FACIAL ASYMMETRY AS A POSSIBLE CAUSE OF DEFORMITY OF THE NASAL SEPTUM.*

BY HENRY L. SWAIN, M.D., NEW HAVEN, CONN.

During the last three years Drs. Brackett, Arnold, and Hirst, of the three successive graduating classes at the Yale Medical School, have, at my suggestion, and with the kindly supervision of Dr. G. G. MacCurdy, measured and studied some of the skulls of the Marsh collection in Peabody Museum at Yale University, with a view to bring out a little more prominently, by comparing the various races, some of the causes of the arching of the palate. The idea was that perhaps some possible relation might be discovered as existing between the shape of the skull and the arch of the palate. A number of interesting facts have come out in the course of the work, some of which I reported to you last year in a paper entitled "The Arch of the Palate." I will briefly recapitulate some sections of this article, referring you to the original for details and measurements, and then finish up with our final studies.

The incentive to the whole work was a well-developed doubt as to the importance of the role which adenoids and the consequent nasal stoppage had in narrowing and raising the arch of the palate. It has always been an accepted belief that if the palate should over-arch, the septum nasi would have insufficient space to grow to its full stature and hence would bend to accommodate itself, and it was more the latter idea of the relation of the over-arched palate to the septum than the palate itself which determined me in starting this three year study.

An early assumption was that, if adenoids were all important in producing changes in the bony framework which resulted in over-arching of the palate, a measurement of a series of skulls of non-adenoid races ought to develop that they had broader and shallower palates in the gross average, and that there would be fewer wide variations or extensive over-archings. Such measurements were made by Brackett¹ in a series of Hawaiian skulls, and it developed that they possessed a perfectly normal index as regards the relation of the height to the breadth of the palate. We assumed as normal what had been developed as the correct average by a large number of different observers. The individual variations from the normal were fully as great as existed in the tables of numerous observers consulted.

* Read before the Annual Meeting of the American Laryngological Association, held at Atlantic City, June 2, 3 and 4, 1904.
Alkan, in Germany, measured among others some Malay and Negro skulls, finding an average very closely approximating the European standard. It therefore seemed fairly demonstrated that even in non-adenoid races high palates could exist, and surely in the Hawaiians and Malays no trace of suspicion could be thrown upon the adenoids as the possible cause. Furthermore, as these Hawaiians belonged to the original race long before any effects of civilization could have made themselves manifest, it is possible in a native race to have the same individual differences as are evident among recent civilized peoples.

Grosheintz, whose methods Brackett followed, came to the conclusion that “A high and narrow palate is usually combined with a small development of the upper part of the face. Small nasal and orbital cavities are associated in the rule with highly arched palates. The highly arched palate usually depends upon a congenital racial peculiarity of the skull and not upon the later extra-uterine influences of nasal-stenosis.” This last conclusion was certainly worthy of comment, especially when contrasted with the very general belief to the contrary.

Brackett’s final conclusion from his study of the Hawaiians was that “While the height of the palate bears no absolute relation to the shape of the face, still a long, narrow face with high, narrow anterior nares and orbit more often exists with a high palate than with a low one.”

Alkan’s opinions next attracted my attention, following the conclusion of Brackett’s work. He differed from the other observers, and presented findings in complete accord with the orthodox version. He said, “The hard palate of the new-born child is characterized by its shortness. With increasing age the height and breadth increase but slowly, while the length becomes proportionately rapidly greater. In people afflicted with adenoid vegetations we find on the average a high, long and narrow palate, i. e., a form which does not represent the normal. The shape of the hard palate has no connection with the shape of the skull. Anomalies in the position of the teeth are of frequent occurrence in those individuals with deformities of the palate or the upper jaw, and may be looked upon as due to the latter.” His work was at hand when we began to study the palates of the Flathead Indians, and his methods were followed absolutely, so as to be able to make accurate comparison, by Dr. Arnold in his work of last year.

The latter found that a deformity process like the flattening could not only profoundly distort the whole skull, but also affected the palate. The latter was broadened and flattened, giving a greatly
altered index. Alkan’s index of the relation of the height to the breadth was 52.6, while the Flathead average was 33.4. Here also, as among the Hawaiians there were wide differences in the height to be observed and chronicled in another presumably non-adenoid race. It seemed evident, then, that in a modified sense the shape of the skull, even though artificially altered, can and does affect the shape of the palate, even though there is no nasal stoppage whatever.

What seemed to us even more remarkable than the change in the palate, was a marked shortening and broadening of the nasal cavity, and while the height was thus lessened the septum was fully as straight as in other races. Hence it, the septum, so adjusted its growth as to adapt itself to its somewhat more cramped quarters.

At this time it was not possible for Arnold to measure all the changes that had taken place in the nasal cavity, so the matter has been taken up this year by Hurst,⁶ and he has done a very large amount of work in the comparative measurements of the nasal cavities, with special attention to the posterior change of the Hawaiians and the Flatheads. The former, it will be remembered, we proved in the previous work were an exceptionally fine type of well-developed skulls, all their measurements conforming very closely to the European standards.

