Original Articles.

ON THE DEVELOPMENT OF SCIENTIFIC HYDROTHERAPY.

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THE NEED OF GREATER ATTENTION TO HYDROTHERAPY IN AMERICAN MEDICINE.

IN a paper I read before the Massachusetts Medical Society in 1904 the attempt was made to indicate the position held by hydrotherapy at the present time in the leading countries of the world.¹ My investigation included a study of the hydrotherapeutic facilities in some of the leading medical clinics of Germany, Austria, Italy and England, an examination of the amount and quality of hydrotherapeutic literature, a comparison of the leading textbooks in German and English with reference to hydrotherapy, and of the medical curricula of the different countries. It was perfectly evident from this inquiry that American medicine lags behind not only Germany and France, but all the leading nations except England. Scientific hydrotherapy will not be widely used in private practice until it is accurately taught in the schools. In 1902 thirteen out of the nineteen German universities gave special courses in physical therapeutics, many of which were devoted to hydrotherapy. In America, on the other hand, not one university gave a similar course.

In the introduction of that splendid system of medicine, "Die deutsche Klinik," Professor von Leyden describes the German clinic as it exists at the beginning of the twentieth century. It is significant that over half of this essay is devoted to therapeutics and attention is chiefly paid to methods of treatment without drugs. Modern therapy in Germany is becoming more and more to mean physical therapy, and of all the branches of physical therapeutics hydrotherapy has the widest field of usefulness. Von Mering's textbook of medicine indicates probably more accurately than any other work the position hydrotherapy holds in the university clinics of Germany. It is composite work prepared by fourteen of the leading medical teachers. In the first edition, published in 1901, there are references to many diseases in the index under "hydrotherapy" and "baths." In the third edition, issued in 1905, all reference to hydrotherapy has been omitted from the index, and the word "bath" does not appear there. On examining the body of the work, the reason is evident, — to have indexed all the diseases for which hydrotherapeutic procedures are recommended would have meant the enumeration of nearly every clinical condition described in the work. Hence, to mention hydrotherapy in the index would have been of no more value than to list all the cases for which pharmacotherapy was advised. Von Leyden said that the "dietetic and physical

therapeutic methods should be studied, developed, practiced and investigated." These words have evidently been heeded. Another quotation of von Leyden's that Bum has selected as a motto for his "Lexikon der Physikalischen Therapie," indicates the direction of therapeutic development in Germany: "Physical therapy should be utilized not in the clinic alone, it must become the common property of general practitioners."

In America the influence of this new movement in therapeutics is yet scarcely apparent. Here diagnosis is still supreme. As in the days of Frerichs and Traube in Berlin, that physician is the most famous who can say to his students after an autopsy, "We have found everything exactly as we expected."²

The therapeutic movement in Germany began with the abandonment of the search for drugs of supposedly specific action. Many of our leaders have apparently believed with Dietl, the high priest of Nihilism, "that there are no true therapeutists, there are only optimistic physicians." The result has been that most of the physicians of this country can be divided into two groups; those whose therapeutic unbelief or skepticism has lead them to pay little or no attention to treatment, and, secondly, those whose reasonless faith accepts without question the claims of the exploiters of proprietary medicines.³ Doubtless the reason that hydrotherapy and the other forms of physical therapeutics are still looked upon with suspicion by our best physicians is due to the fact that they have received such scant recognition by the medical leaders, and have been accorded such extravagant praise by irregular practitioners.

There are some indications that the dawn of a new and better day in American medicine is at hand. In a few schools demonstrations and special lectures on modern methods of treatment are given. Dietotherapy based upon physiological laws is being studied, and instruction in pharmacology has replaced antiquated courses in materia medica.

Excellent works on hydrotherapy have been published and they are having an increasing sale. The admirable textbook on hydrotherapy by Dr. Baruch has been translated into German, an honor rarely accorded to any American medical author.

THE PHYSIOLOGICAL BASIS OF HYDROTHERAPY.

