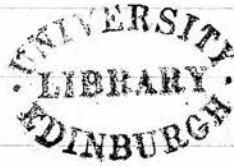


ON  
EMPHYSEMA OF THE LUNGS

DAVID CHRISTISON.

MDCCCLI





I have been induced, to select Emphysema of the lungs as the subject of the following Thesis, partly because very few dissertations have been written upon it for the last fifteen years, and partly because during that period much has been published which tends to overthrow Laennec's views on some points and to add largely to them on others, while at the same time no connected account of all these observations has yet appeared.

These views I have endeavoured to put together in a concise form in the following pages.

### Introductory remarks.

The term Emphysema, from the Greek *emphusai* to inflate, as applied by Laennec to dilatation of the air cells of the lungs is unhappily chosen, for Emphysema had long been used to signify extravasation of air into the cellular tissue of the lungs or other parts of the body. Laennec indeed, in the first edition of his work on diseases of the chest, denied the existence of this affection, but subsequently retracted this opinion and divided Emphysema into two kinds, in which he has been followed by other authors.

1. Interlobular. In which air is infiltrated into the cellular tissue of the lungs, — the Emphysema of all former writers.

2. Vesicular. Emphysema properly (or rather he should have said improperly) so called, which consists essentially in dilatation of the air cells, rupture of their parietes being only a secondary consequence.

We shall see subsequently that this definition of  
 vesicular Emphysema cannot be deemed satisfactory  
 now, as lesions which do not consist in dilatation of  
 the air cells at all have been included under Emphy-  
 -sema by Andral and other pathologists

In the following Thesis it is proposed to treat of ve-  
 -sicular Emphysema only; and however unscientific the  
 name may appear, we must be content with it, as it  
 is impossible, perhaps not desirable, that it should be  
 altered now.

## History of Emphysema

Although Laennec is certainly entitled to the merit of first systematically describing this affection and placing it on the list of diseases, it must be admitted that he has not succeeded in his earnest endeavours to prove that it was totally unknown before. Thus he states that Morgagni Sir John Floyer and others were unacquainted with the real character of dilatation of the air cells. Yet Floyer seems to have understood both the nature of the lesion and its causes in pretty much the same way as Laennec himself, as the following passage shows.

"As it happens in external flatulent tumours, they at first go off and return, but at last fix in permanent flatulent tumours; so it is in the flatulent asthma, the frequent nervous inflations induce at last a constant windy inflation or tumour; and it ought to be considered how far holding the breath in hysterical fits, or the violent coughing in long catarrhs, or the great distention of the lungs in an inflammation, may strain the bladders and their muscular fibres and thereby produce the same rupture, or dilatation, or hernia, as happens in the broken winded."

Here dilatation of the air cells is distinctly mentioned, and although the observations were made on the lungs

of a mare, it is pretty evident, especially from his notice of hysterical fits, that the latter part of the quotation is meant to apply to the human subject.

The following passage in Morgagni, quoted by Lacunec himself, clearly shows that he too had observed dilatation of the air cells.

"Sinistri pulmonis lobus superior quâ claviculâ spectabat, vesiculas ex quibus constat mirum in modum anctas habebat; ut nonnullae, avellanae magnitudinem aequarent; caeterae multo minores erant."

Dr Baillie also, in his work on Morbid Anatomy, notices the following conditions of the lung. 1. Lungs distended with air. This he seems to have regarded as a temporary distention, resulting from obstruction of the bronchi by mucus. 2. Air cells of the lung enlarged. In this there can be no doubt be recognised true vesicular Emphysema, though he only saw three instances of it. 3. Air vesicles attached to the edge of the lung. These were, no doubt, instances of the excessive dilatation, which so frequently occurs, that it is wonderful it should have been so long undescribed, but he altogether mistook their nature, supposing them to be sections of air from the capillaries.

Dr Forbes in a note to his translation of Lacunec's "Diseases of the chest" gives a long list of many of the

older authors who have recorded dissections of cases of pulmonary Emphysema. But all former writers thought the disease very rare and merely worthy of passing notice, while to Laennec belongs the great merit of showing how very common it is, of describing it accurately and discovering the characters by which it may be recognised during life.

