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PART I.  
ORIGINAL COMMUNICATIONS.

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ART. I.—*Remarks on the Uses of the Globules in Relation to Absorption, Secretion, and Morbid Deposition; but here especially for the Diagnosis of Tubercle of the Lungs or elsewhere.* By THOMAS HODGSON WATTS, M.D.

[Continued from Vol. XIX. p. 401.]

WE now approach the most interesting part of the subject, to wit, the application of our observations on the elementary forms of morbid matters to the diagnosis of tubercle of the lungs. Every contribution to the sum of means for the positive detection of this sad malady, is desirable in the highest degree. If such additional test of the morbid state were a complete proof of the actual existence of the affection, it might be regarded as a lasting triumph of our art. We ought to hail its coming as we would welcome the appearance of a wise, good, and infallible counsellor in a time of need. Besides the proof were simple, and open to the sight of all, without scarce a trace of reasoning, or nice and complex inferences, it would be doubly valuable. Such results the examination of the matters of cough by the

microscope would seem reasonably to promise at one eventful period at least of pulmonary decline.

The sputa of phthisical persons ought, in our opinion, to contain the tubercle separated on the mucous membrane of the air tubes, possibly at every period of the malady. So far, however, as regards the breaking up of grey granulations, of knotted, or of infiltrated tubercle, we conceive it frequently possible, to prove the presence of it in the expectoration, by the elementary forms of the morbid matter. We have already proved the softening of pulmonary tubercle in this way; and we consider this may be done on many occasions from the first of the process of evacuation, until it is completed temporarily or altogether, provided all the matter coughed up be carefully examined.

It is especially, however, at the onset of an ultimate catarrh, in cases of pulmonary decline, that the microscope will probably be found valuable in the positive diagnosis of the malady. While the symptoms simulate an acute bronchitis, whether the signs of auscultation are sure or otherwise, the scrofulous matter is separated, together with that of cough, long before a clear trace of a cavity is discernible by the ear. The diagnosis is founded, at this period, chiefly on the evidence of percussion, and even when most certain, is still merely the rational deduction of a probability. Percussion may often, owing to a variety of causes, disappoint our hopes; and the cavities may be so small in the first days as to offer no extraordinary sounds, much less gurgling or cavernous breath. Considering also how tubercle gains the air tubes, even from minute cavities, as seen in the autopsy, we might *a priori* expect to find it in the matter of cough, before pectoriloquy, and the breath of cavities, and on occasion before gurgling. Our researches have confirmed this suspicion in several instances, and we will adjoin a few cases in explanation.

Consadine, twenty-two years of age, who had been ill of cough for three months, was admitted into the Meath Hospital,

1st June, 1841. According to his statement, he had ever been healthful previous to the time of this attack; but his testimony was somewhat invalidated by the presence of large nodes on his shins, and a strongly cachectic look.

He was pale, with a swarthy tinge of skin peculiar to many individuals of the lymphatic habit, having light-sandy hair. There was no remarkable emaciation, because of the natural predominance of the cellular covering in him, and the short duration of the malady. His voice was altered, becoming sepulchral after a few days' residence in the ward. He sweated at night, and also most profusely during sleep, even in the day time. His strength was wasting into weakness, the cough had become most troublesome, and the expectoration was almost incredibly copious, amounting to many potsfull of a puriform matter in the twenty-four hours. There was well marked hectic. He did not complain particularly of pain; but the frequent, and anxious breathing, together with cough, caused him much suffering.

The ear was sensible to some comparative dulness on percussion, particularly at the top of the right half of the chest. Here, in front, there was extensive gurgling; but this was very general, and scarcely well restricted to points. There was neither cavernous respiration, nor pectoriloquy, although the voice mounted the tube with more readiness than is common to that of healthy lung. A similar series of phenomena were discoverable in the top of the left lung, but much less distinct. Throughout both lungs frequent, constant, and near connected adhesive bubbles, of various sizes, were rattling and crepitating every where, but most remarkable in the upper lobe of the right lung. There was much prostration of strength, and the respirations was quick, short, and imperfect.

There was neither well marked tracheal or bronchial breath, nor bronchophony, so completely were all other phenomena cloaked by the gurgle, bubble, and crepitus of the copious puriform and adhesive secretion from the mucous membrane

of the air tubes. The morbid changes found in both lungs after death must have rendered the auscultatory phenomena somewhat obscure. It is remarkable, that our attention was more especially turned to the right lung, although the left proved to be most implicated. Both lungs were thickly studded with aggregated shot-like granulations of yellow matter, excepting only the bottom lobe of the right one. There were patches of infiltrated tubercle on both sides, and several cavities of the volume of hazel nuts; but one excavation in the upper lobe of the left lung would have contained a large pigeon's egg, and even more. All these cavities must have resulted from softening of infiltrated tubercle, as they had still the jagged and broken inner surface, for the most part patched with solid tubercle, and where this was chiefly evacuated, a soft, flocculent, velvet tissue, quite moist, was the only lining. The left lung was compressed, solid, and drawn towards the spine, not occupying above a half of the pleural space. It was bathed in a serum somewhat opaque, but scarcely in sufficient quantity to cover it. There were old, long, and tensely stretched adhesions between this retracted lung and the pleura of the ribs. The rest of the pleural space had probably been occupied by gas. The entire right lung adhered close to the walls of the chest, and the bottom lobe was healthy.

From the day after his admission into hospital until his decease, we examined the matter he coughed up each morning by the microscope, and from the first time to the last, we discovered plentiful specimens of pure tubercle. Not only did we find the peculiar globules of the scrofulous matter, but also remnants of the tissue of lung, in the meshes of which tubercle is very generally secreted. The broken parenchyma of the pulmonary organs is, when taken together with tubercle, also a valuable aid in diagnosis. We sometimes find it alone, after the cavities have voided all the morbid product, and at other times forming the framework to a mass of globules, which, from various accidental

circumstances, may not be characteristic enough, except to the well practised eye.

We selected portions of the tubercle from the matter of cough, about the volume of a granule of sago, and having previously washed it in distilled water, we placed it between two plates of glass, together with a drop of liquid ammonia. The glasses being somewhat tightly compressed, in order to break the tubercle into a regular and thin layer, whereby it becomes translucent enough to seem a transparent substance through the microscope, we fixed it in the focus. The appearance of the tubercle in these instances was such as is represented in *Plate 2*. It was wholly composed of the globules, well grown, and devoid entirely of fibres, or any part of the network of pulmonary tissue. The mass of globules presented a yellow or dilute sienna tint of colour, which was reticulated with the grey produced by their dark margins, joining and lapping over one another. Towards the borders the globules are less compact; some of them project, and incline to join in the current, and their individual form, as well as the manner of mutual union, becomes more sensible. It is, however, especially in the stream of fluid, the current of which can be made to flow with variable quickness, that we observe the peculiarities of form and composition most distinctly. They were swimming, of various sizes, either separate or united one to another, forming varieties of composite globules. These are good examples of well developed gum-like globules, mingled among others either broken, or not so fully grown. There are always fewer corpuscles in such a specimen.

Again, other particles of tuberculous matter, taken from the same source, and treated in like manner, presented another series of appearances. Besides the tubercle globules, there were also numerous fibres of the parenchyma of the lung, which are seen depicted in the same *Plate*. These had distinct organic arrangement in every instance; but in some specimens they wore the mark of wise design, and seemed fitted exactly for a

network, to maintain properly the vessels and air tubes. Their proportion to the quantity of the gum-like globules was variable in different samples; but even here a median or common amount of these two constituents relative to one another, may be established, which is about that we have chosen for our drawing. The less proportion of the pulmonary parenchyma in comparison to the globules, would appear to depend more on the higher degree of development the tubercle has attained, than on accidental circumstances. Still, however, we have very often found fully grown globules, together with a large share of pulmonary tissue. Although, therefore, ripe tubercle globules for the most presuppose more or less dissolution of the texture in which they were formed, yet their attainment of a high degree of development does not account wholly for the absence of fibres in many cases. This may very likely depend sometimes on the primary site of tubercular deposition; and it is easily credible, that the tubercle globules should be free from those other appearances, when their site has been an air tube. Many of the samples of tubercle in the sputa of Consadine, offered to the microscopic view globules-in various stages of development; and the form as well as the colour of them were sometimes considerably modified, both by the prolonged maceration within the cavities in the lung, and by reason of accidental chemical change, or the retrograde process of resolution into more elementary matter. In this place we will omit giving plates of the whole of their appearances, as we intend, on another occasion to give to the Profession all our observations on these bodies in a more exclusive manner, when we communicate a complete history of tubercle in its modifications according to the peculiarities of tissue, and other conditions accidental to it from any sensible source. In this portion, however, the globules were not so ripe as in the example already described; and they were more closely attached to one another, somewhat less in volume, and tended to separate more in little masses, constituting irregular composite globules. These

floated together with individual ones in the current of fluid as in other instances.