The term "hydrotherapy" includes the use of water in its three physical states: solid, liquid and gaseous. The water acts chiefly as a medium for the conveyance of temperature. The greater the variation of temperature between the water used and the body, the greater the thermic irritation. Although both cold and hot applications exert a thermic irritation, the effect

² v. Leyden: Die deutsche Klinik, vol. i, p. 1, Berlin, 1903.

³ A few hours after writing the above I received from one of the leading pharmacists of Boston a physician's sample of a substance stated on the bottle to be "A true hepatic stimulant, intestinal antizymotic and toxine eliminant," and indicated in "Acid intoxication and uric acid excesses, which it overcomes by removing the cause and restoring the normal alkalinity of the blood."

¹ Pratt: BOSTON MEDICAL AND SURGICAL JOURNAL, cli, 1904, p. 201.

of the two is widely different. Mechanical irritation is frequently combined with thermic irritation in hydrotherapeutic procedures. The mechanical irritation is best exerted by the so-called "douche treatment." The essential feature of the douche treatment is the impact of a stream of water upon the surface of the body. By varying the pressure and temperature, the mechanical and thermic irritation may be increased or decreased as desired. In all treatments with cool or cold applications it is essential that a reaction should occur at the close of the treatment. By reaction is understood, a secondary dilatation of the cutaneous vessels following the primary contraction which the cold application produces. In order to insure a good reaction cold applications are almost always preceded by some heating procedure. In hydrotherapeutic insti-

fever, as Romberg and Pässler have shown that the so-called heart failure in acute infectious diseases is usually due to paralysis of the vasomotor center. Cold baths stimulate the sensorium. This action was recognized years ago in the treatment of delirium and somnolence in fever. It is also seen in the feeling of well being induced by properly administered cold applications to persons in health. Lukewarm baths have a sedative action, and are one of the best means of overcoming insomnia.

Modern hydrotherapy is founded on the solid rock of physiological and pathological knowledge. The work of Wilhelm Winternitz should never be forgotten by students of hydrotherapy. His physiological investigations and those of his students rescued hydropathic treatments from empiricism and quackery. The physiological basis

Office and reception room of "The Medical Baths." This is a co-operative enterprise for furnishing hydrotherapeutic facilities to Boston physicians.

tutions, hot-air baths, vapor baths or light baths are generally employed for this purpose.

Exercise or massage is frequently of service in promoting a good reaction after a cold application. It will thus be seen that hydrotherapy is not employed alone, but is combined with thermotherapy, light-therapy and mechanotherapy. There is a widespread error even among physicians that hydrotherapy is limited to cold-water treatments. Other common misconceptions are that hydrotherapeutic treatments exert little or no influence on the body; that no matter how applied, they are harmless and act chiefly or entirely by suggestion. Investigation, however, shows that there are few drugs in the pharmacopeia which, in therapeutic doses, have such an influence upon the animal economy. Cold water is the safest and the most powerful antipyretic. Still more important therapeutically is the stimulating action of cold applications on the vaso-motor center. This probably explains the beneficial effects of cold baths in typhoid

of hydrotherapy is well presented by Matthes in his textbook.⁴ Over one hundred pages are devoted to the consideration of the action of water treatments on the functions of the human body. Water exerts its most pronounced effect upon the circulatory, respiratory and nervous systems. Cold or hot irritation applied to the skin not only acts directly upon the surface treated, but reflexly through the central nervous system upon the circulation in other parts of the body. For example, if the hand be plunged into cold water not only the vessels of that hand become contracted, but of the other hand as well. It has been demonstrated that cold irritation of short duration applied to the feet of a rabbit produces contraction of the vessels of the pia mater. Of great importance therapeutically is the fact that the circulation in the abdominal organs is influenced by the application of heat or cold to the surface of the body (Brieger). Hydrotherapeutic procedures have a pronounced

⁴ Matthes: *Lehrbuch der klinischen Hydrotherapie*, Jena, 1903.

influence on the blood pressure. Those irritants that cause a contraction of the vessels lead to an elevation, while those that produce a dilatation cause a sinking of the blood pressure. Hence, the general statement can be made that cold applications raise the blood pressure, while warm applications lower it.

