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THE TREATMENT OF ATROPHIC RHINITIS BY MEANS OF AN ORO-NASAL CANULA.*

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The problems of atrophic rhinitis remain unsolved. Many theories are advanced as to its etiology and pathology. Even as to its diagnosis we are not always certain; its prognosis is bad, and its treatment purely symptomatic. Sclerosis of the middle-ear has been termed "das Schmerzenskind der Otologie," and with equal justice, atrophic rhinitis may be called "das Schmerzenskind der Rhinologie."

In recent years there have been some very interesting researches concerning the nature of this disease; and in this paper, it shall be my purpose to briefly review some of the later literature on this subject. The theories concerning its origin may be divided into first, the infective or bacterial; second, the theory of secondary involvement from sinus disease; third, that it is a trophoneurotic or nutritional disease.

By some, the *Bacillus mucosus* of Abel and Löwenberg (1) is regarded as the exciting cause. This micro-organism is closely related to Friedlander's bacillus, and is usually found in great abundance in the nasal secretions of those affected with this disease. The mere presence of the micro-organism, however, does not necessarily mean that it is causally related to the disease. The researches of Döbeli (2), for example, show that bacteria

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do not appear in the secretions until several hours after the diseased mucosa has been cleansed.

Cholewa and Cordes (3) were unable to find the bacillus within the tissues of their carefully prepared sections; in fact, it did not even invade the epithelium. They point out that a micro-organism which merely rests upon a diseased tissue can scarcely be regarded as an excitant of disease; although they admit that its presence under the crusts must aggravate the disease process. So constant is its presence that Cholewa in doubtful cases, regards its determination of great diagnostic value. The *Bacillus mucosus* then is rather constantly present in atrophic rhinitis, and is associated with the production of the fotor, and by its presence tends to aggravate the disease process, but it cannot be regarded as its cause.

Bosworth (4) insists that atrophic rhinitis is a sequel to a purulent rhinitis of childhood, but names no specific organism. The incidence of atrophic rhinitis (5), as shown by the examination of school children, would not tend to bear out his hypothesis.

Grünwald (6) claims that nearly all cases of atrophic rhinitis are attributable to secondary manifestations of sinus disease, in fact, he would trace all such cases to a focal suppuration, and claims that after the original nidus has been cured the picture of atrophy will disappear. In many instances, no doubt, this is the case, but certain facts prevent a general application of this rule.

Freudenthal (7) for example, cured a case of antrum disease associated with atrophic rhinitis without, thereby, in the least affecting the atrophic process. Minder (8) presents this same argument. In Case I, of this paper, the patient presented symptoms of acute frontal sinusitis and this subsequently subsided. Finally the recent work of Döbeli (9) is conclusive. He set himself the ambitious task of studying his cases of atrophic rhinitis hour by hour. After thoroughly cleansing the nose, he found that the secretion began to appear at certain minute points distributed on the turbinated bodies, as well as on the septum, and often in positions which precluded its origin from the sinuses. Hour by hour he watched these spots grow and finally coalesce and form the characteristic crusts. His studies further show that former ideas concerning the nature of the secretion were entirely erroneous, since he found it to be made up chiefly of leucocytes which come to the surface by diapedesis from the underlying mucosa. During the later hours epithelial cells and bacteria appeared, and with the

latter also the fetor. Döbeli regards the mucous membrane in this disease as abnormally permeable for leucocytes.

A study of this subject is in no way complete without considering the work of Cordes and Cholewa (10). Briefly stated, they found the chief, and often the primary changes, not in the mucous membrane, but in the underlying bone. The latter shows a process of resorption and softening, not of an inflammatory nature, and regarded by those authors as a form of osteo-malacia. Their drawings really show two distinct disease processes, first an osteo-malacia; and secondly, a chronic inflammation of the mucous membrane, associated with changes in the epithelium and the glands. Their theory revives the theory of a purely trophic disease in a new and concrete form.

