On sub-cutaneous pneumatic aspiration, as a method of diagnosis and of treatment / by Georges Dieulafoy.

ON

SUB-CUTANEOUS PNEUMATIC ASPIRATION,

AS A METHOD OF

DIAGNOSIS AND OF TREATMENT.

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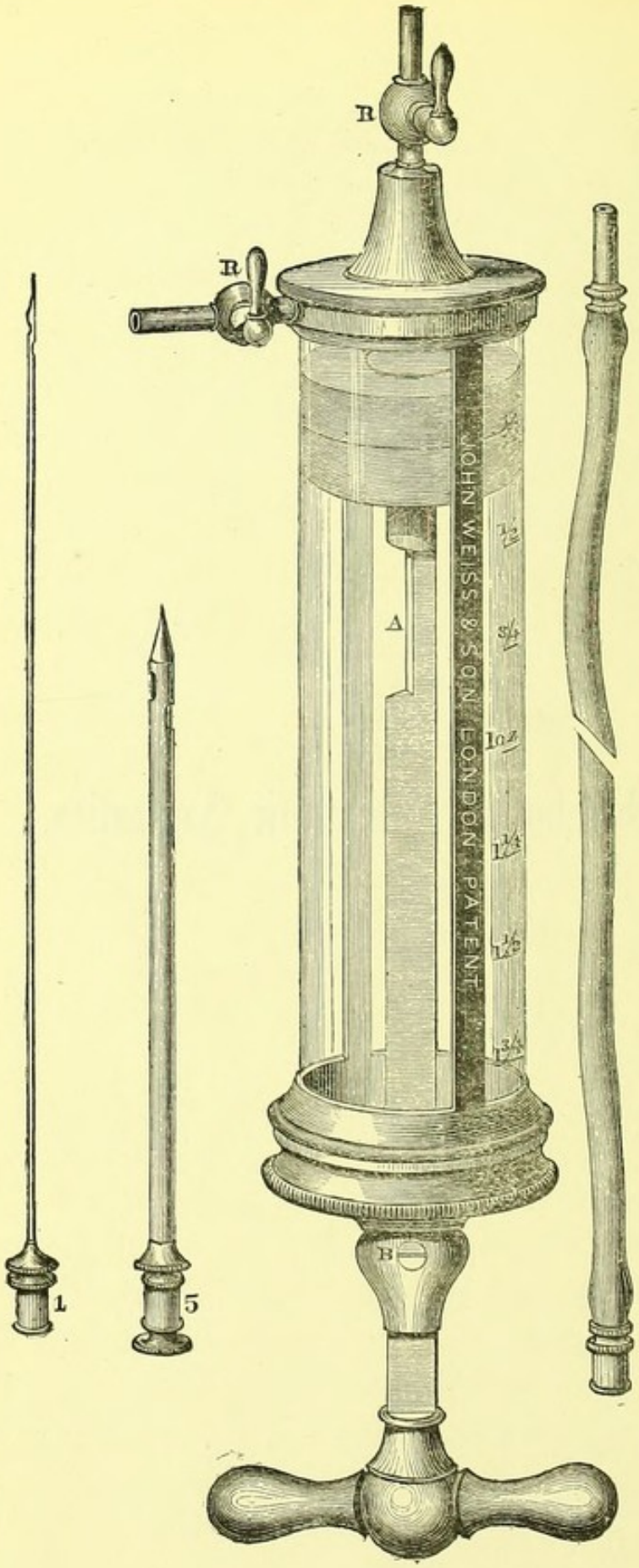
Sub-cutaneous Pneumatic Aspiration.



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EXPLANATION OF THE FIGURES.

The taps RR' are closed when they are placed *across* the tubes.

The operator first obtains a vacuum in the aspirator in the following manner :—

1. Close both the taps RR'.
2. Draw up the piston to the full extent, and fix it by a slight movement of rotation from *left to right*. By this turn the notch A, in the piston rod, is locked upon a catch at B, so that the piston cannot be driven down by atmospheric pressure.
3. After having penetrated the tissue to be explored, attach the aspirator to the needle or trocar. If necessary, this may be done through the intermediation of a caoutchouc tube.
4. Open the tap corresponding to the canula, and the fluid will flow into the body of the pump.

When it is desired to expel the fluid in order to make a second aspiration, it is first necessary to release the piston by a reverse rotation, from *right to left*.

