THE
LARYNGOSCOPE.

VOL. XXII. ST. LOUIS, NOVEMBER, 1912. No. 11.

ORIGINAL COMMUNICATIONS.

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THE RELIEF OF NASAL OBSTRUCTION BY ORTHODONTIA—A PLEA FOR EARLY RECOGNITION AND CORRECTION OF FAULTY MAXILLARY DEVELOPMENT.*

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As a member of the faculty at the College of Dental and Oral Surgery, in this city, I became very much interested in the many diseases and irregularities of the alveolar processes. Through my former students I have seen a rather unusual and interesting class of cases and have become more and more interested in the results of orthodontia. I am firmly convinced of the great benefits to be obtained in suitable cases of nasal obstruction by proper orthodontic measures, and feel that this work will eventually, of necessity, be added to the equipment of the rhinologist. The question of nasal obstruction and its results is so far-reaching and touches so many branches of our profession that it is impossible to give in detail all the theories as to causation, effect and treatment, in any one paper. Of late years attention is being drawn more and more to the influence of the teeth upon the development of the face. It is well to remember that heredity plays a very important rôle in the shape of the face; that at birth the jaws contain fifty-two root germs, twenty deciduous and thirty-two permanent, and that these bones must develop normally if these teeth are to erupt properly. The pictures show the infantile size of both jaws and the relative position of the inferior lying within the arch of the upper. We know all septal deviations do not cause obstruction; that the eruption of the

*Read at the meeting of the Section on Laryngology and Rhinology of the New York Academy of Medicine, March 27, 1912.

teeth is not the sole cause of deviations. We have all seen cases in which the great need is for an actual increase of nasal space, which cannot be obtained by any operation upon the septum alone but requires the removal of part of the turbinate body also. The writer has obtained relief in several cases of this class by aid of orthodontic measures and will report six of these. There is a great diversity of opinion among the dentists as to what does actually take place in the movement of teeth but the results are what we need and as they do obtain them in a very large number of cases we should recognize the fact and take advantage of their skill whenever possible. The writer presents this paper realizing its shortcomings but trusting that it may awaken interest and cause further investigation.

I will give the histories of six cases that I have watched for many years.

Case 1: P. M., 10 years old, has been under my care all of his life, the last three years as my step-son. He has always been a mouth-breather and invariably suffered every winter from repeated colds. In 1904, I removed a very large adenoid but there was little relief to breathing owing to nasal obstruction caused by bowing of the septum. I wanted to have a separation of the maxillae done on him for several years but delayed it because of these repeated colds. In December, 1910, after a very severe and prolonged attack during which the ethmoids poured out a profuse and continual stream of pus, my associate, Dr. Dwyer, made an autogenous vaccine from pure cultures of the staphylococcus aureus, and treated him with that for about six weeks. Under this treatment relief was very promptly secured, the cough and all the nasal secretion ceased and have never returned to date. The nasal obstruction, however, remained and in May, 1911, I took him to Dr. E. A. Bogue for consultation. He found that there was a slight narrowing of the arch with some mal-occlusion resulting. Had there not been marked nasal obstruction, I doubt whether I should have had any widening done. As this septal deviation had always been a source of great anxiety to me during each of his many colds, I decided to try rapid spreading in order to ascertain whether it would have any effect upon his nose. The boy's physical stature is that of the typical mouth-breather, rounded shoulders with protruding shoulder blades, narrow-pointed chest and protruding lower ribs, and general malnutrition. Owing to delay in obtaining the correct spreaders they were not finally adjusted until two days before our departure for the summer, so that it was necessary for me to make the daily ad-

justments following out the very explicit written instructions which were given to me. The total spreading was obtained in two weeks without causing any pain, and could readily be seen by the actual separation of the central incisors. Dr. Bogue took charge upon our return in September. As soon as he secured good occlusion I persuaded him to remove all the apparatus, replacing it with a hard-rubber plate for the upper jaw to hold the separation. I felt that the wires on the labial side of the arches interfered with the muscular action of the lips, and also made it more difficult for the boy to keep his mouth closed, both very important conditions. After two months the occlusion is even better than ever and he has entirely overcome his habit of keeping his mouth open; he straps his lips together every night of his own accord. His septum has straightened and no longer impinges on the turbinates. This winter has been the best he has ever had. He has grown taller and has gained eight pounds in weight; he has not lost a day from school, and for the first time in his life he has joined with his schoolmates in all their out-of-door play. He no longer suffers with eneuresis. I regret that the separation was not done when I first advocated it, as several years ran on during which time there never seemed to be a time that he was well. As he had always been a nervous child, I was afraid that the dental work might aggravate that, but I now know that it would not have done so, and feel that the time lost was very regrettable, as it made the actual separation more difficult, the teeth being in the transitional stage, that is, the deciduous being shed and the permanent not being erupted enough to allow their being used.

Case 2: M. B., 10 years old, has also been watched since birth, being the child of intimate friends, and a constant companion of my boy. She has always been the cause of great anxiety to her parents. In 1905 I removed a large adenoid without bringing about any marked improvement. Dr. Sheppard, of Brooklyn, operated upon her again in 1909, but no improvement followed and they then moved from Brooklyn to Rye, hoping the open-air life would help her. Having advised them to try rapid spreading, they took her to an orthodontist who told them that the adenoids would have to be removed before any work could be done on the teeth and they were about to consult another rhinologist in this city when I persuaded the father to take her back to Dr. Sheppard. He assured them that there were no adenoids and agreed that the nasal obstruction was due to bowing of the septum. Dr. Bogue then took her in charge and did the same for her that he did for my boy. On February 12,

1912, I examined her nose and found free nasal breathing and an undoubted straightening of the septum. The effect upon this child has been remarkable. Before, she was dull and apathetic, extremely pale, had very little energy and although tall, only weighed 59 pounds. Since spreading she has not had a sick day, even with the severe winter, she leads her class in all her studies, she is bright and full of energy and has gained eight pounds within six months, which is more than she has gained in three years before. This case was also difficult to handle, being in the transitional stage of eruption. There was no marked irregularity of the teeth, other than a narrowing of the arch and some vaulting of the palatal arch.

Case 3: H. M., 12 years old, was brought to me in March, 1907. He was under-sized, pale, backward in school with frequent absences on account of sickness. He was a most pronounced mouth-breather with badly protruding incisors and a very marked malocclusion, with a gothic vaulting of the palate. He had very large tonsils and a large adenoid, with great nasal obstruction due to septal deviation. I removed the tonsils and adenoid without relief to the nasal obstruction and then sent him to Dr. Merritt for regulation. I do not know what method was followed in this case, but the results were most beneficial. I had him come to me in February, 1912, and hardly knew the boy. He had grown four inches and was a strong, healthy boy to all appearances. He had not been sick since his teeth were straightened and has been a nose-breather ever since then. He still has a deviation of the pre-maxillary wing but the bowing of the septum has disappeared and he has free nasal breathing.