Although there was no more distinct evidence of cavities in this case than gurgling, yet this taken together with the numerous bronchial bubbles, absence of vesicular murmur to a considerable extent, and the irregular sound on percussion, almost removed every difficulty in fixing at once the diagnosis. The whole history and appearance of the case pointed to phthisis; but the rapidity of its progress, and the enormous amount of pus coughed up, gave room to suspect the possibility of common abscess of the lung, or the establishment of extensive suppuration in the air tubes after some acute attack. Notwithstanding the real nature of the case could not well have been mistaken by the common means of diagnosis; still the direct and positive proof of softening tubercle, so simple by the aid of microscope, was a considerable point won in the knowledge of the state of the unfortunate man, and also a great comfort and satisfaction to our mind. Tubercle might very well be coughed up under an analogous combination of circumstances, when at the same time the evidence of auscultation is inestimably less decisive.

It is worth remark in this place, that Consadine fell rapidly a victim to the ravage of tubercle; he left life before one-fiftieth part was evacuated from the lungs; and never, on any occasion, during the time he was in hospital, was his sputa free from scrofulous matter. But it is not so in every case which has come before us. It may happen, for instance, that the malady is far advanced and old; and the tubercle being almost altogether or chiefly voided, no more of the gum-like globules are coughed up, or only at intervals. The cavities begin to clothe themselves with new membrane, and the case progresses towards a possible recovery, unless there are actually, or follow afterwards, new crops of tubercle; or else the lung being wasted too much, and the economy being irreparably shaken, neither the disposition

nor yet the ability to rally remains. The victim of tubercle, in some of these instances, seems rather to fall under the long result of imperfect hæmatose, than the direct working of scrofula. The blood is meanly prepared, nutrition is slow, and the poor sufferer emaciates; although he seems sometimes to gain in fullness of body after the disappearance of the hectic. The plastic process is set up in the sores of the lung, so also the predominance of the fibrine in the circulating fluid, and together with it, a condition of the vitality favourable to phlogosis, and congestions of a permanent nature. There is Scylla—here is Charybdis; and it must be a favourable air, and every aid, and a good physician, that can bring persons safe through such bewildering dangers.

The case related in the sequel is a good example of the short but temporary absence of tubercle from the matter of cough, in the softening stage of pulmonary scrofula.

John Seery, 34 years of age, ill fourteen months with a cough; was admitted into Meath Hospital, 22nd June, 1841. His mother died of consumption, and his own child of cough. He has been married but three years; and excepting two attacks of some venereal discharge from the parts, he was always in the best health up to the date of this illness.

For many years addicted to drink much whiskey, and particularly to Saturday and Sunday debauch, his good health gave way under the frequent dyspepsia of drunkards.

Auscultation in this case furnished every needful information as to the amount of disorganization of the lungs; and examination of the sputa for tubercle was more a matter of curiosity than otherwise. But we still learn something useful from our observations even here. We see that we cannot establish a negative diagnosis from one or a few examinations of the expectoration by the microscope. Although for a few weeks the poor man coughed up tubercle, yet on one occasion this was not found in the sputa collected for twenty-four hours. It might

happen that on other occasions during a long period of tubercular expectorations, the first observations made upon the sputa of particular individuals might also fail to afford an undoubted specimen of the morbid product, which would, as in this instance, at length be found by farther perseverance. We may establish it then as a rule, that the research of the matter of cough for the tubercle globules, ought to be a daily business in the early stage of phthisis, until the actual softening of the morbid depositions is ascertained. Our pains will be well rewarded, for we will thereby be enabled sometimes to prove positively scrofulous wasting of the lungs in the way of demonstration, at an early period, the fact of whose presence is not always easily settled, even some time after the work of excavation has gone on widely. Again, occasional cases may come before the physician in great practice, in which the view of the expectoration by the microscope would perhaps determine the diagnosis, before so much as a well-founded suspicion of the morbid state might be otherwise excited.

However, it is of less importance in most instances of the latter days of pulmonary decline, to bestow our labour on the indiscriminate inquiry into the appearances of the matters of cough. Not, indeed, that it is of less real value in point of diagnosis, to discover the globules peculiar to tubercle; for there are various combinations of morbid and abnormal conditions, which render sometimes the tell of phthisis obscure unto the end. But, in the common course of things, the signs caught by the ear are quite decisive in establishing the morbid state in advanced consumption of the lungs from scrofula. Thence the ear ought properly to go before the eye in the inquiry into the physical phenomena of phthisis; indeed, the rule should be, to make auscultation the prelude to the microscopic sight, the positive proof of the nature of the disease, when tubercle is expectorated. The ear, and percussion, and the stethoscope are much readier than the more formal investigation of the matter of cough by the microscope; and where auscultation an-

swers the expectations of the physician satisfactorily, it is in most regards lost time, to delay longer in needless inquiry. This holds true in respect to private practice at least, where it is difficult to carry about and right the microscope for a sometimes tedious and somewhat disgusting manipulation for most persons. There are, however, numerous occasions, when this is more simple and ready than auscultation. At times, the tubercle is so plentiful in the matters coughed up, that a few seconds suffice to select it from the mass, and to prove its identity by the microscopic proof. In the wards of an hospital, however, or even in the study at home, the microscope will often be found the most simple and handy means wherewith to ascertain the malady.

Therefore, 'in advanced tubercle of the lungs, when the aural evidence of cavities is decisive, we may establish two reasons for giving the preference to auscultation over the microscope; to wit, the readiness of the diagnosis by the ordinary means; and, secondly, the inconstancy of the appearance of tubercle in the sputa, and particularly when it has been almost altogether voided from the pulmonary organs. We will subjoin a case in explanation of our view of the question.

Edward Farrell, aged 22; ill of cough for four months, came into the Meath Hospital, 13th June, 1841. His mother died of decline at 34 years, and two of her children in childhood. His father is an old and healthy man, and a sister is living and well.

He was always a most healthful person, never suffering from colds until three years back, when he got syphilis. The primary form was cured in about two months; but twelve months later he became affected with an eruption on his skin, which continued for upwards of a month. From this time he began to lose his colour, and although his health was apparently restored, his friends would ask him why he looked so ill, and changed colour so much.

Four months ago, hoarseness with cough set in, and a month later he began to spit largely, his stomach became disordered,

he grew languid and weary, chilliness followed, and he wasted progressively ; but he never had any pain either in his chest or shoulders.

Since he came into the ward, he has spit little, and, notwithstanding it amounts to about three or four drachms daily, of a puriform matter, yet it seldom contains tubercle. On two occasions we found portions of the texture of the lungs, probably from the surface of an exhausted cavern. But for two mornings we obtained good specimens of tubercle globules, advancing towards resolution, but, again we could detect them on more. We have adjoined a partial view of them in the plate representing their appearances, and particularly that of the composite globules. These ordinarily are of the same colour as the mass where they are found, and in this case they had a light sienna-yellow colour. The globules composing them were more minute than the ripe gum-like ones ; and their form being less uniform and characteristic, we look upon them as tubercle, which has partially undergone solution, or one of its changes in the return to simpler elements.

Having established some principles relating to the comparative use of the ear and the eye in the positive diagnosis of softening tubercle of the lungs in the latter stage of the malady, we will next endeavour to show the value of the microscope in aid of the physician, at a time when the locality and history of the disease are our only guides in determining its kind. There are three periods of pulmonary decline ; when the positive detection of the morbid changes going on in the lung is yet to be desired. These are the periods of the secretion and attachment of the morbid matter, the commencement of its expectoration, and the formation of considerable cavities whence this is emptied forth. The two latter epochs of the series are sometimes discoverable by the aid of the microscope ; and to explain this fact more fully than hereto, we subjoin the following case.

