THE NASAL VOICE WITH REFERENCE TO ITS
BEARING ON THE PRACTICE OF RHINO-
LARYNGOLOGY.*

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The special significance of the nasal voice to the rhinolaryngologist lies in this, that its correction is commonly dependent upon nasal or pharyngeal surgery, that under certain circumstances its presence modifies in an important manner the ordinary indications for operative treatment of the nose or nasopharynx, and that, without a knowledge of the nature and significance of the nasal voice, mistakes in diagnosis, prognosis and treatment are liable to be made, and operations of permanent injury to the patient undertaken.

The nature and cause of the nasal voice, or nasaling of the voice, is now, after many years of patient experimental study by men like Passavant, Merkel, Wintrich, Grützner, Schmidt and H. Gutzmann, quite satisfactorily established. One should rule out of mind nasal resonance as distinguished from nasaling, for a certain degree of nasal resonance is a quality of all normal voices, and is particularly significant in all voices of especial richness of quality. Nasaling, on the other hand, is not only due to an extreme exaggeration of the normal mechanical conditions upon which nasal resonance depends, but it is also produced, in the second of its two forms, by an entirely different mechanism from that responsible for nasal resonance, and consequently with a different voice effect.

The familiar nasaling which is produced by obstruction in the nose or in the nasopharynx affects primarily only the normally nasal sounds, altering their quality through impairment of the conditions of resonance in the nose and nasopharynx.

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When in the production of the nasal sounds, m, n and ng, the vibrating air from the larynx is permitted by the low position of the soft palate to pass outward through an unobstructed nasopharyngeal cavity and through unobstructed nasal cavities, the resulting sounds are normally produced and sound normally nasal. When, however, the nasopharynx or nose is obstructed beyond a certain degree, these nasal sounds, while still nasal, take on an altered quality, sometimes spoken of as a "dead" quality. This alteration from the normal resonance of the nasal sounds produced by obstruction varies as to whether the obstruction be nasal or nasopharyngeal.

The kinds of obstruction in the nose and nasopharynx are known to every rhinologist and need not be considered here. One cause of rhinolalia clausa should, however, be mentioned. When we consider that rhinolalia clausa depends upon obstruction to the free passage of air from the pharynx through the nasopharynx and nose in the production of the nasal sounds, it is evident that such affections of the soft palate as bind the velum closely to the posterior wall must, by preventing the passage of air into the nasopharynx, also be responsible for rhinolalia clausa. This occurs, of course, chiefly from the adhesions following syphilitic diseases of the soft palate.

Rhinolalia clausa involves the speech not only with respect to the nasal sounds themselves, but also affects the sounds immediately preceding or following them, for during the normal production of many of these adjacent sounds the soft palate is still at least partially dropped, and the sounds are, therefore, to a certain degree, nasal. And, besides, the sounds normally oral may be irregularly involved, through their functional nasalization, in the manner to be described later (as rhinolalia aperta functionalis), owing to the exaggeration of the nasal qualities of the speech in general.

The second form of nasaling affects the mechanism for producing not the nasal but the oral sounds. Only one anatomic structure is at fault, the palate. If the palate is normally formed, and if the movements of the soft palate are normal, the velum leaps quickly backward and upward with each oral sound to meet the posterior wall of the pharynx, thus shutting off all or nearly all air from the nasopharynx and nose, and compelling it to pass out of the mouth. Any condition which produces either a permanent opening in the soft or

hard palate, or interferes with the movements of the soft palate, has the effect of preventing the relatively complete shutting off of air from the nasopharynx and nose when demanded in the formation of the oral sounds; the sound producing air then escapes freely into the nasopharynx and nose, and consequently transforms the oral into nasal sounds. If the opening from the mouth or pharynx through the hard or soft palate be in the posterior two-thirds of the space between mouth and posterior pharyngeal wall, all spoken sounds are nasal; if the opening occur, on the other hand, only in the anterior third of this distance, all sounds are apt to be normal excepting those normally produced at or near the lips, which then become nasal. In *rhinolalia aperta* then, when, as ordinarily is the case, dependent upon openings in the posterior two-thirds of the palate, all sounds are organically nasal, the usual nasal sounds *m*, *n* and *ng* being produced normally, and the oral sounds abnormally.

