THE PULMONARY PATHOLOGY OF GENERAL PARALYSIS.

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EVERY one who has had to make *post-mortem* examinations of the bodies of persons who have died of general paralysis of the insane must have been struck by the fact that the pathological changes in that disease are not confined to the brain and nervous system. Having their primary seat and permanent home in the cerebral cortex, these changes spread in various directions, and send forth their evil influences throughout the system, so that when the disease is far advanced, there is scarcely an organ or tissue that does not present some morbid modifications. The essential *substrata* of the diseased processes in the central nervous system must, of course, always receive a principal share of attention; but the secondary degenerations of other parts are certainly deserving of some consideration, both because they reflect light on the conditions in which they originate, and because they may alter or cut short the course of the malady to which they are themselves subsidiary.

Among the secondary degenerations in general paralysis those that affect the lungs are not the least conspicuous and important. In a large majority of the cases of this disease in which autopsies are performed, coarse changes in the pulmonary structure are plainly visible, and in many instances these are of a character which indicates that they have interrupted the progress of the cerebral disorder, and cheated its victim of the dregs of life.

But although thus manifest and significant, the pulmonary changes in general paralysis have hitherto received only a

passing notice. They have not been subjected to careful study or analysis, and it would be impossible to find on record to-day any definite information as to the relative frequency of their different varieties. Under these circumstances, it has seemed to me that it might be useful to sum up a few observations which I made upon these changes some years ago. The observations are somewhat superficial, and, being simply macroscopical, have not the value which they would have possessed had they been supplemented by histological investigations; but still even in their crude state they are not perhaps without interest and practical suggestiveness.

My observations were carried out in the West Riding Asylum, and were made on the bodies of 100 patients—80 males and 20 females—who died in that institution of general paralysis between April 1872 and August 1875. The average age of these patients at the time of death was 41 years and 7 months in the men, and 42 years and 5 months in the women; and the average duration of asylum treatment was 16 months and 2 weeks for the men, and 24 months and 1 week for the women. The earliest age at which death from general paralysis occurred was 24 years in a man, and 32 years in a woman; and the greatest age at which it occurred was 55 years in a man, and 57 years in a woman. The average age for the incursion of the disease is about the same for both sexes, viz. 40 years; but the advance of the malady is more rapid and violent in men than it is in women. In the 100 cases which are here reviewed, all cases of general paralysis in the West Riding Asylum that reached a fatal termination, within the period defined (April 1872 to August 1875), are included, whether death happened in the ordinary course of the disease, or in consequence of some intercurrent malady; but it is to be noted that in this group of cases intercurrent maladies did not appear until towards the natural close of the general paralysis. In every case the patient was in the fourth or last stage of the disease when death took place, and in a large number of cases that stage was so far advanced, that the intercurrent malady might be looked on rather as a mode of death than as a fatal complication. And yet evidence is not wanting that

intercurrent affections, although so late in intruding in these cases, did to some extent shorten their duration. Of all such affections, those of the respiratory apparatus are the most frequent and deadly, and if we examine the distribution throughout the months of the year of the mortality in the cases which we are considering, we shall at once recognise the influence of diseases of the respiratory organs. General paralysis is essentially a nervous disease, and, like all other nervous diseases, it is most fatal in the spring months. Were the mortality which results from it, in a large number of cases, when it runs an uncomplicated course, arranged in the manner adopted by Dr. Arthur Mitchell and Mr. Buchan, in their masterly investigations into the influence of weather on health in London, it would be found that the curve which could be regarded as its constant would closely correspond with the curves of convulsions, epilepsy, whooping-cough, and other nervous diseases. In the accompanying woodcuts reproduced from a paper by Mr. Buchan, the curves for convulsions and whooping-cough are given, the straight black line in each figure being drawn to represent the mean weekly death-rate on an average of the fifty-two weeks of the year, and the figures on the margin the percentages above or below the average.

It will be gathered from these woodcuts that the maximum mortality from convulsions and whooping-cough occurs in

the spring months—February, March, April, and May; and that their minimum mortality is in the autumn months—August, September, and October.

Now if the incidence of the mortality from general paralysis in the several months of the year be thus diagrammatically represented as regards the cases which we are examining, and

which, although too few in number to justify any very precise conclusions, may yet supply some trustworthy indications, we shall see that this disease too has its maximum mortality in April and May, and its minimum mortality in August and September; but that its curve likewise presents a second very decided rise in December and January, in this respect resembling pneumonia and bronchitis, which have their maximum mortality in the cold months of the year.

When the curve of the mortality from general paralysis can be constructed from a number of cases so large as to obviate mere accidental variations, such as that in the November fall in the accompany chart, it will be found that it is really a compound of the curves of the mortality from nervous and respiratory diseases, and it may hence be inferred that the affections of the respiratory organs which complicate general paralysis have a certain independent influence on its course and termination.

