THE GOULSTONIAN LECTURES

ON

THE NATURAL HISTORY OF PULMONARY CONSUMPTION.

Delivered at the Royal College of Physicians, London.

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LECTURE I.

MR. PRESIDENT, FELLOWS, AND GENTLEMEN,—There are moments, I suppose, in every young man's life when an idea—to himself seemingly a fresh one—stamps itself upon his mind as true, and therefore to be worked out to its full meaning. Such a time occurred to myself, when, one afternoon, I accompanied into one of his wards at Guy's Hospital the late Dr. Barlow, sometime Goulstonian Lecturer and Censor of this College. I had been working clinically and microscopically at cases of so-called—more commonly, perhaps, in that day than this—"tubercular phthisis". I remember asking him, with the audacity of a student, not always to be reprehended, what was the difference between this "tubercular phthisis" and fatal cases of acute pneumonia, except in the much slower march of the former, and the absence, to a very large extent, in it of the pungent heat of skin always present in the latter. I told him that in both I had found what seemed to me very often to be the same microscopical appearances. His answer—the answer of one who had been a fellow-worker with Addison—was that he recognised their great similarity. The thermometer was then unknown; and neither of us had in our minds cases of acute miliary tuberculosis, but cases only of acute primary lung-affection on the one side, and, on the other, cases of chronic primary lung-disease. It needed but little later reading to learn the existence of a discussion—at that time even by no means new, by no means even yet satisfied—the discussion as to the rôle of inflammation in phthisis. In the course of events, I became connected with a hospital where, more than before, I was brought face to face with a disease which already had for me great interest; and also with one which gave me large opportunities to observe and watch to its end the occurrence of general tuberculosis in children; side by side have I worked at these cases of "tubercle" in the child, of what I believe to be the same so-called tubercle in the adult, and those much more common cases of so-called "tubercular infiltration" in the latter; and these, sir, are the sole grounds of excuse for bringing this well-worn subject once more before the College.

Since that day of my first wakening to its importance, attention has been paid tenfold to a subject the literature of which in England had slumbered almost since the time of Morton, till the works of the brilliant writers of France stirred the pens of Carswell and Addison; in France itself had intertwined round their central point of work the names of Bayle, Portal, Laennec, Louis, Broussais, and Andral; and in Germany had passed on from these, through the hands of Rokitsansky and others, the steady flame of increasing light. And every one of the last ten years has added more and more to that literature, in every tongue, till the united voices of all medicine, to use the words of the Latin poet (Virgil, *Georg.* iv, 260), "tractim susurrant" of "phthisis" and "tubercle". And yet, withal, it has seemed to me for some time that this question of the minute anatomy of pulmonary consumption—this ever-recurring disputation as to the origin and signification of tubercle and its degenerations, which has been, and still is, looked upon in many quarters not only as the most frequent, but the sole, cause of that pulmonary consumption—has overshadowed almost entirely the clinical history and the clinical symptoms. Tubercle has been worshipped, and the patient has been forgotten. And however much it may have seemed so to my mind before, the discussion on "tubercle" at one of our learned societies not long ago, would, I think, have opened the eyes of most of us to the utter vagueness and confusion in which the subject is encouraged to lie; to the absence of definition and precision in the use of simple words; to the professedly

larger knowledge which has not advanced so very much beyond that of the great Frenchmen I have already mentioned—aye, and of Morton himself.

The word "tubercle" has come to be so loose in its usage, both clinically and pathologically, that the most ordinary thinker is bewildered by the variety of its meaning. To quote a late instance—not that it is by any means an uncommon one—Volkman ("Lupus und Tuberculose," *Berliner Klinische Wochenschrift*, 1875, No. 30), in a paper written last year on the relation of lupus and tuberculosis, looks upon the former as a "granulation-tumour", and so far to be classed with the latter. From the clinical point of view, he thinks it is not very exceptional to find lupus combined with cheesiness of the lymph-glands, etc., in its neighbourhood; and he is of opinion that "tuberculosis of the lungs"—I leave the term, as he does, undefined, though I have a very strong theory as to what he does mean—is no infrequent occurrence in the members of families afflicted with lupus. It is yet, as Rokitsansky put it years ago: "The question of old—What is tubercle?—must at this day be changed into, What is this particular tubercle?" (*Path. Anat. Syd. Soc. Translation*, vol. i, p. 294.) To some of us who are teachers, the matter is brought yet closer; the student, perplexed by the uncertain use of the selfsame word, cries in vain for some definition of "tubercle" and "tubercular"; begs in vain to see this "tubercle", amid the contrariety of opinion, in its supposed development and degenerations; and in time departs from us with only that glib vagueness for which we, his teachers, are most to blame. Yet, once more, the friends of patients affected with early signs of pulmonary consumption, ask us, "Is it tubercle?" and, with a readier judgment than some of us may have intended, place at once the seal of fatality on a disease which is not by any means absolutely hopeless.

