

These authors probably represent very fairly the views entertained in regard to the origin of bronchial respiration. All assert that it may originate in the bronchi, with the exception of Guttman, who limits it too closely to the larynx. Careful observation shows that it may arise in the nose, lips, or throat, depending both upon the movements of these parts and the rapidity with which the current of air passes over them. When a similar sound has its source below the larynx it implies some abnormal condition of the parts by which vibrations are excited in the current of air, — such conditions, perhaps, as might be found in advanced catarrhal pneumonia, when the lung has been more or less extensively destroyed, — but the requisites for its *production* are *not* found in simple consolidation or in effusions into the pleural cavity.

We must, however, admit that the sounds formed in or above the rima glottidis may be modified by the character of the passages or cavities which they enter, or that of the adjacent tissues. Dr. Langmaid, at the meeting where this matter was discussed, alluded to the fact that the bones of the head vibrate greatly, and stated that advantage was taken of this to get harmonic notes in which the trachea and bronchi took but little if any part. This seems to be only an example in the *head* of what is generally spoken of as *consonance in the chest*. For the production of the latter sound it is necessary that some change should take place in the pulmonary tissue, which increases its consistency either through disease or compression, so that the bronchi connected with it may respond more readily to and reinforce the waves of sound transmitted from the larynx or parts above.

The object of this paper is to show *where* bronchial respiration *originates*. If the views advanced be correct, the question which has so long agitated the medical world, in regard to the relative claims of conduction and consonance, seems to be simplified. There is certainly no doubt that the sound traverses a certain interval to reach the ear applied to the parietes, and that it is modified in various ways by the media through which it passes, or that, in other words, these media are also made to vibrate in connection with the primary sound. *We have therefore both conduction and consonance*. The sole task is to determine the relative agency of each.

DIPHTHERIA AND CROUP: THE ANNUAL REPORT FOR THE SUFFOLK DISTRICT MEDICAL SOCIETY.¹

BY T. B. CURTIS, M. D., REPORTER.

HAVING been appointed to present to the Massachusetts Medical Society the annual report of the Suffolk District branch upon *subjects of local interest connected with the practice of medicine*, I thought that the

¹ Read before the Massachusetts Medical Society, June 13, 1877.

epidemic of diphtheria now in progress would furnish the most acceptable subject for our consideration. The very great mortality already occasioned by this intractable and justly dreaded disease, and the great number of cases which are probably yet to be encountered before the present outbreak shall have run its entire course, seemed to render it without any doubt the most important event of the year to all the members of the medical profession here present. As it is manifestly impossible as well as undesirable that I should attempt on such an occasion to treat the vast topic of diphtheria in all its bearings, my remarks will be limited to certain aspects of this interesting subject. I propose, then, to consider the views which have obtained and which now prevail among the medical profession of this community regarding the significance which should be attached to the word *diphtheria*, and to discuss the relations existing between this disease and so-called *croup*.

What do we understand by diphtheria? The word itself is of comparatively recent origin, having been first devised by Bretonneau in 1826. Derived from the Greek *διφθέρια*, meaning *membrane*, it was applied by its originator to a *specific infectious* disease, of which the main characteristic consists in the formation of *false membranes* upon certain mucous membranes and abraded surfaces, and which is accompanied by more or less marked general symptoms of *asthenia*, supposed to be due to a constitutional infection. The new word, and what is of far greater moment, the *new idea* of a specific morbid entity, embracing all the forms and varieties of pseudo-membranous disease, conceived by Bretonneau, and fully developed by his illustrious pupil, Trousseau, have been as yet but slowly and incompletely assimilated by the medical profession of this country and of Great Britain. The so-called diphtheria did not make its appearance at all in the registration of Massachusetts until 1858, when eighteen deaths were returned under the new designation. In 1859 Dr. B. E. Cotting published a paper on Diphtheritis, or the Membranous Disease commonly called Croup, in which the views of Bretonneau and Trousseau were promulgated, and in which the unity of the various forms of pseudo-membranous disease was clearly set forth and strongly insisted upon. In that year the deaths attributed to diphtheria in the State were thirty-two. In 1860 there were two hundred and thirty-eight deaths so recorded, and they continued to increase rapidly in number till 1863, when the fatal cases reached one thousand four hundred and twenty.