Rhinolalia aperta is dependent characteristically upon cleft palate. Likewise a congenitally short palate, being unable to reach the posterior wall on phonation, has identically the same effect on the voice. Destructive disease of the soft palate, often resulting from late syphilitic ulceration, is a quite common cause. And with the soft and hard palate normally formed, if the movements of the velum be interfered with, *rhinolalia aperta* follows as a necessary consequence. This occurs in deep infiltrations of the soft palate, chiefly syphilitic, in organic paralysis, notably bulbar paralysis, in paresis following diphtheria, and in paresis following rough handling of the palate in operations for adenoids.

A combination of the two organic causes of nasaling is not uncommon and complicates the situation. *Rhinolalia mixta* occurs when the nose or nasopharynx is occluded, and at the same time the palatal closure for the oral sounds is prevented in any of the ways mentioned. The voice partakes of the qualities of both forms of nasaling.

Thus far we have spoken only of organic causes of nasaling; but the functional causes for both forms are of particular importance to the rhinologist, and will not be neglected in a later portion of this article.

The diagnosis of *rhinolalia clausa* is not difficult for the rhinologist when it depends upon obvious extreme nasal or

nasopharyngeal obstruction. Difficulties arise, however, because the degree of obstruction capable of producing nasaling is hard always to estimate, and if one is not on his guard he may be operating unnecessarily to produce enlargement of the nasal or nasopharyngeal space, in order to correct a nasal voice in no way dependent upon occlusion, and of course without improvement of the voice quality following. Such operative procedures may indeed result in a decidedly increased degree of permanent voice impairment. Accurate diagnosis alone can prevent errors of this kind. To this end let the rhinologist determine, first of all, the presence or absence of rhinolalia aperta. This, if present, will direct his attention to the condition of the palate, which should ordinarily have remedial consideration, if impaired, before any existent nasal or nasopharyngeal obstruction.

Rhinolalia aperta may be distinguished quite certainly from rhinolalia clausa by the ear of the rhinologist, if it be sufficiently trained. But ordinarily this method of differential diagnosis is not certain enough. More than twenty years ago Herman Gutzmann devised the following simple but usually effective test for rhinolalia aperta. It is based upon the proven fact that, if the nose be tightly closed while the vowel sounds are being enunciated, the intensity of the nasaling is decidedly increased, whereas if the voice impairment be due to rhinolalia clausa, no change in the quality of the vowel sounds occurs from holding the nose. He has the patient repeat the vowel sounds "ah-e" several times, both with and without the closure of the end of the nose by compression with the thumb and finger, and notes the result in the sound. If there is no change in the quality of the sound the nasaling is not due to rhinolalia aperta, but if the nasaling is thereby increased the test proves the presence of rhinolalia aperta. The test is a delicate one. It is rendered more easily interpreted if the vowels be increased in number. A good series is ah-o-oo-e. This test may be supplemented by one which is perhaps still more delicate, but which demands some experience. The ear-tip at one end of a diagnostic ear tube is replaced by a nasal tip, and the tube is made to connect the naris of the patient with the ear of the physician. By this apparatus all sounds made with a lowered soft palate are greatly intensified, while the oral sounds are heard relatively much less loudly. With

the normal voice the nasal sounds and their immediate neighbors are alone intensified; in *rhinolalia aperta* all sounds, oral as well as nasal, are heard with about the same intensity. In this manner one may listen to spoken sounds directly as they emanate from the nose of the patient; to vowels (see the above series), to the speech of general conversation, or words especially provided for the test. For example, one may use a sentence which in the first half is made up of words each containing a nasal sound, and the last half containing only oral sounds, like the following: "In summer time, when men seem stricken under the strain of the sun, you or I or Frederick will probably be south of the Ohio." Through the nasal ear tube the latter half of the sentence is much less intense than the first half, if the voice be normal, and about equally intense in *rhinolalia aperta*.