Case 4: W. M., 12 years old. This boy's mother died at his birth, and he was always a delicate and extremely nervous child, brought up in the lap of luxury. When he was 7 years old his tonsils and adenoids were removed, but he remained a pronounced mouth-breather. I watched this child for years but was not his physician and so do not know what was done for him up to 1910. He was the most nervous child I had ever known and I felt that he had St. Vitus' dance. On account of the disfigurement caused by his protruding teeth and wide open mouth, he was taken to an orthodontist who was most successful. All the excessive nerve irritation has disappeared, the boy has grown taller and is ridiculously fat, he is now never sick. He is a nephew of my wife, and I see him frequently, and feel that his improvement has all come since the regulation of his teeth was begun.

Case 5: H. M. is now 20 years old, and I have taken care of her since she was 2 years old, except for a period of seven years, dur-

ing which time her family resided elsewhere. In 1906 I was called to see her for a severe tonsillitis and was dismayed at the condition of her mouth. She had been two years in the care of a dentist who was regulating her teeth. I had never seen a mouth in such a condition. The gums were in horrible condition with very marked pyorrhea, and the poor girl was on the verge of nervous prostration from the agony she was subjected to twice a week. I felt it my duty to advise another orthodontist. He immediately removed all apparatus and after thorough cleaning she was quickly relieved of the troubles of the gums; he then adjusted new apparatus and in a short time adjusted the teeth without any distress. She is now a beautiful girl, enjoys splendid health, and is strong enough to stand the whirl of New York society life. This case illustrates how careful one must be in advising that the orthodontic work be done, unless you can be sure that it is done by one who is qualified. The first man, judging from the mal-occlusion and the torture inflicted after two years of work, had no idea of any fixed plan as to what he expected to accomplish, and the amount of fixtures in the mouth was incredible.

Case 6: F. D., 20 years. This young lady was a teacher and became engaged to a wealthy young man. She had always been keenly sensitive about her personal appearance, caused by protrusion of the incisors with a narrow, vaulted arch, which spoiled an otherwise lovely face. I advised her to go to Dr. Merritt and he succeeded in remodelling her mouth most satisfactorily. By persistent effort she gradually developed her upper lip and now breathes through her nose entirely. This work was done ten years ago and made a lasting impression on me because of the great improvement in her health.

The foregoing cases were too few to draw any conclusions from, but presented several features in common which I noted in following them: 1. All were greatly benefited in their general health. 2. Mouth-breathing has been overcome in them all. 3. In five, recent examinations have shown plenty of nasal space and straight or nearly straight septa. 4. These patients are no longer subject to the recurrent colds with which they were afflicted before the dental regulation. 5. Adenoids had been removed in five without overcoming the mouth-breathing habit. 6. The regulation should have been done at a much earlier period in all the cases, but, notwithstanding this fact, they all received great benefit. 7. Except in one case which was badly treated at first, there was no pain and the patients showed improvement soon after the treatment began.

It is a pity the rhinologist has not worked with the orthodontist during the past so that we could better judge our results and be able to give our patients the benefits of the results. My six cases have become nasal breathers although not benefited by the removal of their adenoids. They no longer suffer with recurrent colds and I do not have the fear of having to operate upon their noses. The general health and development have shown such improvement it is hard to account for it except we recognize that they have increased nasal space which has been secured by the orthodontist as well as the benefits derived from proper occlusion, which insures better mastication of the food. If this can be secured in these late cases, would it not be infinitely better to give the children the benefit as soon as the work can be done and thus help them during the period of their most rapid development and probably prevent these deformities of faulty development.

Our text-books on rhinology practically ignore this subject. In the study of the anatomy thousands of skulls have been examined by many observers and in all, whether broad or narrow-faced, a very large percentage of septal deviations have been noted. There are many theories about how these deviations are produced, excluding those caused by traumatism. Dr. J. G. Wilson published a very interesting article in the *Medical Record* of January 29, 1910. He attempts to prove that in modern civilized man the tendency of the brain-case to develop at the expense of the bones of the face is constantly making itself apparent. He says that the effect of this relative over-development of the brain-case is manifested in the following ways: 1. The recession of the jaws. 2. The gradual disappearance of the accessory sinuses. 3. The great prevalence of deflected septa. He claims that the recession of the jaws is responsible for the many pathologic conditions of these appendages, the diminishing space for the development of the teeth leading to over-development of the brain-case. He shows that deflections are proximate these irregular teeth leads to mouth-breathing and improper mastication. He gives the results of an extensive study of skulls, attempting to prove that there is a gradual diminution of the accessory sinuses, and that the septal deflections are due to relative over-development of the brain-case. He shows that deflections are common in all races but claims that they do not necessarily cause obstruction, this only occurring in those cases where the actual nasal width is insufficient. For instance, negroes often have very large deflections without obstruction, while in the Hebrew race, nasal obstruction is very common because of the very narrow nasal space.

He sums up his conclusions as follows: "1. The sinuses do not at present subserve any useful purpose, but are to be classed as the disappearing or vestigal organs, which accounts for their liability to disease. 2. The presence of deviated septa is equally common in all races becoming pathologic only in races which are congenitally narrow-nosed. 3. The cause of congenitally narrow noses and deviated septa is primarily developmental and finds its true explanation in the fact that the brain case is being developed at the expense of the face and olfactory apparatus." There is food for a good deal of thought in this paper which I have briefly outlined, as it fits in with the observations of many others in its conclusions.

Among the rhinologists, Dr. Mosher aroused much interest in 1907, when he first gave his theories about the pre-maxillary wings, —theories now universally accepted. In this paper he claimed that the great majority of anterior deflections are caused by delayed

Figure 1. Note variation in floor of antra and of nares. Right antral floor lower than left, while nasal floors are the reverse.

eruption of the central incisors. Later he claims that unequal descent of the antra resulting in inequality of the two halves of the palate was another cause of the deviation of the septum, and especially that it was a cause of vomer spurs. As these unequal developments of the superior maxillae are probably caused by faulty eruption of the back teeth, it would seem that we have an explanation for a large percentage of all deviations as being due to faulty eruption of both the front and the back teeth.

