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"AURAL MASSAGE" BY CONDENSATION AND
RAREFACTION OF THE AIR IN THE EX-
TERNAL MEATUS AND MIDDLE EAR:

Its Value in the Treatment of Various Diseases of the Ear.

BY

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"AURAL MASSAGE," by alternately moving backward and forward the auricle with the opened and closed meatus, by the hands, with associate movement of the sterno-cleido-mastoid and occipital muscles, has been recommended and practised for some time for the purpose of giving freedom to the membrana tympani when adherent and thickened, and with some benefit, also, in certain diseased conditions of the other parts of the ear. Another method is to open and shut the orifice of the canal by pressure on the tragus at its lower part, closing the meatus with the thumb or forefinger; the force may be increased by greasing the canal with vaselin alone or with medicated ointments or oils. There is also a more perfect method of massage, by condensation and rarefaction, by means of the instrument of Siegle,¹ which has for years been employed in the examination of the mem-

¹ Siegle's pneumatic otoscope or speculum.



brana tympani. It resembles the ordinary hard-rubber speculum, but is more elongated, and its outer opening is fitted with an oblique plate of glass. A small nipple projecting from its side marks an opening to which is attached a small rubber tube ending in a mouth-piece. The instrument is used by inserting the small specular end into the meatus as far as possible (best covered with a section of rubber tubing and anointed). The mouth is applied to the end of the tube, or a small syringe, to exhaust the air, may be employed, or else an elastic valve bulb can be used; through the glass the movements of the membrana can be watched. All these plans were very unsatisfactory and could not be graded until Dr. Charles Delstanché, of Brussels, gave us two improved instruments, only a brief description of which I can give at this time, as they require cuts to fully illustrate them.

Delstanché's instrument for massage, or, as he terms it, his "masseur," consists of a metallic tube enclosing a smaller tube of metal which acts like the valve of a syringe. The recoil of the valve which produces the aspiration and condensation is accomplished by a spiral spring between the valve and the bottom of the metallic tube. The inner tube is graduated in fifths, so that one may determine by a key the amount of power to be employed. Care is necessary in the use of the instrument for fear of rupturing the drum-membrane, causing a great deal of pain, a flow of blood and an interference with the operation. In order to better condense the air in the tube the nipple-like process is covered with rubber. It must then be withdrawn from time to time, but the

to-and-fro motion may be kept up for some time to advantage, always examining its effects upon the *membra tympani*. The other instrument is termed by Delstanché the "rarefacteur." It is provided with a double valve, and has an advantage over the other instrument in that, without removing the stop-cock, one may alternately condense and rarefy the air in the external meatus, or rarefy it alone. It is much more powerful, and with it we can rarefy the air in catarrhs of the middle ear and Eustachian tube, in which there is a sunken membrane, or break up adhesions between the *membrana tympani* and inner walls of the cavity of the tympanum, or after paracentesis of the membrane, when we have fluid products to be removed.

Several other instruments have been brought forth of late for the same purpose, differing in name, but all of them having the same object in view; they cannot be employed alone, but as an aid to other means, for although they are of value when properly applied by the scientific aural surgeon, they are of limited application, and like all efficient agents can do harm as well as good.

One of the most recent of these instruments has been termed the "vibrometer," which combines massage by sounds, both mechanic and electric, with exhaustion or rarefaction, with a series of musical strings. The first instrument employed was like a violin; the second like a guitar; the last is in the form of a banjo. This latter instrument is termed a vibrometer. A medical friend made a series of experiments with the first one hundred cases¹ of tinnitus

¹ Private statement; the cases are not yet reported.

aurium and deafness, but only 2 per cent. were successful in relieving the patients, and my own efforts have been as resultless. Ten cases out of one hundred will be reported. These will be sufficient for our purpose; they have not been selected, but are like the ordinary cases that present themselves to the aurist every day for treatment.

The following are the rules for the use of the instrument employed, after making a careful diagnosis, and correcting, as far as we are able, defects that would interfere with the successful use of the instrument:

The length of the sittings is from five to twenty minutes, and the number two a week. For tinnitus, like the ringing of bells, the chirping of insects, the singing of birds, the sounds of escaping steam, try the highest notes of the instrument, say twenty thousand vibrations a second. Draw the fine musical string of the vibrometer very tight and shorten it with a clamp to obtain high notes; to obtain low notes elongate the strings. When the tinnitus gives a deep sound like the sewing-machine, the humming of a saw-mill, and for all low-pitched sounds, use the low-toned strings, say of fifty vibrations a second, and the pounding arrangement with the so-termed exhausting wooden plate. When the tinnitus is high, increase the vibrations up even to thousands. When the right pitch has been obtained the patient should only hear one sound, and the noises which he hears continually should be gone. In the case of a physician who suffered with constant tinnitus he was able by the use of the vibrometer to get rid of it, but he required the constant use of the instrument, as the tinnitus would return. He, therefore, desired to have the instrument in his office. Numer-

ous physicians tested the instrument, and most of them would report the disagreeable effects on their ear. One wrote as follows: "So far, since your treatment by electricity, I have noticed no effect whatever. If anything, the hearing has been a little more dense, but I attribute that to the dampness."