Notwithstanding the recent introduction of this new designation into our mortality records, it is impossible, as Dr. Cotting showed, to recognize in diphtheria a new disease. Its great antiquity was asserted by Bretonneau and by Trousseau; and Dr. Squire, in his article on diphtheria in Reynolds's System of Medicine, considers that it is demonstrated to have existed in the earliest ages of medical history. The disease can-

not even be regarded as new to this part of the world, for it was most unmistakably described in its various forms as long ago as 1771, by our distinguished countryman, Samuel Bard, the precursor of Bretonneau, as he is styled in the recent treatise on diphtheria of Sanné. Where, then, are we to look for earlier records of the disease now called diphtheria? If we examine the registration reports of Massachusetts, we find recorded, year after year, under the designation "croup," a varying proportion of fatal cases, constituting on an average from 2.5 to 3 per cent. of all deaths in the State. Upon the appearance in our mortality records of the so-considered new disease, diphtheria, the proportion of deaths attributed to croup began to diminish, so that from 1865 to 1874 deaths by this disease had sunk from nearly 3 per cent. to but 1.6 per cent. of all deaths. If, however, to these so-called cases of croup we add the deaths returned under the new name of diphtheria, we thereby restore the full proportion of our yearly mortality formerly attributed to croup alone, namely, 2.5 per cent. of all deaths. With regard to the comparative frequency of the use of the two designations now employed, we find considerable yearly variations, the cases returned as diphtheria growing, however, yearly more numerous in comparison with cases returned under the obsolescent name of croup. During the present epidemic the predominance of diphtheria in our returns has been greater than ever before, the deaths attributed to this disease in 1876 having been over four times as numerous as those imputed to croup.

It is evident from these facts that the *croup* of our earlier registration comprised the *diphtheria* of to-day, and that we have now two names under which certain fatal cases are recorded where we formerly had but one. It appears, moreover, that the new designation is gradually supplanting the older one, the diagnosis croup becoming yearly more unfrequent among us as compared with the diagnosis diphtheria. The question now arises: What does this change in our nomenclature signify? Is it merely the partial substitution of one word for another, the thing designated and our conception of it remaining unchanged? Or has the thing designated, namely, the disease to which the words are applied, undergone a modification, a "change of type," so that we now have to do with two distinct morbid entities instead of one? Or, the diseased states remaining what they were, have our ideas regarding their nature partly changed, so that diverse opinions now prevail, requiring different words for their expression?

There can be, I believe, but little doubt that the last supposition is correct. The disease is in itself unchanged, but opinions differ with regard to its nature. Some, on the one hand, adopting the views advocated by Dr. Cotting in 1859, hold that all cases of pseudo-membranous throat disease are similar in nature, being dependent upon a common specific infection; and that the marked diversity of the symptoms re-

sults partly from the varying localizations of the false membrane and partly from the variable intensity of the general symptoms of blood-poisoning. By these the word "croup" is applied to the pseudo-membranous invasion of the larynx, which constitutes one of the most frequent and important localizations of the morbid process. Croup, then, according to this view, is never a disease, but only an affection constituting one of the most common symptoms of the constitutional disease called "diphtheria." By those who are of this way of thinking, the word croup is never used in diagnosis, and all cases of pseudo-membranous disease, including primary membranous laryngitis, are registered under the name of diphtheria. Other authors and practitioners, however, while recognizing the specific disease just mentioned, believe in the existence of yet another pseudo-membranous laryngitis, distinct in its nature, and clinically distinguishable from that due to the laryngeal localization of the diphtheritic process. These, therefore, now recognize two forms of membranous disease, one the result of a specific constitutional infectious disease, which they call diphtheria; the other a simple inflammatory, idiopathic, local disease, which is characterized by the formation upon the respiratory mucous membrane of a false membrane and by the suffocative effects thereby mechanically produced. This disease they call croup.