The first point to which I directed attention in inquiring into the pulmonary pathology of general paralysis was the weight of the lungs, and the results obtained with reference to that subject are exhibited in Table I.

The mean weights of the lungs here given— $26\frac{1}{2}$ oz. or 756 grammes for the right, and 24 oz. or 682 grammes for the left in the male, and $18\frac{1}{2}$ oz. or 526 grammes for the right, and $15\frac{1}{2}$ oz. or 438 grammes for the left in the female, are so greatly in excess of all standard lung-weights, that it is obvious that they have been raised in the case of general paralytics by morbid conditions of the lungs, the influence of which is also apparent in the enormous difference between the highest and lowest weights, as shown in the Table. In order to determine to what extent the increase in the weight of the lung in general paralysis was due to pathological changes, I selected from the 100 cases all those in which the lungs were normal, or at least free from coarse and obvious pathological change, and calculated their weight separately. These cases were sixteen in number, including fourteen men and two women, and in them the lungs were practically sound, no departure from healthy structure being observed by the unaided eye beyond a slight emphysema at the margins in one

TABLE I.
SHOWING THE WEIGHT OF THE LUNGS IN ONE HUNDRED CASES OF GENERAL PARALYSIS.

	RIGHT LUNG.						LEFT LUNG.					
	Highest.		Lowest.		Mean.		Highest.		Lowest.		Mean.	
	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.
Persons .	100	46.75	1326	214	25.00	710	56.50	1600	10.50	298	22.25	633
Males .	80	46.75	1326	369	26.50	756	56.50	1600	12.25	347	24.00	682
Females .	20	31.00	879	214	18.50	526	22.00	624	10.50	298	15.50	438

or two cases. The weight of the lungs in these cases is given in Table II.

On comparing this Table with that showing the weight of the lungs in all the 100 cases dealt with in this paper, it is seen that the aggregate effect of whatever pathological changes occur in these organs during general paralysis, is to increase their average weight by about $2\frac{1}{4}$ ounces, or 122 grammes, in the male sex, and by about 1 ounce, or 27 grammes, in the female sex. A comparison, however, of the weight of the normal lungs in general paralytics, with the weight of the normal lungs in persons not affected by that malady, shows that during the course of uncomplicated general paralysis the lungs tend to diminish in weight. According to Dr. John Reid's observations, the average weight of the right lung is 24 ounces in the male, and 17 ounces in the female; and the average weight of the left lung is 21 ounces in the male, and 15 ounces in the female. But the average weight of the right lung in the cases included in the Table here submitted, is $22\frac{1}{4}$ ounces in the male, and $17\frac{1}{2}$ ounces in the female; while the average weight of the left lung is $19\frac{1}{2}$ ounces in the male, and 15 ounces in the female. In female general paralytics it would seem that the lungs are, as regards weight, fully up to the healthy standard (in the case of the right lung the weight given in this Table exceeds that given by Dr. John Reid by half-an-ounce), but it is to be noted that the average quoted is derived from the weight of the lungs in only two female general paralytics, who were both considerably above average height, and cannot, therefore, be regarded as trustworthy. In male general paralytics, however, the diminution in the weight of the lungs is very decided, amounting to an ounce and three-quarters, on an average, in the right lung, and an ounce and a half in the left. This loss of pulmonary substance in general paralysis, when no actual disease has invaded the lungs, must be regarded as in some degree analogous to the atrophy which is seen in advanced age. Senile changes are indeed anticipated and exaggerated in general paralysis, in which a general failure of nutrition is witnessed in muscles, bones, viscera, and indeed in every organ and tissue. An abnormal trophic innervation is doubt-

TABLE II.
SHOWING THE WEIGHT OF THE LUNGS IN SIXTEEN CASES OF GENERAL PARALYSIS, IN WHICH THESE ORGANS WERE NORMAL.

		RIGHT LUNG.						LEFT LUNG.					
		Highest.		Lowest.		Mean.		Highest.		Lowest.		Mean.	
		Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.	Ounces.	Grammes.
Persons	16	30·00	851	15·25	430	21·75	617	27·50	780	14·00	400	18·75	535
Males	14	30·00	851	15·50	440	22·25	634	27·50	780	14·00	400	19·50	551
Female	2	20·00	567	15·25	430	17·50	499	15·25	430	15·00	425	15·00	428