My desire in these lectures would be to make an attempt—however feeble—to bridge over the chasm which at present seems to exist between the pure microscopist and the clinical worker; to weld together, if that were possible, and as is much to be desired, the knowledge of the histologist and that of the bedside worker—the real *τέλος*, as I take it, of the true physician. And in any attempt of this kind—ambitious and difficult as the task be—it is surely of the highest importance to follow out, as far as possible, the dictum of Morgagni, quoted by Andral, as the motto of his incomparable work: "Nulla est alia pro certo noscendi via, nisi quam plurimas et morborum et dissectionum historias, tum aliorum, tum proprias, collectas habere, et inter se comparare." (*De Sedibus et Causis Morb.*, lib. iv, Proem.) After this fashion, however imperfectly, I intend to lay before the College the results, not of much original work on my part, but of the comparison of other men's experience and observations, weighed with such justice as my own small knowledge of bedside work and after-death dissections enables me to have. And as I shall try to be precise in my use of language throughout these lectures, I shall not shrink from defining the exact meaning which attaches itself to certain terms in my own mind. Morton, in the very first chapter of his *Phthisiologia* (*Phthisiologia seu Exercitationes de Phthisi Tribus Libris comprehensæ. Authore Ricardo Morton, Med. D.—Londini: MDCLXXXIX*) has accurately laid down what he intended by the name, the English rendering of which, rather than any Latin equivalent, I have purposely placed in the title of these lectures. "*Phthisis Pulmonaris* est consumptio partium universalis a morbo affectu seu infarctione, tumore, inflammatione et exulceratione Pulmonum primum orta, indeque tussis, dyspnœa, aliisque ejusmodi symptomatibus thoracis ab ipso initio stipata, et cum febre primum lentâ, et hecticâ, dein inflammatoriâ, et tandem putridâ intermittente conjuncta (*op. cit.*, p. 3)." On those words, "primum orta", "ab ipso initio stipata", hang more of the natural history of this disease than may be at first suspected. That definition I accept with but small reservation. Had its terms, thus accurately laid down, been followed by later writers, we could never have had the confusion, which even still exists in some minds, between cases of undoubted phthisis and cases of as undoubted miliary tuberculosis. I shall show presently, from the histories and examinations given by various writers of a more distant as well as of the present day, that the two clauses of Morton's definition on which I have laid stress cannot in any way fairly be applied to cases which are classed by these authors under pulmonary phthisis.

And thus I am led up to a statement—which it is necessary to make to clear my way—of what I believe pulmonary phthisis never to be. And the points to which I shall address myself to-day are these: Firstly, that the primary "tubercle" to which pulmonary consumption was considered to be due was, according to older writers, and is still, according to some writers of the present day, an interstitial growth: Secondly, that this interstitial, extra-alveolar, growth is not the commencement of ordinary consumption. In my other lectures, I shall hope to show that, with certain exceptions to which I shall draw atten-

tion, these particular interstitial growths play but a slight, and that a secondary, part in phthisis; and I shall hold, with authorities equal at least in reputation, if not in number, to those who support the contrary, that the pulmonary consumption of this country consists primarily in intra-alveolar changes.