Many even of the most recent authors agree with Laennec in every particular. Others, among whom may be mentioned Andral and Dr Lombard of Geneva, without denying his views, have added very much to them. While others, and especially Dr W. Gairdner, are inclined to deny altogether the truth of his views at least of the causes of Emphysema.

### Anatomical characters.

Here the question naturally arises, what lesions are to be considered as coming under the head of vesicular emphysema? And, on comparing Laennec's description with those of Andral and others, we cannot help concluding, either that the former has omitted lesions which should have been included in the term emphysema, or that others have unwarrantably extended its signification.

In order to consider this subject satisfactorily it may be well to give a short account of Hypertrophy, Atrophy, and Emphysema of the lung, first as defined by Laennec and then as defined by Andral.

The former considers Hypertrophy as the result of increased functional activity in one lung, from Emphysema, Pneumothorax, Hydrothorax or large pulmonary excavations affecting the other, and it is thus described "In instances of this sort it cannot be doubted that the air cells are enlarged and that their parietes have acquired a preternatural thickness; although it is extremely difficult to prove this even with the aid of the microscope."

Of Atrophy of the lung he gives no anatomical description, and does not mention its occurrence as a consequence of old age, but merely notices that kind of atrophy which

consists in condensation of the lung from pressure, as from great effusion into the pleura

Emphysema he defines as consisting essentially of dilatation of the air cells, rupture and disappearance of their parietes being only a secondary consequence. He also considered the parietes to be in a state of hypertrophy, and seems to distinguish this affection from simple hypertrophy more by the causes than by anatomical characters.

Andral is much more minute in his description of these affections; hypertrophy of the lung according to him is of two kinds; one, accompanied by induration, and characterised by a tendency to obliteration of the air cells, (but this was regarded by Laennec & Louis as well as most recent authorities as a form of tubercular deposit, and called the granulations of Bayle); the other is the hypertrophy of Laennec, and on variety of this Andral says constitutes one form in which Emphysema occurs; he describes it as of frequent occurrence in persons labouring under chronic catarrh and it differs from simple hypertrophy in this, that the air cells are considerably dilated

Atrophy of the lung, according to him, is a very different affection from the atrophy of Laennec. The cells diminish in number and the Parenchyma is atrophied; the septa may be seen reduced to a great state of tenuity in some parts, perforated or nearly absent in others, so as to form large

cavities, traversed by a few bands of cellular tissue; it is a consequence simply of old age, or of obstruction to the free passage of air into the pulmonary cells.

This is another form of Emphysema according to Andral scarcely to be considered morbid in many cases in old people, being merely a consequence of diminished functional activity and causing little or no distress, while in other cases the dyspnoea is very great, no other cause but this state of atrophy being found on dissection.

Andral describes still another form of Emphysema produced by pure mechanical causes; as violent efforts of any kind, paroxysms of coughing in persons afflicted with old catarrhal affections, &c. and characterized by

1. Simple dilatation of the minute bronchia and air cells
2. Rupture of the parietes. 3. Interlobular infiltration of air.

Laennec then defines Emphysema shortly, as dilatation of the air cells, but does not include simple hypertrophy.

Andral, also excluding simple hypertrophy, describes 3 kinds of Emphysema.

1. A variety of simple hypertrophy, only differing from it in this, that the air cells are considerably dilated
2. In which there is no vesicular dilatation at all, but merely the formation of large cavities by the absorption of the cell walls

3. Simple dilatation of the air cells from mechanical causes

The first and third of these do not differ essentially from each other, and agree very well with that of Laennec. But the second kind must either be excluded, or, if received, the definition of Laennec must be abandoned in favour of one which shall include all these lesions. The latter course seems most advisable, as Andral's second variety has been described under the head of Emphysema. By M. Lombard, Dr Williams (Library of Medicine) and Dr Townsend (Cyclopedia of Medicine). It is probable also that large cavities of air may be found in the lungs, without our being able to determine precisely whether they are dependant on dilatation or atrophy.