The writer does not agree with Mosher in his views as to the difference in size of the posterior choanae, nor does Swain in his article on "Facial asymmetry as a possible cause of deformity of the nasal septum," published in THE LARYNGOSCOPE, July, 1905. He has rarely found any marked variation either in height or in width, and when there has been any difference in height it has been due to a difference in the development of the sphenoid sinuses. The

horizontal plates of the palate bones rarely vary in their relation to each other and to the pterygoid wings of the sphenoid which are fixed points but do vary greatly in their relation to the tuberosities of the upper maxillae which are never alike. To the writer it seems that the palate bones belong to the cranial group and do not enter into the development of the jaws or face. Dr. Mosher's paper is a classic and is the first to draw attention to the causation of spurs and deviations, but there are several points which might be profitably discussed, especially as to the effect of the antra.

It is generally stated that septal deflections are very rare before the seventh year. The writer believes that this must be a mistaken idea, for in two of his own cases there was decided bowing of the

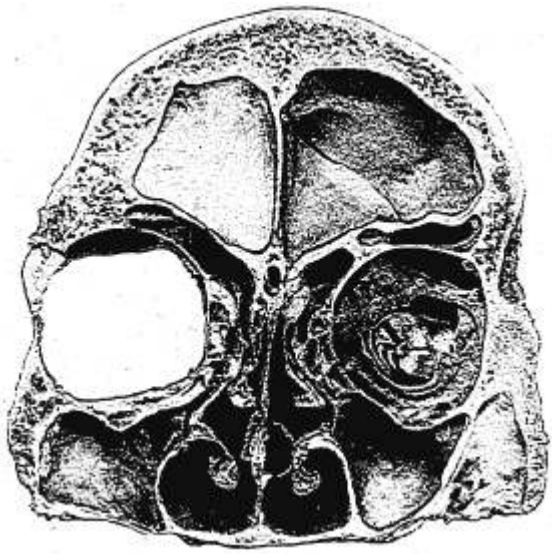

Figure 2. Note absence of alveolar process and the relative position of floors of antra and nares.

septa, sufficient to cause marked obstruction, before they were 5 years old, and he has observed bowing in many others before the seventh year.

It is well to remember that the alveolar process is purely a temporary structure developed on the maxillae for the purpose of holding the teeth, that it is very cancellous, that it varies in every individual and that it constantly undergoes change as the teeth develop or are lost. It disappears entirely with the loss of all of the teeth and it is interesting to note the effect its disappearance has upon the septum, the antra and upon the mandible. The antral floors rise to a level with the nasal floor and the writer has noted that there is gen-

erally a very marked bowing in the vertical axis of the septum with the shortening of the hard palate which is always present after loss of the teeth. This septal condition seems to bear out the writer's theory of the causation of the vertical bowing in some cases.

One must remember that the septum is rather extensive as is shown by the illustration. It is formed by the perpendicular plate of the ethmoid, the vomer, the two palate bones and the two su-

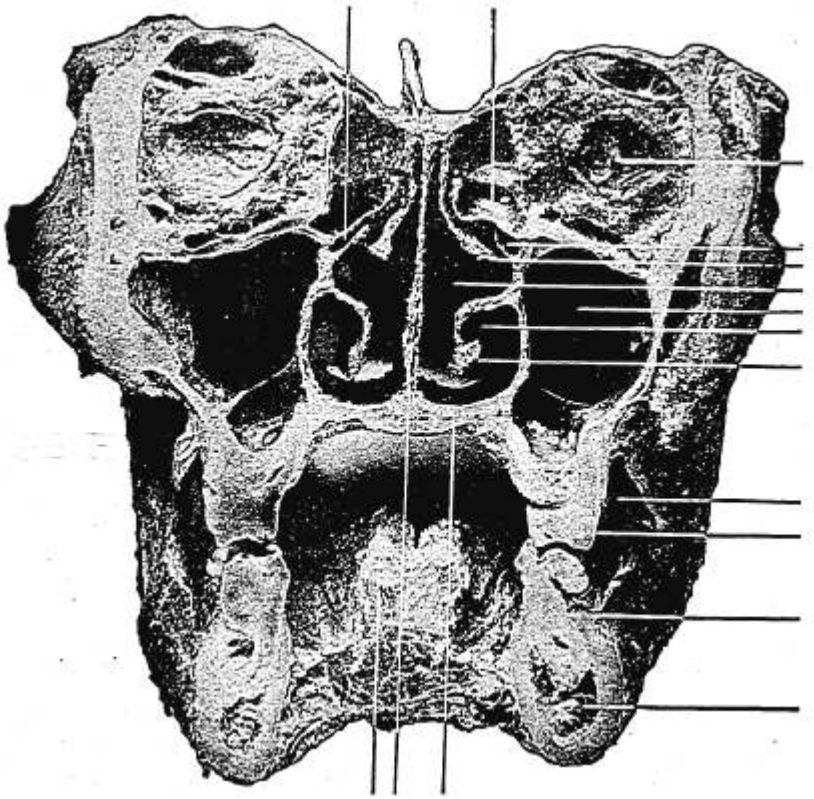

Figure 3. An unusually symmetrical head. Septum straight; nasal fossae large; also maxillary sinuses. Teeth show good occlusion.

perior maxillae, as well as the extensive cartilage. In examining a number of skulls, something over 600, deflections were found in over 75 per cent. The writer was impressed with the peculiar double deviation which he will attempt to describe and illustrate with skulls later. It was impossible for the writer to form any conclusions from these, not knowing anything about them as to age or race, but it was found that whenever deflections were present there were irregularities also of the dental arches. The illustration shows an unusually symmetrical skull. Note the regularity of the

teeth and arch. Among some of the peculiarities noted, but not grouped as yet, were:

1. Anterior nasal openings differ frequently in size.

2. Posterior openings practically alike in width but occasionally vary slightly in height. Dr. Swain claims that they may vary in width, but variation is so slight it is only discoverable on measurement, rarely exceeding one millimeter.

3. Floor of nose higher on one side than on the other in front.

4. External nasal walls vary frequently, sometimes being fairly straight but often bulging outward, thus actually increasing the nasal space. This bulging varies on each side, often very markedly.

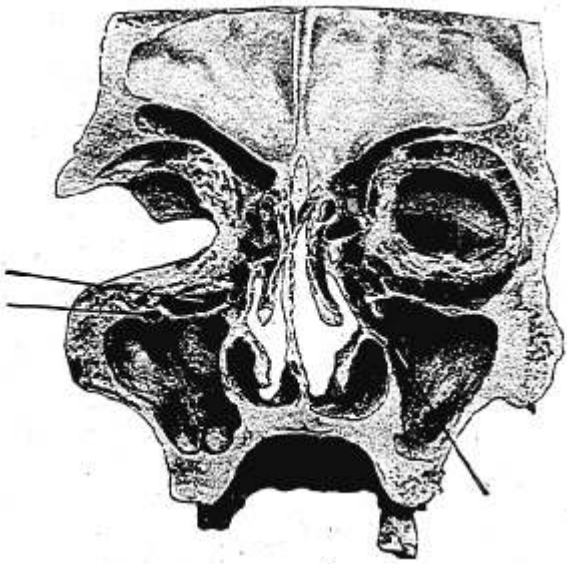

Figure 3a. Note irregularity of lateral nasal walls; difference in antra, and irregularity in shape of alveolar process.