It is impossible not to be struck, in reading works published since the time of Laennec, with the manner in which men's minds, prejudiced already by what seemed an easy, and certainly a very enticing, explanation of the origin of pulmonary consumption, argued, not from fact to fact, but from theories as to facts to further theory. The *φυμάτα ἀπέρτα* of Hippocrates and Galen had been recognised as the pathological results of phthisis since the early dawn of medical observation; and the general theory of their development and course in the lungs, down to the very moment almost of Laennec's statement, may, I think, be summed up in the words of one whom I have already quoted, and shall frequently quote again. The writer of the *Phthisiologia* lays down (*op. cit.*, p. 73): "Gradus hujus morbi sunt quæ sequuntur, sc. 1^o. Infarctio Pulmonum a sero sanguinis inibi copiosè secreto. 2^{do}. Tumor renitens, præsertim vero in partibus Pulmonum glandulosus, ab eodem sero partes istas nimis distendens, et difficilem exitum habente. Qui tumor videtur mihi esse Tuberculum crudum a Galeno memoratum: Quæ tubercula sive crudos, et glandulosos tumores, sæpe in Phthisicorum cadaveribus deprehendi, cum ceteræ pulmonum partes Apostematibus et exulcerationibus essent obsitæ." In his address to his reader, he had already said: "Quin et tubercula per pulmonum parenchyma hic inde dispersa, quæ serius, vel citius inflammata, atque exulcerata funestam phthisim tandem inducunt, nihil aliud sunt quam glandulosæ tunicæ vesicularum pulmonarum quadam intumescentiæ a sero copiosè nimis inibi secreto, ibidemque coagulato efformatæ" (*op. cit.*, third page of preface). Here, at any rate in word, though not in fact, was already a foreshadowing of the lymphoid and perivascular theories of Broussais and of to-day; there can, however, I think, be no doubt that these "tubercula cruda" were the old *φυμάτα ἀπέρτα*—the later crude, yellow, infiltrated tubercles of Laennec. And probably to Laennec's theory as to the genetic connection between these infiltrations and the grey miliary nodules, which he described as "nascent tubercle", is due the largest part of the uncertainty of thought, and therefore of language, of to-day.

It is, I think, worth while to consider what Laennec's position really was—a position which very largely explains, as I take it, his strong opposition to the views of Broussais in reference to inflammation. To Laennec, the "peculiar form of accidental product"—to quote his own words (*Auscultation Médiate*, Paris, 1819, tome i, p. 10)—"to which modern anatomists have especially applied the name of tubercle, which aforesaid was given indiscriminately to every kind of abnormal tumour or protuberance", was essentially extra-alveolar, extra-bronchial. M. Thaon (*Recherches sur l'Anatomie de la Tuberculose*, Paris, 1873, p. 6) credits Laennec with what he considers to be a praiseworthy silence as to the original seat of "tubercle". But his idea of its seat is to be gathered, not, so far as I can remember, from any direct statement, but from the general description which his work contains. For instance, Laennec distinctly lays down what he conceives to be the difference between excavations in the lung due to ulcers, and those due to tubercles. He asserts (*op. cit.*, i, 20) that a cavity due to ulceration spreads by corroding the tissue in which it is formed; while tubercular cavities, the result of the spontaneous destruction of an accidental product which has discarded and pushed aside, and not destroyed, the pulmonary tissue, have no tendency to grow at the expense of the latter. The original words are strong: "Qui a écarté et refoulé, et non détruit le tissu pulmonaire" (and see *ib.*, p. 30, line 10 from top). He proceeds to show how the tubercles, at first miliary, develop into crude tubercles; how, "about this period, the lung-tissue, which had been untouched up to that moment, becomes dense, greyish, and semi-transparent, from an infiltration of tubercular matter in its substance; till, on its complete softening, this tubercular matter makes its way out into one of the bronchi (p. 21-23)." Again, he holds (p. 25), that the bronchi are scarcely ever to be distinguished in the tubercular masses, though the direction in which they open into cavities, however small, shows that they must originally have traversed the tubercular matter; not, like the vessels, pushed aside by it, but enveloped by it, and destroyed by compression. These views had been, also, the views of Bayle, in his comparison of tubercular with ulcerous phthisis: he held that, in the former, the lung-tissue was simply compressed, not destroyed by the tubercles. In addition to these tubercles, and a form of infiltrated tubercles (cf. esp. *op. cit.*, ii, 13), Laennec had noted tuberculous masses, not round, like ordinary crude tubercles, but irregular and angular, paler, duller, and less distinctly marked off from the lung-tissue (p. 30) than the ordinary ones; these masses he calls tubercular infiltration, and allows that he has found them by them-

selves in lungs affected with pneumonia. So far this third kind was evidently due to lobular pneumonias—a fact borne out even by the pathology of our day.