The definition of Dr Townsend perhaps includes all that is required, but is too long. "Emphysema of the lungs essentially consists in the rarefaction of its Parenchyma, produced either by dilatation of its cells or rupture of their parietes, referrible to three causes. 1 Hypertrophy. 2. Atrophy. 3 Overdistention of the air cells."

The following sentence of Andral's also, though not expressly stated as a definition, is very suitable as it includes the ultimate condition of Emphysema and does not involve any theory as to its mode of formation. "Emphysema consists in the transformation of the minute air cells into larger cavities con-

-aining air."

It is evident that the same anatomical description will not suffice for the two forms of Emphysema, and this subject must therefore be divided into two heads.

### I. Anatomical characters of the vesicular Emphysema of Laennec.

The appearance of the external surface of the lung is characteristic, although it varies considerably with the amount of the lesion. When moderate, the dilated air cells have the same appearance to the naked eye, as the healthy vesicles have with the aid of a magnifying glass; a few cells only may be affected, or all the cells of a lobule, in which case it stands out somewhat from the surface of the lung, a few or many lobules may be found in this state, so that sometimes the whole lung may be diseased. The colour is changed also, having become much lighter, sometimes perfectly white, and often when many lobules are affected the lung has a variegated aspect, the diseased lobules appearing bleached and contrasting strongly with the purple colour of the healthy parts.

Such is the appearance of the surface of the lung when the air cells have undergone a moderate degree of dilatation, but often the disease goes much further. Large bullae and elevations are seen, and dilated portions separated by a constricted neck from the rest of the lung; these

when traced into the lung are found to communicate with still larger dilatations. Elevated cavities are distinguished from extravasations of air, the result of interlobular emphysema, by not changing their position on pressure.

This character fails indeed when the extravasated air is bounded by the partitions which separate the lobules, and which prevent the air from moving about; in these cases it is known to be infiltrated air when of a triangular shape.

But dilatation is by no means confined to the surface of the lung, although most distinct there. It is apt to be overlooked however on section, the parts becoming filled with fluids, but is easily recognized by inflating a portion of the affected lung and allowing it to dry, care being taken to reinflate it frequently; it will then be found also that only a small portion of a dilated air cell is in general visible at the surface of the lung, so that one that appeared the size of a hemp seed at the surface may on section be found to be three or four times as large.

Air cells may simply dilate, or under the influence of sudden pressure and other causes may burst into each other; they may also burst into the cellular tissues, causing interlobular emphysema. It is doubtful to what extent an air cell may dilate without its

parietes giving way; most generally they attain the size of a millet seed, but Laennec thinks he has seen them as large as Haricot beans. Dr Townsend says, that after careful examination, he is of opinion that single air cells rarely if ever attain the size of a pea. As to the size which cavities, formed by the bursting of the cell walls may attain, there seems to be scarcely any limit to it.

Emphysema generally attacks both lungs and may prevail to any extent in a lung. But the upper and anterior parts are most frequently affected, and it is along the anterior margins especially that strings of large bullae are found. This, Dr Watson remarks, was probably the real nature of the fringe of fat described as having been found at the anterior margins of the lungs of George the Fourth. Sometimes the edges are thick and rounded, sometimes thinner than usual.

When the Emphysema is considerable the lung is increased in size, so as even to alter the shape of the chest; this is very conspicuous when one lung only is affected. On opening the chest the lungs in place of collapsing protrude from the chest.

On pressure with the hand the emphysematous part does not crepitate well and the air escapes slowly. The sensation produced is compared by Laennec to handling

a down pillow. It is difficult to flatten or compress the lung. What this depends on is uncertain; obstruction of the Bronchi has been supposed to cause it, but apparently without being proved by actual dissection, for Dr. W. Gairdner asserts that he has often carefully dissected the bronchial tubes leading to the Emphysematous parts, and has never found obstruction in them. It must depend apparently on some alteration of the tissue of the lung, destroying its elasticity, at least the natural elasticity which makes it tend to press the air out of the lung. In one sense it is very elastic, elastic in the wrong direction, as it immediately resumes its former position after being pressed in with the finger.

On inflating an emphysematous lung the dilated parts seem to sink down, an appearance really produced by the distention of the healthy cells.

