, and that cases are dignified with the name of diphtheria which have no pretension to so formidable a cognomen, as is moreover shown by the facility with which they are remedied. Such an instance has presented itself to me within the last few days.

In those cases in which the disease has made its assault with greater violence, and which are characterised from the commencement by rigors, vomiting, and more intense general distress, the throat will likewise be found tumid and vascular, but the vascularity will be of a dusky mulberry hue, like that of erysipelas, and the diphtheritic membrane will, even at this early period, be found to have invaded the greater part of the surface of the tonsils and soft palate. I have in one or two instances, in fact, seen the entire fauces, as far as the eye could reach, invested with this membrane in twelve

[1] See plate, fig. 2.

hours from the first complaint. Such cases most justifiably excite the utmost apprehension, for in a brief period more a most serious increase takes place in all the symptoms. The system has now fairly taken the alarm, and there will be either a hot skin with quick pulse, or, as in the severest cases, a state approaching to collapse with a cold and livid surface. The swallowing, though it may, especially in adults, be in some cases not materially embarrassed, now, in young children, most generally becomes difficult and painful, so much so that the little patient obstinately refuses to make the attempt either with food or medicine. And this constitutes in itself one of the main difficulties in the treatment; if the patient, by force or persuasion, be induced to swallow under these circumstances, the scene is often a fearful one, and the child is seen struggling and fighting for breath, while the food is violently ejected by the mouth and nostrils.

The case has now assumed a most formidable aspect, the child is enfeebled by its inability to take food, and harassed by the attempts it cannot avoid to swallow the saliva and foul secretions of the mouth; the false membrane has invaded every visible portion of the pharynx which appears as if coated with dirty wash leather, and is discoloured with the blood and sanies which exude from the congested vessels beneath it. The breath has all along been offensive, but now it is horribly so, so that the most tender mother can scarcely nurse her child without feelings of repulsion; a bloody and fetid secretion excoriating the skin runs from the nostrils, and the glands and cellular tissue of the neck are tender and infiltrated, thus adding materially to the embarrassment

of deglutition. In a certain proportion of cases, we are at this time further warned, by increased difficulty of breathing, attended with a peculiar croupy sound, that the diphtheritic membrane has spread to the larynx and trachea, inducing a condition of things which may be regarded as almost inevitably fatal, so few have been the recoveries under such circumstances. In this case symptoms of asphyxia speedily show themselves; the countenance becomes livid and ghastly, the skin cold and covered with petechial spots; but yet the little sufferer struggles on for hours after the pulse has ceased at the wrist, fighting for breath, imploring, if old enough to express its wishes, to be left to die, and in its distress and restlessness, throwing itself about to almost the very moment of death.

The above description applies to the steady progress of diphtheria in the severest cases, and may be taken as typical of the disease in its most aggravated form; but there are many cases equally fatal in the end, in which the symptoms do not explode with such violence, or reach their acme with such rapidity. On the contrary, the throat-symptoms, never very pronounced, appear to be readily amenable to treatment, and the child in a few days might be thought to be exempt from danger. The amendment, however, turns out to be fallacious, and the child, to all appearance free from risk, is suddenly seized with croupy breathing, and in a few hours is beyond hope. These deceptive cases are well described by Mr. Brown, of Haverfordwest, who was one of the first to call attention to the presence of diphtheria in this country. He says, in alluding to these cases, "I have seen them die in four hours from such sudden invasions; they may linger five or six days, with intermissions of eight or

twelve hours, the croupy breathing would suddenly cease; the little patient would get up, smile, eat, drink, and amuse himself. The delighted parents would point to him in admiration of your skill. The sonorous breathing, which told so plainly at your last visit that death was there, has disappeared; and, off your guard, you, in the general joy, pronounce him safe. A few hours suffice to turn this joy into mourning; the stridulous breathing returns, to end only with life." [1]

