The Relation of Diphtheria to Croup.

by James Crabb

The true nature of Diphtheria is a subject that has of late years demanded & obtained a large share of attention from the heads of the profession. Every branch of the subject even, whether its anatomy its nosology, its aitiology or its treatment, has been matter for the most varied & opposite opinions. And it is hardly necessary to add, that there are few diseases in the whole range of the Practice of Medicine or of Surgery, that could better justify the attention Diphtheria has received.

Though the word itself (from διφθέρα, a leathery skin or membrane) is of comparatively modern origin, being introduced by Bretonneau under the name of Diphthérite in 1821, yet either in its true form, or in that of some of its allies, the disease has been recognised from the most remote ages. The "Egyptian" & "Syrian ulcer" of Homer were of course but general terms, & included not only Diphtheria strictly so called, but also Pharyngo-laryngeal and laryngo-tracheal croup. Like many of our most malignant maladies, - cholera, plague, syphilis, small pox, - it has followed in the track of civilization from East to west. It appeared at Nesples in 1618; thence travelled to Spain, & owing to the frequent communication between that County & America, it appeared at Kingston Jam. in the same century. Its subsequent diffusion over the civilized world was accomplished in no long time; & on its first appearance in this country about the middle of last century, much confusion

naturally excited regarding it among our physicians. Indeed it was not till the beginning of the present century, when the great French Epidemic of 1818 appeared, that it came to be studied with the attention it demanded. Bretonneau of Tours' famous memoir of 1821, describing the Epidemic of 1818, was the first real attempt to Establish the disease on a Scientific basis. In this Country, it was not till the Boulogne Epidemic of 1855, & the subsequent English Epidemic of 1858, that British Physicians began to study it closely; so that for the Earlier descriptions of it, we are mainly indebted to the French. The names of Bretonneau, Billiet & Barthez, Derlander, Guersant, Trousseau &c. will ever be remembered among the first appreciators of its true Characters: though in later years, the subject has been more thoroughly examined & the Germans. Even yet, the keenest controversies exist regarding its analogy, nosology, aitiology & treatment; & the present thesis may be described as an attempt to bring one into clearer relief those opinions regarding it, which are worthy of being preserved, & at the same time to sweep away those which may be found erroneous or misleading. Having had some little opportunity of watching the disease, I hope to bring forward some illustrations from my Experience that may tend to Elucidation in one or other of the above departments, & I shall append a list of authors to whom I am mainly indebted—

Now, the first of all logical processes is that of definition, & it is all the more requisite to have a clear conception of terms in matters controversial - The only question is, from wh: department of the subject our definition is to be taken - While it wd be most in accordance with the spirit of modern medicine, it wd also be most logically exclusive, if we define it by reference, primarily, to anatomical appearances, and secondarily to pathognomonic symptoms & aitiology - One may search in vain among symptoms for logical definition of disease, & the very term "Croup" wh: was thought such a gain to nomenclature at one time, is not too good an Example of their futility -

The one cardinal point then in genuine Diphtheria is this: that there is an infiltration of newly formed cells into the Sub Epithelial Connective tissue, as contrasted with the Entire mucosa, an infiltration so abundant as to compress the vessels & arrest the circulation - It is somewhat loose & unspecific to talk of this infiltration as a "rapidly coagulable fibrinous Exudation" forming on the surface & also within the substance of the mucous membrane - For the Exudation is simply called fibrinous from the chief of the spontaneously coagulable substances, & as will be shewn, the Exudation is really not fibrinous but essentially corpuscular - Now while we cannot say that the nature of this Diphtheritic inflammation is specifically distinct from the Croupous inflammation, yet

the death of the mucous membrane in Diphtheria with its consequences, is a fact sufficiently important to render necessary a distinction between the two forms of inflammation. The Pathological, aitiological & therapeutic differences will be discussed in detail under their own heads.

But let us now consider the anatomy of Diphtheria more in detail. And the best means of thoroughly understanding its true character, will be by a preliminary Study of the Croupous inflammation. It will be unnecessary to enter upon the conditions of catarrhal inflammation, for these are not within the limits of the present controversy. Suffice it to say that we do have in the Croupous inflammation, hyperaemia & swelling, the essential difference between catarrh & Croup consisting in the products of this hyperaemia & swelling. The contrary opinion that there was no hyperaemia in Croup, probably arose from its absence after death, a circumstance easily explicable by the large proportion of white fibrous tissue in the parts. It should also be observed, that the cervical glands may be swollen in mere catarrh.