CASE I.—An old gentleman, eighty-two years of age, was subject to gout, but had generally good health. The tuning-fork C, 500 v., was heard five inches from the left ear; in the right ear, three inches, as a musical note. The Weber test showed obstruction in the middle ear; the Eustachian tube was opened by the Valsalva method. Inflation by Politzer's air douche improved the hearing. The watch was heard by the left ear $\frac{5}{36}$ in., right $\frac{3}{36}$ in. The ordinary voice was heard with the left ear. Tinnitus aurium existed in the right ear, from catarrhal disease of the middle ear, and was increased by the use of quinin, which had to be taken in large doses at varying intervals owing to malarial disease. He had for years suffered from intermittent fever. The form of tinnitus aurium was of a puffing character, and was increased when he arose from a sitting or lying posture. He has had almost all the time an intermittent pulse (at the present time, 10 A.M., it intermits once in every thirty beats) improved under $\frac{1}{40}$ grain strychnin. I opened the Eustachian tube by the Politzer method on Thursday, May 18th. Applications of the vibrometer gave the puffing and drawing sensations for some five minutes, a feeling of fulness in the right ear, and sounds in the ear not so loud. On May 22d I made a second application after he had just arisen from a short sleep; it left a musical note in the right ear, drowning the hissing noise, but it did not last long. On May 19th the man stated that since the use of the vibrometer he had never suffered so

much from the noises, which prevented him from sleeping at night. He was not willing to use the instrument any more. As the character of the noises indicated that they were from the heart or bloodvessels, he was ordered a preparation of caffein, pepsin sacch., bismuth citrate, and strychnin, to be taken when the noises were very troublesome and when he had dyspeptic symptoms, from which he was suffering.

CASE II.—Mrs. L. P. S. was eighty years of age. She had been a sufferer from scarlet fever of a severe type, and had a second attack; she was still able to hear imperfectly. Subsequently she suffered dreadfully from grief and mental conditions, and contracted catarrhal inflammation of the middle ear. She had almost entirely lost her hearing. On testing, on May 18th, she could not hear the $0/36$ inch watch in either ear, nor the tuning-fork in air in the left; the tuning-fork was not heard on any part of the right side, or by the Weber test when the ear was shut. I opened the Eustachian tube of the right with the catheter, and inflated the tympanum with chloroform. This improved the hearing of the voice. Her tinnitus aurium was like the sound of a sewing-machine. I arranged the vibrometer for a similar sound, and employed it several times. At the conclusion she was able to hear the tuning-fork "A" when it touched the auricle. The voice was heard better across the office. She disliked the effect of the vibrometer, and was not willing to continue treatment.

CASE III.—Mrs. G. H., aged thirty-five, applied for treatment, April 9, 1894. She had had deafness and distressing noises in the head for one year. She suffered from coryza and melancholia, with irritation of the bladder and inherited pulmonary tuberculosis. Pharyngitis and chronic inflammation of the turbi-

nated bones, with discharge of blood and pus, were present, and she had to breathe through the mouth. Bone-conduction was good, air-conduction diminished; the left Eustachian tube was normal, the right narrowed. The meatus was normal, the membrana tympani adherent on the right, with connective-tissue deposit. The nostrils were narrowed and deformed, and drawn upward from an ulcer. The former treatment had been by Seiler's tablets, to make a wash, and the use of Politzer's air-douche. The subjective sounds at her first visit were very distressing, chiefly of a boiling and whistling character. The treatment was by cleansing the nostrils and then applying a solution of silver nitrate, on cotton, with a bent wire, a saturated solution of potassium iodid, five drops, three times a day, increasing until the stomach was disturbed; I then substituted strychnin, $\frac{1}{85}$ grain daily. I used cleansing and pressure, and opened the tubes by catheter. Delstanché's masseur was used. The nose was improving and more natural, and there was improvement in general condition. She described her hearing as better, yet certain tones were not heard. Hearing distance was, right ear 36/36 left, 36/12. The description of the noises, as written by herself, was, on May 18, as of rushing in the right ear and roaring a little. I employed the vibrometer (which she described as being very disagreeable), either faint or drawing a musical note. On May 31 the noises were less, but were like the rumbling of passing coal-cars. I sought to give her a sound as like it as possible for five minutes. On June 4 noises were still less, and she felt very much better. She took the vibrometer treatment for five minutes, "pounding," and then the musical string. On June 5 she stated that she was decidedly better. I ordered the syrup of hydriodic acid in place of the potassium iodid, which dis-