less responsible for much of the impaired nutrition that is seen in this disease, but in the case of the lungs it is scarcely necessary to resort to any trophic theory to account for some wasting in them. It is to be remembered, that in the latter stages of this disease locomotion and vocalization are greatly interfered with, and sometimes abolished, while there are at the same time failure of the heart's action and weak inspiratory power. In protracted and uncomplicated cases, it may be shown during life that the chest's capacity is diminished, that the movements of the thoracic walls are restricted, and that the respiratory murmurs are feeble; and it is not to be wondered at, therefore, that some diminution of volume and change of consistence are found in the lungs after death. These organs are of pale colour, of dry texture, and less firm and resisting than they ought to be, having lost their elastic resilience, so that they are capable of being squeezed into a small compass. The air vesicles are of large size and the bronchi look as if thinned. The process upon which these changes depend is, in all probability, essentially one of withering and obliteration of capillaries dependent on diminished respiratory function and blood volume.

The other pathological changes encountered in cases of general paralysis, may be best considered as they affected the pleural covering of the lungs or the lung substance, as congestion, consolidation, or phthisical degeneration.

Changes in the Pleuræ.—The pleural sac enclosing the lung is more given to morbid affections than any other serous membrane, and in persons labouring under general paralysis it seems to be even more prone to abnormal conditions than amongst mankind generally. Such abnormal conditions, which were almost invariably the result of inflammation, were found in 64 of the 100 cases of general paralysis which I have made the subject of special examination as regards the state of the lungs. The nature and distribution of these abnormal conditions are indicated in Table III.

From this Table it appears that in 36 general paralytics out of 100, the pleuræ were in a normal state and free from adhesions, but that in the remaining 74 cases pathological changes of one kind or another were noted. In 5 cases there

were unmistakable signs of recent inflammation of one or both pleuræ, and in 71 cases there were changes in the pleural sacs which might be fairly regarded as products of past inflammatory attacks. In those cases in which the adhesions were few in number and limited in extent, it might be said that they were not necessarily the result of inflammation properly so-called, but of the hyperplastic and proliferative processes which are so common in serous membranes, and which leave behind them pleural adhesions in so large a proportion of persons who have passed middle life; but even in those cases included in this Table, along with the whitish bands or patches of adventitious membrane connecting the pleuræ, there were in many

TABLE III.

SHOWING STATE OF THE PLEURÆ IN ONE HUNDRED CASES OF
GENERAL PARALYSIS.

State of Pleuræ.	Males.	Females.	Total.
Pleuræ on both sides, free from adhesions and normal	30	6	36
Old, slight, and scattered adhesions on both sides	13	5	18
Old, strong, and general adhesions on both sides	8	4	12
Old adhesions confined to right side	19	4	23
Old adhesions confined to left side	5	1	6
Recent adhesions on both sides	1	-	1
Recent adhesions on right side	1	-	1
Recent adhesions on left side	1	-	1
Fluid in the pleural cavities	2	-	2
Total	80	20	100

instances changes in the pulmonary substance beneath, which pointed to their origin in inflammatory lymph. And in the much greater number of cases, in which the adhesions were wide-spread, or general and firmly organized, the conclusion was irresistible that they had arisen out of pleuritis, which had often perhaps attracted little or no attention. Of course, in a large proportion of these cases, a proportion which, however, it was impossible to estimate, the pleurisy had occurred before the incursion of the general paralysis; but still the facts, that traces of 5 recent pleuritis were found in 100 subjects, and that many of the adhesions which are tabulated as old were only comparatively so, and had probably been formed within two

years of the time of death, justify the belief that there is a special proclivity in general paralysis to inflammation of the pleural membrane. As will be seen presently, the sufferers from general paralysis are particularly liable to attacks of pulmonary congestion, which may readily spread to the pleuræ. They are in the prime of life when pleural inflammations are most frequent, and they are apt heedlessly to expose themselves to changes of temperature and currents of cold air. Anstie thought that extreme muscular over-exertion and strain, as in public speaking, sometimes produces pleurisy in otherwise healthy persons, and if this supposition is correct, it is easy to understand why pleurisy should be common amongst general paralytics, who, when excited, in the earlier stages of their malady, will talk or shout incessantly for hours, and even for days and nights together, with an energy and persistency that the most inveterate orator never attained to. And perhaps another explanation of the frequency of pleurisy in general paralytics may yet be discovered in some constitutional tendency to which both of these diseases are etiologically related.

When the adhesions between the pleura were old they were composed of tough white connective tissues; when they were recent they were formed of thick layers of yellowish lymph; and where effusion had taken place, the fluid was turbid and contained purulent matter and flakes of lymph.

It will be observed that where the pleuritic adhesions were confined to one side, they were located on the right side more frequently than on the left, in the proportions of four to one.

