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ON
PARACENTESIS THORACIS
IN THE TREATMENT OF
PLEURAL EFFUSIONS,
ACUTE AND CHRONIC.

BY
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MDCCCLXVI.

PARACENTESIS THORACIS IN PLEURAL EFFUSIONS.

THE perforation of the thoracic walls, in order to give exit to purulent and other fluids, is an operation dating from the most remote antiquity. In the Hippocratic treatise, ΠΕΡΙ ΝΟΥΣΩΝ ΤΟ ΔΕΥΤΕΡΟΝ—*De Morbis, Liber Secundus*,—a work which there is good reason for believing, although not composed by the illustrious Father of Medicine himself, was written either by one or more of his contemporaries, or by some among his immediate descendants in the school of Cos,—there occur two most interesting and instructive passages, the one having reference to the method by which the existence of pus in the pleural cavity, or empyema, as the latter term is understood by the moderns, is to be recognised, while the other describes the operation by which that condition is to be removed. The order of procedure, both as regards the diagnosis and the treatment, is in these passages laid down with great exactness. Under the former head, it is directed that after the patient has been carefully washed with warm water, he is to be placed in a firm seat, and his hands held by an assistant, the physician meantime taking him by the shoulders shakes him, and attentively listens in order to determine on which side of the chest a sound is occasioned. Again, in treating of the means of cure, it is directed that recourse to the operation is not to be had before the fifteenth day from the commencement of the effusion; where pain is chiefly felt, and swelling is most conspicuous, the opening is to be made, while a preliminary incision through the integuments precedes the penetration of the pleura, effected by a sharper and more pointed instrument than that which is required for the earlier incision, the second instrument being protected by a piece of cloth. In some instances, the perforation of the thoracic parietes was made not through an intercostal space but through a rib. When a sufficient quantity of pus has been permitted to flow, the wound is

to be closed by means of a portion of linen cloth attached to a thread. Daily a similar quantity of pus is to be evacuated. On the tenth day, when the whole of the collection has been allowed to escape, a mixture of tepid wine and oil is to be injected through the opening for the purpose of cleansing the lung. This part of the operation is to be practised twice daily: the injection of the morning being withdrawn and replaced by a fresh quantity in the evening, and so on. At length, when the purulent fluid has become clear and thin, a metallic sound is to be introduced, the size of which is to be gradually lessened as the fluid itself diminishes; thus the wound is permitted to cicatrize.

In connexion with the brief description which I have now epitomized, it is very interesting to note the expression by the author of the treatise, of some shrewd observations relating to prognosis; for example, an empyema on the left side, he remarks, is less dangerous than on the right. In modern times, as I shall have occasion again to notice, the operation of thoracentesis has been more successful on the left side than on the right. Again, the author mentions, that according to his observation, when the pus was clear and studded more or less with small sanguinolent threads, that appearance indicated the probability of a satisfactory recovery; but, on the other hand, if on the first day of its removal the fluid possessed a colour like the yolk of egg, while on the succeeding day it was thick, having a pale green hue, and emitting a fetid odour, it was likely that the sufferer would not recover, but shortly die. In Hippocratic times, the operation of thoracentesis was not invariably made with the knife, that is by division of the integuments and muscles, in an intercostal space, and the subsequent penetration by means of a sharp-pointed instrument through the costal pleura; it was sometimes effected by means of the actual cautery.

The succussion of the chest, to which as a means of diagnosis reference is made in the treatise from which I have been quoting, occupies, as is well-known, to this day an important place in our recognition of hydro-pneumo-thorax, or, as it may be called also, of pneumo-thorax with effusion; and very appropriately it bears in our time the designation of *Hippocratic* succussion. The production of the fluctuation or splashing sound on succussion enables us to recognise the existence of that morbid condition, and as I believe of that condition alone. It cannot be said to diminish the interest of the statement in the Hippocratic writings concerning this sound, that the author supposed its production to

depend on the existence of pus in the pleural cavity, in contradistinction to water,—he regarded it as a ready means of distinguishing an empyema from a hydro-thorax. Thus, he had overlooked, or rather had been unaware of the necessity there exists for the co-existence of air and fluid in the pleural cavity, in order that any sound should be produced. The writer had noticed and has placed that observation likewise on record, that when much sound is heard there is less pus in the cavity than when the sound produced on succussion is feeble. The explanation of this accurate observation is now readily afforded by us, although misinterpreted by the Hippocratic writer; but surely the misconception respecting the primary cause of the auscultatory phenomenon, which he has so faithfully described, need not lessen in any measure the tribute of respect and admiration for his amazing powers of observation, which a perusal of almost any portion of his writings is calculated to draw forth.

Other references there are in several of the Hippocratic works to the relief which an operation is capable of affording to the sufferers from empyema and aqueous collections,—for example, in the Book of Aphorisms—one of these, because expressing an opinion which I shall have to consider in another part of this paper, may be quoted. It is the twenty-seventh aphorism of the sixth book:—"The sufferers from empyema and dropsies treated by incision or by the cautery certainly perish if the pus or water is suddenly evacuated."

In the writings of Galen there is to be found little in addition to the directions for the treatment of empyema which exist in the pages of Hippocrates. It is not unlikely that the operation of thoracentesis was performed by him at Pergamos, if not in Rome; but that this means of cure was not held in any high estimation by the professors of the healing art during the earlier centuries of the Christian era, is rendered probable from the little that has been written regarding it by Galen himself, and by the nearly complete silence on the subject of Cælius Aurelianus and Celsus.¹ I need

¹ As regards the last-mentioned renowned writer, it is no doubt true that in book fourth, when treating of affections of the liver, he remarks,—"*Si vero jecur vomica laborat, eadem facienda sunt, quæ in ceteris interioribus supurationibus. Quidam etiam contra id scalpello aperiunt, et ipsam vomicam adurant.*" And again, in the eighth book, and there having distinct reference to the chest, because writing "*De Costis fractis*"—"Si suppuratio vicerit, neque per quæ supra scripta sunt, discuti potuerit; omnis mora vitanda erit, ne os infra vitietur; sed, qua parte maxime tumebit, demittendum erit candens ferramentum, donec ad pus perveniat; idque effundendum;" but notwithstanding these and a few other references to the treatment of empyema,—that is, of

not particularly refer to the opinions of the Arabian physicians concerning thoracentesis, some of whom, Rhazes for example, undoubtedly practised it, much as the Greek physicians had done, but none have added anything to our store of knowledge regarding it. Nor do I propose to trace at any length the history of thoracentesis during the seventeenth and eighteenth centuries,—it had been again employed, although very rarely, in the sixteenth ;—such a task is quite uncalled for, seeing that M. Trousseau in the first volume of the “*Clinique Médicale de l’Hotel-Dieu*,” has already accomplished it in a most interesting and satisfactory manner. Moreover, as the student of medical history is well aware, the subject to which I have thus briefly alluded, is discussed at great length by the erudite Kurt Sprengel in his “*Versuch einer pragmatischen Geschichte der Arzneikunde*.” It is worthy of note, however, that in the seventeenth century Thomas Willis and Richard Lower, two names famous in connexion with the progress of anatomy and physiology in England, had performed it. About the middle of the eighteenth century, when the employment of the cautery in thoracentesis had become entirely superseded by the knife, the latter method became in its turn supplanted by the trocar. M. Trousseau informs us that the use of the trocar was recommended in 1765 by Lurde, but that nearly a century before that time its employment had been proposed by Drouin. That the strong recommendation of its advantages by Lurde and others did not obtain for the trocar an immediate or even speedy adoption is evident from the circumstance that surgeons of the eighteenth century so distinguished as Desault and Chopart objected to its employment, on the ground that the wound it inflicted was necessarily violent (*pénétrer brutalement*), and that there existed no small risk of injuring the intercostal artery or the lung.

As was to be expected, the great discovery of Laennec gave a decided impulse to the performance of thoracentesis, from the aid which auscultation afforded in the diagnosis of pleural effusions. The whole subject is discussed with that author’s usual sagacity as well as brilliancy, in his work on auscultation ; but, strangely enough, he withheld his recommendation of the operation, except in cases which were in their nature exceptional. He remarks, “There are two cases of pleurisy in which the operation should be performed. The first of these is when in acute pleurisy the effusion, very abundant from internal abscesses, abdominal and pectoral,—I repeat that Celsus is nearly silent on the subject of thoracentesis, which, on the other hand, as we have already seen, Hippocrates so fully considers.

the beginning, increases with such rapidity that in the course of a few days it causes a general or local œdema, and threatens suffocation." To this Laennec gives the name of acute empyema (*empyème aigu*); and, on the other hand, he assigns the appellation of chronic (*empyèmes chroniques*) to those instances in which the effusion has from the outset been chronic, as well as to those which, in the first instance sufficiently acute, have afterwards become chronic. Now, regarding the employment of thoracentesis in the latter cases, he remarks,—“It is to be had recourse to as an extreme remedy, when there is œdema of the affected side, when the lengthened existence of the malady, the gradually advancing emaciation and feebleness of the patient, and the failure of all other remedies to effect absorption of the effused fluid, seem to hold out little hope of any cure.”

