weeks' standing. All the tube had entered the bowel, and no guide to the position of the disease had been discovered. As I said before, I performed the operation on the right side, and the patient survived for six weeks, and died mainly, I believe, from a bed-sore. In that case, I met with a peculiar condition which I do not think is mentioned in any of the books, and which I have only seen on two occasions: I mean the presence of gas in the peritoneal cavity. On cutting down upon the bowel, I found the peritoneum considerably distended; but, there being good sunlight at the time, I was able to avoid opening the cavity, and the gas soon disappeared, and did not influence the patient's recovery in the least. I noticed something similar to this in a case in the hospital in 1874. There, again, the peritoneum was enormously distended, so much so that it was impossible to operate without pricking it, and the case terminated fatally from peritonitis. The explanation of this condition, no doubt, is that the bowel above the obstruction having been distended for some days, a certain amount of gas transudes into the peritoneal cavity. The practical bearing of it is, that you are liable to mistake the distended peritoneum for distended intestine.

And now as regards the operation itself. It is performed by preference on the left side, or on the right side under exceptional circumstances. The patient is placed on the right side, with a pillow under the loin, in order that the left loin may be thrown into greater prominence. You then measure a point midway between the anterior and posterior superior spines of the ilium, and from that point draw a vertical line upwards to the last rib. This line will give you the position of the bowel. Then make an incision four inches long, somewhat obliquely between the crest of the ilium and the last rib, half of the incision being on each side of the vertical line marked out. There is some difference of opinion as to the precise direction of the incision, some preferring it horizontal, others oblique. I myself prefer it slightly oblique, running parallel to the last rib. In making the incision, you divide the skin, subcutaneous fat, the external oblique and latissimus dorsi muscles, thus exposing the internal oblique. Having divided that for the whole length of the wound, the fascia lumborum comes into view, and you carefully divide it on a director. You have now exposed the loose fat about the kidney and colon in the anterior part of the wound, and the edge of the quadratus lumborum behind. Keeping the edges of the wound open with spatulae, you displace the fat with the finger and seek for the bowel. In cases of obstruction with distension, you have no trouble in doing this, the bowel presenting at the wound covered only by fascia transversalis. This fascia varies in thickness in different cases, and has sometimes been mistaken for peritoneum. But, if the bowel be empty, you tear through the fascia transversalis carefully with the finger-nail just in front of the quadratus lumborum, and, on introducing the forefinger, you will generally succeed in hooking the intestine. If you do not succeed in doing this, by turning the patient over on to his back the bowel will, in all probability, fall on to your finger. Bringing the bowel into the wound, you roll it round and expose the posterior surface, which, as you know, is generally uncovered by peritoneum, and, when the bowel is distended, this surface is much larger. With a large curved needle, you then pass a stout silk thread through the skin to one side of the ink-mark, across the bowel, and again through the skin at a corresponding point on the other side of the mark, repeating the proceeding at the other end of the incision. Thus the colon is held to the margins of the wound before being opened. A transverse incision is now made into the bowel between the threads, and the finger being introduced, the two loops can be drawn out, and, on dividing them, you have four threads to fix the bowel to the wound only requiring to be tied. The rest of the incision on each side of the bowel is then closed by ordinary sutures, and the operation is completed. The complications are very small. The greatest difficulty is in reaching the bowel when it is empty, but, with a little experience, this becomes quite easy.

Last week, with Mr. Erichsen, I saw an interesting case of total obstruction in a gentleman who had been treated homoeopathically for three weeks. The small intestine was distended to three times its normal size, and there was a clear history of obstruction of the large bowel. We decided on colotomy, and I performed it as usual in the left loin. After I had finished the operation, on putting my finger into the lower opening in the bowel, I found a mass of disease, evidently cancerous, at the upper part of the sigmoid flexure; for I may say that it is not really the sigmoid flexure that is opened in colotomy, but the junction of the transverse with the descending colon; since, on putting your finger into the upper opening, you find that it goes horizontally in front of the kidney.*

These being the principal points concerning the operation, you will watch the one on Wednesday with greater interest.

* This patient survived the operation seven months.

REMARKS

ON THE MORTALITY OF PLEURISY CONSIDERED IN RELATION TO THE OPERATION OF PARACENTESIS THORACIS.*

By WILSON FOX, M.D., F.R.S.,

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[Dr. Fox desires to correct an error in the portion of his paper published in our last issue. It relates to M. Lebert's statistics of complicated and uncomplicated pleurisy (page 723, col. ii, lines 14 and 15). The sentence should have been: "Out of 28 deaths occurring in 201 cases, only 10, or 5 per cent., were free from grave complications."]

[Concluded from page 725 of last number.]

