THE TREATMENT OF RESPIRATORY AFFECTIONS

BY MEANS OF

LARGE MEDICINAL INJECTIONS THROUGH THE LARYNX.

BY

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To Professor A. Rosenberg, of Vienna, is due the credit of originating the method of treating pulmonary and laryngeal phthisis by the direct injection of medicinal fluids into the larynx and trachea through the glottis. His first paper on the subject was published in the 'Berliner klinische Wochenschrift' in 1885, and a more extended report on cases in the same journal in 1887.

Experiments to show its practicability, and the rapid absorption of which the pulmonary tissues are capable, have been made by Sehrwald and Reichert. The former ('Practitioner,' vol. xxxvii, 1886) injected the fluids "percutaneously," i. e. through an artificial opening in the trachea of dogs; and the result of his experiments showed—

1. That large quantities of fluid could be injected without discomfort.

2. That the fluids not only passed into the alveoli, permeating the surrounding tissues, but also reached the peribronchial and pleural fibrous structures, and even penetrated the cartilages themselves.

3. That the lungs absorb more rapidly than the digestive tract, or even the subcutaneous tissue, the rapidity of absorption corresponding with the extent of the absorbing surface: so much so, indeed, that the lung of a dog can absorb four times its own weight in less than five days.

4. That medicines thus introduced act in smaller doses, and more rapidly, than when introduced in any other way.

Reichert's experiments, made on calves and sheep, proved that the fluid injected found its way even into the finest bronchioles.

The 'Edinburgh Medical Journal' of January, 1888, contains an interesting report from Dr. A. Behag; and the method subsequently received considerable attention in Scotland from Drs. Jamieson, Downie, and others, who reported cases in the Edinburgh and Glasgow medical journals. Dr. Byrom Bramwell also reported two or three cases in his 'Clinical Studies' (June, 1889).

Rosenberg had recommended a solution of menthol, on which he relied because of its twofold (anti-bacillary and anæsthetic) action, in olive oil; and this solution, in varying strengths and doses, is the remedy used and reported on by the practitioners I have referred to. The cases treated appear to have been pulmonary phthisis and ulcerations of the larynx.

The last authority of importance to whom I shall refer, is Sir T. Grainger Stewart, who reported ('British Medical Journal,' vol. i, 1893) two cases of bronchiectasis treated with good results. He used a solution of menthol and guaiacol in olive oil.

Notwithstanding this publicity, and the favourable

opinion expressed by those who have tried it, I think I am justified in saying that to the great bulk of practitioners the treatment is unknown. This is my justification for asking the Royal Medical and Chirurgical Society to affix the stamp of its approval to a method which, in my humble opinion, opens up an entirely new field for pulmonary medication, and by a method eminently rational.

To bring the remedial agent into direct contact with the diseased part is a principle so well recognised in surgery, that it should require no argument to prove the *rationale* of extending its application to diseases of the respiratory system. Can anything be more faulty than our present system of attempting to render "aseptic" a pulmonary cavity—filled with tenacious muco-pus, and inhabited by myriads of bacilli—by a vapour, not a tenth part of which probably ever reaches the affected parts? I freely admit that improvement often follows the constant inhalation of the vapour of antiseptic drugs. But who would attempt the treatment of a spinal abscess by a "vapour" if he could wash it out first, and then send in his antiseptic solution or fill it with aseptic absorbent?

We are not yet in a position to attempt, with any hope of success, the washing out of a pulmonary cavity, but instead of the vapour or "smell" of an antiseptic we can send in the antiseptic itself.

If an ordinary abscess cavity were quite the same as a lung cavity, this would not be so much of an improvement in treatment. There is, however, some difference.

A lung cavity does its best to empty itself; not so an abscess. The persistent cough which accompanies it forces out its contents; and by suitable injections we can not alone aid this effort of nature, but make a reasonable attempt to render *less actively* septic that which remains behind.

Is the treatment by intra-tracheal injection easily practicable?

All the writers on the subject answer in the affirma-

tive. I think, however, that much practice is required to do it in a satisfactory manner. I have given nearly 4,000 injections, and thought myself an adept after the first dozen. I no longer think so. As in vaccination, or many other simple "operations," we always think ourselves perfect, yet practice reveals to us our imperfections. I shall, however, recur to this point.