Congestion of the Lungs.—Of all pathological changes in the lungs in general paralysis, congestion is the most common, and this is often present to a degree much greater than one is accustomed to find after slow death from exhausting bodily diseases. It was present to a marked extent in 49 out of the 100 cases of general paralysis which are here dealt with, and in many of these its intensity was such that it was difficult to say that it did not amount to pneumonic consolidation. In 38 of the 49 cases, it existed in both lungs, in 11 cases it was limited to the right lung and in 6 to the left, and whether involving one

TABLE IV.

SHOWING THE WEIGHT OF THE LUNGS IN THIRTY-TWO CASES OF GENERAL PARALYSIS IN WHICH THESE ORGANS WERE BOTH CONGESTED.

	Right Lung.						Left Lung.					
	Highest.			Lowest.			Highest.			Lowest.		
	Ounces.		Grammes.	Ounces.		Grammes.	Ounces.		Grammes.	Ounces.		Grammes.
	Mean.			Mean.			Mean.			Mean.		
Persons	32	35.00	992	12.00	340	698	31.75	903	14.00	395	22.50	641
Males	24	35.00	992	17.75	505	773	31.75	903	16.25	460	25.00	709
Females	8	21.25	602	12.00	340	505	18.75	530	14.00	395	15.25	435

or both lungs it was invariably more extreme, and extensively diffused in the male than in the female sex. In Table IV. is set forth the weight of the lungs in those cases in which both were congested, and here we see that the vascular engorgement and œdema caused an increase of weight of 5 oz. in the right, and of 5½ oz. in the left lung in the male, but of only a quarter of an ounce in each lung in the female. This observation is interesting in connection with the well-known fact, that women die of pneumonia in much smaller proportion than men do, and that that disease is, as a rule, much milder in them than in the other sex.

The congestion of the lungs in general paralysis is of course hypostatic in character, and is almost invariably most marked posteriorly, and in the lower lobe. But it is by no means limited to this pulmonary region, for in 25 of the 49 cases in which it existed, it is described as having extended throughout the whole lung. In 22 cases it was confined to the lower lobe, and in 2 cases (in one of which it was associated with an abscess, and in the other with miliary tubercles) it involved the upper lobe alone.

The amount of congestion varied from slight hyperæmia, with some serous infiltration of the pulmonary parenchyma, up to extensive engorgement of a dark red, or even blackish colour. The boundary line separating the cases of most pronounced congestion from those of actual pneumonia was certainly not well defined, and some of the cases tabulated as congestion might have been perhaps not improperly called pneumonia. The presence of even obscure crepitation in the congested lung tissue, the escape of frothy fluid from it on section, and the restoration in some degree of the natural colour of the lung by prolonged washing, were taken as signs that congestion had not actually passed over into the pneumonic condition. With the congestion there was constantly bronchial catarrh. In 17 cases pus was found in the bronchi, and in 30 cases there was frothy mucus with increased vascularity of their lining membrane.

The hypostatic congestion of general paralysis is not difficult to account for. The sufferers from that protracted and debilitating disease have their muscular strength reduced to a

low ebb, and in them respiration is carried on, as we have seen, with little vigour. Incapable in many instances of voluntarily changing their position, they remain for prolonged periods in attitudes favouring the accumulation of blood in dependent parts, while a loss of power in the nervous mechanism, regulating the calibre of the vessels, is also conducive to local congestions. It is possible that in the advanced stages of general paralysis, there may be some degeneration of the excito-motor ganglionic elements, which exist in the plexuses surrounding the pulmonary vessels, in the inferior thoracic or superior cervical ganglion, in the communicating nerves, in the antero-lateral columns of the cord or in the vaso-motor centre in the medulla oblongata. But it is not necessary to suppose changes in any of these in order to explain the vaso-motor disturbances, which are evident at an early period in the course of general paralysis, and which some have regarded as an essential element in the disease, for recent experiments have demonstrated, that the vaso-motor centre in the medulla is linked with certain portions of the cerebral cortex. Budge has proved that irritation of the crus-cerebri induces arterial contraction, and Eulenburg and Landois have shown that definite areas of the cerebral hemispheres in dogs, corresponding to the central convolutions in man, constitute vaso-motor centres for the extremities of the opposite half of the body. These vaso-motor centres, destruction of which by the cauterizing leads to a more or less enduring increase of temperature in the limbs of the opposite side, are situated in the vicinity of the voluntary motor centres of the cortex, which are invariably involved in the degeneration of general paralysis. And if vaso-motor centres for the limbs are located there, it may be legitimately inferred that vaso-motor centres for the head and neck, thorax and viscera are not far off, in the irritation or destruction of which ample explanation is to be found of the pallors, flushings and perspirations, the local changes of temperature and the internal congestions which are so frequently noticed in general paralysis.

