

However, I parted from them with sincere regret, for I had been charmed with their effect. During sixteen weeks of continuous use in my surgical work in private and hospital practice the narcoses with these mixtures had been so uniformly good that I was convinced that the improvement in general anesthesia, so much sought after, especially in regard to our daily practice, would have to be looked for principally in the direction of physical improvement of general anesthesia rather than in the chemical improvement of anesthetics. I therefore determined to try to find a mixture that would contain neither petroleic ether nor free ether, and yet have a boiling point corresponding to the temperature of the human body.

It was due to the invaluable and continued assistance of Dr. Weidig that I was enabled to successfully pursue the task I had set for myself. During the time of experimentation (the first part of the year 1898) I administered M.S. for general anesthesia and found it to be an excellent narcotic.⁹ I might mention parenthetically that M.S. is still used by a number of surgeons at the German Hospital.¹⁰

THE ORIGIN OF ANESTHOL.

As stated before, the B. P. of M.S. is 125.6 F. (52 C.). Now, if Schleich's reasoning were correct it was clear that if M.S. could be modified in such a way as to give it a B. P. at 100-104 F. (38-40 C.), such modified anesthetic—being in absolute conformity with Schleich's principles—would be still safer than M.S. and represent at the same time the logical mixture for general anesthesia. After considerable experimenting it occurred to Dr. Weidig to try the admixture of ethyl chlorid, which has a B. P. at 59 F. (15 C.) and M.S. He found that a mixture of 18 per cent. volume of ethyl chlorid plus 82 per cent. volume of M.S. has B. P. at 100.4 F. (38 C.); 17 per cent. volume of ethyl chlorid plus 83 per cent. volume M.S. has B. P. at 104 F. (40 C.); 16 per cent. volume plus 84 per cent. of ethyl chlorid volume of M.S. has a B. P. at 107.6 F. (42 C.).

Considering it unnecessary to make so fine a distinction I proposed that the first and third mixtures be dropped and the second one only be used, viz., 83 per cent. volume of M.S. plus 17 per cent., volume of ethyl chlorid, which has a B. P. at 104 F. (40 C.), thus employing one and the same mixture for all cases. Just at that time the anesthetic properties of ethyl chlorid as such were published by R. Ludwig¹¹ and G. Lotheissen.¹² The success and lack of accidents in the employment of pure ethyl chlorid for general anesthesia, as brought out in these articles, gave me sufficient courage to test Dr. Weidig's new mixture in the living without previously experimenting on animals. This new mixture we termed "anesthol."

THE FIRST USE OF ANESTHOL.

I used anesthol for the first time Oct. 15, 1898, in an interval operation for appendicitis. The narcosis and its sequelæ were all that could be desired, equal to the best I had seen from the use of Schleich's mixtures. Since that time I have used anesthol almost exclusively

in all my operations requiring general anesthesia, in hospital as well as private practice, that is, for a period of nearly four years. The only exceptions were such operations on the face where I deemed pure chloroform preferable.

DESCRIPTION AND PROPERTIES.

Anesthol is a clear, transparent fluid of very agreeable odor; it has a sp. gr.¹³ of 1.045 and a B. P. at 104 F. (40 C.). It is a chemical combination of ethyl chlorid and M.S., not a mixture; for, on evaporating 1000 c.c. of anesthol for five hours at a uniform temperature of 104 F. (40 C.) 22 c.c. (2.2 per cent. volume) with a sp. gr. of 1.262, were left. The sp. gr. of chloroform is 1.490. This fact proves that up to the last moment a "solution of components" discharges and does not leave a final residual chloroform, the narcotic with the highest B. P., as is the case in Schleich's mixtures (Weidig).

The analysis with regard to the actual quantity of each of the three drugs contained in anesthol according to volume, as made by Dr. Weidig, showed that anesthol contains 17 per cent. of ethyl chlorid, 35.89 of chloroform and 47.10 per cent. of ether, representing as will be seen, a proportion of about 1:2:3. It certainly is of interest and worthy of note that the proportion of the renowned English A.C.E. mixture is the same. The latter, however, was constructed in an empiric way, while anesthol is based on scientific principles, being the result of an attempt at adapting the B. P. of an anesthetic chemical combination of chloroform and ether, M.S., to the temperature of the human body. After this had been accomplished on a strictly scientific basis the resulting new anesthetic chemical combination of ethyl chlorid, chloroform and ether (anesthol) was analyzed with the above stated result.