There is yet another, and often quite unforeseen disappointment to the hopes naturally excited in these cases, by the observance that all the severe and characteristic throat-symptoms have disappeared. I allude to the supervention of fatal asthenia—a rapid and sudden exhaustion which nothing would the day before have predicated, but which, on the contrary, nothing but previous experience would lead any one to anticipate. The patient is to all appearance progressing favorably in every respect; the membrane which threatened suffocation has been ejected and ceases to be reproduced; the patient swallows with ease, and takes food with avidity; everything points to a speedy convalescence, when suddenly comes the shipwreck of all hopeful anticipations in an apparently causeless sinking of the vital powers which nothing can arrest. This untoward termination is one that has been occasionally witnessed by all who have seen much of the disease, and is not to be lost sight of until some weeks of uninterrupted convalescence have ensured recovery.

It must not be supposed from the above account that diphtheria is always the fearfully fatal malady here re-

[1] 'Medical Times,' Dec. 28, 1850.

presented. Happily, it is in numerous instances a far less formidable disease, either from the original mildness of the attack, or from its being met by prompt and efficient medical treatment, and, so to speak, aborted at the outset. The membranous exudation is stayed in its fearful progress, and gradually exfoliates and is expectorated, while the subjacent mucous membrane begins to assume its natural colour and appearance, at the same time that the glandular swellings subside, and the pulse improves in volume and power. But it must be remembered that these favorable changes are often slow and uncertain even when fully established, and that many weeks sometimes elapse before the patient can be pronounced convalescent.

Before quitting the symptomatology of diphtheria, I may remark that a late writer on this subject[1] has made the observation that the urine has been found to be albuminous in severe cases. To what degree this phenomenon is to be looked upon as an integral portion of the disease I am unable to say, but we may fairly assume that when it does appear it indicates not only a high degree of internal visceral congestion, but a congestion, as in scarlatina, typhus, and other blood-diseases, indicative of a dangerous physical degeneration of the vital fluid, and therefore of serious import as regards our prognosis.[2]

[1] 'Observations on Diphtheria,' by Dr. Wade. Churchill, London, 1859.

[2] The author of the above brochure has subsequently published a letter in the 'Lancet' (Feb. 8th), in which he points out that I had misunderstood him, in stating that the albuminous character of the urine is found only in severe cases. He states that he has observed it also in apparently slight cases, but he admits that he found "indications of impairment of the renal functions were constantly precursory of an unfavorable termination."

The duration of diphtheria is various. I have seen it fatal in forty-eight hours from the first overt seizure, and it has been known to terminate even sooner—the system being as it were knocked down at once, as is seen in exceptional cases of other forms of blood-poisoning. It may, on the other hand, continue for two or three weeks, and prove fatal either by pure exhaustion, as has been before said, or by the supervention of other lesions. Amongst these paralysis of the muscles of deglutition has been noticed, as well as a state approaching to more or less complete hemiplegia. In favorable cases an improvement may be looked for on the fourth or fifth day, and is indicated by the expectoration of membranous shreds, detached from the fauces, as well as a corresponding general amelioration of aspect, and increased facility of swallowing. Even when the exudation has invested the larynx and trachea, the false membrane has in some rare instances been expelled with immediate relief to the urgent difficulty of breathing.

We now proceed to the pathological appearances of this disease. Those which are essential are chiefly confined to the fauces and upper part of the respiratory tract, although the primary and even secondary bronchial tubes are sometimes involved. The soft palate, the back of the pharynx, the uvula, and the tonsils, will be found more or less invested with a fawn-coloured fetid membranous deposit, torn up in places, and more or less detached by the repeated cauterizations which have probably formed a part of the treatment. Below this adventitious deposit the mucous surface is deep red or livid, with papular elevations which correspond to indentations in the lower surface of the membrane. Be it

understood, however, that unless the result of caustic applications, there is no ulceration or sloughing, as is seen in those forms of angina known under the names of "ulcerated" and "putrid" sore throat. I insist strongly on this point, because on it rests the opinion that diphtheria is a disease distinct from other and more familiar forms of "sore throat," while, on the other hand, I hear continually of cases described as diphtheria in which *ulceration* is mentioned as a prominent feature. Wherever the diphtheritic membrane is detached, as it may be accidentally or by the forceps, a bloody and highly fetid sanies exudes. The membrane itself often extends into the nostrils and to the œsophagus, and in addition, in a large proportion of fatal cases, will be found to have invested the glottis, and to have traversed the entire extent of the larynx and trachea, and even to have reached the bronchial tubes, forming an exact cast of these tubes, and more or less completely impeding respiration. Such cases are, as I have said, almost invariably fatal.