Laennec proceeds to state that the operation is rarely followed with success; and this he ascribes to causes which have not been sufficiently estimated. The first of these is the unhealthy condition of the lung, which is too frequently the seat of tubercles; but the chief cause which, in the opinion of Laennec, opposed the successful result in cases of empyema treated by perforation was the compression, amounting to flattening (*aplatissement*), of the lung against the mediastinum and vertebral column, and the dense nature of the false membrane coating the lung. “The lung,” he observes, “subjected to pressure (*refoulé*) for a long time has lost its elasticity and expansive force; it allows with great difficulty the air to penetrate from the trachea, and only very slowly regains a size sufficient to fill something like the space which it occupied before the occurrence of the malady.” The objection to the performance of thoracentesis from the entrance of air into the pleural cavity, which, as he remarks, has always attracted the attention of surgeons, Laennec does not overlook; but it is evident that the importance assigned to it has in his opinion been exaggerated, while the precise action of air upon the contained organs has also been misinterpreted. Notwithstanding the objections to thoracentesis thus alluded to by Laennec, and there are others, a reference to which will be made as I proceed, it is very satisfactory to find this great observer, near the conclusion of the article on the treatment of pleurisy, thus expressing himself:—“I am persuaded that the operation for empyema will become more common and more extensively useful in proportion to the increasing employment of mediate auscultation.”

Becker, a physician of Berlin, is quoted by Trousseau as

having, in 1834, published five cases of chronic pleurisy treated by puncture of the chest, the operation having at his request been performed by the distinguished surgeon, Diffenbach. In the following year, Dr Thomas Davies, in the *London Medical Gazette*, endeavoured to establish the value of the operation as a remedy in hydrothorax and empyema, while he objected to its employment in pneumothorax as useless. There are two particulars worthy of note in the observations of Davies,—the first is, the very successful results of paracentesis thoracis in cases of children. On this head I shall have something to say in another part of this paper; for my own experience of the operation in children, although by no means extensive, leads me to agree in the expression of opinion given by Dr West, “that the impression left on my mind by each year’s additional experience is more and more in favour of its comparatively early performance.” The second particular in the lectures of Dr Davies has reference to the exact method he pursued in operating. He used a small trocar, and adopted no special means for preventing the entrance of air; but,—and this procedure has undoubtedly something to recommend it,—he introduced a grooved exploring needle as a preliminary measure, seeking thereby to determine the nature of the effusion, its consistence, and if false membrane likely to interrupt the removal of the fluid existed. In short, as a means of establishing the diagnosis, Dr Davies used the exploring instrument, and as giving confidence to the physician, I am prepared still to recommend its use; indeed, in practice I very generally employ it.

In 1841, there appeared a very valuable contribution to the subject of paracentesis thoracis in the treatment of pleurisy, by a well-known surgeon of Vienna, recently deceased, Schuh, and a still more distinguished physician of the same city, Skoda. This monograph was succeeded in 1844 by the important memoir read to the Academy of Medicine in Paris, by M. Trousseau; while in the same year there were published in our own country two papers well worthy of notice, both of which have had an important influence in extending the benefits which the operation of thoracentesis is capable of exerting. These papers are, first, “On Paracentesis Thoracis as a Curative Measure in Empyema and Inflammatory Hydrothorax,” by Dr Hamilton Roe;¹ and, second, “On Paracentesis Thoracis, with Cases,” by Dr Hughes and Mr Cock of Guy’s Hospital.² Since the period of publication of these memoirs, the

¹ *Medico-Chirurgical Transactions*. Second Series, vol. ix. 1844.

² *Guy’s Hospital Reports*. Second Series, vol. ii. 1844.

attention of the profession has been called to the subject by the appearance from time to time of many successful instances of thoracentesis in the different journals. In America, of late years, Dr Brady, of New York, and still more recently, Dr Bowditch, of Boston, have done much to gain for the operation an established place in professional confidence. The latter physician employing a particular apparatus, for which we are indebted to Dr Wyman, has had his method of operating, and his remarkable success in the treatment of pleurisy by that means, brought under the notice of the profession in this country, more especially through the writings of Dr Budd, and Dr W. T. Gairdner. In his work on Clinical Medicine, Dr Gairdner has at some length discussed the propriety of operative interference in cases of pleurisy; and to some of his observations I shall have occasion in the sequel to refer.

So far as I am able to judge, it appears to me that there is a growing conviction in the minds of professional men, that, notwithstanding the reliance which is justly placed in the ordinary, and happily still more available remedies which we possess, the cases of pleural effusion, acute and chronic, are not few in which recourse to the operation of thoracentesis should be had; and in the instance of those who have employed it, a growing confidence in the remedy itself. Pleurisy, whether acute or chronic, is to be regarded as a serious, it is not unfrequently, however skilfully treated, a fatal disease. From time to time there appears to be an unwonted or remarkable prevalence of pleurisy, and it is specially at such times, as I have myself observed, that there are apt to be marked peculiarities in the nature of the cases which present themselves to our notice. Some are characterized by the violence of their onset, the very acute lateral pain, and the high pyrexia, which seem to call for speedy and very active treatment; others are unaccompanied by any marked degree of either—indeed the pain, wanting altogether the true characteristics of the typical pain of pleurisy, may be absent, and the constitutional disturbance for a time at least trivial. The latter cases are oftentimes, moreover, most insidious in their progress; and it is not of unfrequent occurrence to find a sufferer from pleurisy presenting himself at the hospital, or in some other way seeking professional advice, when, and not till then, one side—it is usually the left—is distended by effusion. There is, probably, much truth in the statement of M. Pidoux, that large or excessive effusions are apt to occur in one particular form of pleurisy very different from the ordinary disease.

Such experience is, I am persuaded, far from being unusual; and I am equally satisfied that, in the opinion of all experienced physicians, the disease in its ACUTE FORM—for of that I wish now *in the first place* to treat,—is one which tends in some cases, if not at times in many, to the unfavourable termination. M. Trousseau has very specially considered this question, and that in all its bearings. “To justify the employment of paracentesis of the chest in pleurisy with large effusion,” he remarks, “it is necessary as a first step to establish, contrary to the opinion expressed by M. Louis, that pleurisy is sometimes fatal.” Here let me briefly record not the earliest fatal case of pleurisy which I have witnessed, but one among the earliest. There were circumstances in connexion with this case which necessarily led to its making a deep impression on my mind; to these I need not now refer, except to express the conviction which, with an increasing experience of the treatment of pleurisy, and, latterly, an assured confidence in the value of paracentesis, I do with confidence, that the use of that remedy *might* have availed to save life.

CASE I.—A lady, æt. 45, the mother of several children, had enjoyed uninterruptedly good health, till the occurrence of her fatal illness, now about twelve years since. That took place as follows:—After exposure to cold she was seized with severe pain in the left side, accompanied by short cough, and difficulty of breathing. A few leeches were applied over the seat of pain within a few hours from its commencement, and when the existence of distinct pleuritic friction sound had been discovered on auscultation, repeated small doses of Dover’s powder, and a mixture containing acetate of potash, were also prescribed. On the following day, the lateral stitch was found greatly relieved—in fact nearly removed—but extended dulness on percussion and considerable embarrassment of breathing were present. The pulse, previously sharp, was then very frequent and soft. The same treatment was continued, and shortly after a large blister was, in addition, applied to the side. In the course of a few days there was evidence of increased pleural effusion, afforded by still more extended dulness on percussion, by displacement of the heart to the right of the sternum, and by entire obliteration of vocal thrill and vesicular respiration sound over considerably more than the lower two-thirds of the left side of the chest. These indications were not in themselves alarming; but in the anxiety of countenance, and the frequent as well as somewhat feeble pulse, there *was* something to create anxiety. I requested Dr Begbie to visit this lady with me. On that occasion,