If the riddle of the cause of atrophic rhinitis remains unsolved, its treatment also is far from satisfactory. In general it may be stated that the efficiency of therapy is in inverse ratio to the number of remedies recommended, and this is undoubtedly true of atrophic rhinitis, for which a host of measures has been tried. These vary from the use of alkaline cleansing agents and local irritants, to the injection of diphtheria antitoxin, or the breaking of the diseased turbinate bone. The cautery and electrolysis have had their adherents and denounciators. Paraffin has been injected under the mucosa with the idea of closing the wide lumen of the nose. Gottstein's tamponade frequently repeated has proven advantageous. One author (11) recommends menthol, formaldehyde, ichthyol and gomenal, but speaks of "the desperate straits befallen the therapeutics of this obstinate condition." All the text books give long lists of remedies.

The accepted treatment is purely symptomatic and aims at two goals, namely: first, to cleanse the nose of the tenacious, foul crusts and to keep it clean; and second, to stimulate the diseased tissue and, if possible, to check the course of the disease. In their last analysis all the effective methods come under these two heads.

Sometime ago it occurred to me that the defective secretion in atrophic rhinitis might, in some way, be corrected by introducing a flow of saliva into the nose, and that, further; this saliva might have a therapeutic effect in modifying the atrophic process. It appeared feasible to constantly cleanse the nose and to supply it with moisture by establishing a small fistulous tract (anastomosis) between the oral and the nasal cavities, in other words, by producing a form of artificial perforated palate for a therapeutic effect.

Into this perforation a small permanent tube might be fitted, and through it the patient could, at frequent intervals, force saliva into the nose, and thus cleanse, moisten, and stimulate the interior of the nose. This, too, would prevent the compressing effect of the dry crust which Grünwald (op. cit.) has compared to the action of collodium. The presence of moisture in the nose would also tend to prevent complications of pharyngitis and laryngitis sicca.

I further believed that the saliva being a secretion and foreign to the parts, would perhaps exert a stimulating or irritating effect upon the diseased mucosa and would thus reproduce one of our therapeutic endeavors. Reasoning by analogy, and in support of this hypothesis, it may be stated that a physiological secretion will generally irritate a surface unaccustomed to its presence; for example, the gastric juice irritates the skin after the gastrostomy, similarly the bile from a cholecystostomy. In salivary fistulae, the skin becomes eczematous from the constant irritation (12).

According to the statement of Kyle (13), the salivary and nasal secretions are chemically almost identical. Still the saliva contains ferments and bacteria not found in the nose and might reasonably be expected to act as a mild irritant. A further possibility was that the flora of the mouth differing from that of the nose might crowd out any specific bacteria of ozena.

Certain additional practical considerations also favored treatment by this method. The quantity (14) of saliva, 1 to 2000 C. C. in twenty-four hours, would certainly suffice to keep the nasal mucosa bathed in fluid. A further fact of importance is that while ozena often effects the pharynx and larynx, it is never known to invade the mouth, thus showing some specific resistance either in the buccal mucosa or in the saliva itself. Finally, it was apparent that the patient could conveniently use irrigations of water from the mouth through the tube, provided the salivary secretion proved insufficient.

Accordingly, I have devised the following operation for the introduction of a permanent canula between the mouth and nose. The floor of the nose and the roof of the mouth are cocaineized and adrenalized; cocaine being then injected into the periosteum of the roof of the mouth by means of a hypodermic needle bent at an angle. A point is selected in the hard palate where it shelves off and becomes horizontal, and about one C. M. from the median raphe. Here a crucial incision is made with a curved, pointed bistoury. With a sharp periosteotome the periosteum is pushed back, exposing the bone. The patient is now instructed to open the

mouth as wide as possible. With a guarded bone drill $\frac{3}{16}$ inch (5 m. m.) in diameter an opening is bored through the hard palate into the nose. Care must be taken not to strip up the mucosa on the floor of the nose. This can be avoided by nicking the mucosa with the curved bistoury introduced through the trephine opening. This operation requires but a few minutes.

After treatment.—The artificial opening is now closed by introducing a flanged rubber plug which fits snugly against the roof of the mouth. The best for this purpose are those used for the repair of bicycle tires. These may be perforated and saliva can be forced through from the beginning of the treatment. The after treatment continues with daily removal of the tube until the oral and nasal mucosae have united. Granulations must be kept down with nitrate of silver and antiseptic mouth wash. This after treatment is very tedious, and trying both to the patient and surgeon.