But the lesions after death are not entirely confined to the parts above mentioned; the submaxillary glands are also much engorged, and the surrounding cellular tissue infiltrated with a sanious pus. In addition to this, we find a generally congested state of the internal organs, such as is seen in most of the zymotic diseases, together with a dark and diffluent state of blood with transudations in the serous membranes, and other manifestations of what may in general terms be called the typhoid state. But these are not peculiar to the disease in question, and are consequently of no particular interest.

The physical appearance of the false membrane itself

likewise claims some special attention. It has been variously described as a fibro-plastic membrane similar to that thrown out in true inflammatory croup, and, on the other hand, as an aplastic secretion which exhibits a lower type of vascular exudation, and does not admit of organization, but acts as a foreign body, and as such if not removed, undergoes rapid putrefaction. This is the description of it given by the reporter in the 'Lancet,' and is, I believe, the most trustworthy of the two. The membrane is sodden by the sanious secretions in which it is enveloped, and which are exuded from the abraded mucous membrane below it. The colour is at first whitish, but, from the cause above mentioned, soon becomes of a dirty yellow or ash-grey colour. Under the microscope, in addition to corpuscles and irregular fibrillar structure one observer more particularly, Dr. Laycock of Edinburgh has detected the presence of a parasitic fungus, which he is disposed to look upon as the *fons et origo mali*. Dr. Laycock's communication, it must, however, be conceded, fails to impress the reader with the confidence in his theory which it would have done, had his case been one of uncomplicated diphtheria, whereas it is a case only of an exudation resembling that of diphtheria occurring at the close of a long-standing disease of the supra-renal capsules. The fungus alluded to by Dr. Laycock is the "Oidium albicans" a parasite which he admits to be also discoverable in the patches of muguet or aphtha, and which has been recognised by other microscopic observers in the secretions of the mouth during the course of many other diseases; so that it is, I think, no unfair inference that it must be looked upon as an accidental and secondary

phenomenon, rather than as an exciting cause of the disease.[1]

Such are the features which characterise this severe malady during life, and which are found on *post-mortem* examination. It becomes now an interesting question to decide, what is the special peculiarity of the disease, and what its alliances with the more familiar forms of throat-affections? There are some writers in the medical journals of the past few months, who look upon diphtheria as only a variety of ordinary ulcerated sore throat, and one deriving its special intensity and fatality from its association with that depressed condition of the vital powers which is the common result of the many anti-hygienic circumstances by which the labouring poor are surrounded; that it holds, in fact, the same relative position to ordinary angina that typhoid pneumonia does to ordinary inflammation of the luugs in healthy subjects. Others regard it as closely allied to scarlatina, and so far there may be some grounds for the surmise, inasmuch as scarlatina has prevailed in many of the districts in which diphtheria has shown itself. Others, again, and amongst them Dr. Copland and Dr. West, speak of the disease as a variety of croup, assuming its peculiar characteristics in virtue of its epidemic element, and the fortuitous influences of atmospheric and other hygienic influences. It appears to me, however, that a

[1] This opinion is confirmed by Dr. Rogers, in a recent letter to the 'Lancet' (Jan. 22d, 1859), in which he expressed his belief that the presence of the "oidium" in diphtheria is quite exceptional, and is only there to be found because the membrane has become acid during putrescence, which appears to be a condition favorable to the development of the sporules. Dr. Rogers further states that he has only found the parasite once in fourteen specimens.

closer investigation fails to identify the disease with any we have been accustomed to see, and that a strict comparison of symptoms in their individuality and sequence will be sufficient to establish a differential diagnosis with any one of them. This comparison I shall now proceed to make.