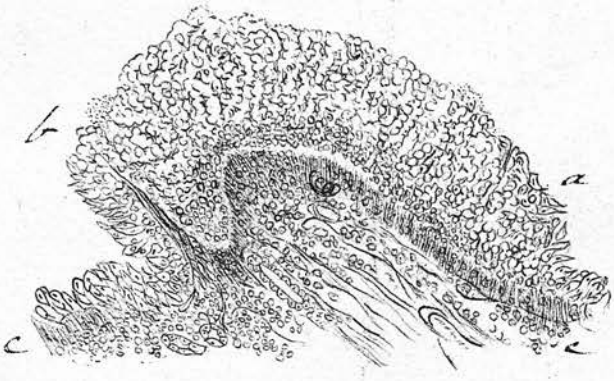
Now, firstly, with regard to the character of the "exudation" in Croup. It is yellowish white (in Diphtheria, it is of a darker grey, interspersed with red & green blood pigment) tough & elastic, clearing up & swelling (like fibrin) by the action of acetic acid. Mucus, on the other hand, becomes opaque & pulpy by acetic acid. This substance adheres tenaciously to the surface of the mucous membrane

of wh: it forms a most accurate cast. The thickness of it will vary from a mere efflorescence (the "hoarfrost" of Rokitansky) to a line. The site of the croupous inflammation is of course the larynx par Excellance, then the trachea & pharynx, & hence the two varieties; laryngo-tracheal croup & pharyngo-laryngeal croup. Now not only have we to distinguish diphtheria from both of these, but we must also distinguish these from each other.

1. Pharyngo-laryngeal croup is what is most commonly confused with diphtheria. The morbid process is always insular. At various points of the fauces & surrounding parts, the milk white patches are seen upon an intensely hyperaemic base. The edges are gradually loosened by suppuration, & the patch separates. But no ulcer is left, & if let alone, there will be no scar. The same patch is never reaffected. With regard to the constitution of the "exudation", though macroscopically fibrinous, yet it is composed of nothing but cells whose protoplasm has degenerated & among whom a subsequent fusion has taken place. What the exact nature of this degeneration is, is unknown, but it may be provisionally styled a fibrinous degeneration. The Diphtheritic membrane is no exudation at all, for that wh: is exuded in the process wh: leads to the formation of the slough, is situated in the mucous membrane, under the slough.

The following is Rindfleisch's description

Fig. I.

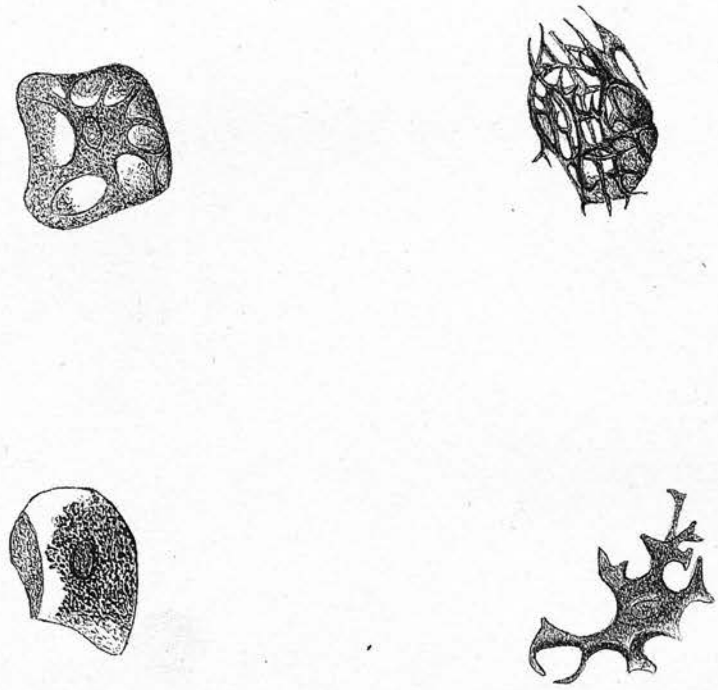


Vertical section through a croupous plaque on the isthmus faucium, with the n
Cons fold on wh: it rests - a -
false membrane - c. normal mucous
membrane $\frac{1}{300}$ - (Rindfleisch)

(To face p. 6)

of a vertical Section (see fig I):- "The Section Embraces the Entire thickness of a false membrane, together with the mucous surface on wh: it lies: Originally spherical the Elements have come into Contact with one another at various points, & have become welded together into a plump Network, Consisting in a manner of "Connecting pieces" only, without any Trabeculae. All the more Elaborate is the System of crescentic & branching fissures, wh: permeate the false membrane, taking the place of meshes. In certain lights they appear dark, & so might readily be mistaken for the positive part of the Structure: the possibility of Error can only be Excluded by Staining the preparation with Carmine. The Cells are of variable Size: their dimensions increase as they approach the Surface; at the Extreme periphery of the membrane, they are nearly twice as large as Simple Corpuscles: further inwards they become Smaller, the Smallest ones lying immediately upon the mucous Surface; here too, the degeneration is less marked: they can hardly be distinguished from the Normal Cells wh: are still imbedded in the parenchyma of the mucous membrane. This gradual transition naturally masks the boundary line between the Surface & the ~~boundary line~~ false membrane though it never quite obliterates it. It proves most undeniably, however, that the false membrane is produced by the Secretion of young Elements upon the irritated mucous Surface, followed by their gradual Stiffening

Fig. II.