turbed her digestion, and also gave ten minutes' treatment with the vibrometer. On June 7 the patient reported some trouble with her heart, and repressed respiration. She had neglected the strychnin, which was again ordered. She would not use the vibrometer, as it gave her "a stuffy feeling," and was unpleasant to the ears. On June 13 she had improved hearing, and the noise was much less. The Eustachian tube was free and the nose all right. I used massage to the ear. On June 20 the nose was not so well, and there was a slight dropping, which was relieved by application of silver nitrate. I opened the Eustachian tube and injected vaselin, and applied massage to the membrane tympani and the ossicles. There was some pain and irritation of the kidneys, and I ordered the free use of Bedford water. My patient left for the summer decidedly improved in every way.

CASE IV.—James C., aged fifty-three years, was an insurance-agent. He had been deaf for twenty-five years; with the left ear he could not hear his watch on contact; he heard his own watch on the right, on contact, but not mine. There was no inheritance of nasal trouble. He had been in the army, and had contracted rheumatism with naso-pharyngeal catarrh, but this had been cured. He had a low buzzing sound, but no otorrhea or pain. He had no headache, no vertigo, and no discharge from the ear; hearing was best when everything was quiet, of the left, in air quiet close, best on contact on right; the watch of thirty-six not in contact with left ear. Under treatment for three months, I used the Politzer spray of carbolic acid and Dobell's solution. I introduced the Eustachian catheter in both ears, and inflated with chloroform, with no benefit. I then employed the vibrometer, and directed strychnin granules, one-fortieth of a grain, and syrup of hydriodic acid.

Just before leaving he informed me that previous to becoming an insurance-agent he had all his life worked in a foundry; he evidently had foundry-man's deafness. On May 24 he stated his hearing was somewhat improved by the treatment of May 21, but he had lost it since. The sounds were of a low buzzing character, and I arranged the vibrometer for the use of the lowest tones, and he received the application for twenty minutes. At the conclusion I found he could hear his own watch on the right, half an inch, and on the left on contact. Hearing for voice was better; tuning-fork in air, left ear, one inch; right, two inches. On May 28, the patient desired the "pounding and exhausting" arrangement; this he had for several weeks, and I then opened the Eustachian tube with catheter and chloroform vapor, and also injected a 20 per cent. solution of pilocarpin. His hearing in the right improved to two inches; in the left he could not hear the watch on contact. On June 1 he stated that any improvement only lasted twenty-four hours. I found he was both a chewer and smoker of tobacco, and had the peculiar yellow mucous membrane and laryngeal catarrh from tobacco. He took the vibrometer for fully four weeks after he could still hear its peculiar sound in his ear. He ceased his attendance.

CASE V.—Miss K. F., was a school-principal, with otitis media catarrhalis chronica, from childhood, due to cold, coryza, and rheumatism. There was no discharge, no pain, but she had subjective sounds, singing, etc. There was no inheritance of deafness; she was subject to sick-headaches, and the menses were painful and exhausting. The Eustachian tubes were opened in both ears by the Valsalva method and the catheter. There was good bone-conduction, but air-conduction was diminished.

The meatus was normal but dry, the membrana tympani opaque, sunken and adherent. The air-douche improved the hearing for distance. Bone-conduction was good. The nostril was occluded, the septum having been operated upon, but still defective. She had been under the treatment of a careful aurist for six months, but was not improved. By careful treatment since November 25, 1893, by inflation with catheter and chloroform, and Delstanché's massage, she has improved from almost deafness to left ear $10/35$, right, $4/36$ but it is still difficult to hear the voice, especially in certain words. I employed the vibrometer fifteen minutes, May 19, and fixed it as nearly as possible to the sounds she heard. Some time afterward the ordinary sound was replaced by the vibrometer-sound in her best ear, while in the right ear she only perceived a beat in the ear, while in the other it was a pricking and sounding. On May 30 she returned very much distressed with the noises in the left ear, and thought the vibrometer increased them the last application, but upon examination I found the Eustachian tube blocked up with mucus and the throat inflamed. I cleansed this all out and opened the tube with the Politzer air-douche. I then applied the vibrometer on the very deaf ear by using the "pounding and exhausting" impression. Hearing returned to $10/36$ left, $10/36$ right. On June 13 the noises were on the increase, and I washed out the nose and throat, opened the Eustachian tube and directed $\frac{1}{200}$ of a grain of nitro-glycerin daily, which proved of advantage to all the symptoms. She left for her summer vacation.