5. Occasional twisting of the vomer at its origin.

6. Deviation of the median palatal suture.

7. Variations of the palate arch in shape and on surface and of alveolar process.

8. Faulty direction of teeth and their roots. (See Figure 4).

9. Relative position of the tuberosities to the sphenoid bones, the latter never varying in their fixed relations to each other.

10. Narrowing of the arch and nares very common.

11. Shortening of the arch, this shortening being all in the maxillary portion of the arch, the palate bones varying very slightly, is, in the writer's opinion, one of the chief causes of deviations and indicates that the maxillae has failed to develop forwards.

This illustration shows faulty position of third molars due to shortened alveolar arch.

12. The intimate relation between the alveolar process with the internal outline of the nose including the antra, especially where the roots of the bicuspids and the molars enclose the floor of the antra.

13. This condition is present almost without exception; the pos-

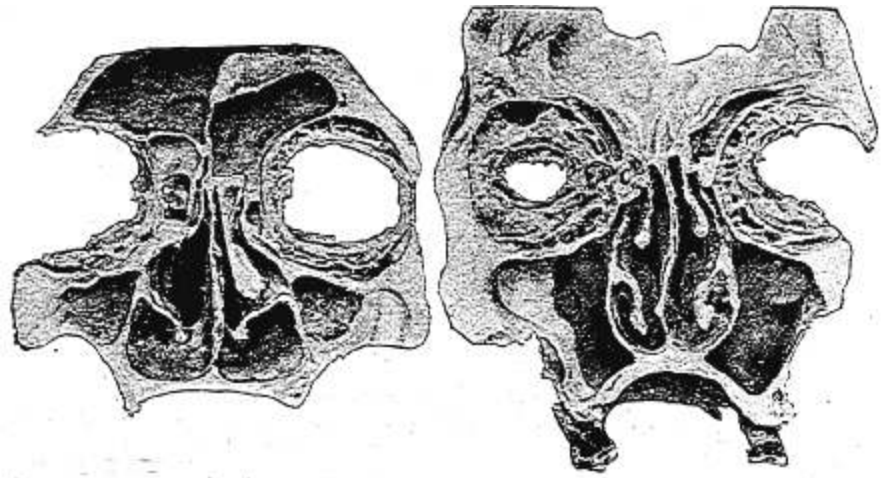

Figure 4. Note irregularity of teeth, extreme narrowness of nasal floor, and bulging of lateral walls. Note particularly the extension of antra under floor of both nares.

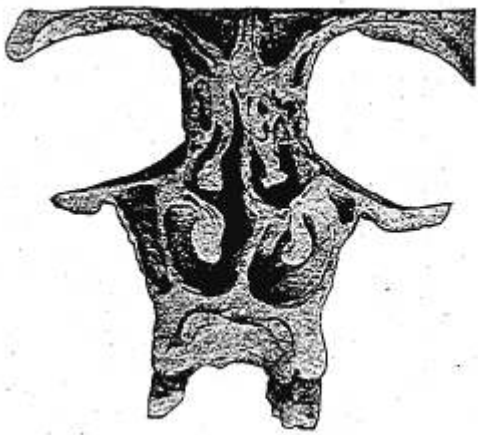

Figure 5. Note narrowness of arch and of nose. Large spur.

terior border of the vomer and nearly ½ inch of it anterior to the border are *practically* straight (this agrees with Dr. Swain), this corresponding to the articulation with the palate bones which, as noted before, rarely vary.

14. A bowing of the septum in a vertical axis from before backward was noted in a great many cases, as well as the horizontal bowing. Not being permitted to cut the skulls it was impossible to examine the relative position of the antra.

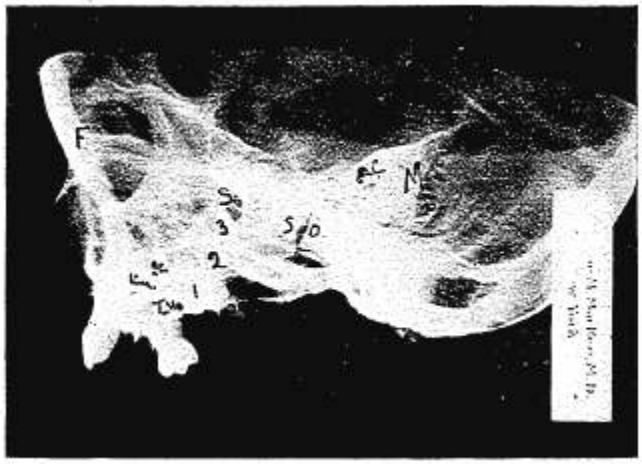

Figure 6. X-ray photograph. Note lack of forward and downward development. Note position of third molar and other impactions.

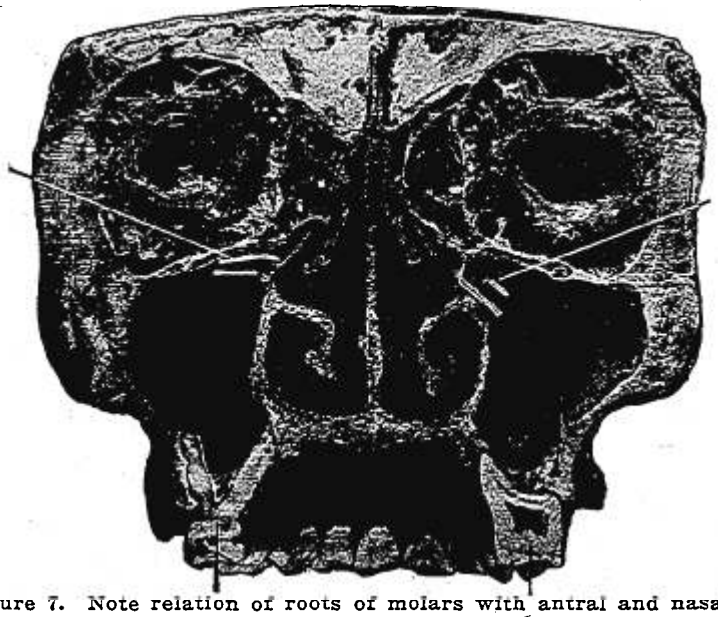

Figure 7. Note relation of roots of molars with antral and nasal walls.