The great distinctive mark between diphtheria and croup, properly so called, is to be found in the locality chiefly affected. In both, it is true, the main feature is the presence of an exudation; but in the one disease it commences in the fauces, and only reaches the windpipe by extension and in a certain per centage of cases; while in the other, that of true inflammatory croup, it commences in the larynx and trachea, and does not necessarily affect the soft parts above the glottis at all. As a result of this, a marked difference is also found in the symptoms of the two diseases. In diphtheria the uneasiness is first referred to the parts subservient to deglutition; in croup, on the contrary, the symptom which earliest and most strongly excites attention is that of stridulous breathing and voice—a symptom which in diphtheria indicates the final development of diseased action. But to place this distinction in a more prominent light, we will collate a description of true croup, as given by Dr. Copland in his splendid work now just completed.

He says, speaking of the onset of the disease: "These precursory signs are well marked, and of a distinctly catarrhal nature; occasionally they are slight, chiefly of a febrile description, and either from this circumstance, or from the shortness of their duration, attract but little attention. The febrile symptoms, when present, consist

of alternating heats and chilliness, or in the more acute cases, of slight chills followed by heat of skin, flushed countenance, &c. . . . *Upon examining the pharynx and mouth, no trace of inflammation can be detected in this form of the disease; but the tongue is white and loaded at its base.* . . . After the above symptoms have existed a longer or shorter time, hoarseness, if it have not previously existed; sometimes a peculiar shrillness of the voice; difficult, sibilous, sonorous respiration, and an unusual dry, loud, clanging cough, as if passing through a brass tube, are observed." Let this, the precursory and early stage of true croup, be contrasted with descriptions already given of the invasion of diphtheria, and no doubt will, I think, be entertained of the difference of the two diseases. The epidemic croup spoken of by Dr. Copland is no more or less than "diphtheria," but as all his references to it are from continental or American writers, it does not invalidate the assertions already made, that the disease is practically new to this country.

From ordinary tonsillitis, as well as from the throat-complications of scarlatina, the distinction is in my opinion equally patent. There may be the same redness, and in malignant cases, as they are called, the same livid and œdematous condition of the pharyngeal mucous membrane, as is seen in diphtheria, but there is no secretion of the remarkable membrane to which I have alluded. What has been mistaken for this has either been an accumulation of mucus soluble in water, the white rice-looking secretions of the tonsillar follicles, or the ash-coloured sloughs which frequently attend these forms of "sore throat," but which may be distinguished

from the exudation in question, by the fact that they represent an absolute loss of substance, and not a something superadded to the surface, as is the diphtheritic false membrane. The gangrenous eschars of malignant scarlatina and putrid sore throat as it is called, can only be mistaken for the diphtheritic membrane by those who make an inefficient ocular examination, and are satisfied with the olfactory evidence of the existence of putrescent matter in the throat. In the one case the careful observer will detect deep and extensive sloughing; in the other, the adhesion of a putrescent film, but no loss of substance. The fact, also, that in the former cases the patient dies from exhaustion, while in diphtheria they generally die asphyxiated from the laryngeal exudation, adds materially to the correctness of the opinion which separates the two forms of disease.