Fig. 1. Oro-Nasal Canula. Sectional View. Actual Size.

In Case II it required four and one-half months, while in Case III with better technique, it took but seven weeks.

As soon as the edges of the bone have healed the permanent tube, which I have termed the oro-nasal canula, is introduced. This canula consists of a German silver tube one inch long and $\frac{1}{16}$ of an inch outside diameter. About the oral extremity of the canula is a hard rubber collar provided with a flange $\frac{1}{4}$ inch diameter, which may be moulded by a dentist to fit the opening of the roof of the mouth. The tube, when in place, fits very much like a hollow nail driven into the hard palate. The nasal extremity of the tube should extend to the level of the lower border of the middle turbinate body. The canula is self-retaining, and may be removed by the surgeon (or patient) and cleansed, if necessary.

Owing to the fact that ozena occurs in persons with wide nasal cavities, the so-called chamae-prosopia (15), there is usually ample

room for the canula within the nose. With the canula in place, the patient can readily force saliva into the nose, using his tongue as a force pump. The saliva may be seen to enter the nose, and forming bubbles spreads out along the lower border of the middle turbinate and along the inferior turbinate and septum. The course of its flow may be easily studied by putting methylene blue into the mouth of the patient.

In the usual course of atrophic rhinitis the inferior turbinate is involved sooner and to a much more marked extent than the middle turbinate (15), so that the saliva reaches those portions of the nose

Fig. 2. Sectional View, showing the Oro-Nasal Canula in Position.

most affected. In addition to constantly bathing the nose with saliva, the patient can readily force water from the mouth into the nose. By closing the nostril on the operated side and holding the head forward, the water will run through the choana and out on the other side. The lumen is kept clean with a wire bristle. By placing the tongue over the orifice of the tube, the patient can prevent fluid nourishment from entering the nose. There is no interference with phonation.

I have three cases to report, in which I have performed this operation.

CASE I.—Mr. B. V., printer, age 27. Consulted me in July, 1904, complaining of pain over the left eye.

Family History.—One brother has atrophic rhinitis (as determined by me in a subsequent examination).

Personal History.—This patient had typhoid during infancy. Patient has had crust formation in his nose for an indefinite period past. He would force water up his nose to clear it of the crusts. The patient would occasionally grow hoarse at night. Onset of present trouble began about a week ago with discharge from both nostrils. The pain over the eye was worse in the morning; *status presens*.

Examination.—Temperature normal. Marked tenderness over the left middle frontal sinus. Hypertrophy of the anterior of the

Fig. 3. View of Roof of Mouth, showing Oral Extremity of the Canula fitting against the hard palate.

left middle turbinate with pus at this point. Atrophy of both inferior turbinates to a marked degree. Pharynx visible through the nose on the left, but not on the right, owing to slight deviation of septum. Pharynx dry and glazed. Scarcely any fetor.

Diagnosis.—Acute frontal sinusitis; and atrophic rhinitis.

Treatment.—Sinusitis resolved under local treatment in a short time. Operation for introduction of oro-nasal canula was performed August, 1904, an opening was made through the roof of the mouth and the opening plugged with cotton. The tube inserted after one week, but I removed it September 12, 1904, as the edges had not healed.

I treated the granulations with trichloracetic and silver nitrate.

October 4, 1904, the tube was reinserted, although the edges were not healed.

November 12, 1904, the tube was reinserted.

December 3, 1904. The patient now wears the tube with much comfort, forces saliva through freely, and notices fewer crusts in the nose and less dryness in the throat. Some (objective) faint odor in secretion. Crusts not so hard and come out easily when the patient blows his nose (formerly had to blow very hard); crusts not so large and numerous (formerly they were as large as his thumb). Patient occasionally washes out his nose with water from his mouth. Left side free from crusts except about the tube; dry crusts on the right side. (This was noted after the patient had refrained from washing out his nose for one week.)

May 13, 1905. Reinserted tube after having removed it for about three weeks.

June 3, 1905. Tube now in place for three weeks past. No soreness of mouth; mucous membrane on the left side appears healthier than on the right side.