The Cryer stereoscopic pictures are very instructive and will illustrate most of the conditions noted above. Up to the time of Mosher's paper but little had been suspected of the connection of the teeth with the nose, by the rhinologist. The dentists have

claimed that regulation was almost always followed by improvement in health, but rarely attributed that gain to the increased nasal space, but claimed that it was chiefly due to the relief afforded to the nervous system from freeing the dental impactions. By dental impaction we mean any condition in which there is not room for the teeth to erupt in their natural position, thus making eruption difficult. It is most surprising to notice how many cases of malocclusion will be noted if one examines every patient's mouth with care. The writer would like to give the views of some of the orthodontists who are advocating early and rapid spreading of the jaws. Dr. Bogue claims that the eruption of the permanent teeth can be foreseen from the position of the deciduous teeth, and is an ardent advocate of early separation even before the eruption of the permanent incisors. It is well to understand that some orthodontists, Bonwill, Barnes, Bogue and others have formulated definite rules or measurements by which they claim that they can outline an ideal arch into which all the teeth should easily erupt for each individual mouth, as soon as the permanent central incisors erupt sufficiently to be able to measure their width. As these teeth should erupt *before* the eighth year, at the latest, it is possible thus early to know the size of the ideal arch, and if there is any marked difference in the patient's actual arch it is certain that there will be an impaction. Dr. V. E. Barnes, of Cleveland, in a most instructive paper published in the *Dental Cosmos* of January, 1912, says: "That the difficult teething of infants results from a defective development which is generally associated with artificial feeding; that the failure of the mother's milk to properly nourish the child indicates that the prenatal conditions were probably not normal and that in consequence both prenatal and postnatal developments must be more or less deficient. The eruption of both sets of teeth covers the principal years of growth of the body, and he claims that many of the serious cases of delayed development of children are, at least, influenced by the dental impactions and, that although this may be only one of the factors which combat an individual's health, it may become a determining or major factor." He quotes Dr. E. S. Talbot as follows: Dental impaction is a *result* of early, and a major factor in later defective development. Dr. Barnes advocates early but rapid opening of the suture, which is known as the region for lateral development. He argues that, as the eruption of the incisors at or about the *seventh year* marks the *completion* in any jaw of its *width development,* if the actual jaw does not closely approximate that of the ideal arch as constructed for that jaw from

measurements of the proper teeth, as per Bonwill measurements, then expansion and proper adjustment should be done to allow room for the easy eruption of the permanent teeth. He says: This must be before the seventh year and should be before the fifth or

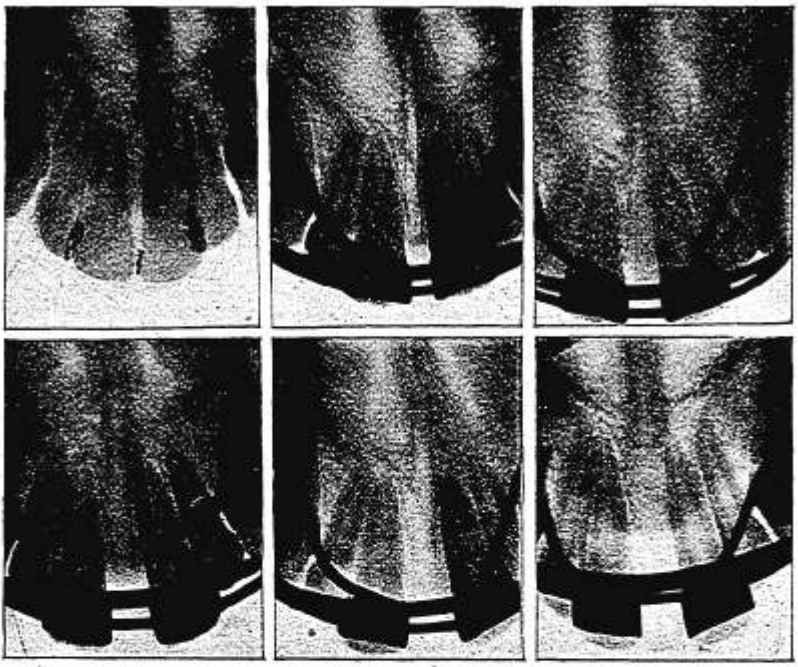

Figure 8.

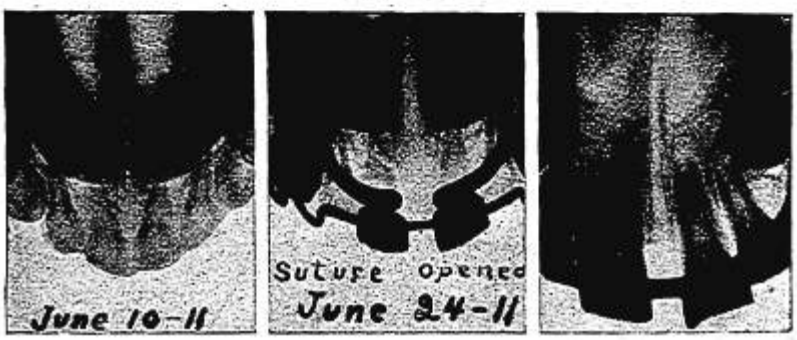

Figure 9.
Figures 8 and 9 show separation of premaxillary suture.

sixth year. In his conclusion he says: That the preventive treatment for dental impaction consists in an early orthodontic operation, and that the operation must be made upon the deciduous teeth, expanding the arch anteriorly and laterally and not at the expense of posterior teeth. Dr. Barnes has kindly allowed me to use his

illustrations and those which actually show the opening of the premaxillary suture are the first and only ones that I have seen.

The writer would like to recommend the reading of Cryer's "Internal Anatomy of the Face" in which he describes and illustrates many anatomical variations and dental impactions. In his conclusions he says: "It is, of course, to be understood that the factor behind these anatomical variations, leading to asymmetrical development, is necessarily nutritional; that the most important etiological factor in the irregularity of the upper dentures of mouth-breathers is the loss of the developing and molding influence which directly result from the percussive force of occlusion exerted by the mandible upon the maxillary arch. That the presence of adenoid growths in the naso-pharynx, or in fact any cause which interferes with the normal closing of the mouth, at once interferes with occlusion which he regards as the most potent factor in the normal development of the relation of the upper to the lower denture. Mouth-breathers also lose very largely the effect of the pressure which is exerted laterally in normal mouths by the tongue." The writer believes that another factor in the development of the high arch in the mouth-breather is the loss of the suction traction of the tongue on the arch and the loss of the downward pull of the weight of the mandible when the mouth is closed in nasal breathers. This loss has not generally been mentioned but Dr. Bogue tells me that he has mentioned it in a recent article. Dr. F. L. Stanton, of this city, published a very interesting article in the *Dental Digest* in 1910, on "The Teeth in Respiration," and mentions this action.