The small bronchi near the air cells are sometimes dilated, but much more rarely than might be expected.

When minutely injected specimens are examined by aid of the microscope, no change beyond mere increase of size can be detected in many of the vesicles, but whenever the dilatation is considerable the capillaries are diminished or altogether absent, and often great tracts of cellular tissue are seen without any trace of capillaries.

## II. Anatomical characters of Emphysema dependant on Atrophy

This was first described by Andral and appears to be the same affection as the lobar Emphysema of Dr Lombard. It is not noticed at all by some recent authors among whom may be mentioned Dr Watson.

In place of protruding from the chest, the lungs in this form are reduced in bulk, and this Andral thinks is the explanation of the contracted state of the chest in old people. But the change which has taken place is only fully understood on inflating and drying the lung. Large cavities containing air are then found, the parenchyma being thin and wasted or altogether gone. Sometimes the lung does not collapse on opening the chest but pits on pressure "like an oedematous lung". Andral says we can easily see how this state in which the parietes are absolutely removed should produce much greater dyspnoea than the other kind of Emphysema in which the extent of surface remains the same.

But he forgets that when the latter exists to any extent the capillaries disappear, as shown by the pale colour of the lung as well as by the microscope. He himself also states elsewhere that atrophy seldom causes dyspnoea, as it is generally a consequence of diminished necessity and functional activity.

We know, finally, that the vesicular Emphysema of Laennec does frequently cause most intense dyspnoea.

## Causes of Emphysema

This is a subject of considerable difficulty, which cannot yet be regarded as settled, and which indeed till lately seems to have excited but little attention.

Most authors have simply adopted the original views of Laennec or have named a few additional causes not materially differing from his. No one, so far as I know, has directly attacked them, if we except <sup>M. Louis de</sup> Dr. W. Guinducq, who, in an article on Bronchitis (published in the Monthly Journal for August and September 1850) has at least thrown very strong doubts on the truth of Laennec's opinions: and it is much to be regretted that his promised article on Emphysema has not yet appeared.

It is proposed to consider first the views of Laennec on this subject, as they are most important from being so clearly stated and universally followed: and afterwards those of other authors.

1. Laennec supposed that Emphysema was caused almost always by the "Catarrh rec, a disease in which the smaller bronchi are very apt to be blocked up by swelling of the mucous membrane or the presence of small pellets of tough mucus. He adds as much more rare causes tumours pressing on the great bronchi

or spasmodic constriction of them, also small tumours in the substance of the lungs as tubercular masses. All these causes he supposed to act in the same manner, by producing obstruction to the passage of air, the effect of which he states as follows. "We have seen that in dry catarrh the small ramifications of the Bronchi are often completely obstructed. Now as the muscles subservient to inspiration are strong and numerous, while expiration is merely produced by the elasticity of the parts and the feeble contractions of the intercostal muscles, it must often happen that the air having overcome in inspiration the resistance offered by the swollen mucous membrane or tough mucus fails to do so in expiration, and is thus imprisoned. Succeeding inspirations, at least the more powerful of them, increase the amount of confined air and necessarily produce dilatation of the air cells."

It will be observed that this doctrine rests mainly on the supposition that inspiration is much more powerful than expiration. But so far is this from being the case that, if the numerous experiments of Dr. Hutchinson are to be trusted, a full expiration is one third more powerful than a full inspiration: thus while the average inspiratory power was sufficient to elevate 2.75 inches of Mercury in his spirometer, the expiratory was equal to 3.97. Experiments on ordinary tranquil breathing are difficult and few have

been made, nor are they of so much consequence, but according to six experiments by Valentin the two processes are nearly equal in power. Experiments of this kind in cases of Bronchitis, especially the dry catarrh, would be very conclusive and interesting but have not been made.

It must be confessed however that experiments such as those of Dr Hutchinson are very difficult and liable to error; they require a sort of previous education on the part of the person experimented on. Different occupations and modes of life also have a great effect in varying the results. Thus those accustomed to pugilism, wrestling, climbing hills &c have their expiratory power prodigiously increased; and it is only the uniformity of his results, which entitles us to conclude with him that the expiratory is always considerably greater than the inspiratory power. The comparative feebleness of the expiratory as compared with the inspiratory murmur seems to show that the latter is the more powerful process; on what this depends has not been determined, indeed it cannot be said that the precise mode in which the respiratory murmur is produced, is yet known. But if Dr Hutchinson's experiments are correct, the greater distinctness of the inspiratory murmur cannot depend on a greater power of that process.