The introduction of the needle into the tissues requires some precautions. In place of endeavouring to penetrate by pressure, as with an ordinary trocar, it is preferable to combine pressure with rotation, by taking the needle in the forefinger and thumb, and rolling it between them. Such a manœuvre is rendered necessary by the extreme fineness of the needle, which would be liable to bend or twist if driven by direct pressure. Before using a needle it is well to be assured of its permeability. If the aspirator is used but seldom, it is necessary to be careful to soften the piston with water, and then to grease it, so that the vacuum may be perfect.

Sub-cutaneous Pneumatic Aspiration.

Sub-cutaneous Pneumatic Aspiration constitutes a method of diagnosis and of treatment. It is a matter of well-known difficulty to make sure of the presence of a purulent collection, confined beneath muscles or aponeurosis, in such regions as the thigh, the neck, or the iliac fossa, or in the interior of deeply-seated organs, such as the liver or the kidney. The observer is, in such cases, compelled to remain in doubt with regard to the presence and the nature of a liquid, that for a time neither discovers itself by marked swelling nor by fluctuation.

In what manner may we attain to certainty with regard to the existence and the situation of such a collection, or determine whether surgical interference would be useful or injurious? I have constantly been struck with the insufficiency of our means of investigation in these doubtful and difficult cases; and, both in medicine and surgery, I have many times seen the most skilful kept in suspense, and compelled to postpone diagnosis, or to defer treatment, until more certain signs or stronger probabilities appeared to clear up the case.

But there are many instances of the kind in which delay is dangerous; as when a deeply-seated abscess threatens to invade

certain regions, or when an effusion within the pericardium may at any moment produce syncope. Hesitation is inadmissible; and yet doubt paralyses our efforts.

In order to meet the requirements of such conditions, the exploratory trocar was invented; but it is necessary to recognize that this trocar, capillary only in name, responds in no single particular to the idea from which it sprang. It carries with it its own condemnation, being at once too large and too small. It is bulky when compared with the fine needles employed for hypodermic injection; and yet, although its calibre is considerable, it often presents an obstacle to the escape of fluid, if that be a little viscid, or if the channel of the canula become obstructed. It is then necessary to compress the part that is being explored—a manœuvre not always free from danger, and often barren of result.

From hence arises the indication to employ tubular trocars, of a diameter so slender that the most delicate organs may be traversed by them with no more inconvenience than by acupuncture needles, the perfect innocuity of which we know; and from hence also the indication for a means of causing the liquid to flow outwards through the tube by a powerful aspiration. I have obtained this aspiration by having procured the construction of a veritable air-pump in miniature.

In order to produce a vacuum within the pump, it is necessary first to close the two taps at its lower part, then to draw up the piston, and, when this has reached its full height, to give it a slight movement of rotation. It is then held fast by means of a notch cut in the length of its stem. The vacuum is thus obtained as a preliminary measure, and the operator is in possession of a

powerful aspirator, ready to be used when the proper time arrives.

Let it be supposed that we wish to examine an effusion into the cavity of the pleura. The tubular needle No. 1 or No. 2 must first be introduced at an intercostal space, and, when it has penetrated the tissues for about a third of an inch (one centimetre), it must be connected with the pump, in which the vacuum has been established, either directly or through the medium of a caoutchouc tube. This done,—and to this point I desire to call special attention,—the tap must be opened between the needle and the vacuum, and the needle pushed gently forwards. We may thus slowly traverse the tissues, so to speak, with the vacuum in hand, until we discover the effusion. The eyes of the operator should be directed to the glass body of the pump; and, at the moment when the needle enters the liquid, the latter rushes forcibly into the instrument. The diagnosis is at once complete; the manœuvre is absolutely harmless; and the desired object is attained.

I have supposed, for the purpose of demonstration, an effusion into the pleura; but the method of procedure is precisely the same for collections of fluid of all kinds and of every situation,—for effusions into the pericardium, the thorax, or the abdomen; or for cysts of the kidney, the liver, or the ovary.

Thanks to the manipulation that has been described, and to the command of the preliminary vacuum, it is impossible to pass beyond a layer of liquid. This is of importance when the collection is of small extent, or deeply seated. At the moment when the fluid is reached, the diagnosis will be written upon the instrument, sometimes even unknown to the operator.

If the exploration affords no result, we have a proof that the region explored contains no liquid. It is, of course, possible that the tube might be obstructed ; but such an accident must be rare. I have never seen an instance of it ; and, if it occurred, it would be easily remedied, either by using another needle, or by pushing back the obstacle with a silver wire.