September 12, 1905. Patient returns with tube in place; tube does not irritate. Reports hardly any crusts on the left side; right side is dry, with crusts more abundant and more tenacious. Washes out nose once every morning with water forced through the mouth. Can wash out the right side by throwing his head backward and then towards the right. Throat is now freer from crusts and more moist than it was before the tube was inserted.

NOTE.—This patient has now worn the tube practically continuously since May 13, 1905, *i. e.*, for four months, and for a period of ten months, barring an interval of three weeks. He has felt so comfortable that he has not found it necessary to consult me for the past three months.

CASE II.—Mr. C. B. K., piano tuner, age 25; consulted me, April 14, 1903, complaining of bloody crusts in nose and noises in left ear.

Family History.—One sister has catarrh; she loses sense of smell occasionally, but has no crusts. Four boys and one girl. Sister is the oldest; patient is the youngest. Next brother would get "running spells," would run from one half to one hour without realizing what he was doing, but is now well.

Personal History.—Always well until six years ago, when he has epilepsy. Admits gonorrhoea, and denies syphilis.

Present Illness.—Trouble in nose began about six or seven years ago with clogging up with crusts. Couldn't breathe through the

nose, and would remove crusts by running the little finger into the nose; could run finger into opposite side (through perforated septum). Nose would bleed profusely thereafter; crusts would form again before morning, *i. e.*, it would clog up again before morning. Throat would become parched from breathing through mouth, especially mornings. Would lose sense of smell during winter months.

Diagnosis.—Tubal catarrh (left); atrophy of both inferior turbinated bodies. Hypertrophy of the right middle turbinate; perforated septum (syphilis?) No fetor.

Treatment.—Oil atomizer; local application of iodine, and the use of the nose cup with saline solution, which would clear the head, but only for a few hours. Patient would use cup two or three times a day. This treatment was continued for about a year, when patient returned complaining of not being able to breathe freely through the nose. Enlarged middle turbinate was removed July 1st, 1904. This operation gave considerable relief. Patient also received antisyphilitic and antiepileptic treatment.

Operation for insertion of oro-nasal canula was performed February 18, 1905. This case required prolonged after-treatment until the artificial opening in the hard palate had healed. Patient suffered from two epileptic seizures, caused by manipulations in the nose and once also had the packing drop into the larynx while asleep, but coughed it up. The permanent canula was inserted June 17, 1905. Patient had first found the tube somewhat annoying, owing to the passage of air through the same while talking and smoking. There was also some soreness under the plate.

As a result of this treatment he reports that the crusts can be much more readily removed by keeping them moist with saliva. He very seldom finds it necessary to use saline solutions as an adjunct to the canula. He uses the nasal irrigation but once a day, and finds that crusts do not come out in lumps as formerly, and that the quantity of crusts is about half what it formerly was.

July 15, 1905. Patient reports that he has used the nasal douche but twice during the past week, and has found the use of the oro-nasal canula much more convenient. He washes out the nose two or three times a day by forcing water from the mouth through the canula and into the nose. (I always have this tube with me, he says). Owing to the perforation in the septum he is able to wash out both sides at once. He forces saliva through quite frequently during the day. The mouth is not sore, there is no odor, there is slight annoyance while drinking, but not enough to speak of.

July 22, 1905. The tube was removed owing to slight soreness in the mouth. Some granulations had formed and these were treated with nitrate of silver, and the tube was re-inserted.

July 29, 1905. Patient reports no further trouble since the tube has been reinserted.

CASE III.—William R., age 13 1/2 years, school boy. Complained of lumps in nose (crusts); blowing them out caused earache.

Family History.—Negative.

Personal History.—Measles, whooping cough; no diphtheria, otherwise well. Onset of present trouble began three or more years ago. Boys around him complained of odor; teacher gave him a separate seat in school. Big crusts in nose; would have to blow "insides out" to get them out, and this caused earache; tried tablets and atomizer for two years; then salt water, and carbolic spray. Nothing availed. Went to Ohio Medical College clinic, June 28, 1905, and was kindly referred to me by Drs. Mithoefer and Hinnen. Inspection showed numerous thick, dry crusts, and foul odor in both nostrils. After removing crusts I found marked atrophy of inferior turbinated bodies. Pharynx was visible through the nose. Partial atrophy of both middle turbinates, especially in posterior portions. Drums opaque, slightly retracted.