AN analysis of the cases in which purulent transformation has occurred further shows, that tubercle of the lung has only a minor influence in its production, inasmuch as these form only 34 per cent. of the whole of the cases in which it occurred; but tubercle, in addition to other grave general or local lesions, collectively increases this percentage to 43. Conversely, the presence of tubercle *per se*, though probably not without some influence, does not show any marked tendency to the production of this change after paracentesis, if we regard the number of probably tubercular cases in which it has been performed. These are limited, but they are conclusive. Out of Tutschek's six deaths, three were tubercular, and only one of them underwent purulent transformation. Out of twenty-four cases operated on by Zeroni, six died, four being tubercular, and none underwent this change. Out of thirty-six cases by Oeri, there are twelve or thirteen of probable phthisis, and in only two did the effusion become purulent. Finally, it may be recalled that an analysis, by Attimont,† of twenty-nine *post mortem* examinations of fatal purulent pleurisy, shows that tubercles were absent in twenty and present in only nine.

It is tolerably certain, on the existing evidence, that the change is not due simply to the wound in the pleura; but I cannot resist the conviction that, in some instances, a change in the nature of the inflammatory process is induced by the withdrawal of the fluid. Time does not permit me to discuss whether the diminished pressure allows the escape of an increased number of leucocytes. I think this explanation improbable, and that suppuration in the pleura depends on other and more deeply seated parenchymatous changes in the structure of the membrane. There is, I think, a fair body of evidence that this artificial withdrawal does at times intensify congestion, as is shown by the hæmorrhagic character occasionally observed in subsequent reaccumulations; and further, that in some cases it directly increases the inflammatory action, as shown by the higher degree of fever occasionally (though not constantly) observed after its performance. Further, although purulent transformation may occur when the emitted fluid is clear, M. Moutard-Martin's argument, to which I have already alluded, would, if true, tend to show that intensification of the inflammation may follow the operation when the fluid is lactescent; for it is at least open to doubt whether this change would have occurred in such cases without surgical interference.

I think also that it may be asserted that there is but little natural tendency in serous effusions to undergo this change. Were it so, either the mortality of pleurisy, as a whole, would be much greater than it is, or the natural absorption of empyemata would be more frequent than is now very commonly taught. Looking at Table v, the transformation occurred in 14 per cent.; and, as shown in Table iv, it proved fatal in 9 per cent. of all operations.‡

I think also (though this is not susceptible of actual proof) that, in the vast majority of cases of pleurisy where suppuration occurs, it probably does so *ab initio* at early periods of the disease; that its occurrence depends on the special character of the inflammation; and that it does not result from a slow and gradual change in

* Read in the Section of Medicine at the Annual Meeting of the British Medical Association in Manchester, August 1877.

† *De la Pleurésie Purulente, Thèse de Paris*. Attimont analyses 130 cases, of which 80 recovered. *Post mortem* examinations were only made on 29.

‡ The difference between these two tables consists in the fact, that fatal cases only are given in Table iv.

an effusion primarily serous. There is a considerable number of cases published in which pus has been withdrawn by paracentesis, within the first week or ten days of the disease; and I think that it is a fair inference, from what we know of other serous membranes, to conclude that, if suppuration do not occur in them within this period, it is not likely to appear subsequently, except under new intensifications of inflammation arising from special causes; while there is, *per contra*, evidence to show that serous effusions may persist during many months without undergoing this change. Taken as a whole, the proportion of cases in which pus is found in the pleura at a first paracentesis may be represented, in the experience of different observers, as varying from 14 to 20 per cent.* Many of these were chronic cases, but in a large number the operation was performed at an early date. The large proportion of the cases in which the presence of pus is shown by a first operation may, however, I think, be reasonably referred to the severity of the symptoms by which the operation was determined, and the frequency of empyema, as such is probably fairly represented by the 14 per cent. reported by Ewald, and which corresponds, in some respects, to the general data of the mortality of the disease. On this evidence, I think that it must, therefore, be concluded that, in the vast majority of cases where suppuration has followed paracentesis, it must be directly ascribed to the operation, and that the mortality in this respect thence resulting is to be set down to its account.

The mortality also in the phthisical cases is exceedingly high, and I think that it may be reasonably questioned whether this also was not increased by the operation. Reliable data on this point are not very abundant; but there is a fair amount of evidence to show that serous effusions, even in the presence of tubercle, do, and not very uncommonly, undergo a natural spontaneous cure. Thus, out of thirty-two cases not operated upon, recorded by Meyer,† six were probably tubercular, and of these six only two died. Of ten cases of pleurisy in phthisis, recorded by Dr. Flint, four died, but in two of these the effusion was double, and in the remainder it is doubtful whether the effusion influenced the fatal event. Louis, it is well known, held a different opinion, and believed that pleurisy accelerated the course of phthisis. Dr. Walshe, on the other hand, has stated it as the result of his experience that pleural effusion does not materially influence the fatal result in this disease.