I have been accustomed to employ chiefly the No. 2 needle for ordinary exploration, and to reserve No. 1—the calibre of which is extremely fine—for organs of the susceptibility of which it is impossible to be too careful, as for effusions into the pericardium or upon the brain. I have now practised aspiration very frequently, have inserted the needles into joints, into the lung, into the bladder, and into the pelvis through the vagina, and I have never witnessed a single accident.

I have hitherto spoken of the results afforded by pneumatic aspiration as an aid to diagnosis. What are the services that it may render as an aid to treatment ?

The extreme gravity of wounds of certain serous membranes, and the consequences that may follow from the introduction of air or of liquids into their closed cavities, have rendered surgeons extremely careful with regard to the exploration of these cavities. We think twice before we plunge a trocar into the knee-joint ; the supra-pubic paracentesis of the bladder is attended by very decided danger of contact of urine with the peritoneum ; and we know instances in which the simple exploration of abdominal tumours has been followed by accidents that have produced fatal results. Considerations like these have always and rightly induced practitioners to explore with great caution, and often to seek to attain their ends by methods more or less circuitous.

Effusions into joints have been treated by pressure, by blistering, and by tincture of iodine; retention of urine has occasioned operative proceedings sufficiently difficult of performance, and but little soothing in their effects, such as forced catheterism, perineal section, or rectal or supra-pubic puncture. It is far from being my desire to underrate the services rendered by these various means; but I may be permitted to call attention to the results obtained by pneumatic aspiration.

With regard to the evacuation of effusions into joints by this method, I have now collected a large number of cases; and the *Gazette des Hôpitaux* of June the 8th recorded some facts bearing upon the question, derived from M. Gosselin. In an extremely painful sub-acute arthritis of the knee, M. Labbé made aspiration, and a single operation produced an immediate cure. Under other circumstances, M. Chairou, of the *Asile du Vésinet*, performed aspiration and injection with tincture of iodine, for purulent deposits in the knee and elbow joints. On many occasions, in the Necker hospital, under the charge of M. Potain, I have drawn out the liquid from the knee joints of patients suffering under rheumatism, and simple or gonorrhœal arthritis; and in none of all these instances has there been the slightest injurious effect. The question is therefore practically determined; and whenever we suspect or discover the presence of an articular effusion, either simple, sanguineous, or purulent, as in coxalgia, in rheumatic or gonorrhœal arthritis, or in hydrarthrosis, we may without risk remove such effusion by pneumatic aspiration. A single aspiration will usually be sufficient; if the liquid re-collects after a second or a third operation, we may then use an iodine or alcoholic injection, but such cases are exceptional.

There is a serous membrane, the pleura, not very susceptible itself, but which we can never touch without hesitation, on account of the organ that it protects. The operation of thoracentesis has become established when the pleural effusion is well declared, and we then thrust a large trocar, without fear or danger, into the thoracic cavity. But the diagnosis of effusion, and even the rough estimation of its amount, are far less established. A very considerable quantity of fluid may pass unperceived; and the puncture of the pleural cavity, for the evacuation of liquid that was present only in small quantity, or possibly not present at all, would be considered hazardous and useless. It is admitted that some patients present symptoms resembling those of effusion, although the pleura may contain no fluid; and hence thoracentesis has been reserved for cases beyond doubt. We are thus unfortunately placed with regard to a means of treatment that is used only as a last resource.

What hesitation has there been in difficult cases! What painting with tincture of iodine! What blistering to promote the absorption of the effusion! And, speaking candidly, are these various means the expressions of any therapeutic conviction? I think not. They are suggested by a prudence that sometimes resembles timidity, or by doubts that arise from our want of power to affirm a diagnosis. We may make this avowal without disgrace. We have been only in possession of signs which are not sufficient to establish the diagnosis with security. Nothing is more deceptive than ægophony. We recognize the pleurisy, but we cannot be certain about the presence or the quantity of effusion. We hold our hands, in too much complaisance to an idea that seems to reconcile the diagnosis with the hesitation. We

say, "This is a pleurisy with false membranes." We have perhaps made too much of pleurisies with false membranes. It would be nearer the truth to admit that there are false membranes in many pleurisies, and they do not prevent the effusion of even many thousand grammes of liquid.

Let us put the question in another form. We may affirm, I apprehend, without fear of contradiction, that it is for many reasons hurtful to have fluid in the pleura; and that, if we have in our possession an innocuous and certain method of discovering and treating effusions into the thoracic cavity, we ought not to lose an instant in its employment.