Thus we see that formerly all the various forms of membranous disease were regarded as examples of a purely local and inflammatory disease which was called croup; that now Bretonneau's conception of a specific infectious constitutional disease governing the various pseudo-membranous localizations has so far gained ground as to have entirely supplanted in some minds the ideas formerly prevailing; but that a small and gradually diminishing proportion of practitioners still cling to the old denomination, with the idea thereunto attaching of a local unspecific disease, and refuse to recognize as diphtheria certain exceptional cases of localized membranous disease unattended by obvious general symptoms of diphtheritic dyscrasia. Some of these, admitting the gradual diminution of the frequency of croup, assert that the change is to be accounted for upon the supposition that the simple membranous disease of the past is gradually disappearing before a new type of recent development. The masterly descriptions of disease left to us by Bard suffice, however, to negative any such hypothesis. Moreover, there can be no doubt that disease is less liable to become modified than opinion, and the change in our records is sufficiently as well as more plausibly accounted for by the widespread and growing acceptance of the specific morbid entity conceived by Bretonneau.

Upon what evidence, now, does the dualistic view of an idiopathic croup or pseudo-membranous laryngitis, distinct from laryngeal diphtheria, rest, and what are the characters by which this form of disease

is to be distinguished? Croup, it is said, occurs sporadically, and is not contagious or infectious, is not what is popularly called "catching;" it prevails almost exclusively in infancy or in early childhood, while diphtheria is seen chiefly at later ages, or in adults; it is sthenic and inflammatory in character, and is unattended by the symptoms of septicæmia observed in diphtheria; it is rarely if ever accompanied by albuminuria or by swelling of the cervical glands, and is not followed by paralytic sequelæ, as is frequently the case with diphtheria; and finally, the false membrane of croup, although anatomically identical with that of diphtheria, differs from the latter in its distribution, being limited to the respiratory mucous membrane.

Now in answer to these alleged reasons for distinguishing the so-called "croup" from diphtheritic laryngitis, the following objections must be made. In the first place with regard to non-transmissibility as a feature of croup, no demonstration of this alleged fact has ever been attempted. If in many cases of that form of diphtheria which is liable to be called *croup*, the tendency of the disease to spread has not been observed, this circumstance is sufficiently accounted for by the difficulty of recognizing transmission in diseases which are not intensely contagious, and also by the fact that this localized form, at all times exceptional, is chiefly observed at times when the epidemic influence of diphtheria is absent or but slightly marked. Moreover, croup has been described as occasionally taking on an epidemic character by some of the authorities (for example, Steiner), who still differentiate it from diphtheria. Finally, cases are on record in which croup has apparently been caught from diphtheria, while others exist in which diphtheria has been caught from croup. J. Lewis Smith, who describes a non-diphtheritic pseudo-membranous laryngitis, of which he says the diagnosis is ordinarily easy, relates a case¹ of croup in a child which proved fatal. "Two or three days after the death of the child, the two young women who nursed him were affected with severe diphtheritic pharyngitis, with the characteristic pseudo-membrane." A still more striking example of the infectious, diphtheritic character of croup is given by Dr. B. Edson (of Brooklyn), who described recently² a localized epidemic of diphtheria which took place in a home for destitute children. Twelve cases occurred in all. "Eight of the cases," says Dr. Edson, "were beyond question cases of diphtheria. The remaining four, had they occurred sporadically, would unquestionably have been considered typical cases of true croup, being clearly laryngeal throughout their entire history. Occurring, however, as they did in close succession, — due beyond question to the same local cause, — it was deemed warrantable, if not absolutely correct, to consider them all cases of diphtheria."

¹ *Diseases of Infancy and Childhood*, Philadelphia, 1876, page 239.

² *New York Medical Record*, May 5, 1877.