The action of the heart and the frequency of the pulse are likewise influenced by thermic and cold irritants. Cold applied locally over the heart or to the entire body diminishes the frequency and increases the force of the cardiac contractions, while the warm irritant increases the pulse rate. Carbon dioxide baths exert the most marked effect on the heart. The minute carbon dioxide bubbles which cover the entire surface of the body act as powerful mechanical

long continued, diminish the sensibility of the ripheral nerves; and hence are of importance in stilling pain. The value of long-continued warm applications over the abdomen in cases of gastric or intestinal pain is probably due in large part to the resulting hyperemia of these organs. In certain cases the beneficial effect of hot applications to the abdomen in intestinal disease is due to the action of the heat irritant on the smooth muscle of the intestine, producing a lessening of peristalsis, and relaxation of the intestinal wall.

A single energetic hot air bath may lead to a loss of sweat amounting to more than a liter. In one of my cases it amounted to 1,500 grams. That this great secretion of sweat influences profoundly the whole circulation of blood and lymph is easily understood. It is of undoubted

A small treatment-room.

stimuli. In cases of dilated heart I have frequently observed a temporary reduction in the transverse diameter, as determined by percussion, amounting to 3 cm. or more. Cold procedures cause a local increase in the number of erythrocytes and leucocytes in the capillary circulation. Warm procedures, such as hot full baths, hot air and electric light baths, produce an increase in metabolism, especially in the breaking down of non-nitrogenous substances. In hot full baths this increase in oxidation has been shown to be more marked than that which occurs in fever. With the application of intense heat, especially if often repeated, there is increased destruction of albumin.

The sudden application of cold to the surface of the body, especially to the back of the neck, produces a deep inspiration, and at its height a pause. This is followed by deep respirations, usually of increased frequency. Heat irritation, on the other hand, leads to respirations of increased frequency and generally of more superficial character. Both the cold and warm irritants,

value in the elimination of morbid products. It has been shown that in renal insufficiency the abnormally high molecular concentration of the blood can be reduced by sweating and it has been recently found that in these cases the low nitrogen content as well as the molecular concentration of the sweat is considerably increased. The importance of the increased secretion of sweat in the elimination of various poisons, including lead, mercury and bacterial toxins, and in the elimination of pathogenic micro-organisms, should be mentioned. The procedures which elevate the blood pressure and improve the general circulation cause an increased diuresis. This is especially marked after the administration of carbon dioxide (Nauheim) baths. Excessively cold procedures may produce hemoglobinuria and albuminuria.

HYDROTHERAPEUTIC INDICATIONS.

In the treatment of a great number of diseases hydrotherapeutic procedures may be used to advantage. They should, of course, be em-

ployed in conjunction with drugs when drugs are indicated and are frequently of value combined with other forms of physical-dietetic treatment. Often hydrotherapy may be substituted for pharmacotherapy to advantage. A full tub bath at 90° Fahr. of fifteen to thirty minutes' duration is better than trional in insomnia, and hot compresses to the abdomen in gastric ulcer are preferable to morphine.

The great variety of effects produced by water of different temperatures should be specially emphasized. According to the temperature employed, the blood pressure may be raised or lowered, local congestion, or anemia produced the pulse-rate increased or decreased, respirations quickened or deepened, and the action on the

clearly understood that it may have to be altered in a few days or possibly an entirely different form of treatment substituted in order to obtain the best results. Increased experience with neurasthenia has impressed me with the truth of Binswanger's dictum in regard to hydrotherapy in this disease, "that the success of any hydriatic procedure can never be predicted, and the individual reaction of the patient is decisive." I agree with v. Strümpell⁵ and Matthes⁶ that the water treatment in neurasthenia acts chiefly as a psychological influence. An electric light or hot air bath followed by a cool application usually gives rise to a general feeling of well being. This doubtless produces in many sick individuals a powerful *Heilsuggestion*. The benefit I have

The douche room of "The Medical Baths."

sensorium may be stimulating or depressing. In many incurable diseases properly selected hydrotherapeutic measures are distinctly beneficial. They make the patients feel better, eat better and sleep better. I believe that more attention should be paid to the treatment of this distressing class of cases. To keep a patient with inoperable malignant disease or chronic nephritis comfortable, or at least to make the downward journey as easy as possible is no small thing. Some hydriatic procedures are so mild that they may be given with benefit and without danger to very feeble patients.