Dr Begbie was so much struck by the anxious expression of her countenance, and by the peculiarity in the action of the heart and character of the pulse, consisting mainly in their feebleness, that he suggested the possibility of the pericardium being involved; that, in addition to pleural, there was possibly pericardial effusion. This suggestion appeared at the time very important; and although, from the feeble action of the heart and the extended dulness on percussion in the neighbourhood of the organ, perhaps otherwise induced, we had unusually little to depend upon in the way of physical signs, still the implication of the pericardium, or possibly of the heart itself, seemed at the time adequately and satisfactorily to account for the alarming symptoms. From that time the patient had at brief intervals a little brandy or wine. Towards evening of the day on which the last report was made, there occurred a tendency to syncope, demanding the freer employment of stimulants. During the night an attack of fatal syncope took place, death resulting before—being hurriedly summoned—I had time to reach the house. On examination of the body, we found a large collection of serous fluid, with a few flakes of soft lymph floating through it, in the left pleural cavity, the left lung much compressed in its lower lobe, but only partially so in the upper, which was adherent to a limited extent in front. The surface of the lung, where free, was coated with a tolerably thick layer of recent lymph. The heart was considerably displaced to the right, but the pericardium and the interior of the organ were healthy; and, on careful microscopical examination, the muscular structure of the heart was found to be quite unimpaired. Neither in the aorta nor in the pulmonary artery was there found any clot, or any obstructive coagulum sufficient to account for the fatal symptoms: these indeed did not point to the likely occurrence of embolism, and certainly no embolism existed. This, then, was a death in uncomplicated acute pleurisy; in a case, moreover, not characterized by the existence of any excessive effusion. It is worthy of remark, that the mode of fatal termination was purely that of failure of the vital function of the circulation—a syncope, threatening in its recurrence again and again during a brief period, and then ultimately causing death. Neither is this experience in pleurisy—remarkable as it is—very unusual; indeed I feel persuaded, and in special view of the employment of paracentesis, would desire to urge this consideration, that in cases of pleurisy with considerable effusion we do well to regard a termination by syncope as one of the dangers which is to be if possible averted. Such a termination may occur suddenly, almost unexpectedly, or, as in

the case now briefly detailed, may be threatened more or less imminently for a time, perhaps for days, and then unhappily take place. It is very specially in such circumstances that the performance of paracentesis is called for, and that the results from the operation are found to be so satisfactory. The following instance of acute pleurisy, treated by paracentesis and other remedial means, will best illustrate the plan which I have now frequently adopted, and invariably with the same gratifying success.

CASE II.—A. T., æt. 22, a servant, was admitted to the Royal Infirmary, under my care, in March 1864. On the 5th of that month, after exposure in washing and drying clothes, she was seized with severe shivering and vomiting, and soon after had pain in the left side, with stitch. Thus suffering, she was confined to bed and under medical treatment till the 15th, when, with considerable difficulty, owing to her weak condition, she was removed to the Infirmary. On admission, the embarrassment of breathing was great; the face somewhat flushed; the countenance anxious; pulse 130, and feeble; there was little cough and no expectoration; she was unable to assume the entirely recumbent posture, but was supported in bed with pillows in the semi-erect position; she stated that for several days she had been unable to lie on the right side. Passed a very small quantity of high-coloured urine, with a copious deposit of pink urates. On percussion, the left side of chest, in front, in the lateral region, and posteriorly, was found absolutely dull, with the exception of a very limited space in the vicinity of the left sterno-clavicular articulation and above the clavicle, where percussion elicited a partially tympanitic note. The vocal thrill over dull regions was absent; at the very summit of the lung, anteriorly, it was felt in an exaggerated degree. Distant bronchial breathing was audible along the left border of spine, but no vesicular murmur was to be heard anywhere. The timbre of voice posteriorly was ægophonic in character. The lower intercostal spaces in the left lateral region were extended, but there was an absence of any marked distention. There was no parietal œdema of the chest, and no œdema of arm or neck. The heart's impulse was perceptible to the right of the sternum and at the summit of the scrobiculus cordis, it was feeble, and so were the cardiac sounds, which otherwise were unaffected. The respiratory murmur over the whole right lung was greatly intensified. At visit of the 16th, the patient having passed a wholly sleepless night, and taken no food, I tapped the chest, introducing a small-sized trocar, without any preliminary incision, between the eighth and ninth ribs posteriorly, in a line drawn directly

downwards from the lower angle of the scapula. A clear straw-coloured and highly albuminous fluid escaped. Of this twenty-five ounces were allowed to flow; certainly no air entered the chest, although no special means for effecting its exclusion was at the time adopted; and then the canula being withdrawn, a small piece of lint, held in position by two short cross strips of diachylon plaster, was applied over the minute wound. A little brandy with water was administered to the patient during the operation, and after the withdrawal of the fluid she found that without any difficulty the recumbent posture could be assumed. Before leaving, directions were given for the application of a large blister over the left side of chest, and the following remedies were ordered:—*R.* Potassii iodidi \mathfrak{z} i., aquæ destillatæ \mathfrak{z} vi.—*Solve.* *Sign.*, a tablespoonful thrice daily. *R.* Pulv. scillæ gr. i., massæ pilularum hydrargyri, pulveris ipecacuanhæ cum opio, āā gr. ij.—*M.* Mitte tales vi. *Sign.*, one, night and morning. On the 17th, we found at visit that the patient had passed a good night, and that she felt much more comfortable, breathing with little difficulty. She had taken some food. The bowels had been moved, and an increased amount of urine passed. On examination of the chest, the region of tympanitic percussion note in front was found to be considerably extended, and a similar character of resonance was for the first time noticed above the scapular spine posteriorly. After this there was no further anxiety about the case; the iodide of potassium, and diuretic pills were continued for a few days, and then, without the latter having produced any physiological action of mercury, a mixture containing the infusion of digitalis and scoparium was substituted for them. A second blister was also applied after the first blistered surface had healed. Gradually the dulness on percussion diminished, and the normal resonance became restored. Friction sound, very coarse in character, was audible in the left lateral region for a considerable period, but in time that also disappeared. The patient's convalescence was protracted, or rather delayed, by an attack of dry pleurisy, very distinct in its characters, on the right side; but having regained flesh, and with completely re-established health, and with very few, and these indistinct, signs of the malady which brought her under our notice, she left the hospital on the 15th June, after exactly three months' residence.

Now, in this case, the termination of which was so satisfactory, as, at all events, to imply that the remedial means employed were well suited for the treatment of the disease, the question presents itself, was thoracentesis really requisite? in other words, was the condition of the patient at the time when the single tapping was performed,

such as to make it at least improbable that other, and these the ordinary remedies, would have availed to combat the disease? This is a question which I have invariably put to myself before using the trocar, in all of the now many operations in acute and chronic pleurisy which I have performed. In the instance of A. T., the feebleness of the heart and pulse, taken in connexion with the very considerable amount of dyspnoea, led me to conclude that it was necessary to afford relief to the patient as soon as possible: that there was danger, imminent danger in practising delay. I cannot certainly affirm that in this case, any more than in others, to some of which I shall immediately refer, recovery without paracentesis would not have taken place; but I had then and still have a strong impression that the unfavourable termination was, of the two events, the more likely to occur.

The recommendation has been given by some physicians to allow a *certain* period of time to elapse from the occurrence of the effusion, during which the diligent employment of the more ordinary remedies available for promoting its removal is to be practised, and that when this period, fixed by some at fifteen days, by others at three weeks, and as long as six weeks, has been permitted to pass, then and then only the operation truly in such circumstances, as a "*dernier ressort*," or with the proved failure of all other means—the confessedly "*remedium anceps melius quam nullum*," may be had recourse to. This I submit, as has already been done by many experienced physicians, is not giving thoracentesis a fair or even decent trial; for if the remedy can be shown in careful hands to be itself free from any unusual hazard, clearly then we are entitled to claim for it an employment more dignified than is implied in its being looked to as a last resort, or at best a very doubtful means of cure. For myself, I am, in so far as this question of thoracentesis in acute pleurisy is concerned, entirely opposed to the plan of settling the exact occasion of its employment by any reference whatever to time or days. I agree in the criticism by Celsus, of one of the Hippocratic doctrines founded too exactly on the Pythagorean philosophy, "*quum hic quoque medicus*," says he, "*non numerare dies debeat, sed ipsas accessiones intueri; et ex his conjectare*," etc. Nor do I conceive that a satisfactory answer to the many questions which crop up, on anything like a candid consideration of this subject, can be obtained from a statistical investigation—that certainly may aid, it has already aided our inquiry, as in the extended experience of Dr Brady and Dr Bowditch,—but concur in the expression of Dr Gairdner, "This question is one not to be

answered by statistics, but rather by the careful consideration of individual cases."¹