The second argument in favor of an idiopathic croup is based upon the difference of the ages at which croup and diphtheria chiefly prevail. It is, however, easy to see why diphtheria should appear under the form attributed to croup more frequently in infancy than at later ages. In the first place, the insidious first approaches of diphtheria are liable to pass unnoticed in infants and young children, and should attention by chance be directed to the fauces in the early stage of the disease, before the invasion of the larynx has taken place, the insubordination of the little patient is often such as to render a local inspection negative in its results. On the other hand, as was pointed out by Trousseau, the conformation of the larynx is such in the first years of life as greatly to facilitate obstruction and to favor the rapid development of asphyxic symptoms. At later ages, on the other hand, the larynx is less easily obstructed and the tendency to suffocation is less marked, so that in adults the symptoms characteristic of croup are hardly ever observed; asphyxia is observed in them only after a prolonged duration of the disease, when unusually large accumulations of false membrane have taken place throughout the larger air-passages, and at a time when a very pronounced condition of constitutional infection has had time to supervene. Hence the almost invariable failure of tracheotomy in the diphtheria of adult patients. It seems quite evident, then, that the difference of the symptoms observed in infancy and at later ages should be attributed not to a difference residing in the disease but to a difference in the subjects.

* The relatively sthenic character attributed to croup is accounted for by the selection of a particular type of diphtheritic disease to which this name is given. The cases chosen to represent croup are those in which the suffocative symptoms of purely local and mechanical origin, due to the laryngeal false membrane, predominate. In this type of diphtheritic disease the constitutional symptoms hardly have time to be appreciably developed or may be entirely absent. Such cases are, however, but examples of one extreme type of the disease, the opposite extreme type comprising cases in which the general symptoms by their early and excessive development overshadow or forestall the local manifestations. Between these extreme and widely differing varieties an uninterrupted series of intermediate forms is observable, in which the local and general symptoms vary respectively in intensity. Some of the distinctive features attributed to croup have another source; there are good reasons for the suspicion that a considerable proportion of cases of "croup" terminating in recovery are in reality cases of spasmodic laryngitis or "false croup." Hence the sporadic appearance, the sthenic character, the absence of sequelæ, and the gratifying efficacy of treatment by emesis, attributed to croup by some authors.

As for the alleged absence in croup of certain phenomena supposed

to be characteristic of diphtheria, namely, albuminuria, enlargement of the cervical glands, and secondary paralyses, it is by no means an established fact that these phenomena do not occur in that form of pseudo-membranous disease by some called croup. Albuminuria and adenitis are admitted to be not unfrequently observed in croup by some of those who contest the diphtheritic nature of this form of membranous disease (for example, Steiner). Moreover, the albuminuria and the paralytic sequelæ are so often lacking in cases of unquestionable diphtheria, and so often present in connection with other diseased states, as to have in themselves but little diagnostic or nosological significance.

The last alleged distinctive feature of croup, or pseudo-membranous laryngitis, as it is sometimes called in order to emphasize its localized character, with which we have to deal, is the restriction of the false membrane to the larynx and remainder of the mucous membrane of the larger air-passages. It is a well-known fact that in diphtheria the characteristic false membrane is occasionally absent from the fauces, or at least escapes detection. Curiously enough, however, the authors who describe a croup distinct from diphtheria almost all admit that in croup the false membrane usually occupies the fauces (tonsils, uvula, and palate) as well as the larynx. According to these authorities the pharyngeal membrane, upon which by the way they lay but little stress, is described as differing in no respect from that of diphtheria, being similar in appearance, identical in structure, and similarly attended by glandular enlargements. John Ware, in his admirable monograph on Membranous Croup, written in 1842, says that the state of the fauces was observed and noted by him in thirty-three cases, and that of these in thirty-two a false membrane was present, most frequently and sometimes only on the tonsils, sometimes on other parts, as the palate, uvula, and pharynx "From this statement," said John Ware, "it seems probable that the appearance of a false membrane upon the tonsils or other visible part of the throat in a case of croup may be regarded as a pretty certain diagnostic sign that it is the membranous form of the disease, and its absence as a pretty certain indication that it is one of the other forms." This careful observer, then, considered the presence of a pharyngeal membrane so frequent as to be almost pathognomonic of the membranous form of disease, which he was trying to distinguish from the other and less grave forms of laryngitis, inflammatory and spasmodic. Now if this pharyngeal membrane, which in all times has been found by careful observers to precede or coexist with croup in the great majority of cases, is not diphtheritic, what is it? And if we admit its identity with the similar false membrane of diphtheria, does it not follow that the membranous croup which it accompanies must also be diphtheritic?