Dr. N. M. Black, M. D., and Dr. G. V. I. Brown, D. D. S., read papers before the American Laryngological, Rhinological and Otological Society in 1910, which should be carefully studied by all rhinologists. They agree in their main conclusions as to the great benefits secured by rapid spreading of the upper maxillae in selective cases. As they have practiced this method for over fourteen years, and upon several hundred cases, their results are of real value, they having followed many cases over a number of years. They differ somewhat in their theories of how their results are actually obtained. That the septum does straighten at least in young children, the present writer is positive and he believes that this straightening is due to the actual separation of the suture which allows the resiliency of the septum, described by the late Dr. Asch, to force itself down into the space thus made and also that the lengthening of the suture allows room for the vomer to extend forward to its full length as planned for that particular skull, thus

overcoming the antero-posterior vertical bowing that the writer has observed in so many cases. When this straightening does take place it is reasonable to believe that the septum thus forced into the fissure created by the separation helps to fill in the space and to maintain the expansion. Dr. Wright, in the *Dental Cosmos* of March, 1912, has noted actual straightening of the septum. The writer does not believe that there is any tilting of the arch or of the teeth themselves when the rapid separation has been properly done, for the teeth are firmly held by the apparatus, which is fixed as close to the gingival border of the teeth as possible, and the pressure is so applied as to move the whole mass of teeth apart, and after separation there is little change in the direction of the occlusal surfaces. The x-ray pictures which Dr. Barnes has kindly loaned to me and are shown elsewhere, prove very clearly that the pre-maxillary suture does open, and also show that with this opening there is no tilting of the central incisors at least. Then again, the teeth are very rigid and are much denser than the alveolar processes. If there was actual tilting to any marked extent in the short time actually required to get the separation, it seems to the writer that the outer buccal surfaces of the teeth would produce decided elevations on the alveolar processes as they are forced outward. This condition the writer has never seen either in any of his cases or on any of the many casts he has examined. Dr. G. B. Palmer has loaned me these casts taken before and after regulation. The patient was a man 25 years old. They show actual separation between the second molars of one-half inch and between the bicuspids of three-quarters of an inch. With even this great widening there is no evidence of irregularities on the alveolar border. The width gained in front in these casts is clearly shown by the increase in the width of the false central incisors. As to whether there is any actual lowering of the arch there has been much discussion, which only tends to befog the real question, which is that actual relief is given to the patient and they will testify that they do breathe more freely. The writer believes that, although there may not be any actual lowering at the time of the separation, the more normal development of the whole face as a result of the restoration of nasal breathing and the freeing of the dental impactions, especially when done early in life, will eventually bring about an actual lowering of the roof because of the downward growth of the whole face. One cannot measure any actual lowering of the vault of the palate except by a vertical inter-nasal measurement from the roof of the nose which is almost impossible. A comparison of casts is also very deceptive and can-

not be relied upon. That widening of the intra-nasal space does actually take place has been proved by Dr. E. E. Foster, of New Bedford, in two cases of his. In one, the distance between definite points on the inferior turbinates was increased 3 mm., and in the other 4½ mm. Dr. G. B. Wright, of Boston, reports three cases in which widening of 6, 6½ and 2½ mm. was secured, these measurements being from the antral walls. The actual measurement of the nose hardly seems necessary in cases of rapid spreading where there is full development of the permanent teeth at any rate. The separation of the central incisors, which are not held in the separating apparatus at all, and the x-ray pictures, show that the pre-maxillary suture does open, and that of itself must give increased nasal width. With this there must be an actual shifting of the alveolar process outward, which must carry along with it the outer wall of the nose, owing to the intimate relations between the roots of the teeth and the walls of the nose as can be seen on any skull. If we grant this we must acknowledge that a separation of the teeth must bring about widening of the nose also. In the young child, where the separation is done with the deciduous teeth, besides widening the arches of the temporary teeth, you also change the position of the forming permanent teeth, and because of the increased space in the alveolar process allow these to erupt easily and in a larger arc so that the lateral walls of the nose also as they develop, are wider than if left alone. The writer, after a great deal of study and comparison of skulls and of dental impressions made before and after regulation, has been impressed with several peculiarities which seem to appear co-incidentally, and has another theory to submit as a possible factor in the cases of nasal obstruction due to septal deviation. It does not apply to all cases. It is a singular fact as mentioned before that the posterior border of the septum and from 8 to 10 mm. anterior to the border are almost universally straight. This corresponds to the articulation of the vomer with the sphenoid and to its insertion or articulation with the horizontal plates of the palate bones below. The horizontal plates of the palate bones rarely vary in the same skull and are very slightly if at all influenced by the alveolar arches, which belong entirely to the upper maxillae.

The writer in examining his series of over 600 skulls noted that in about one-half of those with septal deviations, that the deviation was not only a horizontal bowing, with or without a spur, but that there was an antero-posterior bowing in a vertical axis, which is plainly shown in the illustration presented. The spurs which are so

frequently to be noted at the vomer-ethmoidal articulation can be explained as the result of excessive pressure with an angular formation resulting at the point of least resistance. It was difficult to explain the probable cause of this vertical bowing, until it was noted that in many of these cases, there was also a shortening of the length of the arch of the palate. This shortening of the hard palate is due entirely to the palate and alveolar processes of the maxillae with which the vomer has to articulate for more than three-quarters of its lower border. The orthodontists recognize this shortening of the dental arch in many cases and endeavor to overcome it, as shown by the schematic drawing of Dr. Barnes. Granting that this is a

Figure 10. X-ray photograph showing bowing of septum. Note shortness of alveolar process. Same skull as Figure 6.

fact we have a most reasonable theory to account for the vertical bowing. The vomer, as planned for the skull, in growing downward and forward tries to grow to its full length but the anterior portion has to articulate with a much shorter line than intended by nature and in pushing itself forward becomes bowed vertically. This explanation fits in well with the conclusions of Wilson given before, in which he describes the recession of the jaws and also the pushing downward of the cranial bones at the expense of the facial as causes of nasal obstruction. That this theory is not unreasonable can be demonstrated by comparing the casts made before and after orthodontic measures have been used. In many of these cases