If these tests show that *rhinolalia aperta* is absent, the nasaling must be due to nasal or nasopharyngeal obstruction. If they show that *rhinolalia aperta* is present, the diagnosis of any also existing *rhinolalia clausa* will depend upon the quality of the nasaling and upon the objective evidences of occlusion in the nose and nasopharynx. It is sometimes important, as will be seen later, to learn whether a *rhinolalia clausa* is dependent not upon obstruction in the nose or nasopharynx, but to an abnormal action of the soft palate. If the nose and nasopharynx are not totally occluded, this can be shown by the diagnostic nasal ear tube, for in such a case the nasal sounds will be greatly reduced in normal intensity, and probably no more intense than the oral sounds.

The application of a knowledge of nasaling in the practice of rhinolaryngology may perhaps be most clearly brought out by the study of certain concrete occurrences. As a preliminary practical step in the discussion, I may mention two recent cases of nasaling, one in a young man and the other in a young woman. The young man was operated for adenoids for no other reason than to improve his voice, but it was not improved by the operation. Upon examination the uppermost part of an adenoid mass was seen to be still present posterior to the choanæ. *Rhinolalia aperta* was absent. The patient being returned to his physician for reoperation, came back now with a normal voice. The nasaling in the case of the young woman is very marked; the adenoid operation was done

three years ago. Here, too, rhinolalia aperta is absent. The amount of adenoid tissue now present is large, and, besides, the nose is markedly occluded. The parents are much more troubled about the voice than about the obstructed breathing, but have not yet consented to return to their physician for further operative treatment, which, from the standpoint of the voice, must include the removal of obstruction in the nose as well as for that in the nasopharynx. The only inference from these cases is the need from the standpoint of the voice for a clean adenoid operation.

But nasopharyngeal operations may have with respect to the voice quite unexpected results. For example, the adenoids in a patient with a markedly nasal voice are completely and expertly removed, and yet the nasaling, both as to quality and intensity, remains unaltered. The nose is found to have but moderate obstruction, this being due to vasomotor swelling. In such a case the rhinologist, if not on his guard (the nasaling being the abnormality demanding correction), may, without further diagnostic study, proceed to operate on the nose. If he does so, this second operation will also be without result in correction of the nasal voice. More than twenty years ago Herman Gutzmann* related a case of exactly this kind occurring in a young German merchant who had gone the rounds of the European capitals seeking relief for an unpleasant nasal voice. Each rhinologist, apparently quite ignorant of more than one cause for nasaling, that of obstruction in the nose or nasopharynx, and concluding, therefore, that the nasopharynx being free, obstruction in the nose must be at fault, had found some new portion of the patient's utterly unoffending nasal organ to remove until the nasal space had become quite enormous. But not the slightest change had any of the numerous operations accomplished towards improvement of the voice. What had occurred was this: 'Earlier in life adenoids had so nearly taken the place of a closed soft palate that the velum had ceased to respond for the nasal sounds differently from its response for the oral sounds; thus it had remained during speech constantly raised against the posterior wall of the pharynx, not only for the oral but also for the nasal sounds, instead of dropping when a nasal sound came into the speech; and through the inculcation of habit this had gone on

*Von den verschiedenen Formen des Näselsens, Berlin, 1891.

just the same after the adenoids had been removed. It was, then, a case of *rhinolalia clausa functionalis*. In Gutzmann's case two weeks of training served to entirely correct the nasaling for which the nose had been repeatedly and unnecessarily mutilated. Similar badly advised operations are not very uncommon, and the only way to prevent them is to be fortified with a knowledge of the etiology and diagnosis of the different forms of nasaling.

The other functional form of nasaling, *rhinolalia aperta functionalis*, is more common following adenoid operations than the form just cited. Owing to the practically complete obstruction of the air through the nose by reason of a large adenoid mass, the soft palate fails to raise for the oral sounds, but remains continuously in a dropped position. In certain cases the elevation is physically prevented by the low position of a part of the adenoid tissue. After the adenoids have been removed the palate still adheres to its habit of inaction, the oral sounds are spoken with a nasal quality, and diagnostic tests reveal the *rhinolalia aperta*. The incorrect action of the velum will continue and will tend to become more and more confirmed until the habit is corrected by training. A similar and well known effect, temporary, however, in duration, results when the palate has been roughly handled during the adenoid operation. The correction of functional *rhinolalia* of either form is much easier if carried out as soon as possible after discovery, rather than after the habit has become thoroughly confirmed by continuation for a long period of years. The establishment of a rule with rhinologists of examining their adenoid patients a few weeks after operation, having the speech especially in mind, would be a saving adjunct to this procedure.