There are, then, a few features of importance in the case now briefly detailed, to which I desire to call attention. The effusion in it was considerable, but certainly not excessive, for there was an entire absence of parietal œdema; and although the left side of chest was somewhat rounded, there existed no very marked bulging of the intercostal spaces. Moreover, the heart was not displaced to the extent I have often seen it in cases of very large effusion; and there still existed, at the time of the patient's entrance to hospital, a little, although that little was altered, resonance on percussion. But with a pleural effusion of fourteen days' existence, stopping short of being excessive, there was in this case a very feeble action of the heart, and a quick as well as feeble pulse. The dyspnœa was great; indeed, as orthopnœa existed, it may properly be styled urgent; but as I have witnessed larger pleural effusions than this case presented, accompanied, as might be inferred, by greater dyspnœa, and have not performed thoracentesis, but trusted to the use of ordinary remedies, so I desire here to impress the view, that the determination immediately to adopt the operation in this case was formed from a consideration of the impediment to breathing, coupled with the feebleness of the circulation. This consideration has guided me in all the instances of acute pleurisy in which I have used thoracentesis. I look upon it as the most important point to receive attention. There may be very considerable dyspnœa without marked depression of the circulation, and there may also be marked depression of the circulation without any very great dyspnœa; while these conditions may exist with a disproportionate amount of effusion. For I have a distinct impression, that in my own experience the cases calling most urgently for the employment of the remedy the judicious use of which I advocate, were not characterized by the excessive amount of the effusion nor by an extreme degree of dyspnœa.

That the tendency to syncope, observable in some cases, is not directly due to the amount of the pleural effusion, I infer from what I have myself witnessed of pleurisy, both fatal and otherwise. In the case of the lady already described, which belongs to the former category, it will be remembered that the amount of fluid found after death was not very large, and further that the physical signs during life—and this holds true of cases belonging to the second category—did not indicate the occupation of the pleural

¹ Clinical Medicine, page 375.

cavity to any inordinate degree by fluid. Again, in seeking to arrive at the true cause of this tendency to depression of the vital function of circulation, it is further worthy of notice that the displacement of the heart, which at first sight might not unreasonably be regarded as explaining the different experience in different cases, does not in or by itself prove sufficient; for, although admitting that altered and probably depressed function will result from its dislocation, it is consistent with my own observation that the cases in which the position of the central organ of the circulation has been most altered have not been characterized by the occurrence of the syncopal tendency. And, again, that tendency, in a most marked and even in a fatal degree, has been exhibited in cases in which cardiac displacement has been by no means great. I have thought that possibly some such cases as the former had escaped this danger, from the very circumstance that the heart, yielding to the accumulating pressure, had had its position more decidedly altered. This explanation, however, is inadequate. The tendency to the occurrence of syncope—the actual occurrence of fatal syncope in pleurisy—has taken place when the effusion has had its seat in the right side as well as in its more frequent situation, the left. In the former, the implication of the heart by direct pressure has been comparatively slight. I apprehend that the cause of this really important, because serious, event in pleurisy is to be sought not in any merely mechanical or purely dynamical disturbance,—it lies, in all probability, deeper. We may not be able—rarely do I think we shall be able—to indicate at an early or at any precise period of the disease the cases in which the depression referred to is to be looked for as more than ordinarily likely to occur. It is, however, intimately connected with those vital changes, more especially of innervation, which we know to exist in all abnormal action within the body, and still more immediately with inflammation, changes, too little regarded by those whose pathological alterations must needs be seen by naked eye or microscope, but which nevertheless modify the progress, and probably largely determine the ultimate event in cases not of pleurisy merely, but of all fatal diseases. Dr Walshe, who has been fortunate in very rarely meeting with a fatal termination in acute pleurisy, has stated, and the expression is borne out by my own observation, that asphyxia (pure), owing to the copiousness of effusion, he has never witnessed as a form of danger in the acute stage of the simple unilateral disease.¹ That such a termination as that now under consideration may take place in cases where the heart's

¹ Diseases of the Lungs, page 290.

structure has been previously unsound, is a proposition which it is unnecessary to consider at any length: that is self-evident; but the tendency is of much more frequent occurrence in pleurisy than in such comparatively rare instances. Besides, these are examples of complicated disease which do not call for consideration, as I am now treating of simple pleurisy. Already, as in the first case detailed in these observations, the occurrence of fatal syncope has been found in connexion with a heart perfectly sound in structure, and only slightly displaced by an effusion far from excessive. It has indeed been suggested, as by Dr Gairdner, that death in such circumstances may be considered to be due "to the severity of the diet, or to the treatment by depletion and digitalis, rather than to the disease." This explanation cannot apply to the cases already noticed, nor to others which I am now anxious to record.

In the following case, the operation of thoracentesis was performed on account of an acute pleurisy occurring in a man upwards of seventy years of age, the oldest subject of the disease as well as of the remedy who has fallen under my notice:—

CASE III.—T. B. was a patient in the Royal Infirmary in October 1862. He was seen at an early period of his illness, and judiciously treated by the late Dr Andrew Pow; but owing to an increase in the severity of the symptoms, and some obstacles to his being properly cared for in his own house, on Dr Pow's recommendation he was brought to the hospital. On admission, he had the ordinary signs of a large pleuritic effusion on the left side. The only exceptional point in his case regards the heart and arteries. He had evidently considerable degeneration of the arterial tunics; and the heart, displaced by the pleural effusion, was also the seat of disease. A bruit indicating some obstruction at the aortic orifice existed, and that obstruction was regarded as in all probability due to some atheromatous affection of the semilunar valves themselves, or to some deposition of a similar nature at the very commencement of the great vessel. These changes, incident to his advanced years, did not certainly improve the prospects of his recovery. I know that my late friend Dr Pow regarded the condition of this old man as very critical, and did not hesitate to ascribe the satisfactory termination of his case to the treatment which was pursued. The patient, on admission, was extremely breathless, and quite unable to lie down in bed. His heart's action was feeble and a little irregular; and his pulse at the wrist, where the radial artery was distinctly visible as well as tortuous, possessed the same characters. Any exertion, even of the slightest

description, aggravated the dyspnœa. The usual remedies had been employed before his admission: blisters, diuretics, and the external application of iodine. Three weeks had elapsed from the first occurrence of the malady. Looking upon this man's age and previous condition of health, as exerting a decidedly unfavourable influence on the therapeutic action of such remedies as might otherwise have received for a time at least a renewed trial, and believing that neither his age nor infirmities could be regarded as in any sense barriers to the operation, I introduced a small trocar between the eighth and ninth left ribs in the lateral region, and drew off nearly thirty ounces of pale, clear, albuminous serum, in which a fibrinous clot formed very speedily on cooling. The immediate result was most assuring, and the subsequent progress of the case such as to satisfy me that a right remedy had been used. As in the former case, the tapping was single; the use of the acid tartrate of potash, in the form of an electuary, with treacle, the application of a blister over the left side, with a moderate allowance of stimulants, were the only other means employed. Admitted on October 2d, the old man was discharged with an expanded left lung, and healthy breath-sounds audible over its whole surface, on the 22d November.

I need not in this case again particularly inquire, Was the simple operation necessary? That question I have endeavoured to answer, in part at least, in the observations which succeeded the details of the former case; and I will only add here, that if "the end justifies the means," the case of this old man and the treatment it received are well worthy of attention. I might speak at length of the great relief he experienced on the withdrawal of the first few ounces of fluid, and of his unwillingness that I should, by the removal of the canula, interrupt the flow. I do not do so, because present relief is one thing, certainly not unimportant, but permanent benefit and successful treatment are what I desire to establish as the results of a judicious employment of thoracentesis.

The record of this second instance of a single successful tapping in acute pleurisy leads me, however, to make one or two further observations. It will be observed, that in neither case was thoracentesis employed until the ordinary treatment had been put in execution and had received a proper trial. I am most happy to express my great reliance upon and confidence in the remedies which are generally employed for the treatment of acute pleurisy in all its stages, including moderate bloodletting, specially in the earliest stage, when lateral stitch is very severe and inflammatory

fever high ; likewise in febrifuge medicines, especially those exerting a sudorific or diaphoretic action. When effusion has occurred and fever still prevails, I use the salts of potash, the nitrate, acetate, or bicarbonate ; while in young and vigorous constitutions I sometimes select calomel and opium, or blue pill with squill and digitalis,—remedies which I have often seen most useful ; or if a rheumatic or gouty taint be present,—as is very frequently the case,—I combine with these remedies lemon-juice or colchicum, or aconite, or actæa. When the more ardent fever has subsided, I have recourse to blisters, large and frequently applied, and to the internal administration of iodine, particularly of iodide of potassium, or the acid tartrate of potash. Rarely disappointed in these remedies, there soon comes a time when, with a steadily if not rapidly diminishing effusion, a change to the use of the liquor iodi compositus, or the syrup of the iodide of iron, or one of the simple salts of iron, or of quinine or cinchona, is found to be beneficial. Placing, therefore, great reliance in the use of these remedies, I do not wish it to be supposed that the cases are otherwise than a small minority in which the withdrawal of the fluid from the pleura in part, or as nearly as possible in whole, is to be considered desirable, or, to use more correct language, is called for.