We see, then, that none of the alleged characteristics of croup suffice to differentiate this form of pseudo-membranous disease from diphtheria.

On the contrary, all the features of croup, as described by those very authors who refuse to acknowledge its diphtheritic nature, are clearly significant of its specificness and of its identity with diphtheria. Its specific character is shown by its occasionally taking on an epidemic course, — to say nothing of its contagiousness, admitted by some of its upholders, — by the extreme rarity of its recurrence in subjects previously affected, and perhaps also by the very considerable mortality which attends tracheotomy in this disease as compared with the results of the same operation in cases of purely mechanical obstruction of the larynx. Its identity with diphtheria is manifest when we consider the similarity of their ætiological conditions, the coincidence of their epidemic outbreaks, and the fact that both forms are liable to occur as sequelæ after certain fevers, the identity of structure and distribution of the characteristic false membrane, and the similarity of certain accessory symptoms, such as albuminuria and the swelling of the submaxillary glands. Finally, such trifling differential characters as have ingeniously been attributed to croup in the effort to distinguish it from the diphtheritic form of laryngitis are clearly dependent upon differences of degree and not of kind, the extreme form disassociated from diphtheria under the name of croup being uninterruptedly connected with the most manifestly specific type of diphtheria by a gradational series of intermediate forms.

Such is the evidence. Inasmuch as the burden of proof must be held to lie with those who assert the existence of two distinct membranous diseases where formerly but one, however called, existed, and where now but one is recognized by those who have most contributed to our knowledge of the disease, I think our decision must be that the upholders of croup as an idiopathic disease have failed to establish their case. Consequently, and in accordance with the canon of Newtonian logic which prescribes that causes should not be multiplied without necessity, it is desirable that we should all admit the unity and specific nature of the pseudo-membranous disease, by whatever name it be called.

The importance of correct notions upon the relations of croup to diphtheria, involving the entire and unanimous acceptance of the morbid entity established by Bretonneau and Trousseau, rests partly upon the danger of regarding and treating a certain proportion of diphtheritic cases as if they were examples of a simple, non-transmissible disease, and partly upon the diagnostic confusion likely to arise between spasmodic and diphtheritic croup. This confusion, to clear up which John Ware wrote his celebrated paper, and which has been and still is so frequent in practice, however at variance with established theories, is liable to be perpetuated so long as the erroneous conception of an unspecific, sthenic, localized membranous croup remains to bridge over the abyss which should separate and distinguish the two diseases.

The dangers likely to attend the management of a case of croup treated upon the mistaken assumption of a non-diphtheritic nature are twofold: in the first place isolation is likely to be neglected, so that the disease will be allowed to spread through families and among neighbors. Secondly, practitioners who look upon the disease as simply inflammatory and sthenic in character are likely to overlook or underestimate the paramount necessity of avoiding all depleting, debilitating, distressing, or even fatiguing treatment, and of insisting from the beginning upon tonic and restorative measures relating to nutrition, stimulation, and rest.