If the palatal paresis following diphtheria continues through a number of weeks the same "habit paralysis" of the velum will be in danger of inculcation. For this reason Gutzmann advises faradization and massage of the palate, if the nasaling following diphtheria continues longer than two or three weeks. Other causes for *rhinolalia aperta functionalis* are found in the childhood imitation of the speech of cleft palate sufferers, and of other persons with a nasal voice, and also occasional cases of open nasaling due to habit, for which no explanation is discoverable.

The subject of the speech in cleft palate is exceedingly complex and exceedingly important, and is only to be touched upon in a paper of this character; but there are certain facts relating to the speech in every case of organic rhinolalia mixta which the rhinologist should always bear in mind. Since in cleft palate the nose is almost always obstructed, either by a deformed septum or enlarged turbinate bodies, or the nasopharynx is occluded by adenoids, cleft palate serves as a typical example of rhinolalia mixta. While the predominant nasaling of cleft palate is usually that of rhinolalia aperta due to imperfect closure of the palate, this is quite regularly combined with a quality of nasaling from rhinolalia clausa due to nasal or nasopharyngeal obstruction. Nature, indeed, shows a disposition to produce a vicarious palate by filling the nose with hypertrophied turbinate tissue. I remember years ago of seeing in an adult a wide palatal defect extending far forward into the hard palate, which cleft was literally completely filled with a massive lower turbinate body. The effect of this natural obturator, was undoubtedly very favorable to the patient's speech. Not understanding this, however, at the time, I began to consider the most favorable means for removing the enormous turbinate body, an operation which as I know now would have done the patient much harm. Fortunately, he was wiser than I and did not return for further treatment. Formerly one could see more unoperated palatal clefts than he sees today, the rule being now to operate during the first months of life, and the practical problem of the rhinologist has to do chiefly with operated cleft palate. As to unoperated palatal cleft cases, let it be remembered that operative interference with conditions producing nasal or nasopharyngeal occlusion should be undertaken only after the closest consideration of the speech conditions involved.

But after operation for closure of the palatal cleft it usually happens either that the soft palate is too short to reach close to the posterior pharyngeal wall, or else the palate is incapable of sufficient movement to perform its natural function in speech. Consequently most cleft palate patients possess to a lesser or greater degree a permanent rhinolalia aperta voice, even after everything possible for the speech, both by operation and training, has been accomplished. In such cases nasal occlusion, as has been said, is with practical regularity present, and also adenoid tissue is common in the nasopharynx.

Moreover, in these cases there is much tendency to eustachian and middle ear inflammation, leading pretty regularly to more or less loss of hearing.

Since nasal occlusion and adenoids are associated in the mind of the rhinologist as a cause of aural inflammations, his disposition is naturally towards operative procedures upon the occluded nose and nasopharynx. It is at this point that considerations relating to the speech become important. In the first place, it is to be considered that other causes for aural inflammation exist in these cases beside those having reference to nasal or nasopharyngeal occlusion. This is proven by the fact that such aural inflammations go on after operative measures have been taken, and Gutzmann declares that they go on practically without any modification resulting from such operations. When one considers the permanent opening between the pharynx and nasopharynx with the continuous rasping effect of food and fluids, at any rate on the lower portion of the mucous membrane of the nasopharynx, one is not surprised that a tendency to middle ear inflammations exists even aside from that due to occlusive causes.

In rhinolalia mixta, whether from cleft palate or other causes, one should approach the question of operation for obstruction in the nose or nasopharynx with a great deal of care. If the rhinologist operates with the free hand usually employed, aiming to produce a normal breathing space, he will often be surprised to note the harm he has done to the voice. The work of training of months may be undone by a single operation of this kind. For in rhinolalia aperta a considerable amount of occlusion in the nose and nasopharynx improves the voice. The presence of adenoids is of the greatest advantage, especially during the early period of training. Thus one should always bear in mind that the presence of rhinolalia aperta serves in a measure to reverse the ordinary indications for nasal and nasopharyngeal operation for occlusion.