Thomas Bryan, 24 years of age ; ill of cough for three

months ; came into hospital the 7th June, 1841. Born of healthy parents, and of a family no way strumous, he was always in good health up to the month of March last. He took cold and hoarseness then, together with hæmoptoe, which persisted largely for a week. About a month after this attack he came from Limerick to Dublin to be treated by Dr. Stokes, who directed him to be cupped and blistered below the right clavicle. He prescribed besides some cough medicine, and advised him to set off for the country.

Following these counsels for a time, he had no return of the bleeding from the lungs ; but he wasted progressively, Some over-officious friends recommended him to return to the city and enter the Meath Hospital, which he did accordingly.

On the 10th of June, three days after admission, he complained of cough, but was free altogether from pain or ache in either chest or shoulders. He coughed up less than a potful of a frothy, muco-puriform fluid, devoid of a trace of blood. He sweat at nights, and appeared falling into hectic. His pulse beat 80 in the minute, feeble and soft. The head, belly, and urinary system were in perfect order, and the appetite good.

Slight wasting of the chest was remarkable below the key bones of either side. It was otherwise properly formed, and the motion of both sides was equal.

Percussion gave a clear sound on the right side in front, although comparatively less so at the top ; and this difference almost amounted to a degree of dullness behind. The respiration was somewhat feeble, and joined to a slight muco-crepitating rale in the clavicular region, and weak vesicular murmur, with occasional crepitus at the upper part of the back.

There was marked dullness of the left lung, particularly over the upper lobe before and behind. The vesicular murmur was indistinct in this part, and in place we had a firm, dry, crepitus, without bronchial respiration. The lower lobe was natural.

The first examination of the matter coughed up in this case provided us with a sample of tubercle, in which the globules

were but little developed, pale, and devoid of the fibres of pulmonary tissue. There were numerous corpuscles perfectly spheroid, mingled throughout the mass, minute, like those often seen in pus and other morbid products, and appeared to be of accidental origin. Although very similar to many particles of scrofulous matter, obtainable from the lungs after death, which has undergone some casual change, it was not still satisfactory enough to determine our opinion. Perhaps when we acquire a thorough familiarity with all the possible modifications of these interesting bodies, we may in the result find such a specimen sufficiently characteristic for our purpose. On the morrow, however, a second trial furnished us with a large specimen of well grown globules, together with the wrecks of a particle of lung. The fibres presented a remarkable appearance, some of them being perfectly clean as under other circumstances, while another portion of them were still clad with adherent globules. This being one of the characteristic features of the tubercular mass met with, though more seldom, we took pains to make a careful drawing of it, (see the plate), as it might be a stumbling block to a new observer. A little movement of the object glasses upon each other is sometimes sufficient to loosen the gum-like globules, and to expose the fibres simply to view. This singular composition of the globules with the texture where they form, gives additional insight into their habits, and strengthens the opinion of their being probably animal crystallizations. In all other respects this particle of tubercle was essentially the same as in the foregoing instances ; and the variety of arrangement merely depended on casual distribution by uncertain pressure.

The earliest rational diagnosis in the case of Bryan, was pneumonia, suspicious from its site, and the probable precedence of a similar morbid state a considerable time previous in the top of the opposite lung. Auscultation afforded no more certain evidence of phthisis, than the crepitus and dulness proper to phlegmon of the lung, although it bore on it something of a

marked character. It was somewhat dispersed, and conveyed the idea of a tenacious but fine bubble bursting, a little larger than that of pure pneumonia of the same standing. It was a sort of crackling crepitus. The rational diagnosis, although obscure, was, however, strong in the suspicion of the actual malady; and the progress of the local signs was in no degree in harmony with the general symptoms. The dulness and crepitus diminished quickly on the smart application of the antiphlogistic cure to the top of the chest; but neither wholly disappeared. The amount of vital reaction approached nearer to hectic than inflammatory fever, although neither had actually declared themselves. The whole history of the case pointed to ultimate phthisis; and before he quitted hospital, the foretel became most unfavourable, and the diagnosis was established as tubercular pneumonia, waiting for the proof.

It is very probable, that this was an example of those slower forms of pulmonary decline, in which the sufferer falls a victim to successive crops of scrofulous growth. And it is not improbable that the attack some months prior in the top of the right lung was quite alike to the present; and at that epoch, the first harvest of tubercle was reaped. A similar, but second evacuation, now progressing in the left lung, has become complicated with a serious phlegmon; and the malady, up to this period in a manner manageable, must now end in complete softening of infiltrated tubercle, proving fatal. Thus the third attack of tuberculization will, in all likelihood, exhaust his vital energies; and the left lung, though the second for the visitation of scrofula, here, by the casual occurrence of acute disease, will prove the spot on which the deadly shaft is falling, while the primary site of the affection will be found to have suffered comparatively little. If the microscope could have revealed the softening of scattered tubercle in the first instance, as is very possible according to the history of the man, the information would have been most valuable. It ought not indeed to have altered the procedure of cure for the time; for it was wisely

directed to quell the new vital tumults in the part, to relieve the vessels of the top of the right lung from growing congestion, and to conquer any inflammatory phenomena already openly in the field. These precautions probably insured to the poor fellow, at that time, the evacuation of the old deposit of tubercle with the least risk ; and gave him fair opportunity to adopt the needful measures to get rid of the ill habit of body, and to restore his health. This form of the malady, especially in subjects wanting the hereditary bent to it, and also simple, circumscribed tubercular hepatization, seem most favourable to recovery. The former grants time to the physician to work with his remedies, and to the patient for his escape beyond the sphere of evil influences under which the health broke. He may thus avail himself of those grand alteratives of the vital economy, climates, regimen, occupation, and change without limit. The wide world lies before him, gifted with health ; and woe unto them who do not, nor can seek for it with hope and zeal, and warmth. Time, big with opportunity, remains the last truthful protector of the consumptive ; but also this wastes like the open reservoir :

So ist jede schöne Gabe  
Flüchtig wie des Blitzes Schein ;  
Schnell in ihrem düstern Grabe  
Schliesst die nacht sie wieder ein.

Also tubercular hepatization has this good feature, that it is sometimes nicely circumscribed, and not combined with any remarkable amount of scattered and more general deposition. This peculiarity of tubercle of the lungs we have repeatedly observed in children, and particularly during infancy. Although in many of these instances, the little sufferers were eminently tuberculous, yet the complicating local changes were most often seated in the glands of the lymphatics ; a very diffuse site, much less central, and by no means so fatal as the noble organs—the right arm of life. But it is not alone at this early epoch, that infiltrated tubercle is on occasions nicely limited ; we conceive

it to happen so, but less often upwards into old age ; and the following case may serve in some degree to establish the fact.

Pearce Butler, 48 years of age, born in Carlow, Ireland ; has been in London the last seven years ; followed the employment of gentleman's servant. His family were healthful people, and he also for the most part ; his mother died at 90 years.

Formerly he used to live well, and fed on beef, mutton, together with other strong meats, and drank porter, ale, coffee, and the like, to his heart's content. For about ten years, he supposes, he would consume about half a pint of whiskey daily. Latterly, however, he has been constrained by circumstances to live low and feed ill. It is now eight or nine years since he gave over whiskey drinking.

During the last twenty years he has been subject to a winter catarrh, persisting ordinarily about two months ; but the attack was not invariable, and sometimes omitted seasonable returns. He was much wont in former days to have pains in his shoulder blades, which were sometimes very severe when he felt cold. For four or five years of late, he has had gout in his right foot, which came on habitually in March, and lasted till April ; however it has not appeared this year. He has suffered under syphilis several times.

For some years he has endured pain towards the lower margin of the left side of the chest. At times he has had months of relief from it. It was sometimes particularly acute, and less restricted than now. Salivation, blisters, cupping, and the actual cautery were all employed to relieve him ; and the red iron was of great temporary benefit, whereby pain was put aside for a considerable time. Now it is somewhat diffuse, and occupies the space of the palm of a hand, without any physical reason to account for it. It is of such a kind that the poor fellow can give no very intelligible description of it, although he never forgets to complain.

For two months past he has been very short of breath, most so on exertion. Since this time he has coughed a great deal,

and expectorated much. The expectoration consists of a viscid, glairy, mucous fluid, which holds in suspension some little lumps, opaque, and as if purulent. He has had headach for the last week ; that he attributes to the straining cough. His pulses are 84 in the minute, and somewhat soft. He has thirst ; and his tongue is pale, moist, and clean. There is less motion of the left side of the chest than opposite. The response to percussion is comparatively duller on the left side ; and a gurgling and an indistinct sort of pectoriloquism are perceptible in the top of the lung.