During the period when the hospital cases already detailed occurred, there were many cases of severe pleurisy successfully treated by some one or other of the remedies named,—cases which I should as soon have thought of treating by the trocar as I should now be willing to forego the use of that valuable instrument in any case resembling those of the young woman and the old man, already detailed. But, again, in both of these cases, I wish it to be distinctly noted that a limited amount of the fluid contained in the pleura only was removed ; in both instances a large quantity, probably a much larger quantity than that withdrawn, remained. Now, I think there is a very great advantage in this particular mode of procedure : for, *first*, while there are no doubt in different cases somewhat different reasons for having recourse to the operation, there is one reason common to all, namely, the desire to give immediate relief to the more urgent symptoms,—to make, if possible, the breathing easier, and the pulse, or rather heart's action, steadier. I believe that these important issues can, in the great majority of cases of acute pleural effusion, be secured by the removal of a limited—even a very limited amount of fluid ; in the instances already recorded, twenty-five ounces, and about thirty ounces respectively were allowed to flow ;

and then the change in the condition of the patient to the better being conspicuous, the further abstraction was unnecessary; for, *secondly*, experience shows, that not only are the urgent symptoms thus relieved, but that the apparently direct consequence of the operation is a busy action of the absorbents and secreting organs, by which the remaining fluid is speedily carried off. This result is in some instances really quite astonishing. In one case, for example, in which the symptoms of pleurisy were very severe, and the effusion excessive, but where for certain reasons I had wished not to have recourse to the simple remedy a day too soon, I was at length compelled to do so, from the extremely scanty secretion of urine, and the apparently entire failure of the foremost diuretics to stimulate the kidneys. I withdrew, by Bowditch's syringe, a very large quantity of clear fluid, and within twenty-four hours the patient passed a large chamberpotful and a-half of urine. This powerful diuresis continued for some days, and the pleural effusion had in that time completely disappeared. But, *thirdly*, the operation of thoracentesis, performed in the way and for the purpose described in the two cases which I have detailed, is really a very simple and an eminently safe means of treatment. There is no risk whatever in such circumstances of the entrance of air, and therefore a simple trocar and canula are alone required; an exhausting syringe or valvular apparatus is quite unnecessary. Selecting a dependent position, and having with a little force depressed the intercostal space about its middle, you introduce the trocar boldly where dulness is well marked; and, as you remove it, the fluid passes through the canula; the limited portion you desire to remove is, properly speaking, determined by the influence the withdrawal of the serum has upon the patient's condition. You carefully watch that, and whenever the breathing is decidedly relieved, and the pulse is improved in strength,—for these events occur together,—you remove the canula. Thus operating, I have never known any air to enter.

While alluding to the possibility of the entrance of air during the performance of thoracentesis, let me say that the dangers of this occurrence have, in my opinion, been greatly exaggerated. I quite agree with an able American writer, the late Dr Swett, that "experience proves that the admission of air into the chest in these cases is attended with no serious inconvenience." In operating in some sub-acute and chronic cases, and before I had the advantage of possessing the syringe of Wyman and Bowditch, occasionally a little air entered, but I never saw this

give rise to any unpleasant consequence. The air was speedily absorbed, and the signs of a very limited pneumothorax, which were at first present, soon ceased to exist. No importance, I believe, is to be attached to the notion entertained by some, that the presence of air in the pleural cavity favours the decomposition of the contained fluid. No doubt, the fluid drawn off from the chest in cases of hydro-pneumothorax is sometimes fetid; but that that condition is not caused by the mere presence of air is proved by the circumstance that, on post-mortem examination in long-standing cases of hydro-pneumothorax, and of empyema with pneumothorax, it is not of unfrequent occurrence to find no fœtor either of the air or fluid such as must have otherwise existed before death. I have satisfied myself that the fluid withdrawn from the chest by thoracentesis may be kept with little change for many days. I have kept it for a fortnight freely exposed to the air, and in contact with animal matter removed along with it from the pleura, without its undergoing any decomposing change. The considerable presence of chloride of sodium in such fluid may probably tend to its lengthened preservation of both normal appearance and smell.

Let it be granted, however, that the entrance of air should be if possible prevented,—and in the treatment of acute pleurisy requiring thoracentesis that can be done by the employment of the American syringe,—or if, as I believe in the vast majority of instances is alone necessary, it be intended to remove only a limited quantity, let the trocar be introduced in a dependent position of the chest, where the signs of effusion are unequivocal. I have of late generally, as Dr Bowditch mentions is his usual practice, entered the trocar on the posterior aspect of the chest between the seventh and eighth or eighth and ninth ribs, in a line leading directly downwards from the lower angle of the scapula. In acute cases of pleurisy, adhesions interrupting the proper performance of the operation rarely—in my experience never—exist in that situation. There is truth in the axiomatic statement of Hippocrates, that the sudden withdrawal of fluid from the shut sacs is attended by danger. I have seen a patient nearly faint—and at such a time a faint is a very dangerous event—when the fluid was rushing out quickly from the pleura through a pretty large canula. We see this accident occur in paracentesis abdominis, if the patient be raised in the sitting posture, and the fluid be suddenly or very quickly withdrawn. It is prevented by keeping the patient in the recumbent posture, and using a small trocar; and these measures render the employment of substitute pressure by the broad sheet unnecessary. In the removal of a limited

amount of fluid from the chest, I have never seen anything like faintness ensue, for generally, on the contrary, the strength of the patient immediately improves. Having given the particulars of the case of an old patient, the subject of acute pleurisy, I may briefly refer to a few other instances, and, first, to that of a young child.

CASE IV.—A girl, *æt.* 4, was tapped on an evening in the month of June 1863. I had been asked to see her through the kindness of Professor Simpson, and on account of thoracentesis being in his opinion required, owing to the severity of the dyspnœa and great feebleness of the little patient. She had been suffering from pleurisy of the right side for several days, and the effusion had somewhat suddenly undergone increase, giving rise to considerable aggravation in the character of the symptoms. In the presence of Professor Simpson and Dr Black, the trocar was introduced between the seventh and eighth ribs in the lateral region, and by means of Bowditch's syringe nearly eighteen ounces of a clear serum, in which a coagulum of fibrine speedily formed, were drawn off. I saw the little patient on the following morning in a greatly improved state, and had afterwards the satisfaction of learning from Professor Simpson and Dr Black that the recovery was complete. I have already alluded to the generally very successful results of thoracentesis in young children, and this remark applies to cases of acute pleurisy and empyema as well as of chronic effusion. I have employed this remedy in the cases of several children besides the one just recorded, particularly in a little girl of three years, and in another little girl of five, both of whom made rapid and complete recoveries. I should certainly not be deterred from the use of thoracentesis by the consideration of the mere tenderness of the child; however young, if the case itself called for the operation, I think it should be employed. Indeed, considering the difficulty of administering ordinary remedies to very young children, it appears to me that they ought specially to be regarded as suitable subjects for the operation.

CASE V.—Of all the cases of acute pleurisy, treated by thoracentesis, which have fallen under my own care, the one in which I felt most satisfied, not only as to the urgent necessity there existed for immediate interference, but after the operation had been had recourse to, of the remedy having truly availed to save life, was that of a youth admitted to the Royal Infirmary, under my care, in October 1864. He was suffering from a very large pleural effusion on the left side, the form of which was greatly altered, being rounded with obliteration

tion of the intercostal spaces, and great prominence. The side was uniformly dull on percussion, and the heart much displaced to the right; there was likewise a little parietal œdema over the affected side of the chest. Orthopnœa, and great feebleness of the pulse existed. Considering this patient to be in imminent danger, a view likewise taken by my friends Dr Wilkinson, late of Tranent, and Dr Alexander Robertson of Queenscliff, Australia, who happened to be in the ward at the time, I at once introduced the trocar, and removed about forty ounces of highly albuminous serum, which, as in other cases already detailed, only to a greater degree, formed into a jelly on cooling. There was immediate relief from the operation, the patient assumed the recumbent posture, and fell into a tranquil sleep. Blisters and diuretic remedies were subsequently employed, and the youth made an excellent recovery, leaving the hospital within six weeks of his admission.