The following suggestions will serve to render the subject more concrete: First, the seeming demand for operation on the nose or nasopharynx, for the purpose of aiding in the correction of a tendency to inflammation of the ears, should be weighed very carefully against the demand of the speech for the continuance of nasopharyngeal and nasal occlusion; second, operation for the improvement of the breathing space through the nose should be extremely conservative, certainly

never producing a fully normal breathing space; third, operation for the elimination of the voice qualities of rhinolalia clausa should also be undertaken with the same extreme care, for a slightly obstructed voice is much more understandable than a badly open voice. And finally, operative effort on either nose or nasopharynx should proceed not by a single large operation, but step by step, with a waiting period between, so as to be able to call a quick halt if any signs of going too far become evident. Regarding the turbinates, extremely cautious cauterization would suit the conditions better than resection. Adenoids should be removed only after the clearest evidence of demand for removal of sufficient importance to outweigh the demands of the voice, and even then a partial operation should always be given preference over complete removal.

TREATMENT.

The correction of rhinolalia clausa functionalis involves the reinstitution of the habit of dropping of the soft palate for each nasal sound. The patient's ear should be educated to appreciate the quality of nasal as compared with oral sounds. He should be directed to take deep conscious nasal inhalations and exhalations, and then to make each nasal sound slowly and deeply through the nose. The appreciation of nasal quality tells him whether the air is or is not passing out of the nose; also the vibration of the bony nasal wall may be felt; but, better still, the nasal ear diagnostic tube serves this purpose. Having learned how to produce the individual nasal sounds, he then practices slowly and distinctly each vowel and certain regularly associated consonants with each nasal sound; and then individual words slowly spoken, and finally sentences.

The treatment of rhinolalia aperta functionalis aims to re-establish the raising of the soft palate against the posterior pharyngeal wall with each oral sound. Here, too, the patient should be trained to recognize the distinction between oral and nasal sounds. To this end deep breaths through the nose and through the mouth should be taken; nasal and oral sounds should be spoken freely before the patient in order to educate his ear. And the recognition of the difference between his own oral sounds when produced correctly and nasally may be aided by holding the palate back against the

posterior pharyngeal wall while oral sounds are produced. A moderately stiff flexible flat aluminum nasal applicator, so shaped as to follow the contour of the palate and with its tip wound with a soft pledget of cotton, answers the purpose admirably. The patient speaks certain selected sounds with the palate held back, and immediately repeats them without the aid of the palatal elevator, attempting to bring the sound out of the mouth rather than out of the nose.

This method serves also as a means for producing passive movement of the palate; and faradization may also be employed for this purpose. Both methods are impossible in persons with an especially sensitive mucous membrane. Active movement of the palate is brought about by the employment of selected vowel and combined vowel and consonant exercises. They should be spoken forcibly and explosively, and with an effort to direct the sound out of the mouth, and to obtain the desired oral quality. It is best at first to base these exercises upon the vowel sound Ah, which demands less perfect closure of the soft palate than the other vowels, using this sound in various consonant combinations with some success before proceeding to o, oo, aw, e and the others. Especial difficulties will require a variety of expedients. The prognosis is excellent, the length of treatment dependent upon the intelligence of the patient and the duration of the disorder.

To summarize:

1. The rhinologist is very liable to error in diagnosis, treatment and prognosis where nasaling is the disturbance in question, unless he is able to diagnose the manner of production and cause of the alteration of the voice in each particular case.
2. He should be on his guard for functional nasaling from either one of the two causes following operation for adenoids. Otherwise operations unnecessary and harmful may be done.
3. Operations on the nose or nasopharynx for nasal voice should not be undertaken until a clear understanding of the cause of the nasaling has been arrived at.
4. A defective palate, for example, when due to congenital palatal cleft, serves to in large measure reverse the ordinary indications for operation for nasal or nasopharyngeal occlusion, and unless the voice indications are carefully followed, serious and permanent injury to the speech may result from such operations.