But Laennec, misled even with his eyes open—for he confesses his surprise (*op. cit.*, 2nd edition, 1826, tome i, 538*) at finding only crude yellow tubercles in cases which he states had presented, during life, all the signs of phthisis—misled, further, by the apparition, side by side in some cases, of certain pathological results which he himself (*op. cit.*, 2nd ed., i, 553) had distinguished, only less accurately than some of us to-day are able to distinguish them, as extra-alveolar and intra-alveolar; and misled, also, as I believe, by confounding the "miliary granulations" of Bayle with the former, the extra-alveolar product, came to that conclusion, which, after him, took fast hold upon the minds of men; and, seeing in the yellow infiltration only the degeneration of the primary nodule, laid the foundation for that mass of generalities which the words "tubercle" and "tubercular" call up. This argument of causation, founded on coincidence of place, led at once to the result of imperfect observation. Bayle (*Recherches sur la Phthisie Pulmonaire*, Paris, 1810) had noticed, in what he called his "tubercular miliary granulations", a small opaque point in the centre, black or white. Laennec (*op. cit.*, 2nd ed., i, p. 538), in remarking on this in a foot-note, claims it at once as evidently the sign of this commencing softening. Andral (*Clinique Médicale*, Paris, 1840, tome iv, p. 3) commenting on Laennec, holds that this central point is the lumen of a bronchus; and here, at last, we come upon an experimental proof which, thirty years afterwards, Virchow, in his *Krankhaften Geschwülste*, following in the wake of Carswell, who had pictured it in 1838, and Addison, who had drawn even more accurately in 1845, is late to recognise.

Well, indeed, may Dr. Wilson Fox (*Pathological Society's Transactions*, vol. xxiv, p. 296) say, referring to two distinct views as to this so-called "tubercle", "if tubercle be only the grey granulation, its demonstrable part in the destruction of the lung-tissue is small; if tubercle be a diffused growth passing into or causing caseous change, its part in the production of phthisis is large". And this very alternative impressed me at the time I mentioned my difficulty to my teacher, Dr. Barlow, with the importance of distinguishing between extra-alveolar and intra-alveolar products—a distinction like that made by Buhl into "superficial" and "parenchymatous". For some time, I have held and taught that there is no developmental connection between these grey miliary extra-alveolar nodules and the intra-alveolar and intrabronchial changes which are the commonest results found in the pulmonary phthisis of this country, in the sense that the former are a first stage of the latter—that the two changes are dependent, the one on the other, I do not deny; to that point I shall return presently; I have held and taught that these grey miliary extra-alveolar nodules never undergo the cheesy change; that the most ordinary form of consumption in this country, as Addison years ago pointed out, consists in slow degenerative changes, which commence in the epithelial lining of the bronchi and alveoli. I should not, perhaps, have been so bold in stating these views, which, though already accepted, at least in part, by some, will naturally meet with opposition, had it not been for the publication of the second part of Professor Klein's book on the *Lymphatic System*, which, to some extent, supports me in holding them. As the results of his work must carry more authority than my humble efforts in the same direction, I make no apology for quoting from his book the points in which we both agree. I must refer, for the moment, to his statement of the results found by himself in the lungs of guinea-pigs in cases of artificial tuberculosis, in elucidating the pathology of which affection writers in this country have borne a very large part. Dr. Klein says (*op. cit.*, p. 53): "The granulations of a lung, which is so far advanced in the process of artificial tuberculosis that the bronchial glands have undergone already necrotic changes, may be distinguished into three kinds: (a) nodules of a more or less well defined outline, being in connection with the wall of a bronchiole; (b) cord-like structures; and (c) nodular structures of a conical or irregular shape." He shows, further on, that the cord-like structures are due to perivascular cords in connection with the minor branches of the pulmonary artery, or of the pulmonary vein, most probably of the former (pp. 55, etc.); and that the third form of granulations, the nodular structures, owe their origin, as Dr. Burdon Sanderson had already stated, to catarrhal pneumonia. And he asserts (*op. cit.*, p. 53) that "all these three kinds of granulations are of the peculiarly semi-transparent aspect; only the third kind undergoes a cheesy transformation, marked as an opacity in the centre." The argument drawn from these statements in confirmation of my own work, was the more strengthened when I came to read, a little later on (*op. cit.*, p. 60), that

