A LECTURE

ON

THE RELATION BETWEEN CROUP AND DIPHTHERIA.

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GENTLEMEN,—Some of you probably will remember that, at the beginning of the year 1870, the relation between croup and diphtheria formed the subject of discussion in the *BRITISH MEDICAL JOURNAL*—a discussion which had its origin in a paper which I there published on the Morbid Anatomy of Croup and Diphtheria. In that paper, I expressed my belief that, while most English writers on croup had confounded together two essentially distinct diseases—namely, simple catarrhal laryngitis and the specific diphtheritic membranous laryngitis—the true doctrine is that of the French pathologists, who teach that membranous croup is always diphtheritic, and that laryngitis from exposure to cold never results in the formation of false membrane.

At the commencement of the present year, the *Lancet* published simultaneously a lecture by Sir William Jenner on Croup and the Diseases that resemble it, and a paper of mine on Certain Points relating to the Etiology, Pathology, and Treatment of Diphtheria. In this paper, I reiterated my former statement that membranous croup is no other than laryngeal diphtheria; and Sir William Jenner stated that his opinion had undergone some modification. He said: "I am inclined now to the belief that there is no such disease as idiopathic simple membranous inflammation of the larynx. I say I am inclined to that belief. I am not sure that it is true; but, as I formerly thought that the weight of evidence was in favour of their non-identity, I now incline, from my further experience, to think that the two diseases are really identical; that the so-called croup" (that is, membranous croup) "is really diphtheria". The simultaneous statement of this pathological doctrine by Sir William Jenner and myself appears to have excited considerable interest, and has given rise to a prolonged discussion in the columns of the *Lancet*. Latterly, too, several communications on the same interesting subject have appeared in the *BRITISH MEDICAL JOURNAL*. I propose now to set forth briefly the main facts relating to this subject, which appear to me to be established almost beyond controversy.

In the first place, then, it is an unquestionable fact, that, although the name *diphtheria* is a modern invention of Bretonneau, the disease which we now recognise by that appropriate designation has existed for centuries. Bretonneau, in his first memoir on *Diphtheria*, translated by the New Sydenham Society, gives an interesting historical account of the disease, and shows that Aretæus describes it, and speaks of it as being so common in Egypt and Syria, that it had received the name of the Egyptian or Syriac ulcer. Two or three centuries later, the same disease is described by Aëtius; but, to come nearer to our own time, ever since the end of the sixteenth century, the disease now recognised as diphtheria has shown itself frequently in Spain, Italy, France, England, Sweden, and in America. Dr. John Starr, in the *Philosophical Transactions* (1749-50), describes under the name of *morbus strangulatorius* a disease which he says "has within a few years reigned in several parts of Cornwall with great severity". In his description we recognise the unmistakable features of diphtheria. He speaks of a "white body seen on the palate and tonsils", and gives a woodcut illustration of a membranous cast of the larynx, trachea, and primary bronchi, which was expectorated by one of his patients. He also describes the formation of a white membrane on blistered cutaneous surfaces.

Huxham, in his *Dissertation on the Malignant Ulcerous Sore-throat* (3rd ed., 1759), evidently confounds together the two diseases scarlet fever and diphtheria. We recognise diphtheria in his description of ash-coloured spots on the tonsils, uvula, palate, and pharynx, in the noisy breathing resulting from the extension of the disease to the air-passages, and in the expectoration of portions of membrane from the windpipe. He speaks of the discharge from the nostrils as being so acrid that it excoriated the lips and hands of the patients, and the

fingers and arms of the nurses. He believes that the "rheum" from the throat and nostrils, being swallowed, caused griping pains, diarrhoea, and excoriations of the anus and buttocks. While passing into the air-passages, "the windpipe itself was sometimes much corroded by it, and pieces of its internal membrane were spit up".