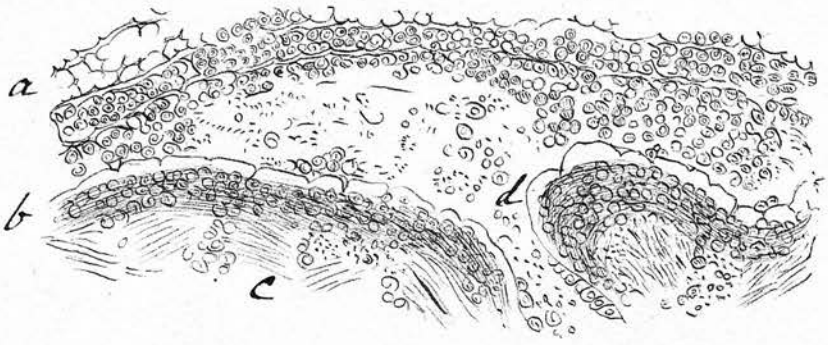


Fibrinous degeneration of pavement cells (

(To face p. 7.)

Sclerosis, glassy swelling, or whatever term we may choose to apply to their degeneration. Accordingly the false membrane occupies the precise position wh: belongs of right to the Epithelium, the degeneration in question taking the place of the normal evolution of Epithelial Elements. What becomes of the original Epithelial investment of the affected region? Has it been simply shed or does it, too, take part in the formation of the false membrane? Wagner has raised the participation of the Epithelium in the morbid process to the rank of a certainty. He describes a very singular metamorphosis of the pavement cells (fig II) in consequence of wh: the protoplasm disappears at certain points, apparently receding to certain branching lines, when it assumes a homogeneous aspect, & refracts light more highly than ordinary protoplasm. The nucleus disappears; the entire cell being represented only by a network of great delicacy, resembling the antlers of a stag in shape." Senator however thinks this description of Wagner's not quite satisfactory, as it wd not sufficiently explain the manifold arrangement in layers of the membrane, wh: may be ten times as thick as the Epithelial investment, in the lower part of the larynx & trachea, where the thin Epithelial covering consists altogether of not more than three or four layers of cells. We should be obliged to assume a succession of formations & metamorphoses of the Epithelium, & a meta-

Fig III.



Tracheal tissue. a. The uppermost layer of false membrane b. The basement membrane The sub-epithelial Embryonic tissue. d effused by a mucous gland, pouring out mucus, & peeling off the false membrane

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morphosis so rapid & complete, that no trace of Epithelium can be discovered in the membranes, or else an Enlargement of the existing Epithelial cells, up to ten times their normal volume.

ii. Laryngo-Tracheal Croup. This form begins primarily with a simple catarrh, & even in this stage, the swollen mucous membrane covered with its viscid mucus rich in cells may give rise to the most alarming symptoms (laryngeal-angina). The mucus forms a thick adhesive yellowish layer on the rima glottidis, quite sufficient to choke the patient. But the viscid mucus is not necessarily fibrinous, though the two may coexist as is readily shewn by the action of acetic acid upon them. The corpuscular character of the exudation is even more distinct here than in the pharynx: & the false membrane presents a laminated structure, the corpuscular layers alternating at regular intervals with the layers of so-called "fibrine." (fig iii.) These "fibrinous" layers form thin plates with upward & downward processes, which penetrate into the interstices between the contiguous cells, forming by their anastomoses a beautiful network, whose meshes correspond very nearly to the individual cells. (a)

It is a peculiarity of the mucous membranes of the trachea that from the first they adhere less closely to the mucous surface than do the false membranes of the pharynx. The mucous surface is much smoother &

the mucous follicles more active, & their secretions accumulating underneath the false membrane (d. III.) they gradually succeed in detaching it. This indeed is one of the dangers of this form of Croup, that the detached mucous membrane is not allowed to get off. The late Dr. Warburton Begbie had in his possession a most beautiful cast of the air passages, consisting of a croupy membrane that had been successfully ejected. But the membrane may also soften, partly owing to a gelatinous transformation of the "fibrinous" reticulum of the cells, & partly owing to a fatty granular disintegration of the imbedded cells. Letzerich (Berlin. klin. woch. 1871, 187) ascribes this softening to fungoid vegetation, & even goes so far as to say that after absorption of the fungoid spores, the casts of the tubuli uniferi are made up of masses of the fungus. (Cf. also Virchow's Archiv. I, III, 493 et seq.) Now, though the excitants of putrefaction are everywhere present, it is only at certain spots - putrefactive foci - that putrescence most readily occurs, because there elements are here present not only always in great numbers, but also in their most active state. In the mouth & throat, which of all places would constitute a putrefactive focus, owing to the incessant play of the air over the parts, every inflammation has a tendency to become diphtheritic; especially as soon as the ~~entrance~~ resistance of the mucous membrane to the entrance of the micrococci becomes diminished, & its epithelium destroyed or cleared.