There is one question connected with diphtheria for the reply to which the public will always look with anxiety—viz. Is it infectious? On this point medical opinion is much divided, the majority of observers, however, pronouncing very decidedly in the affirmative. My own conviction is that it is undoubtedly infectious to a limited degree; by which I mean, that when patients are accumulated in small ill-ventilated apartments, which is too often the case in the cottages of the poor, the disease is likely to be communicated, but I do not think that, like scarlatina or erysipelas, it is prone to be communicated in spite of all sanitary precautions, or that the infection can be conveyed by the clothes or persons of those who superintend the patients.[1] That it commonly spreads in

[1] In the excellent report in the 'Lancet' before alluded to, it is but right to state that the fact of contagion is placed in a more prominent light. M.

a family which it has once invaded, is to be attributed in some degree to the persistence of the same cause as originated the first case. What that cause is, is as mysterious as the cause of any other epidemic disease. It is futile to attribute it, as is done without due reflection, to poverty, want of cleanliness, over-crowding, cess-pools, dung-heaps, and other items in the unsavoury catalogue which has commonly the discredit of every epidemic visitation. Stench and insufficient diet, and filthy and over-crowded rooms have ever been the sad heritage of the agricultural labourer, but diphtheria is of recent origin. Doubtless, these insanitary adjuncts to the labourer's life predispose him and his children to the assault of any epidemic malady, but the specific cause of diphtheria, as of other forms of disease, is a something superadded which our senses cannot appreciate. Whether it be the sporules of a fungus permeating the atmosphere, and absorbed through the lungs into the blood, as suggested by Dr. Laycock, must as yet remain *sub judicé*. All that we can affirm in the present state of knowledge is, that anti-hygienic condi-

Bretonneau, observes the reporter, has collected some crucial cases. One is that of M. Herpin, who was attending a child who had already communicated the disease to its nurse. At one of his visits, while sponging the pharynx, the child coughed up some of the membranous secretion, which lodged in his nostril. This was followed by severe diphtheritic inflammation, and he was reduced to the lowest stage of prostration. The same mishap occurred to another French surgeon, M. Gardron, whose life was seriously compromised. On the other hand, direct experiments by inoculation have failed. Sufficient doubt, however, remains to justify every precaution in avoiding actual contact with the diphtheritic exudations, especially in reference to examining and applying medicaments to the throat. It is far from improbable, for instance, that the same spoon-handle used to inspect an affected throat, and one as yet only suspected, might convert suspicion into reality.

tions of any kind favour the invasion of this as of all similar visitations, and that diphtheria, like simple fever, may assume a low or, as it may be called, a malignant type, proportionate to the intensity of these collateral causes. It is understood that in some localities, and among some families, diphtheria has been mild and tractable, the false membrane being readily checked, and the patient never falling into the fearful debility exhibited in the under-fed tenants of ill-ventilated and stench-surrounded habitations; and it is not too much to attribute the difference in the original intensity of the malady to the favorable sanitary conditions of the one class, and the wretchedness of the other.

Treatment.

Like all diseases which have from time appalled by their severity or perplexed by their novelty, diphtheria has been met by a variety of treatment, and it is only of late that anything like unanimity on the subject has prevailed. If we read through the various articles on the subject, from Bretonneau's treatise downwards, we shall find that in the earlier invasions of the disease an activity of treatment prevailed, which recent experience has abnegated. Leeches to the angles of the jaws, blisters and rapid mercurialization, combined with certain local applications to the pharynx, formed the treatment at first advised. Mercurialization in particular was much lauded, and, indeed, looked upon as the sheet anchor especially in the croupal variety.

It was first employed in diphtherite by Dr. William

Conolly, late of Cheltenham, who was residing in Tours during an epidemic which had resisted all the efforts of Bretonneau and his confreres, and who gladly followed a method which was then attended with the most unexpected results. The favorable testimony afforded by the experience of this period, led to the employment of mercury at the first outbreak of the disease in this country; but it was soon for the most part agreed upon, that such is the asthenic nature of the disease as now generally witnessed, that not only is depletion in any form to be deprecated, but that the induction of mercurial action is indefensible either in theory or practice.