A practical lesson may be derived from the great liability of those who labour under general paralysis, to suffer from pulmonary congestion, and it is to this effect, that their days

may be prolonged by careful attention to their decubitus. A mere change of posture may remove an hypostatic congestion which would soon deepen to such an extent as to curtail life, were the position of the body left unchanged, and careful nursing, by night and day, may do much to ward off complications of this kind. General paralytics who are reduced to helplessness should be systematically moved from side to side, when in bed, and from one attitude to another when occupying a sofa or chair.

It seems to me also, that the liability of general paralytics to pulmonary hypostasis affords a strong argument against that re-introduction of mechanical restraint into our asylums, which finds some advocates in these days. Were mechanical restraint sanctioned, it would probably be had recourse to more frequently in the case of general paralytics than in that of any other class of lunatics. The reckless violence and destructiveness which so often occur at the outset of the disease, and the tottering restlessness of its closing scenes, with the risk of fractured ribs which attends its whole course, would all recommend the employment of what is, at any rate, a sure method of avoiding some distressing accidents. But it is just in general paralysis that special dangers would wait on this sure method. In the stage of excitement there is the danger of pulmonary fluxion, and in the stage of dementia that of pulmonary stagnation. Bonds restraining the muscles are very apt to induce pulmonary fluxion where there are nervous erethism and palpitation, and Niemeyer speaks of scandalous cases of frequent occurrence, in which delirious persons, or patients with delirium tremens, having been brutally strapped to their beds, are found dead the next morning with bloody foam upon their lips. Then, appliances preventing free movement may cause, it is scarcely necessary to point out, passive congestion and œdema of the lungs, while the trouble of removing and reapplying restraint would inevitably interfere with those frequent changes of posture which are so desirable in advanced cases of general paralysis.

Pneumonia.—Distinctly pneumonic conditions of the lungs were found in 13 out of the 100 cases of general paralysis, the post-mortem reports of which we have been examining.

Two of the 13 cases might be regarded as simple or ordinary acute pneumonia with profuse fibrinous exudation, and the remaining 11 as instances of broncho-pneumonia and hypostatic pneumonia. Both lungs were involved in the inflammation in 8 cases, the right lung alone in 4 cases, and the left lung alone in 1 case. Only in 1 instance was a pneumonia found in the body of a female; 12 of the patients who laboured under this disease at the time of death being males. The increase in the weight of the lungs caused by the pneumonic process was very remarkable. In one male, in whom both lungs were in a state of gray hepatization, the right one weighed $46\frac{3}{4}$ oz., or 1326 grammes, and the left $49\frac{3}{4}$ oz., or 1407 grammes. In another male, in whom the left lung was in a state of red hepatization, that organ weighed $56\frac{1}{2}$ oz., or 1600 grammes, while the sound lung of the other side weighed $23\frac{3}{4}$ oz., or 670 grammes. The mean weights of the lungs in the 8 cases (all males), in which both lungs were inflamed, was $35\frac{1}{2}$ oz., or 100 grammes, for the right, and 33 oz., or 936 grammes, for the left lung.

As has been pointed out, in these cases of pneumonia, both lungs were inflamed in a large majority of instances, and in this respect the pneumonia of general paralysis resembles the congestive pneumonia described by Mr. Erichsen as the commonest cause of a fatal issue after capital operations, when of course, debility, prolonged recumbency, and nervous shock, combine to favour its occurrence. In Mr. Erichsen's cases the right lung alone was affected three times, the left lung alone also three times, and both lungs together, twenty-two times. But in ordinary sthenic pneumonia the right lung is most frequently affected, the left lung next, and lastly, both lungs conjointly. Thus Huss found that in 53 per cent. of the 2,616 cases included in his statistics the pneumonia was on the right side, while it was on the left side in 32 per cent., and on both sides in 15 per cent. Grisolle states that in 1,430 cases of pneumonia, which he collected from various authors, the inflammation was in the right lung 742 times, in the left lung 426 times, and in both lungs 262 times. But while, contrary to the ordinary rule in the pneumonia of general paralysis, as well as in the pulmonary

congestion of that disease, both lungs are involved much oftener than either lung singly, it is to be borne in mind that when one lung alone is affected by inflammation or congestion, it is the right lung that most frequently suffers. Rosenbach has shown¹ that in acute diseases of the respiratory organs in cases of hemiplegia, the lung of the paralysed side is much oftener the seat of disease than that of the sound side. In trying to account for this, he discovered that the direct reflex irritability of the involuntary muscular tissue of the paralysed side is decidedly lowered, one result of which is that foreign matter, such as saliva, entering the bronchi of the paralysed side does not give rise to sufficient expulsive efforts, so that unilateral broncho-pneumonia is set up. Founding on Rosenbach's observations, it might perhaps be argued that, as in general paralysis the left or leading hemisphere of the brain suffers probably earlier and more profoundly than does the right hemisphere, and as lesions of the cortex always cause functional and organic derangements on the opposite side of the body, so the right lung must inevitably suffer oftener than the left one. But this theory affords no clue to the preference of pneumonia for the right lung in persons in whom there are no lesions of the cortex, and some more general explanation is yet needed of the right side tendencies not only of pneumonia and congestion of the lungs, but also of pleurisy.