Any one can, of course, prepare anesthol; it is not patented. It is put up in 4, 8 and 16 ounce bottles. It can be had at the principal drug stores.¹⁴

(To be continued.)

SOME NOTES ON AURAL VERTIGO.*

B. ALEX. RANDALL, A.M., M.D.

PHILADELPHIA.

Aural vertigoes have attracted a great deal of attention, especially of late years, yet they constitute a very little known field of our work, while their serious inconvenience or their actual disablement of the patients render them of great practical importance. Like the matter of subjective noises in the head the causation is so multiform that each case presents a problem of considerable difficulty and demands close and discriminating study in order to locate and improve the condition. Advance in this direction has undoubtedly been made by those who have laid stress on the tympanic origin of many of these cases, except when they have ignored or belittled the other elements of etiology and have assumed, because cure has been occasionally reached by

13. I might state here as an interesting fact that the specific gravity of anesthol is very near that of the human blood, viz., 1.056-1.059, certainly nearer than that of any other anesthetic in use.

14. Personally, I have always procured anesthol of Messrs. Chas. Cooper & Co., 194 Worth St., New York, of which firm Dr. H. P. Weidig is a member. It is prepared under the latter's personal supervision. Its purity and correct composition are guaranteed. In order to insure results that will be of value in drawing conclusions from the observations of others, I would strongly urge that anesthol of this manufacture only be used.

* Read at the Fifty-third Annual Meeting of the American Medical Association, in the Section on Laryngology and Otolaryngology, and approved for publication by the Executive Committee: Drs. Emil Mayer, C. R. Holmes and G. H. Makuen.

9. Conf. N. Y. Med. Rec., April 23, 1899, p. 607.

10. Braun of Leipzig favors a mixed narcosis of ether and chloroform, both administered at the same time, but each individually, by means of a special apparatus, not, as we did, both at the same time in chemical solution on one mask. (Report of Congress of German Surgeons, Berlin, 1901.)

11. "Ueber Narkose mit Aethylchlorid," Beitr. z. Klin. Chir., vol. xix, p. 639, 1897.

12. Arch. f. Klin. Chir., vol. lvii, p. 865, 1898. See also: M. W. Ware, "One Thousand Personally Conducted Cases of Ethyl Chlorid Narcosis," paper read before the Section on Surgery and Anatomy, of the American Medical Association, Saratoga, 1902. THE JOURNAL A. M. A., Nov. 8, 1902, p. 1160.

procedures directed to the tympanum, that no labyrinthin cases exist. "Menière's disease" as a distinct entity has certainly suffered much eclipse of late years and our views on the subject have expanded; but the narrowness of view, which would exclude it wholly from consideration as a complex of symptoms due to labyrinthin involvement, is certainly little calculated to advance the general understanding of the subject.

Especially since the grippe epidemic of the last ten years cases of labyrinthin involvement have been not infrequent, and a history such as that of the following case can leave little doubt as to the nature of the lesion. A trained nurse, 25 years of age, awoke one morning after a period of entire health to find herself too dizzy to lift her head from the pillow, falling back helpless at the effort and becoming nauseated by the rotation of everything about her. The left ear was totally deaf, without discharge, pain or other involvement. The condition grew better after some days in bed and at my first examination I found only moderate vertigo and no hearing on the affected side for any tone from the lowest to the highest. Under alterative measures she speedily recovered and was able to resume her duties. Her hearing returned for all notes of the Galton whistle (some 40,000 down to 4,000 double vibrations per second), but below this point she remained absolutely deaf to all tones and was therefore unable to hear any speech in this ear. No evidence of tympanic disease was at any time present and the lesion was probably hemorrhagic and undoubtedly in the upper turns of the cochlea.