* This copy was presented by the author to the College of Physicians.

not only are there "cases of artificial tuberculosis in guinea-pigs..... whose lungs contained miliary granulations, due *only and exclusively* to perivascular cords of adenoid tissue"; but that the professor had "seen a case of 'natural' tuberculosis in a guinea-pig, where the spleen and the liver, and likewise the lungs, but not to such an extent as the former organs, were penetrated by numerous very minute miliary granulations. The mesenteric glands were distinctly, the liver, spleen, and bronchial glands* only slightly, enlarged. In the lung, the "miliary granulations were found to be due *entirely* to the presence of perivascular adenoid cords"; that is to say—and I am no longer quoting Professor Klein, to the presence of structures of which probably Rokitsansky (*op. cit.*, i, 326) spoke with his usual correctness: "This tubercle is subject to no metamorphosis." So far as *post mortem* facts go to show it, Rokitsansky's sentence apparently applies to other products, which, as it seems to me, are quite as secondary as these lymphatic, perivascular productions, but seem—if I may be allowed the term—to have had no time to undergo this change. I had hoped at one time to prove, at any rate to my own satisfaction, as others (Deichler, Colberg, Rindfleisch) had professed to demonstrate, that the miliary nodules found in acute tuberculosis, whether in children or adults, were due to perivascular nodules, or, at least, to proliferation of the capillary nuclei; the unique guinea-pig of Dr. Klein was the type I had hunted for. What I had found, at any rate in the acute tuberculosis of children, was certainly perivascular growth, accompanied generally by slight catarrhal, vesicular, products, and lobular collapse. And I had noticed, as any man may notice, that especially at the two ends of life—in the general tuberculosis of childhood, and the bronchitic and emphysematous phthisis of advancing age—there were to be found, not only the true perivascular nodules, not always easy to be defined, but products, often themselves alone—products to all naked-eye appearance resembling the "tubercle" of authors—the "grey granulations" of Bayle, which Andral (*op. cit.*, vol. iv, p. 10) recognises, and rightly, as the results of "vesicular pneumonia", and Buhl describes as "lobular foci of desquamative pneumonia". Thus far, the results found by myself in these cases differ but slightly from the facts stated by Dr. Klein.

[To be continued.]

ON THE NUMERICAL RATIO OF DISEASE IN THE ADULT MALE COMMUNITY,

DEDUCED FROM THE SANITARY STATISTICS OF HER MAJESTY'S CUSTOMS, LONDON, FOR THE YEARS 1857-74.†

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[Concluded from page 443 of last number.]

I purpose now to direct your attention to the numerical ratio of the various classes of disease that have occurred in the period, and their percentage of recovery, death, and superannuation. The tables on which they are founded extend back for eighteen years. They may be, therefore, assumed to give proportionally a fairly accurate idea of the sanitary statistics of 20,000 men for one year. The nosological arrangement which has been in use since 1862 was based on that then extant in the Royal Navy, and differed but little from that afterwards promulgated by the London College of Physicians in 1863, and which was at once introduced into this and other public departments as a convenient standard of nomenclature and classification. To the simple tabulation of cases a column was added for the number of days each case was under treatment, which was obviously necessary in order to obtain a correct estimate of the relative prevalence and importance of each disease. A considerable discrepancy is sometimes found betwixt the proportion of cases and of time under treatment.

Following that classification, we find that, of the general diseases, the febrile class, including exanthems (A), show a ratio of 6 per cent. of the total number of cases, 6.1 per cent. of the whole time lost by sickness, 7 per cent. of the entire mortality, but no superannuation. The constitutional class (B) yield a ratio of 18 per cent. on the number of cases, 26 per cent. on the time lost by sickness, 40 per cent. on the whole mortality, and 49 per cent. of the superannuation.