Looking at the statistics as a whole, it becomes very difficult to prove positively that paracentesis in serous effusions increases the mortality of the disease, or, if it do so, in what degree. The reason for this is, that it is impossible to say what proportion of the cases thus operated on would have proved fatal without such interference. Admitting, however, that they are selected, and taking Ewald's returns of the mortality of serous effusions not operated upon as a basis (and I think that this mortality of 2.7 per cent. may be reasonably taken as that at least of uncomplicated, if not of all purely serous effusions); and if we compare this with the 17 per cent. of Table III, or the 24 per cent. of Table IV, we shall find that these selections must have been made from a total, for the former, of 1,939, and for the latter, of 3,137 cases of *serous effusions alone*, to produce a similar mortality; and I very much doubt whether any such large numbers are really represented by the experience of the observers collected in these tables. Looking at the results of the practice of individuals, it seems hard to believe that 10 per cent. of Dupré's cases, operated upon in early stages, need necessarily have died without operation; and there is no evidence that Dupré's cases were specially selected on account of their severity or immediately threatened danger to life. A very similar remark may be applied to at least two out of twenty-one of Tutschek's, and to three out of thirty-six of Ewald's—each of which represents, therefore, a similar mortality of nearly one death in every ten or twelve operations in serous effusions. Any one undertaking the operation must, therefore, remember the possibilities which await him, since these cases are published to show the advantages of the operation, as performed skilfully and with modern precautions; and yet, to lose one in ten from such an operation is a risk from which most would shrink without grave reasons for its performance. Special consideration ought, therefore, to be paid to the advantages to be derived from the operation, and to the disadvantage resulting from its non-performance, before we regard it as the common treatment of serous effusions.

I think that attention is required to the fact that these effusions are

not mere passive dropsies, like ascites from portal obstruction, which is only removable by mechanical means. They are inflammatory products, which tend to reabsorption when the inflammation which causes them subsides; and the only impediments to this reabsorption are want of expansibility of the lung, persistence of the inflammation, or changes in the pleura which diminish its absorptive power.

The arguments adduced in favour of an early operation are: 1. The fear of sudden death from an excess of effusion; 2. That long persistence renders the lung incapable of expansion; 3. The more rapid cure; and 4. The immediate relief of the patient. Two others have been adduced, viz., the danger of tuberculation from the persistence of the effusion, for which, however, I can find no evidence in the case of serous effusions; and lastly, the danger of a slow purulent transformation, which I believe also to be, in the majority of cases, an unfounded fear.

The first four reasons require some further consideration. The fear of sudden death from pleural effusions was very largely insisted on by Trousseau, and a fair number of instances have been collected of this event. The total of these which I have found recorded in medical literature are about fifty or sixty in effusions of all kinds, of which thirty are open to analysis. Most of the latter coexisted with serous effusions. Time does not allow me to enter into the very interesting details of this subject; but it deserves remark that paracentesis does not only, not always avert this danger, but that it sometimes directly causes it. Altogether, there have been between 30 and 40 cases recorded where sudden death has been more or less directly associated with the performance of the operation, so that, comparing the whole number of sudden deaths, as recorded without paracentesis, with those ensuing after the operation, the proportion of the latter will be found vastly to exceed the former, if we regard their comparative frequency in all cases of effusion, taken collectively. Into the details of these, time forbids me to enter; but my analysis of them induces me to believe that, in no fewer than sixteen, the sudden death was directly attributable to the operation or to subsequent treatment, and they may be summed up as syncope in seven; asphyxia, from acute oedema of the lung, in five; convulsions (in some from washing out empyemata) in three; and hæmorrhage from the lung in one case. I do not adduce these facts as an argument against the operation when otherwise indicated, for I believe that signs of threatened failure of cardiac power are among the most imperative reasons for its performance; but the argument is in danger of exaggeration if pressed as a reason for the mechanical withdrawal of the fluid independently of such indications.

The fact that long continuance of the effusion may endanger the expansibility of the lung is one deserving of gravest consideration; and it is, in my opinion, the most potent argument for an early performance of the operation. It is, however, to be remarked that probably the density of the adhesions and of false membranes are determined within periods at which the majority of observers at present still hesitate to operate, as involving risk of reaccumulation and greater danger of subsequent purulence of the effusion. I mean that, on the one hand, they commonly occur within the first fortnight of the effusion; and secondly, that the expansibility of the lung has been proved by actual experiment, and by the results of paracentesis, to persist as long as three, six, or eight months. Lastly, also, it must be remembered that a lung bound down by adhesions presents as great an obstacle to cure by paracentesis as by natural absorption.

It is also to be admitted, as proved by actual observation, that the cases which recover under early paracentesis do so, on the whole, in a shorter average time than those in whom it is deferred, and probably than those left to natural processes; and that in some the cure is remarkably effectual and speedy, though this is by no means invariably the case.

These are, I think, the only facts on which an indiscriminate performance of the operation can safely rest; but to my mind they do not outweigh the risks to which I have already called attention; and further, a perusal of published cases shows that, in a very considerable number, some dulness at the bases persists even after a cure by paracentesis.