that, on the contrary, the mucous membrane of the air passages from the vocal cords downwards is so little disposed to diphtheritic inflammation is probably due in part to the fact that the movements of the cilia make it difficult for the micrococci to gain a footing & obtain a settlement & partly also to the fact that the air in the bronchial tubes & trachea contains a large quantity of carbonic acid gas, which most certainly possesses antiseptic properties. On this supposition the comparative rareness of putrid bronchitis is explicable — It is interesting in this connection to find in Rosenstein's description of acute ulcerative Endocarditis under Oertel's name of "acute Diphtheritic Endocarditis" that in this disease also an important part is played by these fungoid organisms, & hence Wagner's name of "Mycosis Endocardii"; & a separable membrane has certainly been described as existing in some cases on the diseased Valve (cf. Ziemssen's Cyclopaedia) — Even Rokitansky so long ago as 1852 gave his countenance to this view, when he said, though in somewhat general terms, that all the Exudative processes on the mucous membrane of the air passages were frequently combined with similar processes on other mucous or serous membranes, & from the development of the Spleen, Lymphatic Glands, & follicular apparatus of the intestinal mucous membrane in these cases, we conjecture that they originate in a disease or dyscrasia of the whole mass of the Lymph or blood —

iii. Pure Laryngeal Croup is very rare. The laryngeal mucous membrane being intermediate in its structure between the Pharynx and Trachea, both surfaces of the Epiglottis & the true vocal cords are coated with a laminated pavement Epithelium, which is not marked off from the connective tissue by any basement membrane: so that the false membrane adheres more closely here than to any other portion of the larynx. It is especially noteworthy that the disease exhibits great preference for the prominent parts of the mucous membrane It is as though the Larynx had been lightly brushed over & some corrosive agent, or as though some irritant gas had been detained for a short time in the upper part of the respiratory passages. Indeed Oertel has shown (Deut. Archiv. VIII. 242) that ammonia & other Chemical irritants have set up a pseudo-membranous inflammation in the trachea & larynx, & that afterwards micrococci was found on the surface of the membranes.

After this description of the Croupous inflammation, it will be seen how absurd some of the recent propositions are with reference to the nomenclature of the disease. True, the word "Croup" has undergone many shades of meaning since the days when it was first introduced by Home of Edinburgh who used it vaguely to designate an "acute inflammation of the larynx & trachea". Bretonneau says on plains of

of Homes "Treatise on Cancer" that it is difficult to conceive how a work wh: contains only a small number of isolated & scattered facts, was capable of obliterating the traces of ancient traditions, &, for half a century, of preserving a great amount of influence over the opinions of practitioners. But such is the fact. Struck with the ordinary mode of termination of malignant Angina; Francis Home persuaded himself that he had just met with an affection which had hitherto escaped the attention of his predecessors; he thought he ought to give it the popular name under wh: he found it designated in a Scotch province; the novelty of his discovery was widely diffused, & the new denomination so fascinated all persons, that it prevented them from recognizing a disease observed from the most remote antiquity, & wh: in our own days is accompanied by all the symptoms wh: it has uniformly exhibited." - But to return, now that the word has ultimately assumed the definite anatomical meaning above described, it wd be a most mischievous & retrograde step, when most of all we require vestigia nulla retrorsum, were we to go back & use the word, as Sir J.R. Cormack wd have us do, simply as a symptom (Edin. med. Journal 1876 p. 779) And I am glad to find Dr George Johnson (Lancet 1875. p 662) of the same opinion as myself - It wd render confusion only worse confounded. Mal-

many authors to insure the word is unquestionable, but within late years it has been gradually settling down to mean the definite anatomical croupous inflam.n above described, as it is seen at its best in the air passages. To introduce croup as a synonym for "stridulous breathing" would seem be a new idea, & could only increase the already too great confusion. The French physicians also, by deficient observation at the outset have done much towards the admixture of terms. They imagined that all "true croupous" inflammation of the larynx spread upwards to the pharynx while it has since been shewn that it is quite possible to have true enough anatomically croupous inflammation in the larynx without at all affecting the pharynx, & thus the distinction is rendered valueless. Moreover, Sir John does not state the French distinction with sufficient precision. They apply he says (Edin. med. journ. ut supra) "vraie croup" to laryngeo. tracheal diphtheria, & "faux croup" to the non membranous affection in which spasm with stridulous breathing is the predominating feature. But the real point in the French distinction was the ascent or not into the pharynx of a genuine croup as above described (See Niemeyer's Practical medicine, art. "Croup.")

We are now in a position to appreciate the real Character of genuine "Epidemic Diphtheritis", "Malignant Pharyngitis", "Angina Maligna" "Tynanche Contagiosa" (Senator) or "Diphtheria". Reference has been already made to the cardinal anatomical point of Diphtheria being the infiltration of newly formed cells into the Sub. Epithelial Connective tissue, & the consequent death of the mucous membrane. It has hence been called the "Inflammatio membranacea" while Croup is the "Inflammatio pseudo membranacea". This membrane of Diphtheria is not of course a deposit on the mucous surface, it is the mucous membrane itself. The condition is precisely the same as mortification from a Chemical irritant, or from Corrosion, & we can see a sharp line of demarcation, separating the living from the dead. The means of separation are inflammation & suppuration. The inflammation is re-active. The pus collects between the Slough & healthy tissue, & ultimately separates it. An ulcer is now left, & then a cicatrix. A relapse may take place & a new Slough is formed. Fresh suppuration takes place, & fresh loss of substance, & naturally, the risk of ultimate Stricture is directly proportional to the amount of previous ulceration. In the milder cases, which are rare, the disease is restricted to the Surrounding pharynx, but when it does Extend to the Larynx, it is re-