I am not aware of any published cases showing the effects of intra-tracheal treatment in other diseases than phthisis, laryngeal ulcer, and bronchiectasis; but during the past eighteen months I have tried it in other pulmonary diseases, and with the most satisfactory results.

I propose to group the cases, rather than take them in chronological order. As there is only one case of bronchiectasis, I take it first.

No. 12.—It was a case of old-standing disease—one of the earliest cases treated by me. Having Sir T. Grainger Stewart's paper before me, I expected good results. One drachm, and later $1\frac{1}{2}$ drachms, of a solution—4 per cent. guaiacol, 12 per cent. menthol, in olive oil—were injected twice daily for a month, but no beneficial result followed. Observation of this case first suggested to me that olive oil was not the best vehicle in which to convey the medicinal agent to the lung. A demonstration of this was easy. I collected some of the dense expectoration from the case in a test-tube, closed with a cork at one end, and poured some of the oily solution on to it; after twenty-four hours the oil still remained at the top, whilst the lower stratum (which could be smelt by removing the cork) did not appear to contain either menthol or guaiacol. A glycerine solution at once suggested itself. My first experiences with glycerine solutions were, however, quite unsatisfactory. I could only note that *in a test-tube* it mixed better with expectorated material, and therefore presumably ought to bring the drugs (if it would only carry them) into closer contact with the diseased parts.

It is all very well to demonstrate, as Sehrwald and

Reichert have done, that the injected material can be found all through the lung tissues after an injection. So could it be found in the bladder. A few minutes after an intra-tracheal injection of turpentine I have noticed the characteristic smell of violets in the urine.

The simple tube experiment mentioned suggests that the finding of menthol in the bronchioles, &c., after the injection of an oily solution (not miscible with the bronchial secretions) is more probably due to a secondary effort at *excretion* (subsequent to absorption) so easily noticed in the kidneys; and this, although probably very beneficial, is, I take it, quite different from bringing the original strong solution into *direct contact* with the diseased parts.

That glycerine is the best solvent for remedies directed to pulmonary phthisis, bronchitis, or asthma, I have no doubt; but for months I did not succeed in finding a satisfactory solution. It is unnecessary to go into detail. I found that the ordinary "glycerines" are most irritating to the bronchial membrane. Price's distilled glycerine is not so. Menthol, guaiacol, creasote, benzosol, &c., can be kept in solution in glycerine by heat.

The consideration of case No. 12 and its lessons have drawn me from the path. I now propose to take up the cases of phthisis, and roughly place them in two groups: (A) with cavities; (B) with consolidation. The table of cases appended also shows those cases in the sputa of which bacilli were found; and I place the specimens before the Society.

(A) No. 1.—When this patient commenced treatment, in June, 1893, her right lung was one vast cavity; her sputum was loaded with bacilli. I can only say that she is still alive, and comes for injections two or three times a day; when she is unable to come she complains of being worse in every way—she loses appetite, the cough becomes more troublesome, and the pain is more acute. She has had at least 1450 injections; No. 1 solution (see page 50) appears to do her most good. •

No. 2 may be regarded as a really satisfactory case. Her father and mother had both died of phthisis under my care. When she commenced treatment she had a small cavity in the right apex, and the sputum was loaded with bacilli. She has now regained flesh and lost her cough, and the cavity is apparently cicatrising. No. 1 solution appears to have done most good.

Cases 3, 4, 5, and 7 may be considered together. They were all cases of advanced phthisis with large cavities existing in one or both lungs. They were not improved, although they expressed themselves *relieved*, by the treatment.

(B) The cases of phthisis in which no cavity could be found show much more satisfactory results.

No. 8 is probably the most remarkable case. Her father and mother and one sister (out of two) have all died of phthisis. She was distinctly tuberculous, sweating and diarrhœa regularly alternating in attendance on a persistent hard cough. The diarrhœa was not checked, although everything was tried, till I commenced the injection of benzosol. She has gained much flesh, but a continuation of "fresh colds" (almost impossible to be avoided by a girl who leaves a hot woollen mill and walks four miles daily for her injection) always appears to block the path to recovery.

No. 9.—His mother died of senile phthisis, his father of cancer. When the patient first came for treatment he had recently had an attack of hæmoptysis; he had a persistent cough, and was losing flesh. Twenty injections appeared to cure his cough, and he has followed his occupation as a stonemason for the past twelve months. In this case the solution recommended by Sir T. Grainger Stewart—menthol, guaiacol, and oil—was used throughout.