The important place of hydrotherapy in the treatment of neurasthenia and in other psychoneuroses is so well known as to completely overshadow in the minds of many its other fields of usefulness. It is true, however, that hydrotherapy achieves equally good results in other diseases. The right selection of hydriatic treatment in neurasthenia is often difficult. No firm or fast rule can be followed with success. Every case must be individualized. If a hydrotherapeutic prescription is given it should always be

seen in many cases has been so marked and so sudden as to make this explanation the most plausible one. Good effects have been much more striking when treatments were carried out at the hydrotherapeutic institute than when they were given in the home of the patient. The action of the procedure on the body would be the same in the two places but the action on the mind might be very different. I have noticed that those neurasthenic patients have rarely done well whose physicians have had slight confidence in hydrotherapy or who revealed to the patients that they had had little experience with it.

NON-COMMERCIAL HYDROTHERAPEUTIC INSTITUTES.

In Boston a successful experiment has been made in professional co-operation. In the fall of 1903 a hydrotherapeutic institute was established by a number of physicians interested in

⁵ v. Strümpell: Die funktionellen Neurosen in Penzoldt-Stintzings Handbuch der spez. Therapie, Jena, 1903, v. p. 391.

⁶ Matthes: Lehrbuch der klinischen Hydrotherapie, Jena, 1903, p. 333.

the securing hydrotherapeutic facilities for the benefit of their patients. At that time the attention of the profession was called to this enterprise in the columns of this JOURNAL⁷ and a plea was made for more attention to this department of therapeutics. The second year of its work has just closed and it is a pleasure to report that it has been a financial as well as a therapeutic success. During the past year the receipts from patients were \$3,086. This was sufficient to make the establishment self-supporting, and was a gain of 70% over the preceding year. Equally gratifying is the increase in the number of physicians who have referred patients to the medical baths, and the increase in the number of disorders that have been treated. At first we received neurasthenic and rheumatic cases almost exclusively. During the last few months

cently instruction in hydrotherapeutic procedures was given here to the Senior class of the Harvard Medical School.

This institute, or the Medical Baths, as it is called, has done much to give dignity to scientific hydrotherapy in this community. The establishment of similar institutions in other cities could not but help to develop interest in this important but much neglected form of treatment. The organization and the maintenance of such institutions should not be difficult in cities much smaller than Boston. Our institute is due almost entirely to the labor of Dr. James. J. Putnam, who planned and initiated this movement, and whose continued support has rendered success possible. Two years ago at his suggestion, a meeting was called to consider "the practicability of maintaining a hydrotherapeutic estab-

Electric light cabinet. When the patient is seated on the stool and the apparatus closed the entire body with the exception of the head and neck is exposed to the radiant heat. Sweating is more profuse, occurs at a lower temperature, and begins sooner than when a hot-air bath is employed, and in muscular rheumatism and neuralgia the analgesic effect is more marked.

among the maladies treated have been cases of heart disease, chronic parenchymatous nephritis, and chronic interstitial nephritis, obesity, arteriosclerosis, tuberculosis and severe cerebral and spinal diseases.

During the past summer it was necessary to close the establishment for an entire month in order to repair and renovate. A new cement floor was laid in the douche room, as the tile floor previously used had given rise to troublesome leaks. At this time an original form of local hot air bath was added to the therapeutic equipment. It was decided before the institution was opened that it should be in no sense a commercial enterprise. It is intended that any surplus which may accumulate after the debts incurred in fitting up the establishment have been paid shall be devoted to increasing its facilities or in promoting the advance of hydrotherapy in various ways. Re-

lishment where private patients can be carefully treated and suitable researches carried on." On this occasion a committee, composed of Drs. J. J. Putnam, E. G. Cutler and R. W. Lovett, was appointed to assume charge of such an undertaking. Since the opening of the Medical Baths they have acted as its governing board. Dr. Putnam raised over \$3,000 for the equipment of the institute. Most of this amount was contributed by friends of Dr. Putnam outside of the medical profession. The physicians who subscribed to a contingent guarantee fund of \$2,000 included many of the attending physicians at the large hospitals and teachers in the Harvard and Tufts medical schools.