But there is another very strong argument against Laennec's theory, an argument first made use of by Dr W.

Gairdner, which proves obstruction of the bronchi, far from producing dilatation of the air cells beyond, to cause collapse of them. Collapse of the lung seems to have been first recognised and described by M. M. Bailly and Legendre in 1844. They distinctly proved that the so called lobular pneumonia of infants was really in the great majority of instances a state of collapse, or return of portions of the lung, to the foetal state. They supposed that this was a result of the comparatively feeble inspiratory power of infants, in consequence of which "the chest not expanding sufficiently, air is not drawn into some parts of the lung; by the natural elasticity of the lungs the air is gradually removed from such parts, which lose their functional activity and collapse. This process is much promoted also by obstruction of the bronchi from catarrh". They do not describe this disease as occur in the adult, probably supposing the comparative inspiratory power to be much greater <sup>in</sup> them.

Dr West agreeing with these observations insists more particularly on the frequency of this state as a result of obstruction in Infantile Bronchitis, and mentions that Dr Baly had met with three instances of collapse in adults, resulting from obstruction of the bronchi. He also states that it probably occurs frequently in old people simply from their feeble inspiratory power.

But Dr Gairdner is the only one who has applied

the discovery of this affection to refute Laennec's long established views as to the cause of Emphysema. To him also belongs the credit <sup>of showing</sup> the distinct characters and great frequency of this state of the lung in adults: indeed it may be looked for almost with certainty in all cases of severe or long continued Bronchitis.

The following are among the principal arguments he brings forward to prove that the effect of obstruction is to produce collapse in place of Emphysema of the lung.

In confirmation of the experiments of Dr Hutchinson which prove the superior power of expiration over inspiration, he observes that in all cases of Bronchitis accompanied by Dyspnoea, inspiration seems to be the great difficulty, while expiration is accomplished with ease and is much aided by the effect of coughing in dislodging mucus.

In all cases of collapse in which the bronchi leading to the part are examined, obstruction is found.

While on the other hand obstruction is never found in the bronchi leading to an emphysematous part.

Emphysema is found generally at the upper and anterior parts of the lungs; Bronchitis & collapse at the lower and posterior parts.

A moveable plug of mucus must act in a diminishing tube during inspiration by blocking up the openings of bronchi, and thus preventing the access of air to parts beyond;

while the plug will easily be removed in expiration so as to admit of the expulsion of any air that may be in the cells beyond.

The direct experiments of Traube and Mendelsohn upon animals, by introducing various substances into the bronchi so as to produce obstruction, prove that the effect of obstruction is to produce collapse.

2. Other causes, although more frequently producing interlobular emphysema, are mentioned by Laennec; as playing on wind instruments, relieving constipated bowels, the process of parturition &c all acting by causing long-retention of the breath. These he must surely have considered efforts of expiration, yet in the same paragraph he seems to exclude altogether the possibility of expiration causing emphysema. Mentioning its occurrence in Croup and severe catarrh of infants he says, - "We cannot attribute the accident to the act of crying, since this takes place during expiration, but rather to the violent inspirations before crying:

Rokitansky also thinks the forced inspirations of croup and whooping cough a very common cause of emphysema.

3. Raciborski attributes it to the mechanical action of coughing distending the air cells and destroying their elasticity. Dr Alison also thinks that this is a principal cause; in lecturing on pertussis he states that the bodies of children who have died of this disease are rarely examined without

finding emphysema, owing probably to violent coughing in connection with spasm of the Bronchi causing distention and rupture of the air cells.

4. Dr Williams, although allowing the occasional existence of the causes of Laennec, thinks that others are more frequent. He supposes that the air is unable to pass beyond obstructions, and on that account presses with unusual force on the neighbouring cells to which it has access, the latter thus becoming emphysematous.