In the first volume of the *American Philosophical Transactions*, originally published in 1771, Dr. Samuel Bard gives an admirable description of diphtheria, under the name of *angina suffocativa, or sore-throat distemper*, as it appeared at New York. He describes the membrane on the tonsils as being frequently, but not invariably, present. He speaks of the membrane in the air-passages as being "preternaturally thickened mucus", without much inflammation; and he contrasts this with a case in which, death having resulted from "a very violent inflammation of the internal membrane of the trachea, there was no such mucous lining to be discovered upon it". He describes the formation of membranes on the abraded skin; and he recognises the infectiousness of the disease, but rather, as he says, "from the breath of the infected persons", than from "any generally prevailing disposition of the air". And this, he says, explains the fact that a whole family may suffer from the disease while the next-door neighbours escape. He speaks of one family in which seven cases occurred, three of which were fatal.

In the year 1765, Dr. Home published his treatise on the *Nature, Cause, and Cure of Croup*. The word "croup" had long been in popular use in Scotland to designate a disease, or a group of diseases, attended with the symptom of noisy breathing. Dr. Home was the first to describe a membrane lining the air-passages as the essential anatomical character of croup. A careful study of his cases clearly shows that under the name of croup he included two diseases essentially different; namely, simple laryngitis from cold, and the specific disease diphtheria. Most of the cases that recovered belonged to the former class, while the fatal cases were diphtheritic. His two first fatal cases of croup with false membrane occurred in a brother and a sister aged respectively seven and five years, who died within a few days of each other. The fact of two fatal cases occurring thus in quick succession would alone excite a suspicion that the disease was diphtheria. In the second case, there was "purulent" expectoration; "the amygdalæ were a little swelled and covered with mucus"; and after death, besides the false membrane in the trachea, the back of the tongue was covered with mucus, and "all about the glottis was covered with tough viscid mucus". It can scarcely be doubted that these cases of so-called croup were really diphtheritic. Cullen, in his *First Lines of the Practice of Physic*, 4th ed., 1784, in describing *cynanche trachealis*, refers to Home as "the first who has given any distinct account of it"; and, after describing the purulent and sometimes membranous expectoration, says that, "when the internal fauces are viewed, they are sometimes without any appearance of inflammation, but frequently a redness and even swelling appear; and sometimes in the fauces there is an appearance of matter like to that rejected by coughing". Under the head of *cynanche maligna*, Cullen evidently includes scarlatina anginosa and diphtheria. The latter cases are indicated by the appearance of white or ash-coloured spots on the fauces, and by the fact that "the larynx and trachea are often affected in the same manner as in the *cynanche trachealis*"; as a consequence of which, "the *cynanche maligna* often proves fatal by such a sudden suffocation as happens in the proper *cynanche trachealis*". But he adds: "There is reason to suspect that dissectors have not always properly distinguished between the two diseases."

Mr. Henry Rumsey, in "An Account of the Croup as it appeared in the Town and Neighbourhood of Chesham, in Buckinghamshire, in the years 1793 and 1794" (*Med. Chir. Trans.*, vol. ii), says that "frequently large films of a white substance were formed on the tonsils", evidently what we now call a diphtheritic exudation; and he describes "a film or membranous substance lining the cavity of the trachea". Mr. Rumsey, after referring to the opinion of Drs. Home and Cullen, that croup is an inflammatory disease, makes the following remarkable comment. "It appears to me that the croup is an inflammation of its own kind. If it consisted in common inflammation, we might expect to find the same appearances (that is, the same kind of concretion on the surface of the trachea) every day, as its mucous membrane is so frequently the subject of inflammation attended with an increased secretion. The matter, however, of which this substance is formed, possesses different properties from those of the mucus which is thrown out upon the membrane of the nose or of the trachea in common catarrhal affections." In these remarks of Mr. Rumsey, we have the earliest intimation of the specific character of that inflammation of the larynx and trachea which results in the formation of false membrane, and of the essential difference between that and what he calls common inflammation.