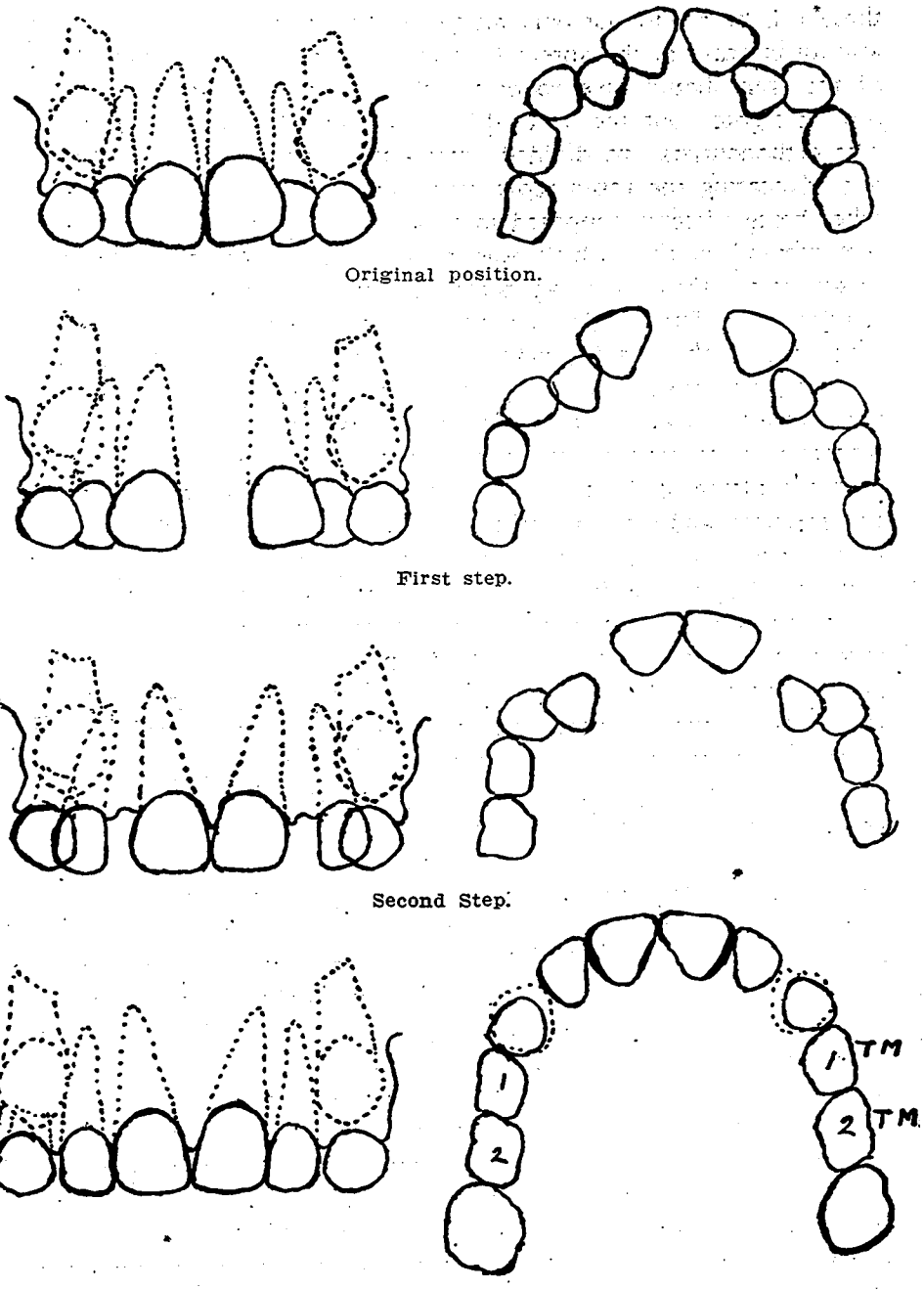

Figure 11. Schematic drawing of steps taken in work, showing original condition. First step, that of separation; second step, that of individual movement of the teeth into proper alignment; and third step, the completed operaion.

there will be found not only an increased lateral measurement but also an increase in the antero-posterior direction. This lengthening of the arch should give room for the vomer to lengthen out and thus straighten out the vertical bowing and allow freer breathing. The orthodontists are divided among themselves into two parties, one advocating the rapid separation and opening of the suture, the other being violently opposed to it and insisting that the only correct method is that which was originated and perfected by Dr. Angle, and a third party advocate extraction to correct alveolar irregularities. The Angle method requires years of treatment and fails to give the nasal benefit in many cases. It would take too much time to explain the method and, to be frank, the writer does not altogether agree with some of their theories, and has known several cases treated in this manner, that is, with weak spring pressure and tilting of the teeth, who have suffered very severely from the soreness and very painful mastication. He feels that whenever patients present themselves with nasal obstruction associated with dental irregularities the sooner those irregularities can be overcome, the better, and that this can be accomplished in a very much shorter time and without any marked distress to the patient by rapid opening of the suture and movement laterally of the teeth *en masse,* whenever practicable, than by the slower process. One must bear in mind also that the teeth in the mandible have to be placed so as to meet the upper in proper occlusion, otherwise no good will come and the patient might even be worse. When these conditions are discovered in the child under 4 years of age they can very quickly be remedied so that as they grow older the maxillae will become larger, and there will be more room in the jaw for the permanent teeth. One of the most noticeable things in the rapid spreading is the early improvement in the general health of the patient which insures greater activity in the development of the bone structures along with all other organs if proper attention is given to the diet and a liberal supply of the bone-forming elements is given with the food. Mouth-breathing is an almost inexcusable condition of the present day and reflects great discredit upon our profession when we know what can be done. In later years, when the permanent teeth have erupted and are fully developed, much good may result, even as late as thirty years, from widening the jaws, providing the apices of the roots are also moved outwards. The procedure takes longer as the age increases, but in selected cases there is no doubt that more benefit will be obtained by this method than by our operative measures. I do not mean that we

should discard all our known methods of treatment, but I do urge that we examine our cases more thoroughly as to the actual amount of nasal space that they may have and as to the condition of the palate arch and irregularities of the teeth before we operate. I am sure that we have all failed to bring relief to many of our patients even after a most successful operation on the septum from the surgical point of view, and do not doubt that the failures are due to the fact that there is not enough room within the nose for all of its component parts, unless some part is removed. The question of expense is unfortunately a stumbling-block to many who have to consider the ways and means. If, however, we start them early, it lessens the expense very greatly and at the same time the little patients are helped at the most critical time of their lives when everything counts in their struggle to build up a strong, rugged constitution with which to battle with life. It is universally conceded that we have an infinite number of cases of nasal obstruction, whether from deviated septa, congenitally narrow noses or asymmetrical developments of the maxillae and that these cases increase in number very rapidly up to the eighteenth year. This corresponds to the period of greatest development of the anterior portion of the skull, the brain case practically reaching its full size at the age of 7, while the face continues to develop up to 18 years, very largely by the development of the upper maxillae which extend anteriorly and lengthen themselves downward.