Admirable quarters were secured on the upper floor of a modern office building. Plenty of air and sunshine was thus obtained. The rooms were attractively furnished. A complete Baruch-Richter apparatus for douche treatment was installed. This form of douche table with its

⁷ Putnam: BOSTON MEDICAL AND SURGICAL JOURNAL, January, 1903, cxlix, p. 746.
Fratt: *Ibid.*, 1904, cl, p. 288.

facilities for regulating exactly the different temperatures is probably equal to any in the world. In order to secure the proper water pressure so far above the street level it was necessary to add an electric pump to the equipment. Our operators have been thoroughly trained in the application of simple hydrotherapeutic measures as well as those that require elaborate apparatus. Hence, it has been possible to give all forms of hydropathic treatments. The establishment is under the immediate charge of a matron who has been with us from the beginning. She is on duty the entire day, and arranges the hours for treatment. Our plan of reserving a definite hour for each patient has proved an admirable one. From 9 A.M. to 1 P.M. women are treated, and the afternoon is reserved for men. Mr. Anderson and Miss Moran, our chief operators, are both graduates of the Posse Gymnasium, where they received a thorough training in mechanotherapy. As they only spend a half of each day at the Medical Baths, it has been possible for any physician in the city or vicinity to engage their services for the administration of hydrotherapeutic treatments in the homes of patients. Inasmuch as the number of persons in this section of the country who have mastered the technique of hydrotherapy in addition to massage and gymnastics is small, we consider that this is not the least of the benefits conferred by this institution on the community. The success attained by Dr. Putnam and his colleagues in this enterprise has led nearly every hospital in the city to formulate plans for adding a hydrotherapeutic department to their equipment.

REPORT OF ILLUSTRATIVE CASES.

The following cases which I have seen within the past year indicate clearly the beneficial results that may sometimes be obtained by hydrotherapeutic procedures alone and combined with other remedial agents.

CASE I. *Chronic parenchymatous nephritis; extreme anasarca; disappearance of edema; weight diminished 58½ pounds with gain in strength.* — Mrs. L., aged forty-five. She was referred to me by Dr. Daniel of Watertown. For a year there had been marked anasarca. Her abdomen had been tapped three times. Diuretics had been tried repeatedly but it had been found impossible to reduce the urine. I found 0.9% of albumin in the urine with hyaline and granular casts. At the time of my first examination, March 30, 1905, the face was puffy, the abdomen was distended with fluid, and the edema of the legs was so great as to produce an elephantine appearance. She weighed 188½ pounds. A "salt-free diet" with electric light and full-tub baths were prescribed. After four months' treatment there was only a trace of edema remaining. Her weight had been reduced to 130 pounds, a loss of 58½ pounds, with a gain in strength, and apparently a gain in flesh. There has been an increase in the amount of urine secreted. Her general condition is now very good. On Oct. 10, 1905, she weighed 129½ pounds. I attribute the remarkable improvement chiefly to the "salt-free" diet, but I believe the electric light baths to have been a valuable adjunct.

CASE II. *Coronary endarteritis; chronic interstitial nephritis; cardiac insufficiency; great improvement pro-*

duced by carbon dioxide baths and muscular exercise. Mrs. J., aged sixty-six, was a patient of Dr. Cahill. She had been confined to the house for six months owing to shortness of breath. While spending a few days in Boston in the fall of 1904 she climbed two flights of stairs in order to visit her dressmaker. This exertion produced such severe dyspnea that the attempt had not been repeated. The apex beat was in the sixth intercostal space outside the mammillary line, and 13 cm. from the midsternal line. The cardiac outline was enlarged, chiefly to the left. There was a systolic bruit at the apex. The pulse was at times irregular and intermittent. The blood pressure at the first examination was 215 (Riva-Rocci, broad cuff). The urine contained a trace of albumin and an occasional hyaline tube-cast. The twenty-four hour quantity was only 385 cc.