No. 10 was a case of an almost exactly similar character. She consulted me a few days after an attack of hæmoptysis (which was preceded by cough and loss of weight). One month's daily injections cured her cough, whilst she gained 8 lbs. in weight. She has continued

well ever since. Both her parents died of phthisis. Treatment: Sir T. Grainger Stewart's solution; later No. 1 solution daily, at one sitting.

No. 11 was a case of consolidation of the right apex with asthma (which had existed four years). About twenty daily injections completely relieved the asthma. He thought himself cured, and I lost sight of him then. No. 1 solution was used in 3-drachm doses.

No. 10A unfortunately only shows the results of clumsy manipulation. Three of the patient's brothers had died of phthisis, one under my care. It was a typical case of early laryngeal tuberculosis with ulceration. The sputum pellets showed masses of bacilli, and he was rapidly losing flesh. I could not, however, convince the patient that there was anything seriously wrong with him, and portions of a few injections of Sir T. Grainger Stewart's solution having unfortunately found their way into the stomach and caused discomfort, the patient discontinued treatment. I have heard nothing of him since. (I shall refer to the results of injections finding their way to the stomach again.)

No. 21.—An advanced case of pulmonary phthisis with cavities, laryngeal ulceration, and severe dysphagia. Patient attends irregularly, but injections of 3 drachms of No. 1 solution on alternate days have almost completely relieved the throat symptoms. At first an injection was followed by loss of pain for eight hours; now the relief continues for forty-eight hours.

(Note.—This cumulative effect [as an anæsthetic] of menthol is referred to by Dr. Rosenberg in his second paper.)

In every case of phthisis treated (excepting 10A) the patients expressed themselves as much relieved by the treatment. Even in the fatal cases, relief of cough, pain, soreness in throat and sweating was always expressed. Excepting the case 10A, no patient ever sought other treatment when this failed, so satisfied were they with its reasonableness and effects.

In no case, however, can I claim a *cure* of phthisis in the third stage. Case 2 looks hopeful, but I am well aware how rapidly such cases relapse. I think, however, that cases 8, 9, 10, and 11 testify to important results in the early stages, so far bearing out the observations of Rosenberg, Behag, Downie, and others.

Three cases of phthisis remain to be mentioned ; I shall refer to them under the head of hæmoptysis.

The other cases which follow show more satisfactory results for intra-tracheal treatment ; for example :

No. 6. *Abscess of the lung*.—He came to my surgery, October, 1893, supported by his wife and a friend. The history was that he had had a cough for a year ; three months since he had an attack of pneumonia. When I saw him his respirations were 40 per minute, temperature 102°, pulse 120. He was livid in the face, his left lung appeared to be rapidly softening in the lower two thirds, and he was spitting 38 oz. of red, stinking matter—mostly pus—in twenty-four hours.

I first injected 1 drachm of oil of turpentine (with an equal quantity of olive oil) daily for four days ; then changed to terebene in equal strength. Many other combinations were tried during seven months of treatment, after which he returned to his work apparently “cured.”

No. 13. *Chronic pneumonia*.—A boy æt. 14 had had two attacks of pneumonia. Three months after an imperfect “recovery” from the last attack he continued to expectorate large quantities of muco-pus, slightly tinged with blood. His respirations were 32, pulse 110, face livid, and shoulders much stooped. He was treated for four months, during which time he had 250 injections—turpentine, terebene, Sir T. Grainger Stewart’s, and finally No. 1 solution being used. At the present time—four months after treatment has been discontinued—he appears perfectly well.

No. 14. *Asthma*.—This is a remarkable case. The patient had suffered from asthma almost continually for

twenty years. At the time the intra-tracheal treatment was commenced he had been using "Himrod's cure," four or five times a night, for some months. After the first half-dozen squirts he was enabled to discontinue its use; whilst twenty-four daily injections (last given April, 1894) appear to have "cured" him, as he has not had a single attack since.

The *expectorant* power of glycerine injected into the lung was well evidenced in this case. At first I injected, alternately, oil, solution No. 1, and a glycerine solution of menthol and benzosol. Both gave relief—the oil for four or five hours; but the injection of the glycerine solution was always followed by a copious *emptying* of the lungs, causing relief for twenty-four hours. This I think is another advantage of glycerine over oil.