Of the diseases brought together under this class, the most important are rheumatism and gout and phthisis. Rheumatism and gout together constitute 13.5 per cent of the number of cases, and 14 per cent. of the time lost by sickness. They show directly an infinitesimal propor-

tion of mortality, less (0.4) than 1 per cent., but no less than 32.7 per cent. of the whole amount of superannuation.

TABLE II.—Numerical Ratio of Classes of Disease in Her Majesty's Customs.

Classes of Disease.	On No. of Cases.	On Time lost.	On No. of Deaths.	On No. of Superannuation.
1. General Diseases:	Per cent.	Per cent.	Per cent.	Per cent.
A. Febrile and Zymotic..	6	6	7	0
{ Rheumatism & Gout..	13.5	14	0.4	32.7
B. { Phthisis	1.4	8	31	9
Other diseases	2.7	4	7.5	7.5
2. Local Diseases				
Of Nervous System.....	7.5	9	9	20
Of Circulatory "	1	2	13	1.5
Of Respiratory "	27	20	11	17.7
Of Digestive "	17	13	9	7.5
Of Urinary, etc. "	2.4	3	2.6	0.7
Of Skin and Cellular	11.5	10	0	2.7
3. Accidental Injuries and External Violence	10	11	9.5	0.7
	100	100	100	100

TABLE III.—Deaths and Superannuations in the Force of Her Majesty's Customs in London in the Years 1857-74, being equal to those occurring in One Year in a Force of 20,000 Men.

	General Diseases.	Deaths.	Superannuation.	Total.	Ratio per 10,000 Men.
A.	Typhus fever	6	0	6	3
	Enteric fever	1	0	1	0.5
	Relapsing fever.. ..	1	0	1	0.5
	Remittent fever.. ..	1	0	1	0.5
	Small-pox	5	0	5	2.5
	Cholera	2	0	2	1
	Erysipelas	2	0	2	1
	Rheumatism	0	38	38	19
	Gout	1	4	5	2.5
	Cancer	6	1	7	3.5
B.	Tuberculosis	2	0	2	1
	Phthisis	71	12	83	41.5
	Syphilis	1	0	1	0.5
	Dropsy, from complex diseases	10	1	11	5.5
	Diabetes	1	0	1	0.5
	Pyæmia	1	0	1	0.5
	Leucocythæmia.. ..	1	0	1	0.5
	Local Diseases.				
	Apoplexy	6	1	7	3.5
	Paralysis	4	5	9	4.5
Diseases of the Nervous System.	Epilepsy	4	4	8	4
	Brain-disease	4	0	4	2
	Delirium tremens	3	0	3	1.5
	Insanity	0	14	14	7
	Loss of vision	0	3	3	1.5
	Disease of heart	24	2	26	13
	Aneurism	4	0	4	2
	Embolism	1	0	1	0.5
	Senile catarrh	0	2	2	1
	Bronchitis	11	17	28	14
Diseases of Respiration.	Pneumonia	8	0	8	4
	Pleurisy	3	0	3	1.5
	Hydrothorax	3	0	3	1.5
	Asthma	0	4	4	2
	Quinsy	0	1	1	0.5
	Dyspepsia	0	3	3	1.5
	Gastritis	1	0	1	0.5
	Diarrhœa	1	0	1	0.5
	Dysentery	4	0	4	2
	Melæna	0	1	1	0.5
Disease of Digestion.	Jaundice	1	0	1	0.5
	Disorder of liver	7	2	9	4.5
	Hernia	0	2	2	1
	Nephritis	2	0	2	1
	Bright's disease.. ..	3	0	3	1.5
	Cystitis	1	0	1	0.5
	Urinary calculus	0	1	1	0.5
	Disease of Bone	1	3	4	2
	Spinal disease	0	1	1	0.5
	Miscellaneous.				
Violence.	Debility	0	4	4	2
	Atrophy	0	1	1	0.5
	Ulcers	0	0	0	0
	Fracture, etc.	7	1	8	4
	Drowned	11	0	11	5.5
	Suicide	4	0	4	2
		230	130	360	180

Phthisis yields 1.4 per cent. of the number of cases, and 8 per cent

* Professor Klein allows me to make this correction of a merely clerical error in the original.—A. B. S.

† Read before the Section of Public Medicine at the Annual Meeting of the British Medical Association in Edinburgh, August 1875.