remarkable to observe that the corrosive action only is taken on, & the membrane here leaves no ragged ulcer - Just allowances must of course be made for the differences in the arrangement & structure of the mucous membrane of the different parts as well as of the thickness & quality of the Epithelium, & differences also in its function moreover; the danger must vary with the External sources of mischief to which these parts are exposed, & especially the agencies upon which it most probably depends whether an inflammation is to be diphtheritic or not. And it is certainly not to be wondered at that the ulcerated portions of the mucous membrane of the throat with their pseudo membranous sloughs are very apt to become the seat of putrefactive changes, for nowhere more than here is there such a combination of all the conditions for putrefaction i.e. the foetid decomposition of nitrogenous materials - Warmth, air, moisture decaying animal tissue, muco-purulent secretion, possibly also some adhering remains of food - Can we imagine any combination more favourable for the production of putrefaction?

With regard to the other lesions in Diphtheritis, the most important are undoubtedly those of the kidney & nervous system - The latter will be noticed under the nosology of the disease, but we may here conveniently allude to the peculiar kidney degeneration. It

is not Exactly the ordinary form of acute Inflammatory Bright's disease, as is ordinarily seen in Scarlatinal cases, but it takes the peculiar form of the parenchymatous degeneration of Rosenstein, whose characters may be briefly noticed. "The kidneys are flabby & bloodless, somewhat enlarged. From the cut surface we can scrape off a quantity of greyish pulp. This pulp consists of Epithelial cells which have escaped singly or in connected tube like groups. The cells, especially of the cortical portion are swollen by albuminous infiltration, look cloudy & granular; they are rarely covered with small fat globules, & undergo molecular disintegration. Such a condition is not to be ascribed to pure parenchymatous inflammation, or to simple renal hyperaemia. It is true that the Epithelium of the tubules swells, undergoes fatty degeneration, & breaks down in parenchymatous nephritis: but the latter differs so greatly from the affection now under consideration, not only in the intensity & extent of the process, but also in its independent character, & its unmistakeably inflammatory nature, that it is impossible to regard the diseases as identical. In like manner, it is equally improbable & unproved that hyperaemia shd. be the cause of parenchymatous degeneration of the kidney - as this affection is called, for want of a better name.

Nosology

The fever of Diphtheria is not sui generis. It follows somewhat the course of a typhoid chart with morning remissions: & as in that disease the height will vary directly as the amount of the exciter. It has been noticed however that in the more croupy cases, the temperature has not a constant relation to the danger to life. Here, the prognosis must depend more on the degree of laryngeal stenosis & dyspnoea. As has been already noticed in speaking of the anatomy, it may take very little to bring on this fatal asphyxia; the mere collection of a little mucus or shred of exudation on the vocal cords being quite enough to prove fatal, if relief be not afforded. But as a rule the tendency is to the formation of more & more membrane the carbonic acid poisoning increases, & death is often preceded by emphysema, owing to rupture of the pulmonary vesicles, & the consequent escape of air under the pleura, & into the mediastinum & cellular tissue of the neck. The asphyxia is of course aided by bronchitic or pneumonic complications. The pneumonia, wh: is the rarer form, is usually circumscribed, owing to diseased particles finding their way into the lung during in-spiration. One well marked case of this I have seen in a child who died in the Edinburgh Royal Hospital for

Sick Children. It was a case of Characteristic Diphtheria, The left lung was adherent, & the pleural cavity contained about ℥ij of fluid. Both lungs were much Congested, & Each contained lobular patches of pneumonia, Each about the size of a walnut.

This is the ordinary form of death, but it may also happen from Septicemia, & possibly from uncontrollable haemorrhage if the gangrenous process be Extensive.

Now it is not only in those severer cases where we have the severest inflammatory symptoms that we have the severest secondary symptoms. Even in mild cases where there might not even have been a rise, where the fever may have been almost absent, & the general health good, so that the patient is able to be about all the time, & the disease in short runs its course in the mildest form, Even here dangerous accidents may occur, & we may have the subsequent paralysis most severe. The fact that albuminuria will occur during these cases, shows that the parenchymatous degeneration of the kidneys is not due to excessive increase of the bodily temperature, but is a direct result of the infection with Diphtheritic poison. This idea, however, does not seem to commend itself to Senator, who thinks that as a rule, the albumen will readily disappear in 2 or 3 weeks, & therefore imagines that its importance is somewhat overrated.

He acknowledges, at the same time, that the parenchymatous nephritis is a most common cause of the albumen. Doubtless some of cases can be accounted for by the general venous stasis caused by the dyspnoea, & others by the ordinary acute Inflammatory Bright of Scarlatina.