That faulty maxillary development is a probable cause of many eye conditions has been noted by Dr. W. F. Daly, of Boston. He says: "A train of ills associated with the growing period of the human face is found in the eye and its adnexa, such as the various heterophorias and more pronounced anomalies of muscular dynamics, with resultant loss of vision of one eye in a large percentage of cases.

In looking for causation for all such conditions, the search for the occult has caused the obvious to be overlooked.

When we consider that apart from all preconceived theories of origin, all heterophorias, squints, and amblyopias found coincident with heterophoria, making their appearance during the first six years of life, the period during which the pre-maxillary wedge is either driven or not, is either faultily placed or negligently allowed to place itself, the intimate relationship of the conditions, their development *pari passu*, their intolerance of correction in later life, and other points in common, become strikingly significant.

A report will be made later concerning the relationship in these cases of maxillary readjustment, of orbital measurement, growth, refractive, and muscular conditions."

It is reasonable to suppose that each bone in the skull should bear a definite relationship to each other as to size, and consequently that the failure of one or more of them to gain their full size must effect the growth of all others which articulate with it, and which attempt to attain the size planned for them by nature. It is also conceded that there are a vast number of dental irregularities. It is only of late that the relation of these dental irregularities and the nasal obstructions has been recognized and is being studied. It matters little what theories we accept if we can agree on the actual facts. The dentists acknowledge that the chief factor in the causation of irregularities is *primarily* the adenoid which causes mouth-breathing, and they insist upon its removal. Unfortunately, this operation is frequently not performed until the jaws have been actually influenced and the irregularities are present, so that we fail to bring relief so far as the mouth-breathing is concerned. It is not necessary to describe all the well-known harmful effects of mouth-breathing upon the general system, which are infinite in number. The writer has endeavored to point out how deficient development of the jaws, no matter what the cause, affects that of the whole face and especially that of the nasal spaces. The dentists have demonstrated beyond question that an ideal arch can be projected for any given jaw into which all the permanent teeth should easily be able to erupt, as soon as they can measure the width of the permanent incisors which should erupt normally before the seventh year. A fairly approximate measurement has even been obtained from x-ray photographs taken before eruption. Dr. Bogue claims that irregularities of the deciduous teeth are always followed by the same condition with the permanent, and urges early separation whenever the first teeth are not normally placed, as a preventive treatment of later irregularities. Drs. Barnes, Black, Brown, Jackson and many others are all advocating the early treatment as preventive of later deformities and their results certainly bear them out and should be recognized by the rhinologist as the rational method of securing enlarged nasal space. No harmful effects have ever been reported, so far as the writer has observed, as following the rapid separation, which is another point in its favor. Even when the patients are not brought under care until after the permanent teeth have fully erupted and their roots have attained full development a great deal of benefit can still be obtained, by widen-

ing and lengthening the arches which must also widen and lengthen the interior of the nose. The writer wishes to thank Drs. Bogue, McKee, Barnes, Jackson and Palmer for their interest and for the loan of their illustrations and casts which have been shown. The problem before us, when one stops to consider it in its broadest sense, is far-reaching. Should we not, however, do our full duty and try to teach what is known to us all as of first importance? We should start at the beginning, but this period is in the hands of the family physician. It is his duty to instruct the mothers as to their duty to the helpless beings which they are to bring into the world and to impress upon them how greatly prenatal influences affect the development of the infant. He is responsible for the health of the mother during pregnancy and should be able to so watch over her and build her up during her pregnancy that, when the child is born, she should be able to do her duty and nurse the infant from the beginning and not allow it to be brought up on the bottle and thus lose nature's influence of the sucking and biting efforts of the child on the nipple. Again, nothing can take the place of the mother's milk. He should force the mothers to realize the absolute necessity of their doing their duty to their children in nursing them, which they so often do not want to be bothered with and which even if they do begin they often fail to keep up because they are not willing to give up their round of pleasures, so that the milk soon becomes unfit for the child. Many wives feel that they owe it to their husbands to do whatever they wish them to do, but it is hardly credible to believe that if they were both taught to realize what it means to the future development of their child to start it right they would not sacrifice their own worldly pleasures, for the sake of the child. The mother should not be allowed to give up her nursing entirely, even though her milk supply is deficient, it being infinitely better to give the child supplemental feedings with the bottle, if necessary. The writer feels that this period is in reality the most important in the life of the child and when neglected will invariably be followed by serious evils, the effects of which will have to be combatted with throughout life. It is recognized that mouth-breathing is probably the chief factor in producing dental irregularities and that in infants and very young children this is caused by the presence of adenoids. The question thus arises: Why are adenoids so frequently present? The pediatrist is, or should be the one to know, and be able to prevent their growth by proper feeding and attention to the general health from birth. There is no doubt that when they are there the children are more

liable to repeated colds and that these colds add to their enlargemen, but they should not be there in a properly nourished and normal child to begin with. Then too, the family physician is the one who first sees these infants and he carries them along for years, oftentimes, before he discovers adenoids which he thinks are large enough to remove; it frequently being that the adenoid is not considered until the child develops an earache. In the meanwhile, steady development of the child goes on and is more apt to be faulty, affecting many organs beyond repair. We should watch for the appearance of adenoids from childbirth and urge that they be removed whenever they are found, even though they be small. We should also watch carefully for mouth-breathing and endeavor tc overcome that habit as soon as possible, even if it is necessary to close the mouth with plaster or other appliance. Unfortunately, the rhinologist is rarely called upon to see infants, so that by the time they are called upon and have to operate for adenoids, it is found that the mouth-breathing is not overcome because of the actual change which has taken place in the shape of the jaws and nose. As soon as it is known that the child remains a mouth-breather after operation, an examination should be made of the teeth for irregularities and disease, and if found, they should be corrected as early as possible; thus relieving the irritation of the nervous system caused by the dental impactions (irregularities always being associated with dental impactions) and at the same time increasing the nasal space, which will allow of nasal breathing in a large majority of cases. In conclusion the writer wishes to urge again how important it is to start the child right from its conception and during its prenatal condition. After birth we should be watching for the first appearance of mouth-breathing and endeavor to remedy it at once, for the loss of the molding effect of the tongue and of the facial muscles is a great one and when once lost is very hard to restore, and in consequence the development of the whole face is bound to suffer. Still later we should be on the watch for irregularities and should have them corrected as soon as they are discovered, frequently as early as the third year in order to assist nature in developing a normal face for each child. We must recognize the effect of heredity upon the child and not try to make each face beautiful, but direct our efforts toward the improvement of health.

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