We made this examination of the patient on the 1st April, 1836, whilst we resided with the late Dr. Fergus, Professor of Forensic Medicine in King's College, London, in the St. George's Infirmary, Mount-street, Westminster, to which Sir James Clark, Bart., was chief physician. After a long residence and treatment in King's Ward for the shortness of breath and catarrh, by means of light antimonials during the day, and minute doses of Dover's powder at night, he at length died with severe dyspnœa, relieved for a time, but uselessly, by Hoffman's æther and laudanum.

The autopsy was duly made. The length of the body was six feet three inches ; and the skin was clean without eruptions ; but there were marks of cauterization and cupping over the lower part of the chest on the left side.

The head was well formed, and the brain healthful, excepting a degree of softness in a portion of the left lobe of the cerebellum. There was some effusion of serum into the arachnoid cavity, and the arachnoid was somewhat thickened. The pia mater stripped properly from the convolutions.

There was considerable congestion of the inner surface of the large air canals. A few old adhesions held the lungs to each pleura of the ribs on points. The right lung was emphysematous, containing much serosity ; and its air tubes were deep red. The top of the left lung was partly occupied by a large cavity, capable of holding three or four drachms of fluid, surrounded

by a nearly solid strata, with traces of tubercle. The rest of this lobe was emphysematous; there was also emphysema of the lower lobe, together with great congestion and œdema, and a few scattered tubercles. The air tubes held much pus, and were very red within. The root of the bronchus was compressed, and partially constricted by an arterial tumour, where it enters the lung.

The heart was natural in every sense; an ounce and a half of serum was found in the pericardium. There was an aneurism as large as an orange, where the aorta is crossed by the left pulmonary vessels; it contained a fibrinous clot.

The bronchial glands were very large and black. The liver was too large, but otherwise healthy. The spleen was large and soft; the pancreas normal; the kidneys and bladder quite proper.

The mucous membrane of the stomach was found much thickened. There were strictures of the small intestines on two points, but of sufficient calibre to admit the point of the little finger. They seemed to have resulted from loss of substance by ulcer and subsequent cicatrization.

The cavity was emptied; a few specks of yellow granules of tubercle of the same date, and equally advanced, marked the nature of the cavern; and a few scattered, grey granulations in another remote portion of the lung, pointed to a later persistence of the malady, though in a light degree. Dr. Ferguson, whom death bore away to a premature tomb, whom we shall ever lament, so lofty a mind, so generous a friend, and so excellent a man;—to his genius and better heart we burn to pay the homage of memory, and to grieve on his untimely loss, wherein our Profession has suffered with ourselves; and science may well weep long for him—a guiding spirit melted from being—as wont the honey bee for scented flowers of summers gone, in whose atmosphere it gathered sweets;—he, indefatigable in the endeavour to apply the deductions of a sound pathology to clinical medicine, looked upon this case as a fine

sample of a number of observations he had made during several years' residence in that admirable institution, in proof of the frequent cure of considerable tuberculization of the lungs. He viewed it as doubly interesting, in relation to a course of the antimonial treatment, to which Butler was submitted for a long time, and which he was inclined to consider as having been of eminent service. We are not disposed to doubt this probability; but we wish to convey the opinion, that more lies in the nature and peculiarities of cases of pulmonary decline admitting of cure, than in the value of a particular routine of practice and lauded remedies. Butler was of a family in no manner a prey to scrofula; and in spite of the ills of venereal debauch, his constitution rallied and overcame, until angina from aneurism hindered him in the duties of office. Until then, almost pampered with the goods and comforts of life, he at length could no longer earn his daily bread; poverty, and want, and distress came upon him, as the storm on the goodly bark. His was shattered in health; and the ill habit presided over the economy, and acute tubercle settled in the lung. The house of charity of a benevolent public received him from the miseries of a cellar in a London lane; comfort again smiled upon him, the aids of medicine were lavishly applied, and new hope took him kindly from despair. Confidence in the wisdom of his physicians grew buoyant, and he rallied for a time, but to fall the victim of an incurable angina.

Whatever may have been the value of the gentle antimonial treatment in this case, we are convinced of its beneficial influence over hectic. We have seen most of the hospitals in the great centres of learning in Europe, but we never saw anywhere hectic so manageable by the physician as in the wards of St. George's, Mount-street. The extreme doses were one-sixteenth of a grain of tartar emetic, with effervescing salines. The assisting remedies were a couple of grains of Dover's powder at bedtime, sometimes joined to a few more of the powder of mercury with chalk, when the alimentary canal was deranged. To keep

the bowels from growing costive, occasional morning doses of a teaspoonful of castor oil were amply sufficient. And to answer particular cases, sulphates of quinine, or iron, or aconitum in minute proportions were had recourse to. Prudent fumigation of the lungs with chlorine was made throughout the disease, when no marked irritability was present. It was a routine practice, founded on keen observation, and guided and modified by an acquired tact. Every new vascular turmoil in the lung was met by immediate leeching ; for, resident in the hospital, we were ready at the call of the patients by night and day. And we have often had reason to admire the relief obtained by small leeching, daily repeated, with a night and morning dose of five grains of hyosciamus and blue pill, in ulceration and pricking pain in the larynx and trachea.

We have thus far sought to show in how much the sight of the tubercle globules, in the matters of cough, is useful to tell positively scrofulous decline of the lungs. But we have as yet only confined our remarks to pointing out the particular epochs of the malady, where the microscope may sometimes be employed with success. We will now direct attention more in particular to consumption in complication with other diseases, and such deviations from the order of health, that sometimes make a certain diagnosis impossible by the ordinary means. If even the proof by the microscope were of less importance to the practical physician, because it does not give us the first intimation of the work of havoc going on in the chest, still it may be invaluable in another sense. Wherever particles of tubercle are plentifully cast forth from the pulmonary organs, it discovers the fact ; and such a test has been hitherto wanting to settle the point at issue in the compositions of maladies, where tubercle of the lungs, even far advanced in softening, is predominant over all. The difficulties of diagnosis, in the instances alluded to, proceed from whatever conditions of the case render the evidence of percussion, and noises of the lungs, obscure or negative.

The physician will often meet with examples of deformity of

the chest during a long career of practice, which ordinarily cause much embarrassment in the determination of his opinion. It is not uncommon for persons so deformed to suffer from habitual cough, and being equally subject to the several other affections of the pectoral cavity, the diagnosis of tubercle is incalculably more difficult. Whether the irregular form is the effect of foregoing disease, not tubercular, or the result of mechanical inconveniences, matters little. Percussion affords no longer satisfactory information ; and softening tubercle may be voided by cough to a considerable amount, before we have any very positive clue to the actual formation of cavities. The history of the case may be obscure ; and the whole of the physical signs discoverable by the ear may not exceed the sum of those indicating purulent catarrh. Since we began our researches into the appearances of the sputa, we have had but one opportunity of putting the value of the microscope to the test under such circumstances. This was in the case of a shoemaker, a man advanced in years, of a healthful family, long subject to cough, and difficult breathing, which had been greatly aggravated for the last few weeks. The entire chest responded too clear on percussion ; it was much flattened, and the whole region of the sternum was depressed back, but particularly below, where was a hollow like a goblet. This had been caused by the pressure of the last from boyhood upwards. He expectorated a thin, puriform matter abundantly. There were mucocrepitating sounds over the whole chest.

The opinion was, for a time, so positive of its being mere puriform bronchitis, that we delayed the examination of the matters of cough until a convenient time, being fully occupied with other cases. The malady made rapid progress however, and the true diagnosis was established. The poor fellow left the wards unexpectedly to die among his friends ; and we only succeeded in obtaining a spoonful of sputa, which both the nurse and he assured us was recently coughed up. Examined by the microscope we found it to be a finely granular fluid, of a

yellow tint, containing numerous microscopic hydatids of the volume of the globules of pus. They were barely yellow, smooth, transparent, and lively in motion for the most part. They were either single and separate, or many huddled together in globular vibrating heaps. They were neither soluble in acetic nor nitric acid, and exactly alike to such as we have obtained occasionally by allowing minute particles of tubercle to grow quite putrid in water. If the testimony of the nurse is faithful to truth, they should be considered as characteristic in such a case of the existence of cavities. The matter they were found in was similar to pus dissolved by the process of putrefaction, which could only happen in a cavern where it might be long detained.