I do not enter into an analysis of the facts which have been brought forward to show that operations undertaken at an early period of pleuritic effusions are attended by a *less mortality* than those performed at late periods of the disease. Cases thus grouped collectively, as by Dupré and Dr. Evans, undoubtedly give this result; but it appears to me that the argument deduced from it in favour of indiscriminate early paracentesis is open to a marked fallacy, inasmuch as a large number of the recoveries under these circumstances would probably have equally taken place if no operation had been performed; and, on the other hand, the delay of absorption is in itself an indication of unfavourable vital conditions. The facts, as they stand (though

* Ewald, 14 per cent. in 250 cases (but 178 of these recovered without operation, and 70 of the purulent cases did not undergo operation); Oeri, 15 per cent. in 40 cases; Zeroni, 20 per cent. in 30 cases; Toft, 18 per cent. in 200 cases (Virchow's *Fahresbericht*, 1871. The original of this has been inaccessible to me). In Table III, the collective results give 37 per cent. in 537 cases in which the character of the fluid is stated; but probably the excess of empyemata depends on these cases having been selected for operation. Wrany's *post mortem* returns give 36 purulent in 216 cases, or 16 per cent.

† *Annalen des Charité-Krankenhaus*, vol. xi, 1863.

I do not wish to press this argument), might almost equally be brought forward to show that paracentesis may be regarded as a very questionable expedient in effusions of long standing. There are, however, a sufficient number of cases of marked cures under these circumstances by this method of treatment to justify its application (though with some hesitation) in particular instances.

I have dwelt at a length which already has exceeded the limits of the time allotted to me on the treatment of serous effusions, because these are the most capable of analysis. For purulent effusions we have no positive data or standard of comparison by which to estimate the possible improvement, or the reverse, effected by paracentesis. Still, looking at the very high collective mortality of 37 per cent. following the operation, which is also equalled and often exceeded by the individual experience of nearly all recent operators, we must at least long for some improvement in this method of treatment. I think it not improbable that this may to some extent be attained by a careful application of Mr. Lister's antiseptic processes. Ewald thinks that the mortality may be diminished by early free incision.

Following the line of thought which has guided me in the consideration of the treatment of serous effusions, there are some questions which even yet appear to me to deserve consideration in relation to those of a purulent character, though they can only be stated as questions. They are summed up in one; viz.: Are there no natural cures for purulent effusions? The answer is undoubtedly in the affirmative; and strangely Ewald, on comparing Andel's statistics of operated and non-operated cases with his own of operations on empyemata, points out that the non-operated cases show a mortality of 13 per cent. less than the operated: a result which induced him to abandon as fruitless this statistical inquiry. The recovery in the former class was due to external perforation, or to perforation of the lung. The last named event may be regarded as involving great dangers; but the favourable result of a spontaneous external opening, insisted on by Hippocrates, has been brought out very strongly by recent statistics; for twenty-five cases of this nature by Andel show only two deaths, or less than 8 per cent.; while Dr. Goodhart gives eleven cases, all of which recovered. Ewald, however, in six cases, had three deaths, or 50 per cent. Even Andel's eight cases of bronchial perforation give only three deaths, or 37 per cent.—a mortality less than that of many operations on empyemata; and other observations show that it is one mode, though an unfavourable one, of recovery.

Lastly, a question arises to which only a doubtful answer can be given; viz.: In what frequency can purulent effusions undergo spontaneous absorption? That it is possible is denied by some observers; but the fact is placed beyond dispute by an observation of M. Moutard-Martin.* An exploratory puncture only was made; pus was found; the operation was deferred, and the patient recovered. Other instances exist of a variable quantity of pus left in the pleura being removed by absorption and without requiring further operation. Dr. Goodhart states that the late Dr. Hughes affirmed, from his own experience, the possibility of the absorption of purulent effusion; and instances certainly occur (of which, through the kindness of Sir William Jenner, I have seen one example) where patients presenting the most advanced hectic, with all the rational symptoms of extensive purulent effusion, recover perfectly without operation. Further, on looking at the proportion of cases in which pus has of late been found in the pleura, it may fairly be asked whether it is not most likely that it was present in some of Louis', Colin's, and Dr. Walshe's cases, which underwent a natural cure by absorption. Again, chronic pleurisy in childhood is stated by almost universal consent to be nearly invariably purulent; and yet Barthez and Rilliet have stated that, out of thirteen such cases, they have known seven to recover by spontaneous absorption; and it may equally be asked whether the 623 cases from the Franz-Joseph Kinderspital, with a mortality of only 1.6 per cent., did not probably include some of this nature.

I do not propose to urge these questions as arguments against the evacuation of the pus in empyemata, but I do not think that they can be altogether lightly passed over. My chief object has been to show that the mere existence of a pleural effusion ought not necessarily to be regarded as a cause for immediate recourse to paracentesis, and that greater dangers attend the operation than are sometimes asserted to exist. The desirability of the operation cannot, as Dr. Gairdner wisely said some years ago, be determined by statistics, but by a careful consideration of individual indications. Although, therefore, I am most strongly of opinion that lives may be saved and health preserved by a careful performance of the operation where such indications exist, I believe that there is a risk of others being sacrificed by its indiscriminate employment which might have recovered had the dis-