Such are the principal causes of Emphysema mentioned by authors. That Bronchitis is the main cause even admits of some doubt, <sup>and has been doubted by Louis</sup> and the method by which it can act is by no means ascertained. The arguments of Dr Gairdner, given above, entitle us to conclude that it is not by the direct effect of obstruction as Laennec supposed, and not by any superiority of the inspiratory over the expiratory power.

That the powerful expiratory effort of coughing is a very efficient cause is extremely probable. The pressure exerted by the included air upon the cell walls while the powerful muscles of expiration are resisted by the closure of the glottis, immediately before the act of coughing must be considerable, and if long continued must tend to dilate the air cells; this will be assisted, though not exactly in the way Dr Williams indicates, if obstruction is at the same time causing collapse of the lung at some parts and thus affording room for the dilated

parts. It would thus not be difficult to explain the concurrence of collapse and emphysema, if they were always in juxtaposition with each other, as they not infrequently are.

But it is very difficult to explain the fact, that, while Bronchitis and Collapse are generally found at the posterior parts of the lung, Emphysema occurs most frequently in front. The only conjecture we can offer is that there is a greater amount of respiratory motion in the front of the chest, and in consequence the effects of coughing will be greater, and more space afforded for the expansion of the air cells.

Whatever may be the efficient means of producing Emphysema, there must surely be some strong predisposing cause in the lung itself. There must also be a total change in the nature of the tissue during the progress of the disease, to account for the complete loss of its natural elasticity, and its acquired power of so greatly overdistending the chest. The undoubted hereditary nature of the disease, would seem to indicate some predisposing condition of the lung. Dr Jackson of Boston, by carefully interrogating intelligent patients at Paris, ascertained that of 28 cases the parents of 18 were affected with the disease previously; its hereditary nature was most strongly marked in those cases in which the Emphysema showed itself at a very early period, so that of 14 such cases, all had asthmatic parents.

## Symptoms and Diagnosis

### I. Of the vesicular Emphysema of Laennec

A very full account of the symptoms has been given by M. Louis in a long article on Emphysema in the *Mémoires de la Société Médicale d'Observation*.

Perhaps one of the most constant symptoms is difficulty of breathing. There has been some difference of opinion however as to dyspnoea being actually caused by an Emphysematous condition of the lung. Andral indeed does not seem to have regarded dyspnoea as a very prominent symptom at all, and M. Beau (*Archives générales de Médecine*, Vol. 54) even attempts to prove that Emphysema cannot cause dyspnoea; probably he was prejudiced in this endeavour, by his desire to simplify the subject of asthma, the sole cause of which according to him is catarrh, accompanied by the secretion of thick mucus; but there are few who can agree with him, however satisfactory it might be, in restricting asthma to so well defined a limit, although there is some justice in his complaint that "there are few maladies so ill understood, and that with most physicians asthma is a word void of meaning or altogether synonymous with dyspnoea" M. Louis on the other hand asserts that dyspnoea from Emphysema alone is often so urgent as to compel patients to seek relief in hospitals, while no

symptoms of Fever, diseased heart, oedema or even catarrh could be detected.

Perhaps when the affection commences slowly as in cases where it has existed from the earliest infancy, it may continue long without causing much dyspnoea, the extent of surface of the lung being increased without any material change of structure. But when fairly or quickly established it produces dyspnoea in several ways. For there is a great diminution of the capillaries. The elasticity of the lung is altered so that it not only has no tendency to collapse, but actually offers great resistance to the expulsion of air from it. The utmost efforts of respiration fail to produce much motion of the already over-distended chest and throat but little air is taken in at each inspiration. So that, independently of the concomitant affections of heart disease, collapse of the lung and Bronchitis, with probably paroxysms of spasmodic asthma, induced by the state of the lung, we cannot wonder that Emphysema should produce dyspnoea.

The difficulty of breathing has been described by Laennec and others as constant, but aggravated by paroxysms irregular in their period of return and duration; liable to be increased also by unusual exercises digestion &c and above all by attacks of acute catarrh.

There is no fever, unless during the frequent attacks of Bronchitis.

The Pulse is generally regular

The skin has a dull earthy hue and the lips are violet coloured & swollen looking, when the disease is considerable.