No. 15.—A lady æt. 65 had suffered from asthma with bronchitis for over twenty years. She still suffers from bronchorrhœa; but she has not had a "bad night" since last May, when she finished her course of twenty-four daily injections, the same as used in the last case.

No. 16.—Third case of asthma; he was unable to work when I first tried the treatment. Ten daily injections (alternated as last) relieved him so much that he was able to take work at an iron foundry. Lately he has been coming every Sunday for an injection, which he says "opens his lungs" for the week.

No. 17.—There is nothing remarkable about this case of chronic bronchitis of an ordinary character. The patient had six injections only of No. 1 last May, and says that he has never been "bad" since.

Nos. 18, 19, and 20, laryngitis and aphonia, may be taken together. They were all treated with No. 4 solution (injected once daily through a nozzle with *side* openings), and were immediately "cured."

Hæmoptysis.—There remain Cases 22 and 23. No. 22 is a case of advanced phthisis, and 23 is in an early stage. In each hæmoptysis was the symptom treated. I place them, therefore, under that heading. In No. 23 severe

hæmorrhage occurred last March, and continued two or three days. It did not recur after an injection of 4 drachms of No. 2 solution. This is only mentioned as an example of the use of turpentine intra-tracheally. No. 23 is a better example. I was called to see him on October 19 last. At 5 a.m. that day he had suddenly expectorated $\frac{3}{4}$ of a pint of bright red blood. When I saw him at 11 a.m. he had again commenced to spit copiously. Ergot, gallic acid, &c., were prescribed with temporary relief, but the following day he was again spitting blood freely. I then injected 2 drachms of oil of turpentine with an equal quantity of olive oil; in a few minutes the bleeding ceased, and has not recurred. The injection was repeated on the two days following.

P.S.—A third case of hæmoptysis has since been treated by injection of turpentine. S. S.—, æt. 48, had a severe hæmorrhage on November 16th. In spite of a strong acid astringent which had relieved him on two previous occasions, he was still spitting blood profusely when I saw him on the night of the 18th. Two drachms of turpentine in olive oil were injected, after which no more *red* blood was expectorated. The injection was repeated on the two following days. As in the other cases mentioned, no inconvenience was caused by the treatment.

It is unnecessary for me to describe the *modus operandi*, but I would venture to differ from what has been written on the question of dosage. Neither Rosenberg nor Downie states exactly what quantity he injects at each "squirt," though they mention $\frac{1}{2}$ to 1 drachm at a *sitting*. Bramwell suggests 15 minims at once. I have found it best generally to empty a syringe holding about 100 minims at *each squirt*, and to repeat this 100-minims two or three times at each sitting.

Differences will be found, strange to say, in the position of the rima glottidis with regard to the base of the

tongue, and occasionally one finds a patient in whom the epiglottis habitually forms an acute angle with the rima.

The size of the rima, again, differs much in different patients. To learn my way about, therefore, I always use a laryngeal reflector for the first few injections, and afterwards I work without one.

If, when the injection is delivered, the patient be directed to incline or lie on either side, it appears probable that the bulk of the fluid will gravitate in the desired direction. I have tried to inject patients whilst they were leaning to one side, but the result was unsatisfactory.

At first I employ tongue traction, but after a few injections the patients do it, holding the tongue with their own pocket handkerchiefs, thus diminishing the risk of infection.

After each sitting the syringe should be washed out with a strong solution of carbolic acid.

If the operation be properly performed no inconvenience results—neither asphyxia (which has many times been suggested to me as *impossible* to avoid), pain, nor even *cough*. At first, I confess, my patients grumbled much, but after a painstaking experience of a few dozen injections, complaints became less frequent.

Three mistakes are liable to occur :

1. Touching the fauces, base of tongue, epiglottis or rima glottidis with the nozzle of the syringe.
2. Squirting down the œsophagus.
3. Squirting during expiration.

If the first happen, efforts at vomiting usually result. If the second, gastric pain occurs, with unpleasant eructations when menthol or guaiacol is used. If the third, a feeling of suffocation follows, whilst some or all of the fluid intended for the lungs is returned into the mouth. These unpleasant results can best be avoided by great care in passing the tube through the mouth and fauces. When the nozzle of the tube is seen to be behind and below the

top of the epiglottis, the tube should be rapidly passed into the larynx, and should fit the curve of the base of the tongue, and lie tightly against it, thus *fixing the epiglottis* and *preventing spasm*. The squirt should be delivered like lightning—either with inspiration, or during a slightly prolonged interval following expiration (except when used for laryngeal affections).