Tubercle following upon old catarrh and emphysema of the lungs, is in no manner uncommon ; and when it is met with, the diagnosis may remain obscure for a considerable time. The over clearness of the chest, on percussion, renders the detection of partial solidification of the lungs extremely doubtful ; and as dilatation of the air cells is often more remarkable in one lung than another, and even in different points of the same, so also the inference derivable from comparative dulness or clearness are in no way certain, and have little practical weight in marking tubercle. The long continuance of the cough here, the distended chest, and the habitual expectoration of plentiful, and even puriform sputa, add to the difficulty. The feebleness of respiration likewise robs the physician of another important comparative sign.

Richard Bonner, 20 years of age, has always had a cough since he can remember ; and during the last eighteen months he has suffered from extreme dyspnœa, so as to walk but few steps without insufferable anxiety of breathing. At the cited period, he had an attack of pleurisy ; and in November a painful abscess formed in his left side, followed by a running which continued some days in large quantity.

There is comparative dulness of the left clavicle ; the spine of the left scapula is dull ; and above the clavicle of this side,

the respiration is somewhat cavernous, but difficult to decide so near the trachea.

The difficulties in this case are the restricted amount of positive auscultatory signs, the habitual character of the cough, the long, severe dyspnœa, and the previous inflammatory attack in the chest. Dr. Stokes, however, rather from large experience in such cases, diagnosticates phthisis, than from positive auscultation.

The result of the first examination of the matters of cough by the microscope was negative ; but two days afterwards we obtained a sight of the tubercle globules.

Fluid in the cavity of the pleura might sometimes happen to make difficulties in ascertaining the actual existence of scrofulous wasting of the lungs. Particularly when combined with purulent catarrh, a certain opinion is not easily established. In those circumstances, the proof by the microscope might come timely enough, on occasion, to satisfy us before auscultation avails our purpose. When of a purulent character also, the hectic could very easily lead to the worst conclusion, of which the event might prove the faultiness. But, again, we should lay little weight on a temporary negative by the microscope, as this will only serve the object of inquiry when softened tubercle is coughed forth, and the lungs may be tuberculized without its giving notice of the fact. But as the evidence of percussion is of much less value in these instances, the earlier positive information at times derivable from the view of tubercle in the sputa, is likely to prove an advantage to the physician.

In regard to solid alteration of the lungs from hepatization, not tubercular, and other causes, and cirrhose, the microscope is not likely to avail much ; it will add only to the negative evidence. This may, however, serve sometimes to complete the complement of probabilities, and make them sufficient to determine an opinion somewhat exact. It is rather in establishing the converse fact of solidification from tubercle, that it may be valuable.

Likewise in the case of carcinoma of the lungs, although we may properly expect both positive and negative information from this source, yet it will be but of little value. In the early stage it may deny that scrofulous matter is coughed up; and in the later period of softening of the medullary matter, it can but prove the reality. This, however, is so very distinctive in its way, judging from a case of carcinomatous sputa, which came under our observation, that were it always to preserve the like characters, it could never be mistook. The glutinous, yellow, medullary mass, so uniform and thick; the smell of it like open cancer when not kept clean; and the cancerous stench of the patient, and particularly of the breath, were striking in the extreme, and remarkable beyond a doubt. It is, however, the negative evidence of the microscope in respect to carcinoma, when it tells positively scrofulous softening of the lung, that we should anticipate, will sometimes be valuable in determining our opinion. One instance of this kind we have met with; although the amount of uncertainty was barely sufficient to raise the question of carcinoma. The period of life of the man, being far advanced in years, the rapidity of much solid alteration in one lung, and the previous sound constitution, the absence of a sure sign of cavity, and of respiration also to an uncommon extent in the part, all these reasons, and default of hectic, created a momentary suspicion, which before many days elapsed was relieved by the formation of cavities. However the first proof of the sputa by the microscope was decisive of tubercle.

Having reviewed rapidly the several cases in which the microscope promises new light to the physician in the positive tell of pulmonary decline, we will take leave of this part of our subject, in making one suggestion to the surgeon. It happened in the course of these inquiries, that we examined the matter coming from a tumour in the axilla, which afforded us several times good specimens of softening tubercle; for which we are indebted to our friend Dr. Innes, of the 84th Regiment. This was a cluster of enlarged glands, as large as a turkey's egg, which

had grown rapidly from the pressure of the belt of a knapsack on the cicatrix of a scrofulous abscess. The sufferer, a common soldier, had previously had syphilis, thereby he fell into ill health, and the scrofula succeeded. There was some very remote possibility that a more malignant quality of disease had supervened ; but it was not so in reality. The new test here only proved the most probable opinion of the case correct. There might, however, occur cases in which the nature of a tumour is doubtful ; and since Müller has traced the appearances of all the varieties of carcinoma, and malignant growths so completely, the microscope may perhaps prove of value to settle such a difficulty.

Whatever real use the future, and further observations may award to the microscope in the diagnosis of scrofulous disease, we are satisfied with the broad results of our endeavours to make it available to a practical aim. The having unravelled the elementary forms of tubercle, the modes and ultimate sites of its formation, and its relations to complicating morbid states, establish this branch of pathology on the soundest basis.

Tubercle has previously been observed in the large veins, and in the minute venous ramifications, by several distinguished pathologists, and particularly by our friend Dr. Carswell. This great master in human pathology was led to argue on this ground, that it usurped, as the first site of its formal existence, the circulating fluid. The whole medical mind of that epoch was ready, with few exceptions, to accept this opinion, which the detection in the blood of urea, bile and other organic compositions proper to the physiological state, seemed to render probable. But the analogy between the normal secretions of health, and those of disease, is not complete ; and the inference thus derived exceeds the bounds of a severe conclusion, estimated according to the present state of knowledge. May be, the time may come, when this opinion shall be established as a reality ; but we doubt its being so most firmly. It is never found in the blood in the most aggravated cachexia, before the local deposition of it in the organic textures. It was never detected

in after-death coagula, previous to its softening in some locality of the body. When seen otherwise in the vessel, it was always in the character of a plug; and important local changes of a similar nature were found likewise in the immediate neighbourhood. This is the amount of information communicated on this interesting subject; and whilst we object to so ingenious an opinion, we will add to rather than detract from the force of the arguments in favour of it. Not only, therefore, do we allow the full value of the few observations made concerning tubercle in veins, but our own researches tend to bear them out completely, and to bring fresh evidence of the fact of vascular tubercle. The examination by the microscope of this morbid matter, on occasion, shows something analogous to gum-like globules in seeming vessels, as well in their finer distribution hidden to the naked eye, as also in the ultimate loops of apparent capillaries. This appearance, however, is not invariable, and seems more especially attached to an advanced epoch of the malady in one set of cases; and we consider it possible to point out the proper relation of it to the act of tubercular secretion.

During the period of simple secretion, as in the case of tuberculization by the grey granulation, the vessels are not choked with the globules of tubercle, so long as the grey bodies remain a thick plastic fluid, approaching ever so near, or even actually within the limits of solid matter. The spleen of scrofulous infants offers them most conveniently to the observer; and even at this stage, the vessels surrounding these granular depositions bear the marks of that share they take in the morbid work. They lie imbedded in a network of minutest blood-vessels, deeply injected, but the blood is still readily soluble and removable by washing. If they are allowed to rest some time in distilled water, they blanch quite white, and the vascular tissue grows velvety and flocculent, like the outer membrane of the animal ovum on a larger scale. This aspect probably results from the empty web of vessels hanging in shreds, in a framework much more resistant than the neighbouring tissue of healthy spleen.

Here we have, thus far, punctiform tuberculization, only along with congestion on a minute point, additional adhesiveness of tissue, and the secretion of a sort of plastic fluid, not admitting of organization into fibres, but in place being a true embryo of tubercle globules.

But it would not appear to be altogether so at a later epoch, when the granulations shall have blanched or become yellow matter. Especially when the latter has commenced the work of softening, we have frequently seen appearances resembling branches of minute vessels and loops of capillaries, as if gorged and distended with tubercle globules, which could never have circulated as such. They always seemed firmly attached within them, proportionably more indeed than coagulum of blood in inflamed veins of considerable calibre. They appear too large for ready circulation, nor are they sufficiently elastic, possessing much rather the resistance of solid particles, than the limitless pliancy of the blood-globule. The entire of those apparent vessels and capillary loops partake of the character of stiffness, and look more brittle than mere membranes. Upon the whole, however, they preserve still a considerable amount of elasticity, and, if really tubercle, it is then, perhaps, the very best injection of the capillary in red-blooded animals, and interesting alike to the cultivators of anatomy, physiology, and pathology.