Laennec asserts there is always more or less cough in every case, sometimes dry or with a trifling amount of viscid sputa, at other times severe and with abundant mucous expectoration.

These are the principal general symptoms, not taking into account many others derived from concomitant affections, which will aid us in forming a diagnosis.

Of the physical signs a very complete account has been given by Dr Stokes (Dublin Medical Journal, Vol. IX). The most characteristic is increase of resonance on percussion, with diminished or absent respiratory murmur. The only other disease with similar symptoms is pneumothorax, numerous other signs together with the history of the two affections prevent the possibility of their being confounded with each other. The extent of the resonance also is increased, when the lungs have augmented in volume so as to press aside neighbouring organs. The hepatic dulness may be encroached on. In extreme cases cardiac dulness is altogether gone, unless when the heart is enlarged, sometimes even then. Dr Stokes says however that Emphysema may exist in the early stage, with distinct dilatation and feeble respiratory murmur & yet without unusual resonance on percussion.

The respiratory murmur is faint and expiration prolonged. The feebleness of the respiratory murmur is caused in advanced cases evidently, by the small quantity of air that enters the lung; for the chest, being already even in a state of rest much distended by the increased volume of the lung, cannot by any effort be made to expand much farther. This is very evident by watching the chest during an attack of dyspnoea in an Emphysematous patient. The same causes are probably in operation in a minor degree when the disease is merely commencing. The murmur is sometimes absent for a time or permanently; this may arise from temporary complete bronchial obstruction, from collapse of the lung, or from the existence of large cavities by the rupture of the walls of the vesicles.

It is very doubtful whether there is any rale characteristic of Emphysema. The usual rales of Bronchitis are of course frequently heard; but Laennec lays great stress on the "rale crepitant sec a grosses Bulles" as quite pathognomonic of Emphysema. He does not say exactly how it is produced, but describes it as conveying the impression of air entering and distending lungs which have been dried and of which the cells have been unequally dilated. Some have supposed they have heard this rale, but most deny its existence. Indeed it would be very unfortunate and puzzling to beginners in auscultation that such a sound as a dry moist rale, as

this seems to be, should be introduced to confuse the present very simple classification of rales. M. Beau only heard this rale when there was an abundant secretion of mucus, so that probably it is nothing more than one of the common moist sounds of Bronchitis. The friction sound of ascent and descent supposed by Laennec to be produced by the rubbing of dilated cells on the pleurae is probably merely an indication of slight pleurisy as is maintained by M. Meriadec Laennec.

Alterations in the form of the chest is a very marked symptom in many cases. Laennec remarks that this is very perceptible when one side is more affected than the other, the emphysematous side being much larger than the unaffected side, and the intercostal spaces wider; if both sides are affected equally, the chest has an almost round or globular outline, swelling out both before and behind; the shoulders are raised; the depression under the clavicles filled up. Indeed the dilatation of the chest begins here in general according to Louis; that observer also states that a "saillie" behind the clavicles is an excellent character. Laennec says that this shape of the chest alone is often enough to determine the disease. Yet some have denied that it is a character of Emphysema at all. Thus M. Beau states that the globular form of the chest is no sign, as it occurs as frequently in other cases, even in a state of health; also that the chest is only

dilated during the asthmatic paroxysms, he has frequently found the chest during such a paroxysm from four to eight centimetres larger than before or after it, and, although all the signs by auscultation and percussion of Emphysema were recognised during the paroxysm, they were completely gone when it was over. Indeed to suit his theory of asthma being caused only by a certain form of catarrh, he regards Emphysema rather as a symptom of asthma, than a separate disease, rather as a temporary distention of the lung resulting as well as the asthma from the obstruction caused by thick mucus, both disappearing when that obstruction has been got rid of, than as a permanent dilatation of the air cells. But this theory has not met with any support, for although the possibility of emphysema being only temporary may be admitted, it cannot be questioned that in the great majority of cases it is a permanent affection.

The size which the chest attains is sometimes very great: thus Dr Stokes mentions a case in which the circumference of the mammary region was seven inches greater than the natural development. M. Louis considers more or less circumscribed projections of the chest as very diagnostic, but these according to others are very often of physiological origin.