As regards Cutaneous Diphtheria, it is well understood that as in the case of many other blood poisons, it is essential for the development of the Epidemic disease, that the skin be stripped of its Epidermis; & accordingly, we see it frequently developed in regions where, as at the fold of the thigh, the skin by excessive stretching, is found in almost perfect contact with itself, & thus becomes quite analogous to the mucous integument. And thus the reason why we see Cutaneous Diphtheria commence on the mouth, lips, nares, & ears, is because these points more than any others, are frequently excoriated in consequence of eruptive diseases Coryza, or uncleanliness. In these cases also Rousseau & Belonmeau have particularly observed round the excoriation, an Erysipelatous blush & swelling attaching the Edges of the wound, as well as some scattered phlyctenae; & in the case which I record in this thesis the same thing was observed as soon as the Edges of the Cachectonic wound was attacked. I looked upon it however as the very natural consequence of the putrefactive changes going on underneath the Shield of the tube, & I found it gradually to disappear

as soon as I got the wound purified with carbolic oil. In no situation, I believe, have antiseptics more difficulties to contend with than in the operation of tracheotomy, owing to the incessant play of air over the parts, & yet there are few cases where we ought to employ antiseptics them to the best of our power.

Nevertheless, it is by no means universal that abraded surfaces will take on this Diphtheritic action. The pus may not necessarily form a slough, but may dry up so as to form a green viscous coating, & coagulate in flakes & shreds. There may be, moreover, a superficial fibrinous exudation - a true croup membrane, consisting of filbrin & pus corpuscles. But all this is not Diphtheritic, unless a real portion of the surface of the wound perishes, & adheres as a pseudo-membrane & the deeper portions in the form of a grey discoloured slough. (Senator)

In the convalescent stage of the disease, even though all may be apparently going well, it is a well known fact that the patient sometimes collapses suddenly from paralysis of the heart. The pulse suddenly becomes frequent & weak: the skin becomes pale & cool & the patient dies apparently from syncope with oedema of the lungs. On examination there is usually found fatty degeneration of the heart or Extensive Coagula - ~~Besides~~ The nervous lesion is usually supposed to exist in the

inhibitory nerves running in the channel of the pneumogastric. The other paralyses of Diphtheria usually come on late when the patient is very pale & weak. They begin as a rule in the throat. The soft palate is first affected & then the nasal cavities are no longer shut off from the mouth in the actions of speaking & swallowing. The arches of the palate & uvula become relaxed, & are not raised ~~at~~ in attempts at phonation, & shew no reflex movement. When the nerves of the larynx get involved, food gets into the lungs setting up pneumonia The nerves of the muscles of the eye, may also be affected causing defective accommodation (cf. Hutchison Lancet 1871. i. 13.) When of mixed nerve trunks are affected as in the extremities, we find disorders of sensibility & smarting, & also rheumatic pains, but these latter more rarely than paraesthesia, numbness, formication. Moreover the disorders of sensation disappear much sooner than those of motion. Electricity frequently yields the results characteristic of peripheral paralysis in a certain stage: viz diminution of the faradic contractility of the muscles with normal or even increased Galvanic excitability. Kraft Ebbing (Deut. Archiv. IX. 123) is confident of the peripheral origin of the paralysis, but many authorities take the opposite view. They have however, all a favourable prognosis, except that of the heart.

Aitiology.

There are two chief ways in which Diphtheria may arise (1) by direct contact with filth, bad drainage, cesspools &c. (2) by contact with others. Numerous Examples of the Contagiousness of the disease (wh: however he does not think is highly Contagious) are given by Dr George Johnson in the Lancet 1875. Jan 2: one of the best of which is the following taken from Simon's report to the Privy Council. ~~(p. 9)~~. "No case of Diphtheria had ever been seen at Folkestone during my time, until Isabella W— aged 4 3/4 years arrived at Boulogne on the Evening of July 2nd 1856, being then in an advanced stage of the disease. She died on the following day. On July 6th Catherine W— her Sister, aged ten, was attacked. But she had never been in France; She had always resided on the East Cliff, Folkestone, in the same house to wh: her dying sister was brought four days previously. One other case occurred in the same house, three days after, & they all terminated fatally." In the district where I now practise, Epidemics occur almost regularly in the Spring of diphtheritic throats, the drainage of the place being in a notoriously bad condition. This spring the Epidemic has been accompanied by several cases of typhoid & by two remarkable cases of acute blood poisoning: the details of one of wh: I may briefly enumerate:

A little girl of 14, was caught one

afternoon in a drenching rain. She had but few clothes on, & no umbrella: but had her clothes changed on coming into the house - This was about 5 p.m. In the course of the evening she felt "not right" & felt no appetite, but the parents simply gave her some spring medicine, not thinking it worth while to send for the doctor. She had rather a restless night: but in the morning she was seen to be much worse. She was delirious & semiconscious, and not in high fever. There was no rash. Thinking, however that she was suffering from some one or other of the exanthemata, she was ordered diaphoretics & hot blankets to bring out a rash if possible. This was at 9 a.m. At 12 noon she was covered with a few bluish-purple blotches, & was quite unconscious. At 3 p.m. she died.