ease been left to the natural processes of cure. Besnier has drawn attention (see Table 1) to the increasing mortality of pleurisy in the Paris hospitals, amounting to nearly the double of that of some former years, since the practice of thoracentesis has been largely followed; and, though he hesitates to ascribe it to this cause, the question thus raised deserves grave consideration. The dangers of the operation are not the less real because they are not immediately apparent. The first effect (with the exception of some cases of oedema of the lung following the operation) is commonly to produce relief; and this has given rise to the often repeated statement that it is invariably innocuous. The subsequent dangers are those of purulent transformation and repeated reaccumulation; and both of these are, I think, more distinct than is now often stated; and in the present day, when the facilities for the performance of the operation are so greatly increased by the use of the aspirator and of fine trocars, I think that Sir Thomas Watson's words of warning may be very appropriately recalled. "The mortality from uncomplicated pleurisy is exceedingly small. It would, I fear, be vastly augmented if every patient having manifest effusion were to be tapped. The danger of the operation is this, that it may, and probably will, induce suppuration or cause the effused fluid to become putrid."

I have not entered into the various interesting questions relating to the details of the operation in serous and purulent effusions; but I think that one point deserves attention—viz., that aspiration and the withdrawal of the whole of the fluid, when this is serous, appears to have some tendency to be followed by purulent transformation; and further, that, when the operation is required by the excessive amount present, the removal of a portion only is sufficient for immediate relief, and is very frequently followed by the absorption of the remainder.

I have added to the tables already given, one which Dr. Bowditch of Boston had the kindness to forward to me after they had been drawn up and printed for the illustration of this paper (see Table VI). If added to Table III, it would reduce the mean mortality of serous effusions to 16 per cent., and the mean mortality of the purulent and sero-purulent effusions collectively to 35 per cent. Dr. Bowditch's large experience gives great weight to the distinction which he draws between purulent and sero-purulent effusion, which deserves grave consideration in the nomenclature hereafter to be applied to these varieties.

TABLE VI.—*Enlarged Table of Results of Paracentesis, by Dr. Bowditch of Boston.*

(Sent to Dr. Fox after foregoing Tables had been printed.)

Character of Fluid and Disease.	Number of Cases.	* Number of Deaths.	* Percentage of Deaths.	† Relief temporary and sometimes permanent.	Number of Aspirations.	Permanent opening made.	Might have been successful (?) if a permanent opening had been made.
Serum	70	13	18.56	..	80	0	..
Pus (a)	45	11	24.44	..	81	10	5
Seropurulent (a) ..	23	11†	47.82	..	68	5	3
Bloody	33	18§	54.54	..	73	..	..
Air	6	6	100	..	6	..	..
Gangrenous	1	1¶	100	..	1	..	..
Dry	7	0	0	..	7	..	..
Total	185	..	..	..	..	..	..

a, a. Dr. Bowditch thinks that purulent and seropurulent effusions ought to be classified separately. The latter indicate, in his opinion, a deteriorated condition of system, and are less susceptible of cure. (Letter to the author.)

* Only two died at or about the time of the operation. Both had inhaled ether, and I thought that had the bad effect, and not the tapping.

† When fluid was withdrawn, all obtained temporary, and some very great and permanent, relief.

‡ Anæmic condition of system played an important part.

§ Malignant disease, rather than the tapping, killed.

|| The pneumothorax killed. ¶ The gangrene of lung killed.

ADDENDUM TO THE FOREGOING PAPER.

On the discussion of this subject, a very important question was raised by the President of the Section, Sir William Jenner; namely, the relative mortality of the operation of paracentesis at different ages. To it, I was then unable to give an answer. I have since then investigated this point as far as I have found it possible, although, in very many of the cases published, the ages are not given. The result of my inquiry into such of the cases as are included in the foregoing tables, where the age of the patient and the character of the fluid obtained are stated, is shown in the accompanying table (No. VII), from which I have excluded all cases of hydatids, pneumothorax, and simple hydrothorax, stated as such.

* De la Pleurésie Purulente, p. 77.

TABLE VII.—Showing the Relative Mortality of the Operation for Paracentesis Thoracis at different Ages.

ALL CASES COLLECTIVELY.						SEROUS EFFUSIONS.					PURULENT EFFUSIONS.				
Age.]	No. of Operations.	Number of Deaths.	Deaths per cent.	Complicated Cases Deaths per cent. of all Operations.	Uncomplicated Cases Deaths per cent. of all Operations.	No. of Operations.	Number of Deaths.	Deaths per cent.	Complicated Cases Deaths per cent. of all Operations.	Uncomplicated Cases Deaths per cent. of all Operations.	No. of Operations.	Number of Deaths.	Deaths per cent.	Complicated Cases Deaths per cent. of all Operations.	Uncomplicated Cases Deaths per cent. of all Operations.
Under 10.	67	17	24		22	4	1	25		25	63	16	25		22
10 to 20..	62	18	29	8	20	27	7	25	7	18	35	11	21	8	22
20 to 30..	152	44	28	13	15	89	20	22	13	8	63	24	38	12	25
30 to 40..	70	23	32	8	24	47	13	27	8	19	23	10	43	8	34
40 to 50..	63	28	44	17	26	43	20	46	23	23	20	8	40	5	35
50 to 60..	25	11	44	32	12	16	8	50	37	12	9	3	33	22	9
60 to 70..	5	2	40	20	20	3	2	66	33	33	2	0	0	0	0
Over 70..	1	1	100	100	0	0	0	0	0	0	1	1	100	100	0
Total ..	445	144	32	12	20	229	71	31	15	15	216	73	33	8	25