The same conviction that discountenanced the use of depletion and depressing agents, soon led to the adoption of a method in every way the reverse, and it may now be said to be conceded by almost universal consent that the treatment must be tonic, and, in every sense of the word, sustaining. The number and variety of tonic medicines which have been confided in by those called upon to treat the disease on a large scale, must, I think, show unmistakeably that, provided the strength of the patient be maintained, it becomes a matter of secondary consideration by which of these medicines the end is accomplished. Success has followed the use of several forms of medicine, provided that the patient has been enabled to take freely of wine and nourishment. Those more generally trusted to have been the hydrochloric acid, chlorate of potash, and the muriated tincture of iron. Many cases have done well under the two former medicines, either given alone or in combination, but I have always given the preference to the muriated tincture of

iron, not only from the analogy of its undoubted value in the treatment of erysipelas, but from positive evidence of its unquestionable value in the practice of several gentlemen in this county. I may mention more particularly the Messrs. Dix, of Smallburgh, and Mr. Clowes, of Stalham, each of whom has had unusual opportunities of testing its advantages. If this form of medicine be determined on, it may be given in water in doses of from ten to thirty drops, according to the age of the patient, or it may be combined beneficially with infusion of quassia, and rendered more palatable by the addition of syrup, especially in the case of children. I prefer, however, if it can be so taken, to administer it in water, and diluted only to an extent sufficient to allow of its being readily swallowed, as in this way it acts locally on the pharynx during deglutition. A few minutes after its ingestion a further quantity of plain water may be drank to ensure its more ample dilution in the stomach. The chlorate of potass may be given in doses of from five to fifteen grains either alone or combined with the same number of drops of hydrochloric acid; the medium, as in the other case, may be either water or a bitter infusion.

But whichever of these medicines be decided upon, wine and nourishment must be given with an unsparing hand, measured by effect rather than quantity; and here is the main difficulty in these cases. It is easy to say, give so much wine and so much beef tea, and let the child have this and that medicine every so many hours; but recommending is one thing, getting it done is another. The poor child, if an infant, cannot be per-

suaded to swallow on any terms; and if older, it is so scared and pained by its attempts to do so, that it will refuse everything or take it only by main force, to eject it perhaps by the nostrils. Every offer of drink, every display of the medicine-spoon, is the signal for a scene as painful as we are ever called upon to witness, and the medical attendant, not to speak of the mother, may be well excused if he give it up in despair. Hopeless, however, as such cases appear, we must not resign the contest. We have still a resource. Although nourishment cannot be conveyed to the stomach, it can be thrown into the bowel, and injections of concentrated beef tea, with quinine and brandy, will sometimes sustain a life which, had we trusted to the stomach alone, must inevitably have been extinguished.

I have not yet spoken of the auxiliary measures to be adopted, in the shape of local applications to the fauces. These form a very important element in the treatment, and are most valuable, or may be inefficacious or even detrimental, accordingly as they are applied judiciously or otherwise. At the commencement of the present epidemic, lunar caustic, either in substance or in strong solution, was the application almost universally resorted to. Further experience, however, has somewhat diminished confidence in it, and among those who have been most loud in its praises some are to be found who now dispense with it altogether. The *solid* nitrate, I think, ought never to be used. Applied to the false membrane itself—an extra-vascular formation—it can have no effect, while to the surrounding and subjacent engorged tissues it acts as an escharotic rather than as a stimulant, and produces a slough which may complicate the diagnosis,

instead of producing that astringent effect which, by diminishing the capillary congestion, breaks through the chain of morbid vascular action. If nitrate of silver be chosen as a local application, a solution of from twenty to forty grains to the ounce would, I believe, answer every purpose. Bretonneau, and practitioners of his date, put much faith in the application of hydrochloric acid, and the same has met with the support of several recent writers in the weekly medical journals. The tincture of the sesquichloride of iron has also been extensively used, either undiluted and applied with a camel's-hair brush, or in the form of gargle. Those who have tried it speak most highly of its effects, and several have trusted to it exclusively as a local application. In the milder cases, together with its internal exhibition, it certainly appears to offer the most satisfactory results.