When seeking for an explanation of the great prevalence of pneumonia in general paralytics, the classical researches of Traube at once come to mind. Traube demonstrated that section of the vagi in the neck in animals, produces inflammation of the lungs and early death; and he referred the pneumonia which so frequently follows the operation to paralysis of the digestive canal from the throat to the stomach, and the consequent accumulation in the œsophagus, and overflow or aspiration into the air passages, of the secretions of the mouth and particles of food. Steiner subsequently showed that ligature of the œsophagus at its middle point, with section of the recurrent laryngeal nerves, produced exactly the same results which Traube obtained on section of the vagi; and then, dividing the vagi longitudinally into two bundles, which he was

¹ 'Centralblatt,' 1879, No. 16.

able to differentiate as motor and sensory, he further showed that section of the motor bundle was followed by an extensive pneumonia in a few days, due, like the pneumonia following complete section of the vagi, to paralysis of the œsophagus and larynx; and that, while section of the sensory bundles alone did not induce pneumonia, but only irregularity of respiration, their section immediately subsequent to section of the motor bundles played some part in the succeeding inflammation, by leading, through the powerful aspiratory efforts induced, to the carrying into the bronchi of more fluid than would otherwise have reached them. Now, in almost all general paralytics in the last stage of the disease, there is more or less paralysis of the œsophagus and larynx, with accumulation of food and fluid in the pharynx, and imperfect closure of the glottis. Choking is a common occurrence amongst them, and has to be specially provided for, and it might seem, therefore, that the mechanical or non-trophic theory of the causation of broncho-pneumonia was fully applicable in their case. The objection to this theory that particles of food are rarely or never found in the bronchi of the inflamed lungs is disposed of by the observations of Frey* that the mere trickling or injection of saliva into the smaller bronchi is sufficient to set up inflammation. But while fully admitting that mere mechanical irritation from an *error loci* of the ingesta or secretions may play an important part in the causation of pneumonia in general paralysis, it must, I think, be maintained that there are other factors in its etiology which must not be lost sight of. Solutions of nitrate of silver have been injected into the bronchi of persons free from nervous disease, without setting up pneumonia, and amongst general paralytics cases of broncho-pneumonia occasionally happen which can be distinctly traced to a reflex cause, such as exposure to a cold draught. It is probably with the pneumonia of general paralysis very much as it is with the bedsores in that disease, of which the etiology is complex. Mechanical irritation by frequent wetting and prolonged pressure, is highly instrumental in inducing these bedsores, and great care in avoiding mechanical irritation may effectually prevent their occurrence. In the Royal Naval

* 'Lo Sperimentale,' Jan. 1878.

Hospital at Yarmouth, where a large number of severe cases of general paralysis are always under treatment, a bedsore is never seen, and the officers pride themselves on their skill in preventing their occurrence. But on the other hand, no one who has studied the bedsores which occur in such cases, will doubt that they are produced by a degree of mechanical irritation which would have no such effect in a healthy person, and that they are sometimes developed with a rapidity which betokens a profound disturbance of innervation in the part, as does also their tendency to dangerous extension. And so in the pneumonias, as in the acute and chronic decubitus of general paralysis we are forced to assume that besides mechanical irritation, some centric nervous influence is at work, causing neuro-paralytic hyperæmia, and perhaps a suspension of healthy trophic influences, for the existence of trophic fibres in the lungs is not yet finally disproved.

Phthisis.—Phthisical consolidation, or disintegration of lung tissue, was observed in 25 out of the 100 cases of general paralysis analysed, and in the subjoined Table, some information as to the weight of the lungs in these cases is supplied. The effect of phthisical disease is obviously very materially to augment the weight of the lungs which it invades. The mean weight of the lungs included in Table V. is not only much above the mean weight of the normal lungs in general paralytics, but considerably exceeds the mean weight of the lungs when congested. The mean weight of the right lung in the phthisical cases, was 6 oz., or 166 grammes, in the male, and 2½ oz., or 66 grammes in the female—greater than the mean weight of the right lung in the normal cases, and 1 oz., or 27 grammes, in the male, and 2¼ oz., or 60 grammes, in the female, greater than the mean weight of the lungs in the cases in which there was congestion. The mean weight of the left lung in the phthisical cases was 5½ oz., or 167 grammes, in the male, greater than the normal standard, but in the female the mean weight of this lung was a trifle short of that standard. As compared with the cases in which there was congestion, the mean weight of the lungs in the phthisical cases was slightly in excess in the male, and slightly deficient in the female.