Since it is so clear that tubercle could not have circulated with the blood, as it is when seen in this stage, it becomes a question, did it ever mingle in form with it? This embraces the inquiry into the mode of formation of tubercle within the vessel, as well as the act of tuberculization in general, and deserves much care to explain it fully. There are but two modes, according to which tubercle can be supposed to occupy the entire calibre of the capillaries, and continuous vessels. Thus were the act of tuberculization to continue long after much of the plastic embryo had been deposited outwardly, and has even accepted the solid form, and undergone the globular change, the tuberculizing state persisting as during the period of secre-

tion, but unable to pass more of the morbid matter through the walls of the capillaries, might gather, remain, and assume also the form of globules, being favoured by the mechanical condition of the parts. This appears to us as sometimes the fact, provided that such actual obstruction obtains, as to hinder circulation in the capillaries sufficiently, to deliver the blood wholly to the accumulative affinities of tubercle, without forcing it into the general vascular current. Thus far tuberculization is a simple process, and the ordinary forces of secretion are alone interested in the morbid work, both within the vessels and outwardly. But we do not conceive it so in other cases.

The second mode of tuberculization in the capillary loops, and their continuous vessels, is probably much more rapid. The first step would here seem to be coagulation of the blood, and consequent arrest of its movement onwards. Thenceforth the change into tubercle may go on. The capillary coagula owe their origin ordinarily to the permanent congestion of phlegmon. The blood in the capillaries of the inflamed part, we are told by Glüge, stagnates, leaving the circulation to be carried on through anastomosing loops of larger calibre. The blood globules unite in bodies of several together, forming aggregated globules, which plug and even distend the vessel to the utmost. If suppuration sets in, these compound globules pass into the form of that of pus. So also it would seem to be somewhat analogous in acute tubercle. The blood globules having combined with one another in various proportions, their movement stopped, and the suppurating process failing to set in, that of tuberculization changes them accordingly. Tubercle apparently bears somewhat of that relation to its particular cachexia, which pus and lymph do to the state of ordinary health.

The metamorphosis into pus is much more complete and remarkable than into tubercle, and most likely requires a warmer vital alteration of the part, reacting often with shivering and rigors on the general economy, and not seldom with smart fever. There is a thorough alteration of the coagulated blood in this

case. The compacted globules assume the form of sacculæ with a rough surface, as if spotted with most minute points of more solid matter, and they contain fluid. The fibrine, instead of taking on the aspect of fibres, becomes slightly adhesive fluid, finely granular. Such is pus; and the saccular form is rendered doubly distinct by the addition of an alkaline solution. This, in dissolving them, removes the granular points on the surface; the saccula becomes relaxed, grows transparent, swells considerably, bursts, and disappears; a granular slime alone remaining. It is also not improbable that the creative force of pus, alike to that of tubercle, comes into play in two ways; either directly in acting on coagulated blood globules, both in and external to the vessel, or on its elements in embryo, secreted on membranes from the blood of the capillaries. The former procedure ought to be the more violent; and the life of the part suffers so much, that the capillaries and the whole texture interested, submit equally to the solution and new composition of the vital affinities of the suppurative process. It is very likely, also, that to some such cause we may justly refer in part the violence of abscess over mere purulent evacuation.

There is a striking distinction between the trifling disturbance of the economy sometimes attendant on plentiful, but diffuse secretion of pus on the surface of membranes and even of noble viscera, and the turmoil of whitlow and suppuration in tissue. Purulent catarrh of the lungs seems needless to name, so familiar to every one; but we have often had reason to admire the tranquil separation of pus into the belly in puerperal disease. So long as inflammation persists simply, or with sero-fibrinous exudation, we may remark frequently considerable suffering. When, however, the suppurative act sets in, pain is not seldom no longer responded to, and a delusive alleviation of some prominent symptoms seems to keep pace with the secretion of pus. It is not, again, until the purulent fluid within the belly becomes sour, that new disorder adjoins, and the poor creature grows breathless and cold, and dies with a pulseless

arm and failing heart, as if poison were imbibing. However, neither the peculiarities of site, nor any distinction we could make between suppuration in tissue, and purulent secretion, account wholly for the various phenomena of the formation of pus. The labour of abscess may even be just as kindly on occasion as at other times severe ; but this only adds fresh importance to our position of a difference between the degree of vital turmoil in the two conditions alluded to ; for it proves besides, that there are also special changes of the vitality proper to individual as also to particular sets of cases.

But the change of coagula into tubercle is by no means so remarkable, nor is this metamorphosis by far equally remote. The derangement of the general functions of life is much more tranquil, and only equals at the utmost, if even always so, the disturbance of purulent secretion from the mucous surfaces, much less the disorder of abscess in noble parts. Acute tubercle of the lungs itself is most often marked almost solely by an acceleration of the pulse, otherwise unaccountable, and it may be also by some amount of fever. It is, however, more especially at the epoch of softening that hectic reigns ; when suppuration also adds to the vital turmoil.

The change in the external appearances of the agglomerated blood globules of phlegmon and coagula in their conversion to tubercle, is probably trifling comparatively to pus. The compacted globules, we conceive, instead of undergoing the alteration into an orbicular membrane, as in the purulent formation, would seem gradually to unite more intimately, and by some integral arrangement of vital chemistry, to crystallize into the somewhat globular and gum-like bodies of tubercle. It is also, in all likelihood, to this circumstance that we ought, in part, to attribute the irregular forms and volume of the tubercle globules, inasmuch as they may preserve all the irregularities of the agglomerations of the coagula of phlegmon. We should not, however, lose sight of the many other good reasons for such variety of conformation, and particularly of the influence of tis-

sue, long compaction together, and the admixture with secreted tubercle.

The chemical change, however, from the compacted globules of the coagulum to those of tubercle, is most evident. The globules in the latter are not, as those of the blood, immediately soluble in distilled water, liquid ammonia, and nitric acid. They are, however, quickly acted upon by acetic acid; losing their colour, they seem but scarce visible shadows in the stream, and are progressively dissolved. By the timely addition of a little ammonia, however, the remaining portion of them may be restored to view in their pristine aspect. We conceive the change of these coagula into tubercle ought to be very gradual; and, though oftentimes slow, it may yet proceed with more marked readiness, when the tuberculizing state is of unusual energy. Also it is probable, that the chemical reaction of the compacted globules of the blood thus, in their progress towards tubercle, becomes modified in gradual proportion. We consider this opinion important enough to draw attention; for if it could be established by careful observation, we may rightly hope to be able one day to foresee the work of tuberculization going on in one set of cases, which would be information tenfold more valuable than the knowledge of the fact of softening. The following case will explain our meaning:

Daniel Brien, 24 years of age, unmarried, and of a healthy family, not subject to disease of the lungs, came into Meath Hospital 25th of June, 1841. He never was ill previously, excepting once some years ago having had syphilis. Fifteen weeks before, he got wet at work, and fell ill of looseness and pain of the belly. He was admitted into an hospital for these ailments, and eleven days afterwards, taking cold from the draft of a window, left open near his bed, he was seized with pain in his right side, coughing, and white expectoration, which soon became yellow, and amounted to three potsfull of puriform matter during twenty-four hours. He was bled seven times for this attack,

and was discharged after an interval of a month, although some pain and considerable expectoration still remained.

Now, even, he complains of debility, cough, and pain over a hand's breadth of the lower part of the chest, on drawing a deep inspiration. The whole of the left side responds fitly on percussion, and the lung offers pure vesicular murmur throughout, devoid of abnormal sounds. The front of the right half of the chest, from above to a couple of bells below the nipple, is clear also, and the respiration is vesicular. Below, however, it is dull, and the murmur scarcely audible. The upper scapular region is almost normal; but below the shoulder blade and the lower part of the space between it and the spine are somewhat dull, and this dullness is gradually more decided towards the bottom of the chest. The respiratory murmur is quite distinct above the spine of the shoulder blade, but sometimes accompanied with slight mucous rale. Below, however, where the dullness is, it is proportionately weaker, and accompanied by muco-purulent crepitus, in particular on coughing.