It will be observed that in this case, as in the others, a single tapping was alone required: the practice pursued being that to the excellence of which I have already borne a strong testimony. In this instance the pleura was packed with fluid, and I believe in such a condition as to make it very unlikely that any internal remedies—such had been judiciously used—could act favourably, or indeed act therapeutically at all, until the removal of a portion of the fluid permitted them to do so. Speedily the passage of an increased amount of urine followed the withdrawal of the effused fluid from the chest. Immediately on the performance of the operation, expansion of the compressed lung occurred, ascertained by the clear percussion note over the summit of the chest, anteriorly and posteriorly, as the lad sat in bed, and by the distinct though feeble respiratory sound on auscultation. The patient was disturbed by cough for a day or two, short in character, and attended by the expectoration of a little clear phlegm. This will generally, I believe, be noticed to succeed the performance of thoracentesis in both acute and chronic pleurisy, and more particularly in those cases where the lung, previously compressed, rapidly expands. The presence of a little catarrhal affection of the lung itself, certainly not to be wondered at, is probably the determining cause of the forcible expiratory effort. One other remark is called for by what we observed in this youth's case, as well as in other instances, indeed less notably in his than in others. The lung seemed to expand steadily, for a time even rapidly; percussion resonance, normal in character, returned to the anterior and upper part of the affected side, but in the dorsal region, and still more, the

axillary and lower lateral regions, dulness continued marked. I have known this to hold true in cases of pleurisy thus treated for many months, indeed for years. It need, however, scarcely be observed that the same dulness on percussion, with diminished expansive power, impaired vocal thrill, and enfeebled respiratory murmur, are found long continued, or lasting permanently, in many cases of severe pleurisy treated by ordinary remedies, and which have made a satisfactory recovery. In such instances a considerable deposit of lymph has in all probability taken place, and it is to the existence of that inflammatory product that the physical signs, as well as the physical change in the condition of the chest just noted, are to be ascribed. It is remarkable to how great an extent that dulness and those other signs may in course of time be found yielding, or even entirely passing away.

In at least four other instances of acute pleurisy, very similar in their character to those already detailed, I have thought it necessary to have recourse to thoracentesis. In one of these four, a young gentleman of twenty-four years of age, the pleural effusion was associated with a peculiar swelling of the corresponding limb, both in the leg and thigh. This swelling was not of an œdematous character, but firm, and resembling a good deal the condition of the extremity when affected by phlegmasia dolens. In two cases of typhus, and in one of enteric fever, one of the subjects being a gentleman of about twenty-five, and the other two females in hospital, I have witnessed a precisely similar affection; but Dr Begbie informs me,—and the observation appears to be very interesting,—that in three cases of pleurisy occurring to him within a limited period of time, he has observed the swollen limb corresponding to the pleuritic side. In one of these the lymphatic disturbance in the leg—for such it would appear to be—preceded the pleurisy, in the others was consequent on it. To a few particulars in the history and treatment of one other example of acute pleurisy I shall now allude.

CASE VI.—A married woman, in very comfortable circumstances, was the subject of a very severe pleurisy. The disease occurred on the left side, and was ushered in by considerable constitutional disturbance and great pain. The distinctive signs of pleurisy were early discovered, and before any fluid effusion had occurred, the patient had been placed under appropriate treatment. This, however, did not avail to prevent the serous accumulation occurring and augmenting, until the cavity was apparently completely occupied, and the parietes were much distended. Three weeks of employment of ordinary measures were followed by no

improvement whatever. The condition of the patient had indeed now become critical; there was great fever, hot skin, very frequent pulse, much breathlessness, and general derangement of system. In these circumstances thoracentesis was performed; and with Bowditch's syringe I removed upwards of sixty ounces of straw-coloured serum. The whole fluid passed into the condition of a really firm coagulum within a few hours of its removal from the chest. From the day, I may say the hour, of its performance, this patient improved, and nothing occurred to retard her recovery, which has been rapid as well as perfect.

I shall conclude these observations, on the treatment of acute pleurisy, by a few remarks specially applicable to the condition of EMPYEMA, as it occurs in an acute form. When the effusion of fluid within the pleura is known or suspected to consist of pus, there is then much less room for difference of opinion as to the proper plan of treatment. Purulent fluid is far from being readily absorbed from the pleura, so that in such cases the advice of Dr Watson will probably be found consistent with the view generally entertained by the profession, that "whenever (no matter how we ascertain the fact) the effused fluid consists of pus, it should be let out." If thoracentesis is not performed at an early, or comparatively early period, the probability is that the pus will find a way of exit for itself, either through the chest walls—when the opening is far more likely to prove fistulous and permanent than when incision or puncture is made—or through the lung, or less likely through the diaphragm into the cavity of the abdomen (case of Carroll, in Ward 7, Royal Infirmary, 1857), or in some other manner. The cases of acute empyema which are met with, vary in their character and course not a little. Some are the result, after a time longer or shorter, of ordinary acute pleurisy; others, and these are, as a general rule, less promising, appear to have been attended by an effusion, which, from the very commencement, has been puriform or even purulent. In such there is little formation of lymph, and pleural adhesions rarely result to any extent. That the removal of pus in large amount from the pleura in cases of acute empyema may be followed by results as satisfactory as those which have already been described as succeeding the withdrawal of serous fluid, my own observation and experience have convinced me. It must, however, be held in remembrance that such cases as are from the first attended by purulent effusion, and those also, although in less degree, in which the fluid has soon become pus, are more serious in their nature, accompanied by fever of a truly

hectic character capable of rapidly undermining the patient's strength, less amenable to treatment of all kinds, and are very frequently connected with disease of the lung. I am more suspicious of empyema on the right side being connected with pulmonary disease than when the effusion is seated in the more ordinary position on the left. Possibly this more frequent connexion of tubercular disease of the lung with empyema on the right side may in part if not wholly account for the fewer recoveries after the operation of thoracentesis on the right side as recorded in the statistics of Dr Brady. I will briefly relate the particulars of one remarkable instance of acute empyema treated by thoracentesis, and in doing so shall be led to offer a few observations on the special points of difference between this affection and the one we have already considered.

CASE VII.—Eight years ago, G. P., æt. 25, a painter, became my patient in the Royal Infirmary, suffering from an extensive and recent pleural effusion on the left side. There was that about the appearance of this man which induced me to believe that the nature of the fluid was purulent; he had hectic fever, dusky countenance, and anxious expression. Moreover, he had suffered previously from cough, and had other chest symptoms at the same time; he had lost one brother from phthisis, and during his residence in the hospital another brother died of the same disease. In this case the effusion was very large, altering the form of the chest, giving rise to considerable distention, and to œdema of the thoracic parietes, as well as of the upper part of left arm. The heart was much displaced, and the left side of the chest universally dull. After fully a week's employment of ordinary remedies, there appeared a tendency to pointing in the lowest part of left lateral region, and in that situation I accordingly introduced a trocar, removing 120 ounces of healthy-looking pus, free from smell. The dyspnœa, which had been very great, was much relieved by the operation, and the condition of the chest not a little improved. In ten days the re-accumulation of pus necessitated the performance of thoracentesis for the second time, when about 80 ounces were withdrawn. So matters continued for several weeks, till I had myself, on nine different occasions, removed nearly 1000 ounces. About five months after the original perforation by the trocar, I made a pretty free incision through the parietes and into the pleura, between the eighth and ninth ribs in the lateral region: pus flowed freely into a soft sponge, and the sponge made hollow in the centre, being reapplied, the pus was thus for many days collected. The patient thereafter

left the hospital and resided for some weeks in the country. He visited me from time to time, and calculated that from the period of leaving the hospital fully another thousand ounces of pus had escaped. In the course of other six months the wound healed, and the patient was able to resume his occupation, at which he has continued ever since. The condition of his chest was for a lengthened period most satisfactory; from the time the opening closed until recently, the left lung was fully expanded, and occupied the pleural cavity so completely, as to make it a difficult task—in which many educated students have failed—to say, from a simple inspection, on which side of the chest his empyema had existed.