Dr. Cheyne's treatise on the *Pathology of the Membrane of the Larynx and Bronchi* was published in 1809. In describing croup, he says: "I have seen children so affected that I at first imagined they were suffering under the second stage of croup; but, upon examination, I discovered sloughs on the tonsils and uvula. The cough, voice, and breathing were those of the second stage of croup." Dr. Cheyne doubts whether these were cases of "true croup"; but it can scarcely be doubted that they were cases of diphtheritic croup. Dr. Cheyne mentions two cases in which croup occurred as a complication of scarlet fever. In a child, there was croupy cough and breathing, and "the fauces were sloughy". In this case, no examination was made after death; but, in the case of a soldier who died, "the trachea was found lined by a membrane as in croup". Unquestionably, these were cases of diphtheria associated with scarlet fever.

I have shown you that our English writers on croup, from Home and Cullen downwards, unquestionably met with cases of membranous exudation on the fauces and air-passages which could have been no other than the disease which we now recognise as diphtheria; but until the publication of Bretonneau's memoirs on *Diphtheria*, if we except the brief statement which I just now quoted from Rumsey, no one had pointed out the essential distinction between the specific diphtheritic inflammation of the throat and air-passages, with its resulting membranous exudation, and simple catarrhal inflammation of the same structures.

Most writers on croup before the time of Bretonneau, and many writers since, have confounded two essentially distinct diseases; namely, a specific diphtheritic laryngo-tracheitis, and simple catarrhal inflammation of the air-passages. Bretonneau, Trousseau, Guersant, and all the leading French pathologists, agree in defining true croup to be that form of the disease which is attended with a membranous exudation. They also agree that this is a specific product of the diphtheritic poison; while "false croup", or, as they call it, "stridulous laryngitis", is a catarrhal inflammation excited by cold, and not resulting in the formation of a coherent membrane. I believe this pathology to be correct; but it is unfortunate that the term croup should have been diverted from its original significance of a croaking or crowing noise, to express an anatomical condition. It is unquestionable, that this attempt to restrict the application of the term croup has been a source of confusion, especially to English practitioners, who, having been accustomed to think of croup as an inflammatory disease the result of exposure to cold, often fail to distinguish between this simple inflammatory croup and the "true croup" of the French.

It is evident that most cases of membranous croup have been and are diphtheritic, and the only question that remains for consideration is this: Is there a form of membranous croup which is not diphtheritic? It is possible that there may be more than one form or modification of morbid poison which may excite a membranous exudation in the air-passages. Of this, however, we have no proof; but the evidence is very weighty against the opinion entertained by some that exposure to cold alone may excite a membranous inflammation. Our experience of catarrhal inflammation of the mucous membrane of the air-passages is very great. We see it constantly under the forms of laryngo-tracheitis and bronchitis; and the product of this inflammation, at every period of life from infancy to old age, is the same—a muco-purulent secretion, and not a coherent false membrane.

On the other hand, we meet with numerous cases of diphtheritic inflammation affecting the nares, fauces, and air-passages, with the formation of a more or less coherent membranous exudation; this product being, as Mr. Rumsey said eighty years ago, entirely different from that of ordinary catarrhal inflammation.

It is, then, unquestionable that, in the vast majority of cases, a membranous exudation in the air-passages is the specific product of diphtheria. It is equally certain that, as a rule, catarrhal inflammation the result of cold, although intense enough to destroy life, as it does in very numerous instances, is attended with no such membranous exudation. The arguments which are sometimes put forth in support of the proposition that there is a form of membranous croup which is not diphtheritic, are quite inconclusive. It is admitted by the best authorities that the morbid anatomy of membranous croup is identical with that of diphtheria. The infiltration of the mucous membrane, by some supposed to be characteristic of diphtheria, may exist in the fauces and larynx, while in the trachea and bronchi of the same subject there is an unadherent so-called croupous exudation on the surface. It is certain that the absence of exudation on the fauces will not prove the croup to be non-diphtheritic; for the diphtheritic process may begin in the larynx, or, what is more common, the exudation which first occurred on the fauces may become detached, while the disease is extending downwards into the air-passages. In some cases, the posterior surface of the soft palate is covered by exudation, while none is visible on the

anterior surface. I saw two sisters, aged respectively nine and six years, who were taken ill simultaneously. The younger child had a diphtheritic patch on one tonsil, which went no further, and she was soon well; the other had a croupy cough and breathing, but no visible exudation on the fauces, and she quickly died from obstructed breathing. There was no *post mortem* examination; but there could be no question that the case was one of laryngeal diphtheria without exudation on the fauces. Mr. Lattey of Southam mentions a case (BRIT. MED. JOUR., May 29th, 1875) in which a pellicle appeared on the tonsils on the second day, and separated on the third, when, a day or two afterwards, croupy symptoms occurred; so that, if this case had been first seen at that period, it would have been taken for a case of croup without exudation on the fauces.