The expectoration amounted to a potful and a half in the day of a puriform matter, during the first week of his admission; but by well directed treatment, it has diminished to within two ounces of a similar quality of pus. The night sweats have been checked, the pain alleviated, and a troublesome diarrhoea stopped. The man is more cheerful, acquires something in strength, and there is much reason to hope for an ultimate recovery, from the sad effects of a pleuro-pneumonia so long neglected.

From the date of his admission to the 16th July, we examined the matter he coughed up carefully, and tested anything suspicious by the microscope. We never found a trace of softened tubercle during this time. It consisted of pus globules, together with an unusual proportion of granular sort of fibrinous matter. Some pieces more consistent and white

than the rest, and varying from the size of a pin's head, to that of a small pea, appeared a uniform, finely granular, moist mass, having a slightly yellowed tint, and devoid of globules.

On one occasion, however, July 6th, we found a new appearance, which was a more solid yellow matter, and very like old softened tubercle in its broad features. It lay in separate portions in the same lump of matter coughed up, and resembled fragments of a yellow wafer, somewhat moist, strewed therein. Viewed by the microscope, it was composed of globules considerably like those of soft, yellow, infiltrated tubercle of the lungs, only they were, perhaps, too soft and separate, and uniform, and scarcely compacted enough; besides there was no trace of pulmonary tissue nor capillaries. They were not quite so soluble as the blood globules in distilled water, and in ammonia, but resisted these tests in no measure equal to tubercle. They were again resolvable into separate yellow particles, which once had been blood globules, but were altered enough, to make it impossible to distinguish them, without some rational aid. They were clearly by origin the compacted globules of coagula in phlegmon, and it becomes an interesting query, were they undergoing the change into tubercle? The wafer-like aspect shows, that they had adhered by coagulation on the surface of some considerable air tube. Their having assumed this arrangement, seems more than attributable to mere mechanical causes. Their not having in preference gone over into pus, although coming from organs, secreting pus so plentifully, is also remarkable. The slight modification of their chemical re-action is likewise with the above, a reason for suspicion. Besides the part of this yellow matter, which had formerly been the fibrine of the coagulum, was not organized into fibres, nor yet into the granularlime of pus. It lay in mass, and had put on the appearance of yellow bodies, alike to pigmy potato oats in form, and coloured as pale amber. We have also seen this appearance in the puriform expectoration of confirmed tubercle of the lungs, but we are not able to indicate any

exact relation between them. Besides the other remarkable matters in the expectoration in this case, as often happens, there were also many points of blood to be seen almost daily, but particularly during the early part of his residence in the wards. Some of them were blanched quite white, and only recognizable by the microscope, whilst others were as red as if newly escaped from the vessels.

Tuberculization of the lung, together with flow of blood, is most common. It would be well if its exact relationship to the formation of tubercle could be rightly ascertained. We might hope therefrom to obtain some useful hints as to the leading principles in the cure. The mere knowledge of the pathological fact of bleeding being so often a messenger of phthisis, is more valuable in regard to diagnosis than treatment. This is not the sort of pathology which can bring the physician all the profits he so justly awaits from the study of disease. We should seek to ascertain every peculiarity of the broad features of the malady, and determine thereby the strict bearings of them upon one another. Such an inquiry into the loss of blood from the lungs, in brooding tubercle, has a particular interest.

We have already seen, that an over fulness of blood is common to the vessels in the neighbourhood of secreted tubercle. Also, in the acute form of this malady, there is all the richness in blood of a part under phlegmon. Thence arises the question, is hæmoptoe, in effect, a signal or a serious complication of the morbid state? The former is certainly the fact, and we are of opinion the latter may happen under a series of conditions.

The flow of vital fluid appears as somewhat equal to an effort to relieve the lungs from their pending danger; but we do not approve of allowing to that able physician, Nature, the purposed institution of particular remedies for casual disease. It is likely the hæmoptoe is only an accidental but usual part of the disorder, or of the vital phenomena in tuberculization. The equilibrium of the vitality is disturbed; there is already a

bent to punctiform congestions, and plethora and various functional derangement are common to the lungs in such cases. It is not improbable that the large escape of blood, therefore, may often prove serviceable in warding off minute permanent congestion of a plastic and phlegmonous character. And when the hæmoptoe is frequent or large, it is, may be, more a measure of the intensity of the malady, than an essential requisite of tuberculization.

We ought, however, by no means to look upon it as desirable, even were it proved of transitory utility to the locality. Although, perhaps, extensive bleeding congestion of the lungs is essentially less dangerous in the tuberculizing state, than those other forms of it which are limited, but permanent, yet every extraordinary accumulation of blood in the pulmonary organs, is much to be feared during the predominance of the tubercular habit. Recollecting its being commonly the signal of more rapid and active tuberculization, we ought not to trust to this effort of the unaided vitality for the relief of pressing danger, but we should second, and if possible anticipate it. It is not too much to hope, that in quelling it we aim at the same time a resisting blow at the more insidious and persistent disease. If even the simpler remedies of the one are comparatively only modifiers of the punctiform expression of the tuberculizing state, their careful adoption does not hinder us in the employment of the whole routine of practice applicable for tubercle. Again, the hæmorrhagic fulness of the vessels of the lungs is doubly dangerous in its aptitude to combine the slower attachment of tubercle, with accidental phlegmon ; and it is in this way, may be, a convenient preparation for acute and infiltrated tubercle. Viewed in this light there are good pathological grounds in favour of the treatment of the olden Percy, founded solely on clinical experience in his day.

Again, it is questionable, if the retention of exuded blood in the air tubes, may not also favour somewhat directly the process of tuberculization. If coagula fixed in the air tubes

admit of change into tubercle, this would be evident at once ; but we possess no authority sufficient to establish such a point. If also the secretion of tubercle by the mucous membrane be admitted, we might then allow it to be a mechanical promoter of the morbid work. Notwithstanding, however, the general facility of voiding by cough, the blood escaped into the lungs, still these suppositions are far from being outrages to common sense.

There are distinctly two modes of bleeding from the lungs in the progress of tubercle ; but the flux from open vessels by the process of ulceration and softening, is foreign to our inquiry. It is the escape of blood from the mucous surface of congested lung during the attachment of tubercle we are discussing. Of this kind of bleeding there are two sorts, one copious, and the second punctiform. The latter is very general, more so perhaps than has been believed ; and we observe it not seldom when even the blood is blanched, and not to be distinguished by the naked eye, and resembles a whiter pus. Whatever may be its relation to punctiform tuberculization, must remain for time to reveal ; but it becomes doubly interesting by this relationship, and would seem to indicate a more serious change in the textures whence it comes, than is accounted for by mere catarrhal alteration of secretion. Sometimes it seems mingled in a little matter of expectoration otherwise different from the mass. Whatever changes these points of blood are subject to in the air tubes, besides the loss of redness, remains to be explained ; but we see no decided reason, wherefore they may not undergo, according to circumstances, all the transitions it suffers within the living textures elsewhere, when once it becomes permanently lodged in the lungs.

Tuberculization by catarrh is the most common of the several means of attaching the disease in the lungs. It is in general the prelude of the more active forms, to wit, congestive bleedings and phlegmon, when they do occur ; but it is sufficient alone to inundate these organs with the tuberculous matter,

and frequently accomplishes the whole work of destruction, almost devoid either of those complications. The mere phenomena of pure catarrh are indeed wholly distinct from tubercle ; but the pathological state of the lungs in this affection, is one step within the boundary of those morbid conditions they present in tuberculization. Thus far certainly it becomes an all important disorder of the health, even in its most trifling form.

Slow catarrh and morning cough are frequent forerunners of the deposition of tubercle. It is true, that they may persist almost for a lifetime without so direful a complication ; but, in persons of the tuberculous habit, they should be regarded as ominous. We are disposed to accept the opinion, that the form of the tubercular deposit in these cases is probably the grey granulation, perhaps exclusively. Here the act of tuberculization is, possibly, a bare procedure of secretion into the tissue of the lobule and air cells, and from air tubes. In this point of view it would be interesting to ascertain all the analogies of the pearly sputa, to the plastic fluid of the grey granulation. Although this would be a slow way of inundating the lungs with tubercle, it does not hinder the possible occurrence of more acute attacks ; on the contrary, it would sometimes seem to give a greater disposition thereto.