Politzer¹ says: "For the differential diagnosis between the labyrinthin form of Menière's symptom-complex and that due to middle-ear affection, the tuning-fork tests are of importance. If the Rinne test is positive in advanced defect of hearing, the duration of perception of the fork-tone through the bone shortened, the loud watch-tick unperceived by bone conduction, while deep tones are well heard by air conduction, no doubt underlies the diagnosis of a labyrinthin affection."

It is in these labyrinthin cases that our testing of hearing by tuning forks and other methods must be complete and precise, and in these, therefore, the limitations and uncertainties of these tests will come most conspicuously to notice. The tuning forks may elicit contradictory and valueless responses from our patients and show the fallibility common to subjective tests; yet the judicious employment of a sufficient variety of tones should bring the matter fairly within the control of the examiner and explain or eliminate many of the contradictions. Those who have employed but a single fork and endeavored thereby to discriminate between tympanic and labyrinthin affections are generally confessedly unable to afford us any clear criteria for their views, which they claim empirically to have verified; but this must not discourage us from the more thorough study of the range of hearing and the relation of sound conduction by air and by bone as a means of learning the truth in these matters and better deciding our lines of treatment.

The severe cases of aural vertigo are certainly rare and the number seen even in extensive practice will always form but a poor basis for any sweeping dicta as to the general subject; and the differences which are encountered by different men will always present illustrations of the two sides of the shield and the importance of the point of view of the observer. It will fairly define my own position if I say that in the past ten years

I have been seeking cases suitable for relief by intratympanic operation, and in upward of a hundred cases have met but a single one in which I could feel justified in operation for the relief of pressure on the stapes, and this in a woman of utterly neurasthenic type, who was notably relieved at first by catheter inflation. She has been anything but a brilliant example of the benefits of operative treatment, and would probably have been as much helped by the anchoring of her floating kidney as she claims to have been only after months by the operation on the incus. In the great majority of the cases of vertigo which have come under my observation neurotic and general vasomotor influences have seemed largely at fault for the symptom, except in the considerable group in whom the catarrhal affection of the eustachian tubes and tympanum was so clearly at fault that treatment by the catheter directed to this condition could be fairly expected to give the relief which was obtained.

In the neurotic individual benefit by the catheter may be at first also notable; but the strain of its employment tells unfavorably on their impaired physique, and continuance of the procedure is unwise or detrimental. Its influence must, therefore, be considered similar to that of any impressive measure whether operative or not, and to whatsoever part directed, and is ascribable more to emotional shock than to any physical or physiologic change of relations.

It is as to the third group of generalized vasomotor conditions that I feel that I may offer some suggestions rather constructive than destructive. Some of these cases present a nearly typical Menière attack, with tinnitus, vertigo, deafness and unconsciousness; but some of the worst instances lack one or the other of the most characteristic elements and the impression has a transitory character, which excludes all probability of notable physical change. Even the serous exudation into the labyrinthin structures, which Gruber has urged as the causation of many aural vertiges, can hardly be assumed for conditions which are so sudden in onset and so immediate in recovery; and the perfect hearing which persists in some of these cases, although the attack is severe enough to fell them as though struck by a hammer, raises the question as to whether the lesion is not wholly central. Its vasomotor causation is rarely in doubt and moderate arteriosclerosis is fairly discernible in most of these cases. The therapeutic test well bears out this view of their etiology, and medicaments directed to improve the vascular condition, the iodids and other absorbents, strychnia, quinia and other vascular tonics, but especially the adrenal extract, have given me a notable gain in many of these cases which had proven stumbling blocks to previous attendants. Combination of the various elements is to be expected in many cases, and our therapeutics and regimen must be judiciously directed to the needs of the individual; but I desire particularly to direct attention to the value of adrenalin for the forestalling of these attacks and building up of that self-confidence which is often so seriously impaired in the subject of such a disorder. It is needless to go into any disquisition on the physiologic effect of this potent addition to our remedies, nor is it needful to point out its usual antagonism to nitroglycerin and the need for tentatively employing these opposed medicaments quite empirically in some instances. Yet it may be generally laid down that in the cases of marked vertigo of transient and otherwise undeterminable causation the adrenal may be expected to steady the circulation of the premonitory phase of the

1. Text-Book, Fourth Ed., p. 601.

trouble and prevent the occurrence or greatly abate the severity of the vertiginous attack. Its cautious employment for this tonic as well as prophylactic effect has been most happy in a number of cases which had yielded to no other line of treatment and in some of which the experimental use of nitroglycerin had greatly increased the disturbances.