The collective mortality for serous effusions shown in this table is considerably in excess of the mean mortality exhibited in Table III. This is probably due in part to accident in the collection of cases under the conditions above stated; in part to the fact that these cases include Dr. Evans's and Anderl's collections, and also those cases of this class proving fatal given by Dr. Goodhart and Ewald, and which do not represent the normal proportion of recoveries. If these be excluded, the collective mortality is reduced to rather below the mean of Table III; viz., to 15 per cent. This table (No. VII) cannot, therefore, be taken as showing the mean mortality of the operation of paracentesis; but it has the advantage of being based on larger numbers than would be available were the above named exclusion made.*

Summarising this table into deaths before and after the age of thirty—the period at which rigidity of the thorax commences to be marked—we obtain the following results.

Serous effusions before aged 30, 120 cases, deaths 28 = 23 per cent.
 Serous effusions after aged 30, 109 cases, deaths 43 = 39 "
 Purulent effusions before aged 30, 161 cases, deaths 51 = 31 "
 Purulent effusions after aged 30, 55 cases, deaths 22 = 40 "

The deaths in serous effusions after thirty, therefore, exceed those in the operations performed before this age by 16 per cent.; while a similar comparison of purulent effusion shows an excess of deaths after this age of 9 per cent.

Examining further into the proportions of deaths in the complicated and uncomplicated† cases before and after this age, I find that the percentages of the mortality of all operations before and after thirty are thus represented.

Serous effusions before 30, 120 cases, } complicated cases, 14 = 11 per cent.
 deaths 28 } uncomplicated " 14 = 11 "
 Serous effusions after 30, 109 cases, } complicated " 24 = 22 "
 deaths 43 } uncomplicated " 22 = 20 "
 Purulent effusions before 30, 161 cases, } complicated " 13 = 8 "
 deaths 51 } uncomplicated " 38 = 23 "
 Purulent effusions after 30, 55 cases, } complicated " 6 = 10 "
 deaths 22 } uncomplicated " 16 = 29 "

Or the proportion of uncomplicated cases dying in serous effusions, after the age of thirty, exceeds those before that age by 9 per cent., while the similar difference in purulent effusions is represented only by 6 per cent. The conclusion, therefore, follows that the acknowledged high mortality of purulent effusions, after paracentesis, is proportionately less affected by the age of the patient than is that of serous effusions. On the other hand, the considerable mortality of the operation of paracentesis on serous effusions, after middle life, should induce caution in its employment. The difference is less perceptible, if we compare the proportions of complicated and uncomplicated cases with the whole number of deaths from the operation before and after this epoch of life. Thus, serous effusions give, before thirty years of age, twenty-eight deaths, of which fifteen were complicated = 53 per cent., and thirteen uncomplicated = 46 per cent.; while, after thirty, there are forty-three deaths, of which twenty-one were complicated = 48 per cent., and twenty-two uncomplicated = 51 per cent. But the relative mortality before and after this age is, I believe, better shown by the former

manner of regarding this question. A similar analysis applied to purulent effusions shows that, of fifty-one deaths before thirty, thirteen were complicated = 25 per cent., and thirty-eight uncomplicated = 74 per cent. After thirty, there are twenty-two deaths, of which five were complicated = 28 per cent., and seventeen uncomplicated = 77 per cent. This table would, however, show that in serous effusions nearly half the deaths before and after thirty are in uncomplicated cases; but a similar comparison in Table v shows that only one-fourth of the deaths occur in this class. It is known that after the age of forty pleurisy is, on the one hand, less frequent and at the same time more fatal than before that age, and the increased mortality really commences at thirty, as is shown by the accompanying tables, which I have constructed from two of M. Lebert's,* with which I have placed in juxtaposition the proportion of deaths occurring, after paracentesis, at the decennial periods of life.

TABLE VIII.—Showing (a) the relative frequency of Pleurisy at different Ages; (b) the relative Mortality of Pleurisy at different Ages; (c) the relative Mortality after Paracentesis at different Ages.

	Under 10 yrs.	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	Over 70
A.—Frequency of pleurisy in 921 cases, per cent. (Lebert) ..	2	12	31	25	17	7	3	0.6
Proportionate frequency of death at different ages in 54 cases of pleurisy (Lebert), per cent. ..	(?)	7	24	11	24	20	7	5
B.—Proportionate frequency of deaths at different ages in all cases of death from paracentesis—445 cases. ..	11	12	30	15	19	7	1	0.6
C.—Ditto serous effusions—229 cases. ..	1.4	9	28	18	28	11	2	0
Ditto purulent effusions—216 cases ..	21	15	32	13	16	4	0	1.3