The illness only lasted 18 hours. What was it? Looking at the case by itself one would be inclined to the idea of Scarlatina maligna, & perhaps the prevalent diphtheritic Epidemic would favour that view; on the other hand there was also a small pox Epidemic existing, & the medical gentleman in consultation with me seemed to lean to the idea of suppressed small pox. Especially as he had had a case only ten days previously, of which however lived 3 days, & was accompanied by haemorrhage from the vagina, anus & other mucous membranes.

But this by the way -

It has been sometimes urged that there are many dirty houses wh: are never visited by Diphtheria, though to the outward Eye everything seems in its favour. But as Dr. G. Johnson neatly says, "Every powder containing Charcoal is not Gunpowder": in other words it is requisite to have a certain Combination of local & atmospheric Conditions to produce the Specific diphtheritic poison. The question, however, arises, whether the infectious material of Diphtheria exists in the micrococci wh: are found in certain products of the disease, & whether therefore the anatomical changes are the direct or indirect effect of these organisms. Moreover, is the effect due to Specific Diphtheritic micrococci, or to the non-Specific Organisms of putrefaction. But there are Enquiries that have as yet baffled all chemical & physical tests; & nothing Satisfactory has been obtained by inoculation.

Now, with regard to Croup, it cannot be denied that in by far the great majority of Cases of the Croupous inflammation of the Larynx & Trachea, there is accompanying them a Synanche Epidemic, so that the general Opinion now is that "Croup" & Diphtheria are part-Symptoms of one malady. But this does not amount to saying that they are the same disease whether regarded from their anatomy, pathology or treatment: and I cannot forbear

giving here the pithy answer of Dr. Moxon to Dr. Johnson's identity argument. He has seen false membranes, he says, identical with those in question, caused by a child drinking Scalding water. Several such Cases have been Recorded. Now, he says, unless we are to believe that in these little things, the Diphtheria was in them when they went to the Seaside, & was only waiting for the boiling water, so that it might kill them, we have Evidence in these Children that Common irritation will produce the membranes Wh: James & Johnson say are only produced by Diphtheria. Can we really say, that when the little things drink out of the Seaside, the Diphtheria - hitherto unsuspected - is lying quietly in them waiting for the boiling water?" Dr. William Cumming of Edinb. says he has never seen two cases in one family either occurring Simultaneously or in immediate Succession, & no precautions or isolation were adopted or necessary. He has never seen it followed by paralysis: & the disease never invaded the pharynx, fauces or Nose. Croup again usually begins with Nasal or bronchial Catarrh, & the inflammation Spreading to the Larynx leads to the formation of membrane; Diphtheria has no antecedent Catarrh. But to take any one side of this question with dogmatism, would be quite at variance with the liberal Spirit of medical Enquiry -

Treatment.

much diversity of opinion exists on this branch of the subject as well as on the others. But every one agrees that in an Epidemic, isolation should be practised as much as possible. And the success of this measure will depend greatly on External circumstances of habitation. The value of the ordinary Pathentic remedies will vary much with the severity of the Epidemic. In the worst Epidemics, the very best remedies may be perfectly useless, while in the mildest it is possible to achieve very fair success. In the mild Epidemic which I have had an opportunity of witnessing I have almost invariably found that Chlorate of potash & steel, if taken sufficiently early & sufficiently frequently have proved equal to check the disease. The boy, whose case is hereinafter recorded, neglected to take the medicine as he was ordered, & hence the necessity for Cinchona; while his sister, who was at one time equally bad, took her medicine & recovered. Every thing must be given with a view to build up in this asthenic disease; Even to the end. if collapse shd. threaten, analeptics will be had recourse to, musk, Camphor & Strong wine. Milk of course will be drunk ad libitum, but caution must be exercised in the use of beef tea, for I am much inclined to favour Dr

George Johnson's opinion, as to the curative influence possessed by an exclusive milk diet both in albuminuric and cystitic cases (Lancet. Dec 16. 1876)

As to local applications, the best form I believe is by inhalation or spray. Of the former, vapour of water or steam is by far the most valuable; it may be medicated by many things, but the water is really the most valuable. The spray may be loaded with Sulphurous acid, boracic acid lotion, or weak Carbolic. The great objection, however, is that it is practically impossible to keep the part antiseptic: & the less irritating our antiseptics are the better, for the inflamd. is only too ready to spread to the larynx, even if let alone. And it is mainly on this account that the Cauterization treatment has been almost entirely abandoned, at least in Germany. As soon as there are symptoms of extension to the larynx, a sharp Emetic should be given at once & repeated as occasion requires. The emetic always gives relief, wh. in catarrh frequently continues & leads directly to recovery; in the other forms of course, the relief is only temporary, & the obstruction may soon be repeated.