Acute catarrh is so ordinary a disease, and its relations to tuberculization of the lungs so well known, as to make it seem superfluous to mention it again. But an opinion has been sent abroad, that it may become an agent against consumption. The comparative infrequency of decline of the lungs from scrofula in some cold northern climates, where catarrhs are more than usually common, has led some to conclude, that the copious secretion from the mucous membrane here carries off the tubercle like a ley. But this is too mechanical a view of the matter ; and accounts in no manner for the avoidance of the morbid deposition so general in the intimate texture of these organs. It has been forgotten, whilst arguing thus, that the people are distinct races of men, having different social habits,

and subject to varieties of clime and country. The authorities that tell us of the want of tubercle of the lungs in Iceland, and the frequency of colds, for example also speak as positively of the default of syphilis in equal proportion, and many other peculiarities of disease, and also of the invigorating influence of its region. Even allowing that individuals, late the victims of lingering colds, sometimes recover their health perfectly after a smart attack of acute catarrh, are we to conclude therefrom, that this was the bare instrument of their recovery? It should also be taken into account, that a grave application of the means of cure is then made to overcome an affection which might otherwise have been too readily tampered with. At all events, in our country, where the hereditary bent to tubercle is so great, where the social condition of the people assists to originate the disposition to it, and where an inconstant climate and the workshop favour its localization in the lungs, acute catarrh is a most serious malady. Perhaps next to hæmoptoe, it is the most ordinary means of hastening the more tranquil process of tuberculization. Like, as in those congestive bleedings, the morbid state of the lungs in acute catarrh is also a far step on the path to tuberculization, and when the ill habit reigns, sad indeed is the result.

Purulent catarrh, whether it be the sequel of a recent acute attack of the same form of disease, or the follower upon inflammation of the substance of a part of the lungs, is a common complication of the tuberculizing process. However, in as far as the mere suppuration is regarded, it might perhaps be allowed to be of favourable omen. An extensive suppuration of pus is, of course, comparatively of little consequence abstractedly considered; but, again, it is no complete protection against the independent act of tuberculization. If we could command a well concocted pus, on every hand the result would be desirable; but the physician is not omnipotent over disease, and partial congestions of another kind, as well as bleeding and phlegmon, can equally occur to complicate it mournfully. There

are few things more common than to meet with points of blood mingled in the puriform mass coughed up, discoverable alike by the microscope and naked eye; and these sometimes appear far from undergoing purulent change. Considering the pathological condition of the lungs in purulent catarrh, however desirable a safeguard, in general, the suppurative change may be, as perhaps also the flux of blood on other occasions, still we must regret the need impelling thereto. However fortunate suppuration may be in the lungs, in comparison to a permanent accumulation of blood, and supervening tubercle, the morbid state originating it, is equally favourable to the latter dreadful malady. When the tubercular cachexia overrules, the lungs, even in puriform cough, are in a state of pathological preparation, suited better for the attachment of the scrofulous product there, than when not previously engaged in the turmoil of disease.

This localization of tubercle on particular points, independent of more general secretion of catarrhal matters, whether pearly, slimy, or puriform, is an interesting feature of the malady. It seems often to preserve a similar character in its combination with the plastic process in tissues, and particularly on serous membranes. Poured forth equally with the plastic fluid, the organizable portion of lymph undergoes the change into cellular texture and fibres; it is gathered and arranged by its formative force, and the tubercle is separated apart, and by its collecting so distinctly on points, shows that over and above the respective arrangements of tissue and kind, perhaps also the punctiform source of its secretion. This particular character of tuberculization would appear more striking were it singular; but when we look back upon the general expression of cachectic disorders on a locality, we become familiar with the fact. So it is in skin affections, in the phlegmons of ill habit, the attachment of pus on points in puerperal fever, in purulent absorptions generally, and those punctiform hepatizations of secondary gangrene in the lungs.

However, purulent catarrh is most often the companion of

the expulsive effort of tubercle, whereby the morbid matter attached in the lungs long before, is expelled from its site. The tubercle globules having run through their career, the morbid matter softens and tends to dissolution, and suppuration often aids its escape from the part. It is this combination of morbid actions that seems more especially favourable to hectic. Once having gained the open air the pulpy mass is coughed forth ; and at this period it is, that we are sometimes able to discover the tubercle in the sputa.

The procedure we adopt is this ; we take the whole of the matter coughed up by the patient each morning, having previously charged him not to spit into the vessel before washing his mouth well, after eating or drinking. This precaution saves a great deal of trouble, inasmuch as it excludes all foreign materials which might deceive the naked eye. We search through all the sputa minutely, by portions poured on a clean platter, and every particle resembling in any way softened and separated tubercle, as seen in cavities of the lung, we put carefully aside. After washing them in distilled water, we test them next with the microscope and liquid ammonia, as previously mentioned ; and, if doubt remains, also by acetic acid. There are many matters, both foreign and accidental to the expectoration, which might cause a good deal of difficulty ; and, therefore, in a succeeding part of our paper we purpose to give a full history of the appearances of the sputa.

The needful condition for the tell of scrofulous wasting of the lungs by the microscope, is the presence of little particles of tubercle in the matters of cough ; for the general mingling of it in a fluid state with pus and slime renders it, perhaps, almost impossible of recognition with any certainty. This requires that broken portions of the morbid product escape from the cavity without solution ; but the complete reduction to a fluid mass is so frequent, that we foresee the probable inconstancy of the proof. If, however, our further experience shall not prove it as valuable a means of diagnosis, as we

hope, at this period of our inquiries, we comfort ourselves with the conviction, that all further refinements in this department of our art are suited most particularly, and in general, but to particular and otherwise obscure cases.

We will make one other remark in conclusion, on the frequent paleness in the colour of the skin in the ill habit of tubercle, generally preceding the local attachment of the malady. This is quite distinct from the alteration of look from confinement in the nursery of the sick; and though it mostly keeps pace with the growing cachexia, and a falling off in the ordinary energies of the victims, their ailments may never have been as yet sufficient to awake them to the danger they are in. It is allied to a default in the quantity of blood globules in the circulating fluid, which Andral ascertained in his interesting inquiries into its changes in disease. It is perhaps impossible ever to ascertain the sources of this peculiar step preparatory to tuberculization in so many cases. But we think it is justifiable to draw before our mind, as being worthy of remark, a shadow of likeness between what goes on in regard to the blood in the site of tuberculization as a part, and the disproportion of globules in the circulation as a whole. And we may ask ourselves here, is not a similar power of altered vitality diffused throughout the frame, the active agent of this paleness, which being centered in a part, and aided by busy complicating disease, is sufficient to solve the blood and change it into tubercle? If we could but establish this analogy on a good foundation, we would have, in this disorder of sanguification, a nicer notion of the tubercular cachexia. This is not without interest, so important is a sound pathology in its relationship with therapeutics. The features proper to the local disease here are probably related to the more general malady, and the bond is, perhaps, mutual. Again, the unequal success of the martial preparations in the green sickness and in tubercular cachexia is marked, although experience has proved them valuable in both. The muriate of iron has long been vaunted, and not without justice, in engorgement of the

glands of the lymphatics in the predisposition to scrofula. But we draw within the pale of speculation, where we ought not to venture except in conjunction with nicely detailed facts from careful observation.

We made the preceding observations in the Meath Hospital, where every facility was kindly offered to us in our pursuits by Doctor Stokes and by Doctor Graves, to whom we are indebted for the liberty of publishing the cases we have detailed.

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#### EXPLANATION OF PLATE II.

- a.* The fibres alluded to generally in the several cases.
- b.* Those of them with adherent globules, spoken of in the case of Bryan.
- c.* Refers to the composite globules mentioned in the case of Farrell.

The groundwork of the plate represents the general appearances of tubercle, taken from the matters of cough.

(*To be continued.*)

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ART. II.—*Treatise on Congenital Club-foot*. By Dr. JULES GUERIN, Directeur de l'Institute Orthopédique de la Muette, Paris.\*

[Translated from the French by S. LENOX L. BIGGER, M.B., T.C.D., L.R.C.S.I., Surgeon to the Adelaide Hospital.]

THE last discussion at the Academy has proved that scientific men are not yet satisfied with respect to the etiology of conge-

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\* At the *concours* for the great surgical prize in the Académie des Sciences, the following report was made on this paper :—" M. J. Guérin a encore établi l'existence d'un ordre nouveau de pieds-bots congénéteaux produits par la retraction musculaire convulsive pendant la vie fœtale. Cet ordre de causes dont l'origine sera démontrée plus bas, offre des caractères qui ne permettent pas de les confondre avec les causes qui produisent d'autres espèces des pieds-bots congénéteaux."