Such a method I believe to be afforded by pneumatic aspiration. I have already shown the manner of proceeding to search for a pleural or a pericardiac effusion; and I have now either witnessed or performed a great number of operations of the kind, and have recorded many cases in the *Gazette des Hôpitaux* (March 26 and 31, 1870).

The presence of the liquid being discovered, it may either be drawn off through the No. 2 needle, or by introducing the No. 4 trocar. The aspirator, which will hold a fluid ounce and a half of liquid, is suffered to fill itself in the ordinary manner, and the tap between it and the thorax is closed. The tap on the other tube is opened, and the liquid expelled through it by pushing down the piston. The tap is closed, the piston drawn up, and the thoracic tap opened once more. This proceeding allows the fluid to be removed slowly, and is on this account advantageous to the patient, who is not attacked by the paroxysms of coughing that are frequently so violent during paracentesis performed in the ordinary way. The introduction of even a single air bubble is rendered

impossible, since the only communication is between a cavity containing liquid and another that has been previously rendered vacuous.

The pleural cavity being emptied, it may be washed out at the same sitting with warm water, or injected with an iodine or alcoholic lotion. For this purpose the fluid must be drawn into the aspirator through the free tube, and expelled from it through the thoracic tube.

There is one contingency to which it is necessary to refer, and that is, if exploration should be made for an effusion that does not exist. Such an occurrence must be exceptional, because, although it is common to overlook an effusion, it is very rare to suspect the presence of fluid when there is none. In such a case, however, the operator would reach the pleura, and nothing would appear in the aspirator. The worst that could then happen would be that the lung would be punctured more or less, and that a small jet of red and frothy blood would enter the vacuum. I have seen many occurrences of this kind in the wards of M. Axenfeld ; among others, in a man with hydrothorax, and in a woman with pleuro-pneumonia ; but the wound of the lung was so fine as to be harmless, and I have never known any evil result follow it. We may even ask whether direct depletion of the lung might not be indicated in certain states of congestion, or at the commencement of pneumonia.

Under certain circumstances pneumatic aspiration is applicable to hydrocephalus. I was called by Dr. Blache to an infant seven months old, in whom hydrocephalus had declared itself only a few weeks before, but the rapid progress of the disorder had already given considerable bulk to the head. We practised fourteen suc-

cessive aspirations, and drew off sixteen ounces (500 grammes) of liquid. Thanks to this treatment, the hydrencephalic cries have ceased, the head has diminished in volume, the forehead is lower, the fontanelles less extended, and no accident has been produced by the operations. It is necessary to be careful to avoid the sinuses, and not to enter the needle too far forward. I have employed for this purpose the No. 1 needle, and, after each puncture, we applied pressure to the head by means of very delicate caoutchouc bands.

The pneumatic aspiration may be applied also to the diagnosis and treatment of purulent collections of various origin and situation. In such cases the No. 3 trocar is often useful, and the No. 2 needle may be reserved for delicate organs.

We may in this manner entirely avoid incisions and all their consequences, such as erysipelas, the introduction of air into abscesses, and cicatrices. I have in this way emptied and cured a large suppurating cyst on the face of a young girl. M. Potain has obtained a good result by successive aspirations in a phlegmon of the scalp with detachment of the pericranium. Scrofulous abscesses, buboes, suppurating tonsils, and abscesses of the pharynx, may all be treated in the same manner.

Collections of pus in the pelvis of the female deserve particular attention. A short time ago M. Axenfeld practised aspiration upon a woman in his wards, who was the subject of peri-uterine cellulitis. He first introduced a speculum, and then passed a long needle, No. 2, through the vaginal wall, to search for the abscess in the customary manner. At the moment when the needle entered the abscess, the pus was driven into the cylinder of the aspirator. Dr. Marion Sims, who has carried out the

same method in New York, has also had evidence of its good effects.

The bladder, in cases of retention of urine, may be emptied, and has been emptied, by the aspirator without risk. The No. 1 needle should be introduced above the pubes, and the urine drawn up. The puncture is so fine, and the walls of the bladder are so contractile, that no escape into the peritoneum can possibly take place. When the aspiration is finished, it is well to draw out the needle quickly, or first to aspire the few drops of urine contained within its channel.

Any necessary time may then be taken to overcome the urethral obstruction; for the aspiration may, without the least inconvenience, be repeated many days in succession.

I have also witnessed the cure of synovial cysts, and of effusions of blood, by pneumatic aspiration. For the latter, especially, patience is required; and, if the collection forms anew, it must be repeatedly emptied, and treated with slightly irritating injections.