Another local application in the form of gargle, of great utility, and having, moreover, the advantage of correcting the fœtor of the breath, is Beaufoy's solution of the chloride of soda, in the proportions of two or three drachms to eight ounces of water. Even when other local applications are resorted to, it is well to conjoin the use of this, if only for the purpose alluded to. Could we feel assured that the vegetable parasite described by Dr. Laycock stood in the relation of a cause of diphtheria, instead of a consequence, those substances which are known to be destructive of these low forms of vegetable life might be resorted to. Such are the sulphurous acid and the hyposulphate of soda in the form of a saturated solution. Of the power of the latter to destroy the vegetable growth upon which favus depends, as well as in the case of the "oidium" of the vine, I have had

personal experience. In reference to the local applications to the interior of the throat, the same observations hold good as in the exhibition of medicines internally. It is easier to order than to execute. No false tenderness, however, must be allowed to intrude itself where so much depends upon energy and promptitude. Neither should the applications be entrusted to parents or nurse; the medical attendant alone is competent to carry them out effectually.

Of external applications to the throat, no form should in my opinion be employed except emollient applications, as bran poultices or the more cleanly hot-water compresses. Leeches are inadmissible, and blisters only increase the danger, by putting on a diphtheritic and, in very adynamic cases, a sloughy condition, thus adding materially to the danger of the patient. Should the infiltration of the cellular tissue be very considerable and fluctuation be plainly perceptible, the ordinary principles of surgery would inculcate the evacuation of the pus, rather than risk its further diffusion.

This concludes what I have to say respecting the treatment of diphtheria. It must not, however, be imagined that all cases present the fearful features I have endeavoured to describe, or require the energetic treatment mentioned. Whether from original robustness on the part of the individual, or from the favorable circumstances under which he is placed, or whether, as sooner or later appears to be the case in all epidemics, the poison loses its intensity, a certain number of patients will present themselves in which the general symptoms are mild, and the diphtheritic exudation is limited in extent and is slow in increase.

In these cases one or two applications of the twenty-grain solution of nitrate of silver, or of the undilute tincture of iron, or a gargle of the same, with fomentations of the neck, rest in bed, and nourishing diet, will be sufficient to effect a cure; but in the least severe cases great watchfulness is required, and medical visits to the patient should be frequent until a positive check to the progress of the disease is apparent.

Before taking leave of the subject, I must advert to one other point which may be a matter of question in the severest form of the disease, in which the patient is dying of croup, viz., the propriety of tracheotomy. This subject may be dismissed in a few words. Sanguine as are some French physicians, and more particularly Guersant and Trousseau, as to the results of tracheotomy in true croup, they shun the operation whenever there is a diphtheritic complication, or, in other words, when the croup is the result of the extension of the diphtheritic exudation to the larynx, and the patient is not dying merely from asphyxia, but is sinking likewise from a blood infection which has reached the limits compatible with life. It is obvious that were the membrane limited to the larynx and trachea, instead of invading also the primary bronchial tubes, which it generally does, still no hope can be entertained of the beneficial results of an operation while there is present a degree of typhoid prostration in itself sufficient to destroy the patient.

It must not be supposed in any case, but more particularly in severe examples of diphtheria, that all cause of anxiety ceases with the disappearance of the essential characteristics of the disease. Even when the

throat has nearly resumed its normal appearance, and a vigorous appetite appears to herald a steady convalescence, there is still a necessity for great watchfulness. In severe cases, as I have before remarked, a long-continued exhaustion of the vital powers not unfrequently shows itself, which will tax all our resources, and which in some instances terminates unexpectedly in fatal syncope. A very distressing instance of this mode of death recently fell under my own observation. In this case I did not witness the early stages of the disease, but according to the report of the surgeon in attendance, the diphtheritic symptoms had entirely subsided, and nothing seemed to interfere with recovery, until rapid sinking suddenly ensued. It is well to bear in mind the possibility of such untoward occurrences, under circumstances apparently encouraging. It will save us the pain of giving too favorable a prognosis to the friends of the patient, as well as of allowing ourselves to be too soon lulled into a security which may prove to be fallacious.