CASE VI.—M. O., aged fifty-five, has suffered from catarrhal otitis media, with obstructed and narrowed meatus, and narrowed Eustachian tube, and deafness of several years; improvement followed

the introduction of the catheter, with chloroform-vapor and Delstanché's masseur. I applied the vibrometer with exhausting diaphragm, and found it very agreeable to the patient, producing a sound resembling a machine-shop. On May 29 the throat was found to be inflamed and filled up with mucus; it was sprayed with antiseptic wash, and later with liquid albolene (fzv), camphor and menthol (ää gr. ijss) in solution. I introduced the catheter and opened both Eustachian tubes, and also touched the throat with a solution of potassium iodid (gr. xx), iodin (gr. x), and glycerin (fzj). The patient was not willing to use the vibrometer, the weather being damp and rainy. On June 6 the hearing was very much improved, also the condition of the nose and throat. He liked the vibrometer and thought it would improve him. He now left for Europe, returning in September; but was then so well that he is satisfied with keeping his Eustachian tube opened without the vibrometer. He calls only when his hearing becomes impaired.

CASE VII.—Mrs. I. B. S., aged thirty-nine, had deafness with blowing sound in the back of the head and ears, of twelve years' duration; she had sore-throat and headache, and was gradually becoming deaf; there was no discharge and no pain; she had various subjective sounds, such as boiling, buzzing, roaring, beating, etc. Bone-conduction was weak on the left, and there was diminished air-conduction on the right. The Eustachian tube was narrow, the meatus normal; hearing was improved under catheterism, the hammer-handle not seen. The treatment before coming was by the Politzer, etc. Under careful treatment of the throat, the nose, the use of Delstanché's masseur and the Eustachian catheter with vapor of ether and iodin at home, she gradually improved, for right from 6/35,

left, 12/35 until May 3, it was right, 18/36, left, 12/36; on May 23, right, 10/36, left, 13/36. On May 26 I used the vibrometer, the musical note of two strings, and after the massage and exhaust it left loud noises in the right, and the following day I received the following note: "So far in your treatment by the vibrometer I have noticed no effect whatever. If anything I have been a little more deaf than usual, but attribute that to the dampness after a severe storm." On May 28, hearing after treatment was, left, 15/36, right, 12/36, with sounds of hissing. I gave her that form of motion by the vibrometer, and she thought the noises were less. I exhausted the middle ear and touched the membrane with a solution of silver nitrate, also treated the throat with a solution of compound iodine. On June 4 she was much improved in hearing. On June 8 the patient stated that she thought the vibrometer had made the noises worse. She had the roaring, pounding, and also the musical note. After using the exhaust, massage and opening tube with chloroform-vapor, she was able to hear 12/36 inches, right, and 15/36, left. She heard a clock eight feet off, but general conversation she was not able to follow. Her nose and throat and Eustachian tubes were in perfect order; she had no more severe headaches, and her pelvic organs have been attended to by her regular physician. On June 14 I added to her other treatment hypodermic injections of pilocarpin, a 2 per cent. solution, four drops. Right ear, 12/36, left, 18/36. She left for her summer vacation, and returned in October, but was not willing to use the vibrometer; her hearing continued about the same as when she left.

CASE VIII.—Mrs. G. T., aged twenty-five, has had deafness since a miscarriage, and also an attack of influenza. The right ear heard the watch 36

inches on contact, left $1/36$. On May 30th, after prolonged treatment in which I treated the nose, throat, and ear with various applications, up to June 6th, the right ear was $7\frac{1}{2}/36$ and the left $8\frac{1}{2}/36$. On June 12th, right ear $8\frac{1}{2}$, left, $10/36$. After the use of the vibrometer hearing was clouded for a time; after this it was better. She returned in the middle of October, having lost almost all she had gained, by a severe cold; after treatment she began again to improve.