To an interesting circumstance in connexion with this case I may here allude. An aduncated appearance of the nails, and distinct clubbing of the fingers on the affected side took place during the period the patient was under observation. This change became so marked, and was so much more conspicuous in the left hand than in the fingers of the right, that I had, through the kindness of Dr Frederick Steell, a cast of the hand made, in which the peculiarity in question was well exhibited. A reference to the occurrence of clubbing of the finger ends on the diseased side in empyema is made by Dr Walshe, and by other writers. Dr Walshe remarks that this change “is sometimes strikingly marked.” This, however, is not the point to which I have specially to call attention, which remains to be noticed, it is this, that after the lung underwent expansion, and the purulent discharge diminished, and still more decidedly, when the lung had fully expanded, and all passage of pus had ceased, the clubbing of the finger ends became much less marked, and for many months so continued. Latterly this man has had pulmonary symptoms, which have occasioned a little anxiety: he has repeatedly spat blood, although never in large amount, and the cough, which had entirely disappeared, has again returned. With these symptoms there have presented themselves signs of tubercular deposition in the summit of the right lung, and the fingers of both hands have become clubbed. Nevertheless, he has, with occasional interruptions, been able for his work as a carriage painter; and since his attack of empyema, he has married a wife and begotten one child, healthy, and in every respect well-conditioned.

I have spoken of collecting the pus in a sponge applied over the opening in the thoracic parietes. This plan answers well both in adults and in children, in whose cases it was first recommended by Dr Brotherston of Alloa, in a paper giving an interesting account of three instances of empyema occurring after scarlatina, treated by

paracentesis.¹ Dr Brotherston applied the sponge while the canula was still retained; and this—following his suggestion—I have also done, and found most useful, keeping the instrument effectually in its place, which, owing to the alarm and restlessness of very young patients, is otherwise very difficult.

The difference between cases of acute pleurisy, the effusion in which is serous, and cases of acute empyema, is not such as to make the rules which should guide us in the treatment of the former, otherwise than applicable to the latter. I am prepared to recommend the employment of paracentesis in all cases, where there exists such an association of symptoms,—but very specially the tendency to failure of the circulation,—as already has been so much insisted on, and that without any reference whatever to the nature of the effusion. In the fatal cases of acute pleurisy, which I have seen, and in almost all of the instances of acute pleurisy treated successfully by thoracentesis, either by myself or others known to me, the effusion has been still serous. This experience, however, it is quite possible, might readily undergo a change, for it is only probable that in cases of purulent effusion the symptoms which seem to call for the operation are as likely to be present as in those of the more simple serous effusion. Indeed, the hectic fever and more profound constitutional disturbance which accompany empyema, must be held as likely to cause a predisposition to their occurrence; but with this preliminary statement, I do not consider it inconsistent very specially to urge the propriety of thoracentesis in cases of acute empyema. If the effusion is ascertained to be purulent,—I think the sooner it is removed the better. In effecting this, being desirous to prevent the entrance of air, it is well to employ the American syringe. That a satisfactory recovery may take place without the employment of that instrument, the case of G. P., now detailed, and the many instances of successful treatment of empyema by the ordinary operation of paracentesis which have been recorded, sufficiently prove; but as no danger attends the use of the syringe, and as a conceivable source of accident is by its use removed, while the statements of Dr Bowditch regarding its employment are so encouraging, I now prefer in all cases of empyema to remove the fluid by that means.

¹ Monthly Journal of Medical Science, 1853. So interesting are these cases that M. Trousseau is found quoting one of them,—“Je vous demande la permission (he says, in the first volume of the Clinique Médicale de l'Hotel Dieu), de vous lire un de ceux (empyèmes purulents scarlatineux), que le Docteur P. Brotherston a publiés dans le Monthly Journal.

I have stated that we are not to look to statistics for an answer to the question when thoracentesis is to be performed; but we may, on the other hand, with reason accept a satisfactory reply from that method of inquiry, on some points of no small interest bearing on the more general question, for example, how the quality, and how the quantity of the effusion, influence recovery after thoracentesis. The latter part of this query may be answered in a single word: when the effusion has been very large, when it has been excessive, recovery has often occurred; but the success of the operation—and this has more particularly reference to empyema—is greatest in cases not marked by the largeness, but by the comparative smallness of the effusion.

As regards the quality of the fluid, there is reason to believe that a more extended and careful investigation may lead to some important conclusions. Hippocrates, as we have already seen, attached a distinct prognostic value to the nature of the pus, and this has generally been done from his day down to the present time. The statements of authors are, however, so contradictory as to render renewed inquiry necessary. Dr Brady of New York, for example, gives the results of 132 operations collected from various journals as follows:—Pus in 52 cases, of which 37 recovered, 2 were relieved, and 13 died. Serum in 59 cases, of which 29 recovered, 12 were relieved, and 18 died. Sero-pus in 8 cases, of which 5 recovered and 3 died. In 13 the nature of the fluid was unknown, and of these 10 recovered and 3 died. Dr Brady's results may be expressed in this way,—that of cases of empyema in which thoracentesis was performed, about 25 per cent. died, or 1 in every 4; while of the cases in which the effusion was serous, about 30 per cent. died, or 1 in little more than every 3.

But turn from this picture, which I cordially agree with Dr Walshe would not justify us in regarding thoracentesis as “among the valuable gifts of surgery,” to that presented by Dr Bowditch. In 26 out of 75 instances serum was drawn, and 21 of the 26 got well. Pus was found in 24 patients. Eight got well, 7 died, 9 were *relieved* one or many times, but they had either a very tedious illness, terminating usually in phthisis, or fistulous opening, or a “doubtful result.” I am unwilling, with my present limited experience, to refer to statistics at all, but there can be no impropriety in mentioning, that in no case in which serous fluid was found, has the result been other than a satisfactory recovery. The little girl to whose case I alluded as having been visited by Professor Simpson, is now, as I have understood, at the distance of nearly three years

from the operation, sinking from disease of another nature altogether, and seated in a different part of the body. One young gentleman, on whom I operated nearly a twelvemonth ago, is still far from strong, but his want of strength—and I am happy to think he is regaining strength—is not so intimately connected with his attack of pleurisy, as to forbid me stating his recovery from that disease to have been satisfactory. In the remaining cases, and they exceed a dozen in number, in which serous fluid has been removed, there has been no untoward termination.

It is otherwise where pus has been found. In cases of acute empyema, in which there has been great reason to believe that the lung had been involved in tubercular disease, I have witnessed a fatal termination within a day or two, or a few days, after the operation. In these instances, I do not believe for a moment that the performance of thoracentesis accelerated the fatal event. On the contrary, having seen the wonderful degree of relief to most urgent symptoms experienced by the patients, and having heard their own expressions of thankfulness, I am disposed to think that in such circumstances, although a doubtful, as regards ultimate recovery, it was the best remedy to employ, and that, consequently, it was demanded. For as a palliative remedy, I am indeed prepared to recommend the operation, in the circumstances now adverted to, as well as in cases of hydrothorax, the result of organic disease. In two cases of this kind, the remedy afforded great relief. In one of these I tapped the pleura ten times, in the other twice. The former case has been published in Dr Beale's Archives of Medicine.¹ The latter was seen by Dr Begbie and Sir James Simpson, with whose concurrence thoracentesis was performed. The fluid which escaped was sanguinolent—dark red in colour. Thus, the nature of the case, which had been conjectured, was established. On three occasions I have witnessed such fluid escape, and all of the three patients have died. I must, however, add, that the presence of a little blood, which after the fluid has been for some time in repose, falls to the bottom of the containing vessel, and leaves the great body of the fluid clear, is not by any means an unfavourable index. In such case the blood has escaped from the parietal or pleural wound. Neither do I think the presence of a little blood is to be regarded as serious, where a free coagulation of the mass of fibrine entangling the blood corpuscles takes place; it is the thin watery fluid of low density, and wholly as well as uniformly coloured, that I should dread to find: for that marks the case as one of malignant disease, either of the pleura alone, or of the lung and mediastinum as well.

¹ Vol. ii.

I have now to direct attention to the employment of thoracentesis in cases of *chronic pleurisy*, and this I shall do by relating in the first place the history of one or two cases.