The aspirator will afford the means of removing the gas which accumulates in large quantity in cases of intestinal obstruction, and in typhoid fever, and which is sometimes a cause of dyspnœa.

I have now just indicated the principal applications of Sub-cutaneous Pneumatic Aspiration. There is still much to say concerning a method which may be employed under such varied circumstances; but I think I am entitled to draw the following conclusions :—

1. It is always possible, by means of Sub-cutaneous Pneu-

matic Aspiration, to explore without danger for any collection of fluid, whatever may be its seat or nature.

2. The same method may, according to the case, be employed for diagnosis, or for treatment.

To the foregoing pamphlet may be added the following illustrative cases, quoted from a paper on pleuritic effusion, contributed by the author to the *Gazette des Hôpitaux* for the 28th of April, 1870 :—

Case 1.—During last January I was requested by M. Matice, physician to the Beaujon Hospital, to explore by the aspirator the chest of a patient in his wards. The case was sufficiently doubtful to render it desirable, before deciding upon paracentesis, to obtain certainty of the existence of an effusion. M. Axenfeld examined the patient ; and at the back of the chest there was such an absence of characteristic signs, that, without further research, the presence of fluid would certainly have been denied. Only in the right axilla could dulness be discovered, of small extent, varying with the position of the body, and attended by very slight ægophony. The liver was depressed. With such slight symptoms as these one could admit the existence of an effusion ; but there was no reason to suppose that it would require paracentesis.

I performed pneumatic aspiration, and, to the surprise of those present, this doubtful effusion yielded nearly four pints (2,400 grammes) of slightly purulent fluid.

Case 2.—About two months ago I was called by Dr. Souchard to a woman, thirty years of age, who had been three weeks confined, and who had been attacked at the time of her delivery by pleurisy of the right side, with effusion, which followed an irregular course consequent upon the puerperal state. The physical signs became gradually obscure, while the general symptoms rapidly increased in severity. A consultation was held, at which paracentesis was not recommended.

I saw the patient at a late hour of the night. Her dyspuœa was then extreme, her countenance livid, her speech short and gasping, and her mind wandering. Asphyxia seemed imminent. There was general dulness of the right side, with bronchitic *râles* over the whole of the left side and at the upper portion of the right. It was impossible to determine the presence of such signs as ægophony, souffle, absence of fremitus, or displacement of organs, on account of extensive œdema of the chest and abdomen. I performed pneumatic aspiration without delay, and withdrew more than three pints (2,000 grammes) of purulent fluid.

Case 3.—On the 14th of March I was taken by M. Martineau to a patient whose history was interesting in more than one respect. Six years previously she had been attacked with symptoms of pleurisy of the left side, and she perceived that her heart beat against her right axilla. She mentioned this to her physician, but he, in his capacity as homœopath, did not concern himself about such a trivial detail, and continued the administration of his globules.

For six years this patient had kept her room, and she would spend whole months in bed. M. Martineau, who had recently been consulted, found general dulness of the left side, and the heart beating in the right axilla.

We examined the patient together. The dulness of the left side was complete, and all other symptoms were absolutely wanting. To our surprise, there was complete absence of deformity. The most careful measurement showed the left side to be only about a sixth of an inch larger than the right. The œdema of the parietes rendered it impossible to discover whether the spleen was displaced.

I performed exploration with the No. 2 needle, then replaced it by the No. 4 trocar, and drew off more than six imperial pints (4,000 grammes) of fluid. After the operation, the heart beat in the space between the right breast and the sternum; and we discovered respiratory murmur in the left axilla.

Case 4.—A woman, aged 38, entered the Beaujon Hospital, under M. Axenfeld, for a catarrhal pneumonia. Eight days afterwards a slight friction-sound, and the commencement of broncho-ægophony, were discovered at the back of the left side below the angle of the scapula. On the following day the ægophony was more pronounced, the dulness more defined, and there was a slight *souffle*. An effusion was diagnosed. The symptoms continuing, pneumatic exploration was decided upon. The No. 1 needle was introduced in the seventh intercostal space behind the line of the axilla, and 2½ drachms (10 or 12 grammes) of pale yellow liquid rose into the pump. Fearing not to have gone deeply enough into the fluid, the needle was pushed farther; the resistance of lung was felt, and red and

frothy blood came into the cylinder, showing that the lung had actually been penetrated. A second exploration was made below and behind the first, and with the same result: the flow of liquid soon stopped, and the needle, when pushed on, was distinctly felt to penetrate the lung—a sensation that was again confirmed by the appearance of blood in the aspirator.

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