By this table it would appear that, while 52 per cent. of all cases of pleurisy are met with after thirty, the mortality in a more limited number of deaths (fifty-four) amounts to 67 per cent. of the whole number. Unfortunately, we have no data as to the comparative mortality of pleurisy at different ages, in relation to the whole number of persons attacked at such ages. The three succeeding series again, bring into striking relief the high mortality of the operation in serous effusions after thirty, which, as gathered from Table VII, may be summarised thus:

All deaths after 30 from paracentesis, proportion of whole number of deaths = 45 per cent.
 Serous ditto = 60 "
 Purulent ditto = 30 "

The proportional numbers of the operations performed, after thirty, are, however,

All cases = 36 per cent.
 Serous effusions = 47 "
 Purulent effusions = 15 "

whence it will appear that, in proportion to the number of operations performed, the mortality of paracentesis on serous effusions after the age of thirty is nearly equal to that of the operations in purulent effusions after that age, a result which has been also shown by the preceding analysis (39 per cent. serous; 40 per cent. purulent).

Analysing further the causes of death in the seventy-one cases of serous effusion, I find the following facts in the deaths before and after the age of thirty:

	Before 30.		After 30.	
	No. of Cases.	Per cent. of deaths before 30.	No. of Cases.	Per cent. of deaths after 30.
Phthisis	10	35	12	27
Grave complications ..	2	7	6	13
Purulent transformation ..	9	32	11	25
No cause stated	7	25	14	32
Total	28	—	43	—

a. Two phthisical.

b. Three phthisical.

Analysing the proportional frequency of each of these classes before and after thirty, we find that, of the whole number of cases of phthisis, 45 per cent. occurred before and 55 per cent. after this age; while the same comparison for each of the others gives, for grave complications,

* *Klinik der Brustkrankheiten*, vol. ii, pp. 778, 803.

* Small number.

† Such a deduction reduces the total to 241 cases—109 serous and 132 purulent. An investigation into the variations at different ages inclines me to the belief that the conclusions drawn from these smaller numbers would be fallacious.

‡ For the purpose of this analysis, I have treated as uncomplicated all those cases where no complications are stated to have existed.

25 and 75 per cent.; for purulent transformations, 45 and 55 per cent.; and for cases of which no account is given (and in which, in this analysis, I have taken as uncomplicated), 33 and 66 per cent. respectively. The difference in the frequency of phthisis and purulent transformation is scarcely sufficiently considerable to be made the basis of any special deduction, though, *à priori*, the former might have been expected to be less frequent and the latter more frequent, comparatively, after the age of thirty. The bulk of the cases in which the greater preponderant mortality depends after thirty appears, therefore, firstly, in the greater number of general grave complications which were present after this age; and secondly, among unexplained causes of death; the latter showing an inherent tendency to a greater fatality of the operation in more advanced periods of life, into which, however, on the data at present existing, it does not seem possible to pursue this inquiry further.

ON THE VALUE OF PARACENTESIS OF THE CHEST IN THE TREATMENT OF PLEURITIC EFFUSION.*

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ALTHOUGH the practical value of paracentesis of the chest in the treatment of pleuritic effusions is generally admitted by medical writers, there is still wanting an uniformity of opinion as to the conditions under which the operation should be performed, and the results which are to be expected from it. With a view of promoting the discussion on this important subject, I am induced to give the estimate which I have formed of its value; and, in so doing, I shall briefly consider some objections which have been urged against it, and make a few remarks upon the method of operating.

The cases which I shall use to illustrate the paper are eleven in number, and comprise three cases of simple acute pleurisy, two cases of acute pleurisy occurring as a complication of enteric fever, three cases of subacute or chronic pleurisy, and three cases of empyema.

1. *Acute Pleurisy.*—Taking first the cases of acute pleurisy, the first patient was a young woman aged 20. The pleurisy was on the left side; the heart was displaced; the dulness over the left lung was almost universal, and the general symptoms were of an urgent character. The amount of fluid removed by Bowditch's syringe was sixty-six ounces. In the second case, a young man aged 17, the effusion was on the right side. Fifty-seven ounces of fluid were removed by paracentesis. The immediate relief experienced by both patients after the operation was very marked, and convalescence ending in recovery was speedily established. Previously to operating, the ordinary treatment had been tried without producing any perceptible effect upon the amount of effusion. In the third case, the benefit of the treatment by operation was also well shown; and, as the case presents some features of interest, it is given more in detail.

J. A., aged 18, by occupation a blacksmith, was admitted into the Cumberland Infirmary on June 25th, 1877, complaining of shortness of breath. He stated that, about a month ago, while in his usual state of health, he was seized with sudden pain in the right side; worse on taking a long breath. About the same time, he began to be feverish, to have shortness of breath, a slight cough, and frothy expectoration. The pain and cough continued for about a fortnight. His difficulty of breathing increased, and was worst when he was recumbent. He had not received any special treatment. On admission, his condition was as follows. The patient was a strongly made muscular young man of florid complexion; height 6 ft. 1 in.; weight about 12 st.; his face was flushed; respiration shallow and rapid, thirty-six per minute; no cough. On examination of the chest, the left side appeared to be enlarged; the intercostal spaces were somewhat widened and flattened; but measurement showed both sides to be equal, the circumference in the nipple-line being thirty-eight inches. There was no œdema of the chest-walls. The expansion on the left side was diminished, and vocal fremitus feebler than on the right side. There was absolute dulness on the left side, posteriorly as high as the spine of the scapula, and anteriorly as high as the third rib; over the apex, the percussion-note was hyperresonant. The respiratory murmur was absent at the base, and generally feebler than on the opposite side, except at the apex, where the breath-sounds were distinctly heard. On the right side, occasional crepitations were heard. The action of the heart was laboured, rapid, and irregular; the apex-beat was to be seen and felt