In spite of the high blood pressure I advised carbon-dioxide baths, beginning with salt baths containing only a small amount of carbon dioxide.

She took twenty-eight baths and after the first week of treatment, graduated exercises. The blood pressure became permanently lowered. At the time she finished the course of baths, June 26, 1905, it was 165. The stronger baths produced a temporary reduction of 3 to 4 cm. in the width of cardiac dullness. During the last two weeks of treatment she frequently walked from the hydrotherapeutic institute to the Hotel Westminster, a distance of half a mile, without shortness of breath or other discomfort. Improvement continued and on Jan. 1, 1906, her condition is excellent, and she is able to take exercise.

CASE III. *Obesity, producing dyspnea and difficulty in walking, loss of 26½ pounds in two months with general improvement and gain in strength.* The patient, a woman, aged forty-eight, was referred to me by Dr. C. M. Hutchinson of Waltham. She had been slowly putting on fat for twenty years. For the past five years she has suffered from shortness of breath on exertion, which became so bad as to interfere with her work about the house. She was able to walk but little. When I first saw her on Sept. 14, 1905, the breathing was labored and accelerated, the effect of a short walk. She was a very obese, florid woman, weighing 256 pounds. The bony framework was small. The heart and kidneys were healthy. I prescribed a restricted diet and three electric light baths weekly, each of forty-five minutes' duration. On Oct. 16, she weighed 238 pounds, a loss of 18 pounds in a month. She had much less dyspnea and felt stronger and able to walk more. In addition to the baths and diet I now gave her Carlsbad salts and thyroid extract. On Nov. 20, the end of the second month of treatment, her weight was 229½ pounds, a reduction of 26½ pounds, with marked improvement in her general condition.

CASE IV. *Subacute rheumatism.* June 10, 1905. I saw to-day with Dr. Sheehan of Stoneham, W. A., aged twenty-two, who is troubled with lameness of the legs, stiffness of the neck, and pains in the muscles of the trunk, arms and legs. In 1901 he was confined to his bed three months with rheumatic fever. In 1904 he suffered from stiffness of the joints and muscular pain. Treatment at the Virginia Hot Springs resulted in a complete disappearance of symptoms. In January, 1905, the rheumatism returned and has persisted. The joints chiefly involved are the ankles and right wrist. At times the ankles are swollen. Stiffness has affected chiefly the fingers and spine. On May 1, he came from New York to Stoneham and placed himself under Dr. Sheehan's care. At that time his temperature was found to be 102°. He was put to bed and sweating procedures used. The fever soon left him.

Status praesens. The patient is a well built young

man. The complexion is pale and pasty but the hemoglobin is found to be 95% (Sahli). He walks with the aid of a cane. The neck is held stiffly and the right thumb is slightly swollen and its movement limited. Temperature 99°. Heart normal. I advised daily electric light baths and douches, Carlsbad salts, and a diet rich in fats and proteids.

June 23. Although the weather has been damp or rainy for a week there has been no return of pain or stiffness.

July 7. Feels perfectly well. He has taken twenty-two baths, and spends much time in the sunlight, as directed. He drinks from three pints to two quarts of milk daily with relish, and has gained eight pounds in weight. He had used a cane for a long time before beginning treatment, but discarded it about two weeks ago.

CASE V. *Insomnia of neurasthenia*. Mrs. K., aged forty-five years, seen with Dr. W. H. Howe, June 5, 1905. She had not been sleeping well for the past year. Last summer she spent several weeks camping out in the woods, but obtained no benefit. For the past four months she has had persistent insomnia and anorexia. She frequently does not fall into a sound sleep until five o'clock in the morning, and then awakes at seven. At the time Dr. Howe was first consulted she was taking a small amount of alcohol regularly before going to bed and a dose of trional about every other night. We advised daily treatments at the Medical Baths, consisting of an electric light bath and douches, for a month. Neutral baths at night were also prescribed. No hypnotics were used. She began to sleep well after the first week. She left for the country early in July and returned to town a month later in better condition than she had been for a long time.