Fully as important to avoid as the dangers just hinted at is the confusion of two diseases so dissimilar in prognosis and treatment as spasmodic laryngitis and diphtheritic or membranous croup: the one invariably of short duration and of happy termination, the other attended by an excessive mortality; the one admitting of sure and rapid relief by therapeutical measures, the other almost entirely refractory to all modes of treatment; their only point of resemblance lying in the difficulty of breathing, which constitutes almost the only symptom of the one and the most striking symptom of the other. For this confusion, certain of our text-books are partly responsible, inasmuch as they disseminate and perpetuate the erroneous notion of a simple, inflammatory, localized membranous croup, unattended by pharyngeal membranes or by any of the other characteristics of diphtheria. Authority is thus lent to the maintenance of a type of disease having no foundation in reality, and corresponding only to inadequately observed cases of diphtheritic croup or to cases of spasmodic laryngitis, magnified by an ill-regulated imagination into cases of membranous croup. The diagnosis "croup," as too commonly made, is applied to two distinct sets of cases: one set, in which a fatal termination by asphyxia is almost the rule, is composed of cases of primary diphtheritic croup; the other set comprises cases in which no false membrane is seen, and which terminate in a speedy recovery, to the delight of the parents and to the satisfaction and glory of the medical attendant. It is upon the degree to which the latter class of cases predominate among a physician's cases of "croup" that his success in coping with that imaginary form of disease depends. The more scrupulously he eliminates from his records of croup such cases as terminate favorably unattended by any visible false membrane, the more unsuccessful will his treatment of the disease appear. "Membranous croup," said John Ware, "unquestionably does sometimes come to a favorable termination; but recovery is comparatively so rare, it forms so much the exception, that admitting the distinctive character of the disease it is difficult to conceive that the treatment has anything to do with the recovery." "Thus," says Dr. Jacobi, "very little reliance can be placed on the judgment and the

diagnostic powers of such as save a large majority of their cases or who rely on infallible pet remedies." These remarks apply not only to croup but also to a considerable proportion of cases diagnosticated and reported under the designation of diphtheria. There is no doubt but that much of the successful treatment of diphtheria of which we read such extraordinary statements in our journals must be accounted for by the diagnostic confusion of pharyngeal diphtheria with comparatively harmless forms of sore throat, such as tonsillitis, faucial catarrh, herpetic angina, mild scarlatinal sore throat, etc.

With a view, then, to the establishment of more logical and more clearly defined nosological conceptions, and in furtherance of the acquisition of unequivocal testimony, relating to the management of the epidemic disease with which we are coping, I would respectfully submit that it is expedient for us to recognize the specific unity of the pseudomembranous disease in all its forms, and to discard from our nosology and registration the designation "croup."

RECENT PROGRESS IN MEDICAL CHEMISTRY.

BY E. S. WOOD, M. D.

URINARY CHEMISTRY.

Albuminuria. — M. Letulle¹ reports two cases of albuminuria occurring during the progress of lymphangitis. In both cases the amount of the albumen increased while the temperature remained high (40.3° and 40.8° C.), and gradually diminished with the lowering of the temperature and recovery from the lymphangitis. In both cases granular casts were found in the sediment, but these disappeared with the albumen.

Weinberg² found albuminuria in thirty-three per cent. of his cases of delirium tremens; he noticed that the albuminuria was exactly coincident with the delirium, and also that the amount of albumen corresponded with the intensity of the delirium, — the more severe the delirium the greater the amount of albumen, and *vice versa*. In no case did the urine contain any abnormal sediment.

J. Stolnikow³ gives a ready method for estimating the amount of albumen in the urine clinically. It is as follows: Dilute the urine with distilled water, until a little of the mixture poured into a test-glass just gives a white zone of coagulated albumen when treated with concentrated nitric acid. The nitric acid should be added to the diluted urine as in performing Heller's test, and the test-glass should be al-

¹ Centralblatt für die medicinischen Wissenschaften, 1877, No. 12, page 216, from Gazette des Hôpitaux, 1876, Nos. 130 and 133.

² Centralblatt für die medicinischen Wissenschaften, 1877, No. 6, page 112, from Berliner klinische Wochenschrift, 1876, No. 32.

³ Centralblatt für die medicinischen Wissenschaften, 1876, No. 45, page 811.