one inch to the right of the lower end of the sternum; the appetite was slightly impaired; the urine normal; morning temperature, 101 deg.; evening, 102 deg. The diagnosis in this case was not difficult. The dulness over the left chest, the absence of vesicular murmur at the base, and the general feebleness of the respiratory sounds over the left lung, together with diminished expansion and absence of vocal fremitus, pointed to the presence of a large effusion in the left pleural cavity. The displacement of the heart was also confirmatory of this view. The absence of any symptoms of hectic, the comparatively low temperature, and the absence of œdema of the chest-walls, indicated that the effusion was probably sero-fibrinous in character. The occurrence of pain on the right side, associated with left-sided pleurisy, is interesting; it is confirmatory of Laennec's assertion that, while pleuritis is on one side of the chest, the pain is sometimes on the other, an assertion which has been directly contradicted by Andral and Wintrich, but which has recently been corroborated by Gerhardt, who, in order to explain it, has supposed that there is an anastomosis of the sensory nerves of both halves of the chest. This proposition Huss, one of his pupils, has endeavoured to demonstrate anatomically (*Archiv für Klin. Med.*, vol. ix, p. 242).

In regard to treatment, the patient was ordered to be kept strictly in bed, to have beef-tea diet, and to have large doses of diuretics (iodide of potassium and infusion of digitalis). On the following day, the area of dulness over the left chest had increased, but the breathing was slightly better. On the 27th, two days after admission, there was evidence of still further effusion, and the dyspnoea was very considerable. I performed paracentesis, and drew off forty-five ounces of fluid, which was clear and of a dark amber colour. When examined microscopically, it contained numerous blood-corpuscles. On being allowed to cool, it coagulated to a firm gelatinous mass. The patient experienced no pain or cough during the operation, and there was great relief to the breathing, the respirations becoming slower, fuller, and deeper. The apex-beat returned gradually to its normal position as the fluid was drawn off. In the evening, the temperature was 103.6 deg.; breathing easy. On the following day, the morning temperature was 98.6 deg. He had passed a good night, and expressed himself as feeling greatly better. On June 29th, there was dulness over the left back as high as the sixth rib. The local application of iodine was ordered, and acetate of potash, in twenty-grain doses, was ordered to be added to the mixture.

July 7th. The diuretic had acted well, and the iodine had produced slight vesication of the skin. The dulness over the left chest was nowhere absolute; but the resonance was still slightly impaired at the base. For the last few days, a friction-sound had been heard over the lower part of the lung; the apex-beat was in its normal position. From this date, the patient's progress was one of continued improvement. He daily gathered strength; he had no urgent chest-symptoms; the dulness at the left base became less marked, the friction disappeared, and he became quite well. Towards the end of the month, there was a return of pleuritic symptoms, owing to fresh exposure to cold; but these were not of a serious character.

In the two cases of acute pleurisy occurring as a complication of enteric fever, paracentesis was performed three times in each case. The first was a young man aged 19, and the pleurisy came on during a very severe and protracted attack of enteric fever. The effusion was on the right side, and was of a sero-fibrinous character. The amount of fluid removed was on the first occasion 46 ounces, on the second 56 ounces, and on the third 123 ounces. The urgent dyspnoea was greatly relieved by the operation, and the patient finally recovered. In the second case, the patient was a gamekeeper aged 43, and the fever was of a severe type. The chest-symptoms first appeared on the twenty-fourth day of the disease, and the effusion was on the left side. The fluid removed at the first operation measured 50 ounces, at the second 47 ounces, and at the third 90 ounces, and was always of a serofibrinous character. Recovery was complete, and the patient now continues to follow his usual occupation without ever experiencing any chest-symptoms.

2. *Chronic Pleurisy.*—Of the cases of subacute or chronic pleurisy, the following is a good illustration.

J. L., aged 23, called at my house on August 18th, 1876. He had been sent to me by Mr. Arras, surgeon, of Wetheral. He stated that he had always enjoyed good health until nine weeks previously, when, after returning from fishing, he was seized with pain in the right side and distress in breathing. He had no cough. The pain in the chest continued for about a fortnight, but he did not feel sufficiently ill to leave his work. As the pain subsided, he began to experience greater difficulty of breathing, especially after slight exertion; and, as this symptom continued, he sought the advice of Mr. Arras, who recognised the presence of a large effusion occupying the right pleura

* Read in the Section of Medicine at the Annual Meeting of the British Medical Association in Manchester, August 1877.