Such are the principal means of diagnosis of vesicular Emphysema, and they are distinct enough in advanced cases, but probably the affection may go to a considerable extent without producing any marked symptoms.

## II. Signs of the Emphysema dependant on atrophy

These differ from the signs of vesicular Emphysema, but have only been described by Dr Williams: according to him there is a morbidly clear sound on percussion but without any raising of the pitch of the sound. The shape of the chest is little affected; if altered, it will be diminished in size. The motion of the chest is not materially changed, and as a consequence of this the sounds of respiration are not expelled. Dyspnoea is not necessarily present at least when the patient is old, for as Andral remarks "this condition of the lung is often scarcely to be regarded as morbid, being merely a consequence of diminished functional activity in old people, and should rather be regarded as a fulfilment of a law in the animal economy, which establishes a constant proportion between the quantity of blood to be aerated in a given time and the extent of surface on which this aeration is accomplished." Still Andral allows that it is occasionally even in old people a cause of greatly disordered respiration. The signs of this form therefore are much less marked than those of the vesicular Emphysema.

## Prognosis, and Curability

With regard to this as every other department of the subject very opposite opinions have been held: some considering that Emphysema may cause sudden death, others that it is only fatal by the secondary diseases resulting from it.

Some regarding it as easily curable, others as altogether incurable.

M. Pons, in a memoir read before the Royal Academy of Medicine of Paris, states that the condition of the Emphysematous lung alone, independantly of complications, as heart disease, causes death by extreme dyspnoea. M. Louis again stated that it only proved fatal by causing disease of the heart. The probability is that although the Emphysematous state alone would be sufficient in the end to produce death, yet it cannot reach a very advanced condition, without being accompanied by severe complications which will greatly assist in producing the fatal termination.

As to the curability of this affection, it is certainly difficult to imagine how dilated air cells can ever regain their former condition: but this would seem to be the case, at least it may occur probably as long as no change of structure has taken place. This is the opinion of several observers

M. Beau for example, as formerly mentioned, has frequently recognised all the characters of Emphysema during a severe

fit of dyspnoea, which nevertheless have altogether disappeared afterwards, the chest at the same time diminishing considerably in size by measurement. Drs Osborne and Stokes are also clearly of opinion that it admits of great amelioration at all events. Dr Alison considers it very questionable that it can be cured in advanced life; but that in children it certainly does get well somehow, for often after whooping-cough, all the signs of Emphysema may exist for many weeks and yet ultimately disappear. Laennec also did not consider that it was necessarily a permanent affection.

However in the great majority of cases we need not look for cures; indeed the affection seems to have a strong natural tendency to increase, probably slowly and unnoticed, even when no appreciable cause is present, and certainly during the repeated attacks of catarrh which are so sure to accompany it. It varies very much in the rapidity of its progress; in some cases, Dr Williams remarks, it begins at a very early period and yet the individual may reach an advanced age. In others the disease may reach a formidable extent in a few months.

Emphysema then, even admitting Laennec's opinion that of all forms of asthma this is the one that affords the patient the best prospect of long life, must be regarded as a very serious malady, and the prognosis will vary much, according to the stage of the disease, the liability to catarrh, and the existence or non-existence of secondary affections.

## Treatment.

It can scarcely be said that there is any treatment for Emphysema itself. It must rather be directed against the causes that produce and aggravate the affection. All causes producing dyspnoea should be avoided. Change of air may be beneficial in checking the asthmatic paroxysm.

The usual remedies for catarrh must be employed, as moderating the catarrh is the only means of placing the air cells in a condition to resume their natural state.

Laennec strongly recommends the use of narcotics, especially Opium. All authors seem to agree in ascribing great virtue to the Opium in checking dyspnoea during this disease.

strychnine is proposed by Dr Stokes to stimulate the contractile tissue of the lung, in the supposition that paralysis of that structure may exist. Subcarbonate of Iron is said by Laennec to be beneficial in pale cachectic subjects by diminishing congestion of the mucous membrane and overcoming spasmodic structure of the bronchi.

D. Christison