TABLE V.

SHOWING THE WEIGHT OF THE LUNGS IN TWENTY-FIVE PERSONS LABOURING UNDER GENERAL PARALYSIS AND PHTHISICAL DISEASE.

	RIGHT LUNG.						LEFT LUNG.					
	Highest.			Lowest.			Highest.			Lowest.		
	Ounces.	Grammes.		Ounces.	Grammes.		Ounces.	Grammes.		Ounces.	Grammes.	
Persons	25	40·75	1155	7·50	214	25·50	32·00	905	10·50	298	22·00	621
Males	17	40·75	1155	20·75	590	28·25	32·00	905	15·00	425	25·25	718
Females	8	27·00	765	7·50	214	20·00	20·50	578	10·50	298	14·75	417

In six of the cases included in Table V., only the remnants of past phthisical disease were found in the lungs. These consisted of nodules of earthy or chalky matter, situated at the apex of the lung in every case, and occupying one apex in four, and both apices in two cases. Around these nodules or masses, which were single in four cases and double in one, and which varied in dimensions from the size of a pea to that of a walnut, the lung tissue was invariably dark and indurated, while over them the pulmonary surface was more or less puckered. As it is highly improbable that resolution with absorption of intra-alveolar exudation, and drying up of tuberculous deposits, could take place during the progress of so debilitating a malady as general paralysis, it may be fairly inferred that in these cases the phthisical affection had existed, and had been practically cured long before the supervention of the cerebral disease. In the remaining cases, however, in which phthisical changes were found in the lungs, these were of a kind indicating their recent origin and active state. They were confined to the right lung in 3 cases (all males), to the left lung in 7 cases (4 males, and 3 females), and involved both lungs in 9 cases (5 males and 4 females). They consisted in grey miliary tubercles in 9 cases, in caseous masses in 5 cases, and in mixed grey granulations, and yellow cheesy masses in 5 cases. Cavities were associated with the miliary tubercles in 3 cases, and with the mixed tubercular and caseous degeneration in 4 cases, being in 5 cases confined to the upper lobe, and in 1 to the lower lobe. The vomicæ were always of comparatively small size, with ragged walls, presenting no appearances of a false membrane, and the lung tissue around the miliary tubercles and nodules was for the most part congested and œdematous, and but little indurated. There was no room for doubt that in all these 19 cases, the inflammatory processes leading to phthisical consolidation, and destruction of lung tissue, had arisen during the course of the general paralysis, and had been cut short by the natural termination of that disease. In none of them had the disorganisation spread to that extent which we are accustomed to see in the lungs of patients who have died of phthisis.

Now the age at which patients who perish by general

paralysis are attacked by it, and their previous history and physical characteristics, alike forbid us to attribute any phthisical disease which may be developed in them to the influence of hereditary predisposition. They have passed the time of life at which hereditary phthisis most frequently displays itself, and they have never exhibited that constitutional feebleness which is so characteristic of those who have an inherited tendency to that disease. They are as a rule vigorous and much enduring, until general paralysis lays its grasp upon them; we must therefore look for the personal factor in the causation of phthisis, when they suffer from it, not in an inherited, but in an acquired state of health, unless, indeed, certain neurotic tendencies which the sufferers from general paralysis and phthisis both exhibit, be regarded as having an etiological relation to the latter disease. And this acquired state of health is readily recognised in the general debility and impairment of power which constantly accompany general paralysis. Here we have that condition of the system which favours the development and progress of phthisis, when inflammatory changes are set up by any irritation or injury of the pulmonary tissue. And such irritation or injury is of course peculiarly likely to occur in the victims of general paralysis, whose mental disquietude and muscular helplessness, are alike apt to lead to chilling of the body by exposure to cold, and who are, as we have seen, exceedingly susceptible to pulmonary congestion and bronchial catarrh.

But there is another respect in which general paralytics may be regarded as favourably situated for contracting phthisis. They are generally, during their latter days at any rate, in close association with persons suffering from this disease, and they inhabit buildings in which it has been long established. Dr. Villemin, when speaking of the extraordinary prevalence of phthisis amongst soldiers, expressed his conviction that the barrack is to the soldier, in the production of consumption, what the regimental stable is to the horse in the development of farcy; and evidence is now accumulating daily in support of the transmissibility of phthisis from one person to another.