I would recommend, therefore, that in all cases of vertigo coming to the otologist he should employ minute methods of study as to the tympanic and labyrinthin condition, but also investigate personally or through the aid of a judicious physician all the general aspects of his patient's case. He should exclude or relieve all involvements of the accessory nasal cavities, investigate the refraction and muscular relations of the eyes, as well as learn whatever teaching may be given him by the eye-grounds and, abating nothing of the local treatment by inflation and massage, which the aural condition may seem to demand and using strychnia and other tonics according to the general needs of the patient, he may yet employ as a direct and almost specific means of treatment this vigorous vascular tonic, which has been given us in the adrenal extract.

DISCUSSION.

DR. GEORGE L. RICHARDS, Fall River, Mass.—I have at the present time a troublesome case of aural vertigo, which illustrates one phase of which the Doctor spoke. This man improved for a number of weeks under the catheter and aural massage in connection with such general treatment as was given him by his family physician. But now the period of improvement seems to have passed, and I am not apparently doing him any good. Given a sudden change of temperature from warm to cold and an attack may come on at any time. He is better under continuous warm weather, and he has gone south for a number of winters. Our New England temperature is so changeable that he has never dared to go away from home without taking his wife or daughter with him, for several years, for fear of being overcome with an attack when alone.

DR. C. H. BAKER, Bay City, Mich.—I think the author of the paper made the statement that a case he mentioned was probably hemorrhagic and that the lower tones were lost so that the patient did not recover the power of hearing speech, and I think he gave that as an indication that the hemorrhage was in the upper convolutions of the labyrinth. I was under the impression that the destruction in the lower portion of the labyrinth causes impairment of the lower tones and that the higher tones are disturbed by the involvement of the upper portion. As to the case mentioned by the last speaker, the effect of sudden lowering of the temperature would be to raise the blood pressure by contracting the arterioles, and there I would think adrenalin would be contraindicated, since it would practically do the same thing, and nitroglycerin, from theory, we would expect to be more beneficial. The most distressing case of this disorder I have seen occurred in a man so youthful that it could hardly be thought of as a case of arteriosclerosis. Before the vertiginous attacks began he had symptoms of tinnitus, without impairment of hearing. He has now apparently lost the hearing. The bone was apparently undergoing hyperplasia and filling up the canals, the pressure destroying the activity of the nerve elements.

DR. RICHARDS—In my case, the patient always had nausea with the attacks.

DR. SARGENT F. SNOW, Syracuse, N. Y.—I wish I could have heard this paper before, for I had a case last summer in which I believe adrenalin would have been of much temporary benefit, which probably is all the Doctor hopes for from its use. The chief thing to think of is the removal of the cause, and eustachian destruction is often the main factor of these vertiges. In the last year I have had two cases. In one case, a woman, the only abnormal condition I could find was some enlargement of the middle turbinates. She could not

stay for prolonged treatment, but could have some operative work done. Removal of the turbinates was followed by a cure, and there has been no return. The other case was a man, about 55 years of age, with such intense vertigo that at times he had to be led about the street. He also had obstructed eustachian tubes. I removed the turbinates without avail. Looking further into the condition of the man, I found the whites of the eyes very yellow and the other general appearances that go with a torpid liver. I could get no results that remained at all constant until his liver was aroused. At first I gave him a good sized blue mass pill twice a week and later every week. The eustachian tubes in this case, as well as the first, were obstructed, but this has now cleared up.

DR. GEORGE M. CASE, Elmira—I think Dr. Snow has well represented the condition of affairs. We have not only to look to the local conditions but also to the constitutional conditions. My experience in the treatment of aural vertigo is that you will often find a toxemia or a lithemic condition. A great many of these cases would be relieved by the combined treatment. If we attempt to cure them by only relieving the stenosis of the nose and eustachian tube, we will often fail. It is noteworthy that in many cases of tinnitus and vertigo the constitutional condition is an important factor. In the great majority of cases in plethoric patients I use pilocarpin. Of course, I suppose adrenalin might take the place of it as a temporary expedient.