If the operation be properly performed, the taste of the fluid injected should not be perceived by the patient.

The object of this paper is rather to advocate a *principle of treatment* than any special drugs or combinations. I have tried many combinations during the past eighteen months, which it is useless to describe in detail. I think almost anything can be injected: water, olive oil, or glycerine can be used in quantities of 4 or even 6 drachms twice or three times a day without discomfort.

Instead of describing the many combinations tried in each case, it will perhaps be more satisfactory to mention those from which I think the best results were obtained, with the conditions to which they are applicable.

SOLUTIONS FOR INTRA-TRACHEAL INJECTION.

No. 1. Phthisis, ulceration of larynx, asthma.—(A) Benzozol 24 grains, rectified spirit $\frac{1}{2}$ drachm; mix and add Price's distilled glycerine $\frac{1}{2}$ ounce; dissolve by heat. (B) Menthol 24 grains, rectified spirit $\frac{1}{2}$ drachm, glycerine (as above) $\frac{1}{2}$ ounce; dissolve by heat. Mix A and B, and keep at a temperature of 90° Fahr. or warm before using.
Dose: 2 drachms twice or three times a day.

No. 2. Hæmoptysis.—Oil of turpentine, olive oil, of each 1 ounce; mix. Inject 4 drachms daily for three days.

No. 3. Abscess of lung, bronchorrhœa, &c.—Terebene (Cleaver's ordinary), olive oil, of each 1 ounce; mix. Inject 3 or 4 drachms daily, or use alternately with No. 1.

No. 4. *Laryngitis, aphonia*.—Menthol 24 grains, olive oil $\frac{1}{2}$ ounce; mix. Inject 3 or 4 drachms *slowly* once daily.

No. 5. *Asthma*.—Sir T. Grainger Stewart's solution: Menthol 10 parts, guaiacol 2 parts, olive oil 88 parts. Inject 2 or 3 drachms on alternate days with No. 1.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. vii, p. 20.)

Appendix to Mr. Colin Campbell's paper.

No.	Age and sex.	Disease.	Duration of treatment.	No. of injections given.	Bacilli present.	Result.
1	24, F.	Phthisis (cavity)	16 months	1450	Yes	Symptoms relieved; cavity undiminished.
2	25, F.	" "	14 "	370	"	Much improved in every way.
3	46, M.	" "	8 "	400	"	Dead.
4	43, F.	" "	1 month	30	"	Dead.
5	28, M.	" "	1 "	40	Yes	Dead.
6	51, M.	Abscess of lung	6 months	370	No	Recovered.
7	27, M.	Phthisis (cavity)	2 "	20	Yes	Dead.
8	26, F.	" "	14 "	370	"	Improved.
9	8, M.	" ?	1 month	25	—	Recovered.
10	24, F.	" "	1 "	25	Yes	Recovered (?).
10A	27, M.	" "	4 days	4	"	Discontinued treatment.
11	27, M.	Asthma	—	30	—	Improved.
12	64, M.	Bronchiectasis	1 month	20	—	No improvement.
13	15, M.	Chr. bronchitis	5 months	250	—	Recovered.
14	57, M.	Asthma	24 days	24	—	Recovered.
15	F.	"	24 "	24	—	Recovered.
16	M.	"	1 month	30	—	Recovered.
17	62, M.	Chr. bronchitis	1 week	6	—	Recovered.
18	37, M.	Laryngitis	6 days	6	—	Recovered.
19	30, F.	Laryngitis and aphonia	6 "	6	—	Recovered.
20	38, M.	Laryngitis, aphonia	6 "	6	—	Recovered.
21	38, M.	Phthisis (cavity), ulceration of larynx	14 "	24	Yes	Symptoms much relieved.
22	M.	Phthisis, hæmoptysis	3 "	3	"	Hæmoptysis ceased immediately.
23	23, M.	Hæmoptysis	8 "	3	"	Hæmoptysis ceased immediately.
24	56, M.	Chr. bronchitis	12 "	12	—	Much improved.
25	48, M.	Hæmoptysis	4 "	4	—	Hæmoptysis ceased immediately.