Diagnosis: Atrophic Rhinitis with ozena.

Operation, July 10, 1905. Cocaine and adrenalin anesthesia. Bone drill (hand) left side; rubber canula.

July 15. Numerous foul smelling crusts; both sides, but little reaction locally.

July 18. Slight swelling about opening; somewhat tender. Rubber plug.

July 25. Opening less tender.

July 30.—Beginning to heal; daily removal of plug by patient. Nitrate of silver locally.

August 2. Ditto.

August 3. Tube loose, owing to large opening. Gauze packing.

August 29. The edges of the opening have now healed, and the permanent canula was introduced.

September 6. Patient wears the tube with comfort. He has a scant flow of saliva and therefore washes out the nose through the canula at frequent intervals. By closing the nostril on the operated

side and holding his head forward he can force water through the canula into the nose through the choanae and out of the opposite side. He succeeds in keeping the operated side clean, but crusts are still present in the unoperated side. The fetor is now much diminished.

September 13. Patient now has a freer flow of saliva which he forces into the nose every hour or so. Crusts are now much smaller than before operation. The left side very seldom has large crusts. He has been forcing saliva all morning. Inspection shows a large crust about the tube and partly covering the lower turbinate on the operated side, otherwise the left side is moist and clean. On the unoperated side there are large, dry crusts which are difficult to remove with a probe. There is a slight fetor still present.

Conclusions.—The analysis of these cases shows that all three wear the canula without any discomfort. Case II, for example, has not had the tube disturbed for the past four months. They all find it a convenient method of moistening and cleansing the nose. Case I relies chiefly on salivation; Case II on salivation and irrigation; while Case III with scant salivary flow relies chiefly upon irrigation. All three state that they have fewer crusts than heretofore and that these are much less tenacious. Cases I and II have less dryness in the throat than formerly. The sense of smell is more acute in case II than before operation:

Objectively, I find the mucosa on the tube side moist, and the secretion when present is usually semi-fluid, and not tenacious; on the other side the crusts are thicker, drier and more adherent. The mucosa on the tube side has a healthier, smoother appearance than that of the unoperated side. I can, as yet, make out no regeneration of the mucous membrane in any case except Case I, where the flange of the tube has rubbed the inferior turbinate. As regards the ozena, Cases I and II were practically without this symptom from the start, while in Case III there was very marked ozena prior to operation, and is now comparatively free from this sign.

The results in these three cases have certainly been satisfactory and warrant a further trial of this method. In the future, it will be necessary to elaborate the method and either to introduce a canula into both nasal fossae, or to devise a Y-tube which can be introduced into both sides by perforating the septum.

The results in these cases agree closely with those observed by FitzGerald (16), who has his patients moisten the crusts by means of pledgets of cotton saturated with saliva, he says: "We have no

place in nasal treatment for the spray or douche, not even in the most exaggerated cases of atrophic rhinitis, or when complicated with ozena. I see these patients three or four times a week, removing the crusts with forceps after moistening them with a wire cotton-wound applicator saturated with the saliva of the patient. The patient must be instructed in the use of the applicator and use it moist at least three times daily. He should also exercise his nostrils frequently. Patients who follow this method carefully, seldom have even minute crusts or any fetor after the third week. It is usually necessary to pursue self-treatment for an indefinite period, but patients do not object to this, finding it much more simple, agreeable and efficacious than other methods."

Before concluding this paper I wish to express my appreciation of the kind assistance and valuable suggestions of Dr. B. J. Wolff, who constructed some of the canula for me.

Considering the fact that the pathology of this disease is unsettled, that the accepted therapy is a failure, Bosworth (18) for example, has never seen but one cure in all his experience, I feel justified in bringing forward this method which promises to alleviate and perhaps cure this malady, which hitherto has baffled the efforts of the rhinologists. This paper is presented with the hope that some of my colleagues here present will try this method.

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