DR. C. R. HOLMES, Cincinnati—This is a subject of great importance, because we encounter it so frequently. I have had a few cases of severe vertigo. In fact, I have the records of three cases with epileptoid seizures, which were entirely relieved by opening the eustachian tube. One man, in particular, who was entirely deaf from childhood, began having these attacks. On his way to Cincinnati he had two attacks. While sitting in the car he slipped off the seat. He had attacks similar to those of epilepsy, but without the biting of the tongue. They were relieved by opening the eustachian tubes, but they recurred until the general condition was looked after. I now never undertake the treatment of a case without going into the patient's manner of living, to find the conditions that it may be necessary to correct, such as the method of living, eating, drinking and clothing. I have printed, for the benefit of my patients, slips, which I hand to them that they may not need to ask me a lot of questions, the answers to which they will forget. I give these slips to all my nasopharyngeal and aural patients. I think the general treatment is of vast importance.

DR. J. C. BECK, Chicago—I have in mind one case of aural vertigo in which no trouble was found in the nose or throat. I could clearly obtain the history of specific disease. The patient does not need to reach the usual age of arteriosclerosis to have that condition after syphilis. We find many cases of vertigo are syphilitic in nature, and, therefore, constitutional treatment is certainly called for. Iodid of potassium and the thorough use of mercurial inunctions cured my case.

DR. B. A. RANDALL, Philadelphia—When my paper is read I think the gentlemen will note that the constitutional conditions are fairly gone into, and that I am almost as bad as Haig in attributing to gout and the uric acid diathesis every ill that flesh is heir to. The point made by Dr. Snow is good, that the effect from the adrenal is temporary; but it is often important to get the effect quickly, even though only temporarily, to meet the crisis that is imminent in these cases. We may give the adrenalin chlorid if the aura is very short and no time remains for the slower absorption of the powder, but otherwise the desiccated adrenal or its solution should be used, for with it a more prolonged effect can be secured. If we contract the vessels with adrenalin we may expect some reactive expansion in most cases, and we must meet this with strychnia and other tonics. But the promptness with which the adrenalin can act in the stage of aura or prodrome, which is recognized in not a few of these cases, enables us to permit them to walk abroad like free men and women and that is no small gain. As to nitroglycerin, it is distinctly indicated in some of the very flabby neurasthenic cases, who will improve very much

under its employment and lose the dread of vertigo. But, on the other hand, one of my patients, a gentleman who seems to have been so pleased with the effect of the adrenal that he has been sending me patients ever since, was apparently made worse by the employment of nitroglycerin. He is distinctly neurotic. He is one of the type who can ride in an automobile or trolley without catching a cold, but is stuffed up at once when he rides behind a horse. Of course, these cases are known, but they are relatively rare. Whether these cases are rheumatic or due to some other intoxication, they are subject to easy impression, and the use of adrenal is of special value.

I need hardly answer the point raised as to the structure of the cochlea, which entails the disputed Helmholtz theory and is one of the paradoxes of the auditory apparatus, of which we have so many. In the first turn of the cochlea, where the tube and the expansion of the bony lamina is at its broadest, the basilar membrane of the cochlea is at its smallest. Where all the other parts of the cochlea are smallest, the fibers of the membrane are longest, and here at the apex the lower tones are heard, while the high tones are heard in the lower portions of the cochlea.

TRANSILLUMINATION OF THE NASAL ACCESSORY SINUSES DURING ACUTE CORYZA.*

CAROLUS M. COBB, M.D.
BOSTON.