CASE VI. *Severe neurasthenia of long duration*. Mrs. R., aged fifty-eight years, was sent to me by Dr. W. H. Baker in October, 1904. She stated that for twelve years she had been troubled with severe nervous prostration. She had tried all manner of treatment. At the time I first saw her she was unable to live with her family in Boston, because the stir of life in the city was unendurable. She complained chiefly of frequent attacks of faintness with a sinking sensation over the precordia. While I was obtaining the clinical history she became much agitated, and began to breathe deeply and heavily. Her face became flushed, and she complained that the room was very hot, although it was really uncomfortably cool. She begged to be led to an open window, and was fearful that she would faint.

I suggested that mild hydropathic treatments might be of value. She consented to try them, although she stated that in the past she had been unable to take even sun-baths. Very gentle procedures were employed. At first *Teilwaschungen*, later douches. It was found necessary to fan her constantly while in the electric light cabinet. Her condition improved greatly, and she is now able to live in town, and states that she feels like another woman. She still has very little nervous capital and continues to take treatments.

DESCRIPTION OF KILLIAN'S FRONTAL SINUS OPERATION.

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THE treatment of chronic frontal sinusitis may be considered under two heads: the intranasal, or the so-called conservative method, and the extranasal, or the radical procedure. The former comprises the removal of all irregularities causing an obstruction to free drainage from the frontal sinus: such as a deviated septum, an

enlarged middle turbinate, polypi, etc., and the irrigation of the sinus through the naso-frontal canal.

Rhinologists differ as to the results obtained by this procedure. Turner¹ is of the opinion that the number of cases cured must be very small, while Hajek² takes a more favorable view, which is shown by his report of the intranasal treatment of twenty-seven cases. Out of this number nine were cured, eleven had a slight muco-purulent secretion remaining, while only seven received no improvement in physical signs, although the headaches were stopped in all but three.

Ingals³ has recently advocated a method of enlarging and maintaining the patency of the naso-frontal canal, which adds to the possibilities of the intranasal treatment and deserves careful trial.

Schaffer's⁴ method of perforating the floor of the sinus between the middle turbinate and septum should never be undertaken.

The external ways of reaching the frontal sinus are numerous and can be most easily reviewed in a tabulated form. The first group includes those operations that permanently remove a part or the whole of the sinus wall.

1. Removal of the anterior wall.

(a) Entire anterior wall. Kuhnt.⁵

(b) Part or the whole of the anterior wall with enlargement of the naso-frontal canal. Ogston,⁶ Luc,⁷ Nebinger, Praun,⁸ Röpke,⁹ Coakley.¹⁰

2. Removal of the inferior wall. Jansen,¹¹ Richards.¹²

3. Removal of the anterior and inferior wall. Riedel.¹³

4. Removal of the anterior wall of the sinus and the frontal process of the superior maxilla. Hartmann.¹⁴

5. Removal of the anterior and inferior wall of the sinus, leaving a bridge, and the frontal process of the superior maxilla. Killian.¹⁵

The second group includes the operations that temporarily resect the anterior and inferior walls. Osteoplastic methods of Brieger,¹⁶ Czerny,¹⁷ Winckler,¹⁸ Barth,²⁰ Hajek,² Lothrop.²¹

The object of these operations is to leave the sinus intact or to obliterate it.

In a case of chronic purulent frontal sinusitis, in which intranasal treatment has failed to give relief, which of our present operative procedures is the best to permanently relieve the patient of his symptoms, with the least danger, deformity and time? Such an operation should, first of all, freely expose the sinus so that all parts can be examined and diseased areas completely removed.

2. It should include the removal of the anterior ethmoid cells, as these cells are nearly always associatedly diseased. Zuckerkandl²² states that he has never seen a case on the post-mortem table with disease of the frontal sinus, which did not show involvement of the ethmoid cells.

3. It should provide a large opening for drainage, preferably into the nasal cavity, after nature's example. This opening as Zarniko²³ says, "should not be like a narrow neck bottle but like a wide open bay."