Any observations on Diphtheria or other epidemic disease, would be imperfect without a due consideration of those circumstances which experience teaches us may be preventive of its outbreak and extension. Although, as I have before stated, I cannot subscribe to the opinion that the disease has more than an incidental connexion with bad drainage, impure air, and insufficient food, I should strongly urge the importance of abating these prejudicial conditions, as *predisposing* those exposed to them to this as to other zymotic invasions, by reducing

the constitutional powers, and thus rendering them less able to resist toxic agents of any kind. The poor children who are doomed night after night to breathe the fetid atmosphere of their miserable dormitories, six or eight, perhaps, consuming the air which could at most only supply healthy respiration to two or three, cannot be expected to exhibit such a standard of vitality as shall enable them to rebut the attacks of the unseen pestilence. Let them, in addition to this, be surrounded by the poisonous exhalations of sewers and dungheaps, and have their acquaintance with animal food limited to a small hebdomadal vision of a piece of pork, and you have a state of things the most favorable for giving the malignant impress to diphtheria, if it appears amongst them, as well as to any other disease. Fresh air, especially in the sleeping apartments, must be studiously enjoined, all sources of foul gaseous emanations must be removed, and a full animal diet afforded, conjoined with a reasonable amount of stimulus. Nor is it enough, when the disease has once appeared in a village, to confine these precautions to the persons and houses of the afflicted. Those still intact should be fortified by a more liberal diet, and submitted to the same sanitary precautions, if we would seriously apply ourselves to the arrest of the disease.

When a child is attacked by diphtheria, immediate seclusion from the rest of the family is essential, and those who are of necessity brought into contact with it should take every precaution not to inhale the breath too closely, and especially to avoid the contact of the fetid diphtheritic secretions with the mucous membranes. Sufficient care in this respect is, I believe, not always

exercised in examining the tonsils of other children whom we may be requested to inspect. It is quite possible that the use of the spoon-handle which has touched the diphtheritic throat of one child, may convert the hypothetical into a positive case of diphtheria in another.

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Fig 1.

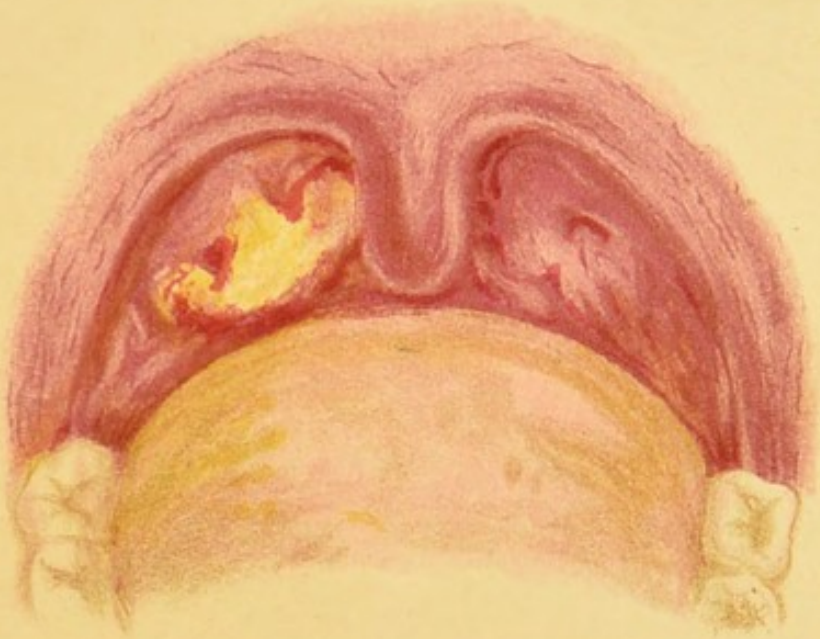

Fig 2.

DESCRIPTION OF THE PLATE.

FIG. 1. The throat in the early stage of Diphtheria from an adult.

FIG. 2. The throat in an advanced stage of the disease, the false membrane investing the entire soft palate back of the pharynx and extending to the larynx, from a child aged seven years.

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