With regard to Tracheotomy, I shd. hardly be inclined to perform it so early as Bonnecau & the French School wd. have us do. It is an operation

whose chance of success is so small, that we ought to wait the time when we can say: If the operation is not done now, it is my conviction the child will die: & this conviction will be based mainly on the Consideration as to whether there are Secondary changes in the lungs, & also of course on the patients' general strength. And though the cases are still rare where the patient is rescued from the jaws of death by Tracheotomy, still they are sufficiently frequent to encourage sanguine hopes even to the End. The details of the operation will I trust be sufficiently brought out by a record of the following case:-

A little boy - Johnnie M- , four years of age, was the Son of a very Strumous mother. Four members of the family had died from Struma in one shape or another, & only 3 were left. The house in which they lived was always looked upon as unhealthy, the Smell both inside & out being at times very offensive. The drains of the neighbourhood were in a notoriously bad condition.

The mother had just been confined; her baby had just died from Sloughing of the navel, which baffled all attempts at purification; & the climax of misery in the family seemed to be reached when two of their children were laid down with Diphtheria. Chlorate of Potash & Iron was administered most

liberally - The little girl was very good & took her medicine regularly: the boy was self willed, & defied the father to get it down his throat. His disease accordingly progressed; the "Exudation" was of the peculiar dark grey colour, interspersed with the red & greenish blood pigments. He was extremely anemic, there was albumen in his urine, & it was not long before the Laryna showed signs of implication. Emetics did no permanent good, & the symptoms were becoming so urgent that Tracheotomy was soon to be required. This was on the morning of the 8th of January 1877 & later on in the same day I was Summoned hastily as the child was said to be dying - I went immediately, & dying Sure Enough he ~~was~~ was. As is not unusual, the asphyxiated Condition had come on suddenly. The pulse was imperceptible, the lips blue, the Eyes glazed, & the lower jaw had fallen away from the upper, & Every breath seemed as if it would be the last. I got immediate permission however to operate, & this I did at once somewhat hastily. The venous oozing was profuse for a time but was checked by the pressure of the Shield. It seemed however, as if I was too late, He refused to breathe. I started arti-

ficial respiration, first by Sylvester's & then by Marshall Hall's method, much to the discomfort of the father, who thought I was simply disrespectful to the corpse of his dead boy - It was only by allowing him to put his ear to the Stethescope, & letting him hear the beating of the heart, that I was allowed to proceed. However, the artificial respiration did not look at all promising for a while, & I then had recourse to the cold douche, & to tickling the trachea with a feather. Ultimately we were rewarded by a breath; another followed, & in about 20 minutes from the opening of the trachea, he was breathing placidly through the tube. He now fell into a quiet sleep, & we let him sleep on. In about an hour he awoke & scratched his ear, as if wondering where he had been. Brandy & milk were now administered & he was transferred to a steam chamber by the fireside formed of screens covered by blankets, with the little bed inside formed of chairs with a plank across them - An india rubber hose was now attached to the kettle & conducted to the Chamber, & basins full of boiling water were placed upon the chairs. & thus the temperature of the apartment was kept constantly between 70° & 80° F.

The breathing soon became easy, & he drank freely of milk & lime water The Exudation wh: came up the tube was picked away as it came & the smaller tube was also taken out frequently & cleaned. He was still ordered to continue with 10 minims of dil. Iron. Perchlor, & 8 grains of Pot. Chlor. Every 2 hours. & this he ~~was~~ was compelled to take partly by coaxing & partly by threat.

9th Jany. He has had a wonderfully quiet night, & I was not sent for till early morning: & this was simply on account of a violent paroxysm, wh: was relieved by taking the smaller tube out, & cleansing the inner one well with a feather. The tongue still very foul, & Exudation still extensive on the pharynx. No secondary symptoms in the lungs. Resp. neck much swollen, evidently from glandular irritation.

10th has again had a fair night, but the exudation wh: comes up the tube is very tenacious, & I now used a 10 per cent Solution of Dil. Potassae down the tube This was used whenever any piece seemed to stick in the tube, & gave it a very slippery soapy feel for the time being: but it was noticed, that after it was stopped, the Exudation was rendered much more viscid. A

change was accordingly made for a Spray of Sulphurous acid 1-8/0 & this was found to answer much better.

Sept. He seems very low tonight has not taken so much milk. Tongue much coated. S.G. 1044. wine Contains 1/4 albumen.

11th. better, tongue cleaner & paroxysms less frequent, gets great comfort from the Sulphurous acid Spray, & asks eagerly for it. albumen 1/8th. a little Digitalis is added to his iron & Chlorate of potash; milk diet & no Stimulants.

12th. The Erythema in the neck seems to spread, & the large tube is accordingly removed. A considerable ulcer is found below the hole, caused by the pressure of the Shield of the tube. It looked very dirty, & was smeared with 1-6 carbolic oil, & dressed with 1-20 on a piece of lint covered with Guttapercha, with a hole in it through wh: the tube passed: albumen less general appearance much better.

13th. The steam wh: has been difficult to manage hitherto is now brought in by a lead pipe, soldered into a hole on the top of a pan. There is now sufficient air coming through the mouth to enable him to blow out a Candle

14th. albumen diminishing: saline draught: Cough less paroxysmal, Erythema less.