CASE IX.—Mrs. Isabella R., aged thirty-seven, had been deaf for eighteen years, caused by confinement, followed by a great deal of mental distress, as her daughter was born blind. The pain was intermittent, and the subjective sounds were of a boiling or buzzing character. She heard better in a noise, had diminished air-conduction and bone-conduction; the Eustachian tubes were opened by the Politzer air-douche; the meatus normal, the membrana tympani of a light color, clear, with deposit, and adherent. She heard a loud voice, the lips almost touching the auricle. With speaking-trumpet she only heard certain words. She has been under treatment of many physicians, aurists, and quacks; not improved, but was rather worse. I gave her treatment with the vibrometer without apparent effect. This was a case of true labyrinthine deafness.

CASE X.—Miss R. E. C., thirty-six years of age, had been deaf for many years; so much so as only to be able to hear words spoken close to the ears in a very loud tone. The left, she stated, had been operated upon. The membrana tympani, then the malleus and incus, were first removed, and the oval window was elevated to relieve the stapes, but no improvement in hearing followed any one of these operations. The parts were filled by what is termed a pseudo-membrane. When standing

by the vibrometer she could not hear the sound of it until the tubes were pressed deep into both ears, then she could hear it, even the low tones. The auditory canal of the right ear was normal, but the membrana tympani was thickened, depressed, and attached; the location of the attachments could be noticed after inflation. Her throat was sclerosed with atrophic pharyngitis, and there were many bands of adhesion in the left nostril; some of these, projecting entirely across the nostril, were removed. On introducing the Eustachian catheter the tube could be partially opened under chloroform-vapor. After removal of hypertrophic tissue she was not improved in her hearing and not able to hear her own watch, but, after the application of the vibrometer and opening the Eustachian tube, she could hear mine only now and then, but only on close contact. She suffered from frontal and occipital headaches, the lungs were weak and there was a family tendency to pulmonary tuberculosis. She had had diphtheria of a very severe character, followed by an otitis media purulenta, and her life had been despaired of. I applied the vibrometer for two weeks, every other day, with massage of the membrana tympani. On June 25th, there was no real satisfactory change. I applied then the solution of pilocarpin, intra-tympanically. She now uses the vibrometer fifteen minutes, and thinks she has improved. The only improvement from the first operation was the checking of the purulent discharge. She thinks she hears voices better, and is desirous of continuing the treatment.

CONCLUSIONS: 1. Imperfect hearing depends on so many causes that no treatment by any one of the mechanical means should be employed until a careful diagnosis has been made.

2. "Aural massage," with the use of condensa-

tion and rarefaction of the air in the external aural meatus and middle ear, will give mobility to the parts and cause absorption of foreign materials interfering with the hearing.

3. Pneumatic massage is useful in middle-ear disease in which there are adhesions to be removed or stretched.

4. No treatment of this kind will take the place of operations, for when all other means fail they must be resorted to, and with wonderful success in *properly selected cases*.

I have endeavored to condense the cases as much as possible, yet I desired to show that nothing was left undone to place the patient in a favorable condition for the action of these mechanical agencies. These details are necessary for the reason that so many cases have been published as *cured* recently without any details, while others use the same means and fail.

There are three other methods now in use for stimulating the deaf ear, all of which I have examined and employed alone with no better success: namely, the vibrophone, audiphone, and the musical-box and pressure-probe.

To stimulate the deaf ear. When "very deaf" patients cannot bear rough, grating, or shrill sounds, a pleasant agency is a small musical box (Cohen), on which is placed a cushion, and upon this the patient places the deaf ear, so that contact with it occurs every day for ten or fifteen minutes; this is to increase the mobility of the ossicles. Lucae has recommended an apparatus for increasing the mobility of the auditory ossicles in cases in which

there is stiffness (ankylosis) accompanying a form of deafness in which the patient is not able to hear general conversation, and Rinne's experiment yields a negative result. It consists of a steel rod or pin at one end of which is a small conical depression for the reception of the short process. The pin goes through a conducting tube, and its other end touches a spiral spring fixed into the handle of the instrument, and yielding readily to pressure. In employing this "pressure-probe" or feathered sound, the patient's head is first fixed and the instrument introduced under a good light along the upper wall of the auditory canal toward the short process of the malleus. The latter is received in the hollow at the inner end of the probe, and sharp taps are then made against it—at first, one or two only, later, up to ten, to be repeated if the result is favorable. Lucae asserts (Gruber) that after the employment of this instrument the air-douche may be used with success. As almost all patients suffer pain on the slightest touch with a fine probe, a solution of cocain must be employed prior to the operation. The tip should also be covered with delicate oil-skin, else it will be found that excoriations will be produced. This operation is only justifiable in the hands of the competent aurist who is perfectly familiar with the parts. Improvement, which in some cases takes place after this painful operation, cannot be relied upon without treating the middle ear at the same time.



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