CASE VIII.—W. H., æt. 28, by occupation a tanner, became affected in March 1864 with difficulty of breathing, hard dry cough, night sweats, loss of appetite, and great loss of strength. In the course of three months he was so much reduced in strength, and so breathless, that he could scarcely walk more than a few yards without taking a rest. During the summer there was for a time a diminution in the severity of these symptoms, but as winter advanced, he felt himself getting worse than ever, had great difficulty in lying down, and could not maintain the recumbent posture except on the left side, with the head and shoulders much elevated. At this period, and up to the time of my seeing the patient, he suffered greatly from palpitation of the heart on the right side. He continued to lose flesh and strength, although taking, under medical advice, cod-liver oil, and having his chest rubbed with the same. This man came under my notice in the month of August 1865. Calling at my house, which he was able to reach only with great difficulty, and with the assistance of his brother, I was struck by his emaciated and worn-out appearance. He was very breathless, and gave me the impression, as I looked at him, that he was labouring under phthisis in an advanced stage. Upon proceeding to examine his chest, however, the cause of his symptoms was found to be a large accumulation of fluid in the left pleura, displacing the heart to the right to an extent I have never seen surpassed; depressing the left lobe of the liver; and causing great prominence of the intercostal spaces, entire immobility of the chest on the affected side, absolute dulness on percussion, and total suppression of all respiratory sounds. A slight degree of œdema of the chest on the left side existed. I learned from the patient, that up to the commencement of his present illness, he had uniformly enjoyed good health; that his immediate relatives were all healthy. Further, that during his illness he had been repeatedly blistered, and had taken from first to last a large amount of medicine. He had the impression, and this was shared by his brother who accompanied him, that the disease under which he laboured was consumption; he had been so frequently told so, that he could not doubt it; still, he thought it strange that he should have no spit, and no constant cough.

Having formed my own opinion of his case, I expressed it to him, and on the following day commenced the treatment, by drawing

off, with a small trocar and canula, about twenty ounces of clear dark straw-coloured serum, having a density of 1030, highly albuminous, and containing a large amount of chlorides. This limited tapping greatly relieved the breathing, but it was far more useful than that; it convinced me, that although the effusion had been in existence from March 1864 to August 1865,—nearly eighteen months,—the compressed lung was still capable of expansion, for upon careful examination of the chest after the removal of the fluid, I found improvement in the percussion note, near the sterno-clavicular articulation, and, on auscultation, heard a distinct though distant murmur of breathing. Accordingly, being assured, by this simple preliminary tapping, of the expansibility of the lung, I drew off, within a day or two thereafter, upwards of one hundred ounces of fluid. This was done with a common trocar, but no air was permitted to enter. The opening was made posteriorly between the eighth and ninth ribs. This operation, performed in my own house, and without assistance, gave immense relief, and for the first time the patient slept on his right side, and with the head raised in bed only to the usual extent. A blister was applied over the side, and a little iodide of potassium and acid tartrate of potash prescribed.

In five weeks there was an accumulation of fluid to such an extent as to make it desirable to repeat the thoracentesis. That was done, and about sixty ounces of fluid were removed. The patient now desired to go home to Stirlingshire, and this I permitted, after receiving his promise to return in the course of a few weeks. He did so; I again tapped him, removing about forty ounces. Again he returned home, and again came back in six weeks according to promise, having meantime begun work as a shoemaker. I tapped him for the fourth time; drawing off about thirty ounces. At intervals, varying from five to seven weeks, I have tapped him three times since; the last occasion was on the 21st April, when, with Bowditch's syringe, I could only get away eight ounces. There was no more to come; and I have every confidence that another tapping will not be required. The man has gained nearly four stones in weight, eats well, sleeps well, has walked several miles without fatigue, and his breathing is, to use his own words in a letter I lately received from him, "as good as ever it was." This is a most satisfactory case, and yet I believe it would be far from being remarkable, if physicians placed that confidence in the efficiency of thoracentesis as a remedy in chronic pleurisy, which, in my opinion, it justly deserves.

Let me ask attention specially to a few features of interest suggested by this case, as now briefly recorded.

1st, The fluid was still serous, at the distance of sixteen months from the commencement of the illness, and it continued so, changing a little in colour, becoming pale, and losing in density, till twenty-five months after the attack commenced, when its formation may be said to have ceased. I have known the fluid to remain serous for a much longer period, indeed, for several years. It did so in the case of a sailor, who was under my care in the hospital eight years ago. I tapped this man's chest on three occasions, removing between fifty and sixty ounces of serum at each time, dark in colour, and free from any smell. The first quantity removed was found to contain cholesterine in considerable amount. The man, finding himself much relieved, insisted, greatly to my regret, on leaving the Infirmary, and so the subsequent progress of his case is unknown to me. That the right lung—his was a pleural effusion on the right side—had expanded to such an extent as to make it hopeful that the case might terminate as favourably as the one now related, I was convinced, but I am equally sure, that after a time and for a considerable period the fluid would slowly re-accumulate, rendering repeatedappings necessary.

2d, I have mentioned that blisters were used, and that diuretic as well as deobstruent remedies were employed after the performance of thoracentesis. Such cannot be expected to act with the same degree of energy as when used in like circumstances in the acute effusions; but, still, I believe their action to be far from wholly inert; used independently of tapping they are useless. Again and again I have seen them employed in cases of chronic pleurisy, diligently and for a lengthened period, but never can I say that any decided benefit resulted.

3d, The tapping earliest performed in W. H.'s case was tentative. I ask attention specially to this expression—for had the lung not given evidence of expansibility after its employment, I should either have adopted a different practice, as in other cases, or on subsequent occasions used the measure as one purely palliative. The lung did, however, expand, affording evidence that after many months of compression the return to a healthy condition is quite possible. To attempt either in the case of a chronic serous effusion, or in that of an empyema, the removal of other than a moderate quantity of the effused fluid, until the capability of the lung undergoing expansion has been ascertained, is, I think, a dangerous practice. True, it is only by strong suction power, which in such circumstances is not safe, that we are able to remove any very considerable amount; but, I repeat, a safer and better plan

is to watch carefully the extent to which pulmonary expansion occurs, and repeat the operation according to circumstances. This also was the method pursued in the following instance.

CASE IX.—D. B. was a patient in the Royal Infirmary in 1863, suffering from chronic pleurisy on the right side, of several months' standing. After the repeated application of large blisters, and the use of iodine and mercury without appreciable benefit, a tentative thoracentesis was performed, and the lung having evidently undergone expansion, the operation was repeated. This plan was pursued for some months, thoracentesis being performed by means of a small trocar at varying intervals, and blisters, as well as iodide of potassium, being likewise used. The result was most satisfactory: the patient, after nine months' residence in hospital, was dismissed with a lung greatly expanded, and in a state of health permitting him to return to the performance of his duties as a warehouseman, from which he had for many months been compelled to desist.

It is not, however, in all cases of chronic pleurisy, and certainly less frequently in empyema, than in instances of simple serous accumulation, that results so satisfactory follow. I have twice, in cases of chronic empyema, found death to ensue after repeated tappings,—the patient gradually becoming more and more hectic, and ultimately sinking through a gradual asthenia; and in a third case, a permanently fistulous opening having been established, the same train of events occurred. This was, however, a case of empyema complicated with serious pulmonary disease on both sides of the chest.

I have had too little experience of the influence of injections into the pleura to be able to express any confident opinion regarding their value. In one case of empyema, with very offensive fetid discharge, the injection of a little chlorine water, freely diluted, had certainly a good effect in controlling the fœtor. In another case of very chronic empyema, limited in extent, I injected, after the manner of the late M. Aran, a little tincture of iodine. The immediate effect seemed to be satisfactory; but the patient, a man in hospital, requested his discharge a short time after the treatment was put in execution, and the result was alike imperfect and unknown. Both Aran and Trousseau, however, as well as other physicians, have borne testimony to the efficacy of injections with iodine.

Another expedient, of which, although I have no personal experience, it appears much may be made, is the drainage tube. In the hands of Dr Goodfellow, of London, and more recently of Dr Banks, of Dublin, Dr George Kidd,¹ and other Irish physicians,

¹ See his interesting paper in the Dublin Medical Journal for 1865.

the introduction of a drainage tube, by permitting the fluid in the pleura to run off as soon as formed, has, undoubtedly, in acute cases of pleural effusion—and also in chronic empyema with fistulous opening, in which the tube has favoured the freer escape of pus—rendered eminent service.¹

I have not thought it necessary to discuss the employment of thoracentesis in chronic pleural effusions at the same length as that to which my observations on this means of treatment in the acute effusions into the chest have extended, believing that there is by no means the same difference of opinion in the minds of physicians regarding the former, as unquestionably exists in relation to the latter.

My belief is, that in many instances of chronic pleural effusions, it will be found an available means of cure; that in others, judiciously employed by itself, or aided by injections, or by the use of the drainage tube, it is capable of greatly alleviating the distress and suffering of not a few cases of this serious chest disease.

¹ The drainage tube will further be specially useful in those cases in which the compressed lung is incapable of expansion. By its means the fluid can be completely removed, and so a contracted side—always preferable to an abnormally distended side—will result.

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