Transillumination of some of the accessory sinuses has been one of the stock tricks of traveling showmen for many years, and in every village where they exhibited a few of the more daring boys learned to make "fire come out of the eyes," and were a decided nuisance with it until something else took up their attention. That a lighted taper held in the closed mouth would, under proper conditions, illuminate the pupils of the eyes has probably been known for many years, but it was not known that the phenomenon was of any practical importance as a means of diagnosis until Voltolini of Breslau published the results of his experiments in 1888. In 1889 Heryng of Warsaw elaborated these experiments and placed transillumination on a practical working basis. Brown Kelly of Glasgow first called attention to the fact that the rays of light entered the eye and could be perceived by the patient. This was in 1892, and his observation was shortly followed by similar ones by Garel of France and Burger of Germany. Davidsohn called attention to the fact that if the eyes were opened during the experiment a dull red reflex could be seen in the pupil, and in a scientific way we have made useful, as a means of diagnosis, the trick of the traveling showman which was copied by the small boys of making "fire come out of the eyes."

In transillumination of the antrum of Highmore the rays of light pierce the hard palate, and first enter the nasal chambers and from there through the external nasal wall to the antrum, and then through the roof of the antrum, which is the floor of the orbit, and then the coats of the eye, and so become visible as a dull red reflex in the pupil. It is evident that this is the course of the light, for in a vast majority of the cases the floor of the antrum does not extend over the hard palate far enough for the rays of light to enter it directly. The floor of the antrum is generally just above the alveolar process, and therefore light would meet with less resistance in following the route as given above. The course of the light leads to a source of error which we will call attention to later.

* Read at the Fifty-third Annual Meeting of the American Medical Association, in the Section on Laryngology and Otology, and approved for publication by the Executive Committee: Drs. Emil Mayer, C. R. Holmes and G. H. Makuen.

MEANS OF ILLUMINATION.

To obtain satisfactory results it is necessary to have a dark room and an electric lamp of sufficient candle power. The dark room is generally easy to get, but it has been my experience that it is not so easy to obtain electric lamps of the requisite candle power. When I first began to transilluminate the sinuses I was not at all satisfied with the results which I obtained, and during my investigation to find the reason for my unsatisfactory results I took my lamps to the General Electric Company and had the candle power measured. I found that lamps which I had bought as two and four candle power were all less than one, and some of them of less than one-half candle power. I have had the same experience when I have bought lamps of instrument dealers, until I have come to the conclusion that they make no effort to ascertain the candle power of the lamps which they sell. One reason for the lack of illuminating power of the lamps ordinarily sold for this purpose is that they are too small and it is absolutely impossible to get sufficient light from these toy lamps. Lamps of sufficient power can be obtained from reliable manufacturers of electric lamps, but they are quite likely to sell you what you ask for, and if you demand a small lamp you will get as efficient a lamp as can be made in that size, but probably it will not be what you want for the work. Even if it is fairly satisfactory for a time, it will soon lose its efficiency and be worse than useless because the results obtained will be unreliable.

TECHNIC.

The technic of transillumination of the accessory sinuses is very simple, provided that you have lamps of sufficient candle power, and by its use we may get confirmatory evidence in regard to the condition of the antrum and frontal sinus. We can compare the two sides, and, what is of more importance, we can compare the condition of the sinuses, as shown by the light reflex, at different stages of an acute attack. The method which I have used for transillumination of the antrum is to have the patient hold a four or five candle-power electric lamp in the closed mouth, being particular to have the lamp held as nearly horizontal as possible. If the antrum is healthy this will usually give the light crescent under the lower lid and the red reflex in the pupils. I have not had sufficient experience with the method of Escat to form an opinion of its merits. His method, briefly, is to carry an electric lamp protected by a metal funnel, to the outside of the antrum, between the cheek and the external wall of the antrum. It is claimed for it that it gives the same results as the other method, and that it overcomes a source of error, i. e., the obstruction to the passage of the rays of light caused by growth, hypertrophies or deformities in the lower meatus. The frontal sinus is illuminated by pressing a small electric lamp, protected by a hood, against the inner angle of the orbit, just below the superciliary ridge. All of the members of this Section are perfectly familiar with the sources of error in transillumination, and I shall call your attention to only one, which can, with a little care, ordinarily be overcome. The one to which I allude is the effect that blocking of the lower meatus may have in preventing the passage of the rays of light. Obstruction in the middle or superior meatus does not have so much and often not any influence. If the obstruction in the lower meatus is of a permanent nature the question of removal is to be considered, but temporary congestion can be removed by