It is sometimes said that, whereas membranous croup is a sthenic disease, diphtheria is asthenic; but it is notorious that, in many cases of undoubted diphtheria, there is a remarkable absence of constitutional symptoms until the larynx is invaded. Then, although diphtheria belongs to the class of epidemic and contagious diseases, it often occurs sporadically, and shows no disposition to spread from the sick to the healthy.

It has been urged, as an argument against the identity of membranous croup with laryngeal diphtheria, that the older writers on croup make no mention of the paralytic sequelæ which occur in some diphtheritic cases. In reply to this argument, I would remark first, that, since laryngeal diphtheria is usually fatal, it rarely happens that the sufferers from this form of disease live long enough to develop the paralytic sequelæ; and, secondly, it is remarkable that in none of Bretonneau's elaborate memoirs on diphtheria is there any reference to these paralytic symptoms, which had escaped the notice of that acute observer. We see only what we have been educated to observe. To deny the identity of laryngeal diphtheria with membranous croup because no reference in past times was made to paralytic sequelæ, would be as unreasonable as to doubt their identity because the frequent coexistence of albuminuria was never mentioned until Dr. Wade pointed out the fact, and so taught us to look for it.

One remarkable fact in the history of diphtheria is, that it often occurs as a complication of other diseases. Thus it may coexist with scarlet fever, or with measles; and it is probable that a common catarrh may act as a concurring cause of the specific diphtheritic process. As an abraded skin may become inoculated by the diphtheritic poison, so may the throat when abraded by a simple catarrhal inflammation. Now, with reference to cases of this kind, I wish to impress upon you a point of great practical importance. Whenever you meet with a case of membranous croup which has been supposed to be a result of mere exposure to cold, make careful inquiry for any possible source of infection from a similar case; and, failing this, make a rigid search for insanitary conditions in the house where the disease originated. You must not be content with simply asking whether the drains and the water-supply are such as they should be; but you must search for insanitary conditions with the certain conviction that they exist; and, unless your experience is different from mine, you will find that the cases of supposed membranous croup from exposure to cold resolve themselves into cases of diphtheria the result of poisoning by foul air or contaminated water; for diphtheria in all its forms and varieties is as certainly as typhoid fever a disease of filth-origin. If ever it should be found that membranous laryngitis occurs from simple exposure to cold, without evidence of infection or of septic poisoning, I shall abandon the belief, which at present I hold firmly, that membranous croup and laryngeal diphtheria are one and the same disease.

In future, if we would avoid confusion in the use of the word croup, we must associate it with a distinctive prefix. There are three distinct diseases to which the term croup has been applied generically.

1. Spasmodic croup; syn., laryngismus stridulus, crowing inspiration, child-crowing, thymic asthma. This is a pure neurosis, and is often associated with infantile convulsions. It is the "false croup" of some English writers.

2. Inflammatory croup; syn., catarrhal laryngitis, the "stridulous laryngitis" or "false croup" of French writers. This disease is a catarrhal inflammation of the larynx and trachea, excited by exposure to cold, often complicated with laryngeal spasm, usually recurring again and again in the same subject in successive cold seasons, rarely fatal, and never associated with the formation of a coherent false membrane in the air-passages.

3. Diphtheritic croup; syn., laryngeal diphtheria, membranous laryngitis, membranous croup, the "true croup" of French pathologists; a specific contagious disease, which may be either sporadic or epidemic, and which may exist alone or as a complication of other diseases, as, for example, measles and scarlet fever. This form of disease is one of the most fatal complications of diphtheria.