The theory of Koch, that the tubercle bacillus is essential to the development of the phthisical process, and that

phthisis is therefore a communicable disease, although not fully established, is daily becoming more probable, and the history of the connection of phthisis with general paralysis seems to lend it some confirmation. The prevalence of phthisical destruction of lung tissue amongst general paralytics is very remarkable. In my cases it existed in 19 per cent. But the prevalence of phthisis, not merely amongst general paralytics, but amongst the insane generally, is noteworthy. While in the population of England, above twenty years of age, phthisis is responsible for 14 per cent. of the whole mortality, in the public lunatic asylums of England and Wales, the population of which may be taken as above twenty years of age, phthisis is the assigned cause of death in 15 per cent. of the whole mortality; while it exists at the time of death in a considerable proportion of cases of general paralysis, epilepsy, &c., in which it is not the certified cause of death, and so does not appear in the tables of mortality.

Now a certain proportion of patients, when admitted into lunatic asylums, are labouring under phthisis, but, on the other hand, a certain proportion of patients are discharged from these establishments when labouring under that disease; and it is, I believe, incontestable that phthisis is generated in lunatic hospitals to a greater extent than in the general community. Bearing in mind that the inmates of asylums are well fed, clothed, and housed, and live in situations specially selected for their salubrity, and under strict hygienic regulations, the prevalence of phthisis amongst them strongly suggests the propagation of the disease by contagion. And this suggestion has additional probability given to it by several other facts and considerations. While in the general community the mortality of males from phthisis is greater than that of females, in lunatic asylums the reverse is the case. In England and Wales, phthisis is the assigned cause of death in 15·2 per cent. of the whole mortality amongst males, and in 13·4 per cent. of the whole mortality amongst females; but in the pauper lunatic asylums of England and Wales it is the assigned cause of death in 12 per cent. of the whole mortality amongst males, and in 17 per cent. of the whole mortality amongst females. Now, the chief respects in which female lunatics differ from

male lunatics in their mode of life, are that they are more sedentary in their habits, and are less out of doors, being more confined to their day-rooms and wards, and compelled to breathe more constantly the air which is breathed, and possibly poisoned, by the patients who are consumptive. And further than this, it might be shown that the mortality from phthisis has been materially diminished in some asylums by increased attention to sanitation, the ventilation of the buildings, and the out-door exercise of the patients, by the adoption, in fact, of means calculated to lessen the risk of dissemination of contagious or infective matter in the atmosphere. It may also be shown, that in every asylum phthisis originates most frequently in patients inhabiting wards such as the infirmary wards, in which the air is liable to be contaminated by the breath and sputum of phthysical patients. And thus it is, I should be inclined to maintain, that phthysical conditions are so common in general paralytics. They are, for the most part, from the first, unfit for out-door employment, and in the latter stage of their illness they are, almost without exception, relegated to the infirmary wards, so that they may have the benefit of better nursing. But in these wards they are very generally in association with patients sinking under phthisis ; and the fact that 19 per cent. of general paralytics dying in asylums present evidences of recent phthysical disease, whereas phthisis is responsible for only 15 per cent. of lunatic asylum mortality as a whole, seems to me to support the view that phthisis is communicable, and is dependent on organisms which are specific. That the tubercle bacillus is a constant attendant on tubercular processes cannot now be denied, that it is the true cause of their infective property is most likely, and that it may be communicated from man to man, and set up phthysical changes anew whenever it lights on a congenial soil, is rendered probable by facts such as those which have been adduced regarding the connection of phthisis with general paralysis.

Until Koch's theory is disproved, it would be prudent to act on the assumption that it is true, and to prevent the close association of persons actually suffering from phthisis with those who, from inherited tendency or deterioration of health, are especially liable to contract the disease. A large number

of lunatic asylums have now detached hospitals for contagious diseases, which fortunately stand empty for a great part of the year, and it might be well to isolate in those buildings all cases of phthisis. The experiment could do no possible harm, and there is every prospect that it would be attended with benefit to the victims of phthisis, and with safety to those who are in danger of its attacks.

Abscess of the Lung.—In 2 cases out of the 100, abscesses of the lung were discovered. In one of these the abscess, which was of the size of a small orange, and situated in the upper lobe of the right lung, was clearly the consequence of a pneumonia, but in the other, the abscesses (for there were three of small size) were probably of metastatic origin. They were in the lower lobe of the right lung of a man, in whom extensive bedsores had formed almost suddenly on the sacro-gluteal region a few weeks previously, and who had suffered from remittent fever. There was no tubercular matter in either lung in this man, and each abscess had surrounding it a ring of consolidated pulmonary tissue.

Gangrene of the Lung.—Dr. Mickle has seen gangrene of the lung in general paralysis, but nothing approaching it was observed in any of the 100 cases which I have been analysing.