We attempted first to determine the proportion of general deviation of the two races. In both, among the adults, there were 19 per cent. of straight septa. The Hawaiians had 10 per cent. of posterior deviations, while the Flatheads had 12 per cent. among the adults. In the middle third of the septum, which includes practically the anterior part of the bony septum in our method of comparison, the adult Hawaiian had 71 per cent. deflections, and the adult Flatheads 68 per cent., which you see makes the difference between the two races very immaterial indeed, inasmuch as there were four times as many Flatheads examined as there were Hawaiians. Measurements of a larger number of Hawaiian skulls would still further reduce this slight difference. Among the young Flatheads fully 50 per cent. possessed straight septa, with 41 per cent. having anterior deflections, so that the probabilities are that the rougher life of the adult Indian, developed by traumatism many deviations from normal.

It will be seen that in both races 10 per cent. and 12 per cent. of deviations of the posterior septum were recorded. This does not include exostosis or other forms of thickening, but refers to an actual departure from the straight vertical line. However, in both races this was scarcely ever more than a millimeter, and in the vast
majority of instances was under a millimeter, so that the general working rule holds good of even these original races, that the posterior edge of the septum rarely deviates noticeably from a straight line, a point I have been much interested in developing.

The vertical measurement of the posterior nares in both races brought out the adult Hawaiian to be 20.9 millimeters and the adult Flathead, 19.1. The breadth of the posterior nares, taken halfway between the top and bottom of the opening, was 13.9 in the Hawaiian, and 14.2 in the adult Flathead, making an index of the adult Hawaiians of 66.4 as against 74.3, a very considerable difference.

Now the variations from the average were vastly greater among the Flatheads than among the Hawaiians. While it is noticed that the average adult Hawaiian was 20.9, some of the Flatheads were as low as 15.1 millimeters, so that the difference between the lowest Flathead and the highest Hawaiian, which is 23 millimeters, is over 8 millimeters.

Inasmuch as frequently asymmetry in the width of the two posterior choanae existed among the Flatheads, in order to strike an average which was anything like as accurate as were the Hawaiian measurements, it was necessary to measure across the entire posterior nares from one pterygoid process to another and divide that by two. A similar but much smaller difference was found in comparing the height of the choane of the two races. The combined width among the adult Hawaiians of the two posterior nares was, in the median position between the top and the bottom, never more than 32, the smallest being 26, which occurred a number of times. Among the adult Flatheads only occasionally did they measure as narrow as 27, and the widest was 37, so that between the lowest Hawaiian and the highest Flathead very large differences existed.

Now, it will be seen by comparison of the table as printed that, whereas it is comparatively rarely that any deviations of the posterior septum occurred, not more than 10 per cent. in the average of the two races, a vastly greater proportion of differences in the actual width and height of the two posterior choanae existed among the adults.

Among the young Hawaiians there was no vertical or horizontal asymmetry, and only in 2.6 per cent. of the young Flatheads was there any difference in the vertical dimensions. In the horizontal direction, however, among the young Flatheads there was a difference in the two sides in 36.1 per cent., which is nearly half. Among the adult Hawaiians there was a difference in the vertical dimensions in 25 per cent., and in the width there was a difference of 61.1. When you average up the amount of asymmetry by taking the total
differences, adding them up, and dividing by the entire number examined, it brings the entire amount of difference of asymmetry in the width of the Hawaiian posterior choanae as .6 per cent. Among the Flatheads the story is quite different. In 46.7 per cent. the adults possessed differences in the vertical measurements, and 76.9 per cent., i.e., over three-fourths, had differences in the width between the two sides. Furthermore the amount of variation differed greatly, so that when you averaged up the total amount of asymmetry in the vertical dimensions it was .53. The total amount of average difference in the width among the Flatheads was .9 per cent., half as much again as among the Hawaiians. The greatest amount of difference between the two sides in the width among the Flatheads was 5 millimeters, while it never exceeded 2 among the Hawaiians, and in by far the majority of cases was only 1 millimeter.

It seems to me most interesting and worthy of further mention that there was no asymmetry whatsoever among the young Hawaiians, and no vertical asymmetry to amount to anything among the young Flatheads, and furthermore that 80 per cent. of the young Flatheads had absolutely straight septa. This asymmetry among the adult Flatheads is even more pronounced when the whole skull is taken into consideration, and frequently the whole of one half of the skull would be greater than the other. This led to a very peculiar facial development, the whole of one side of the face being greater than the other. In these cases of exaggerated growth of one side of the head there was invariably produced a considerable bend in the septum. It seemed as though the smaller side acted as a sort of restraining influence upon the other side of the septum, causing the effect of a string upon a bow, as it were, as is indicated in the rough drawing that I pass around, and the bending was either in the way of an arching toward the more powerful side, or it took a compensatory form, both varieties existing in about equal degree.

Here, therefore, is a new form of developmental bend. As we have generally construed the matter, there is but one form of developmental bend, namely, that produced by the over-arching of the palate. Now we have to add to that the possibility of a bend in the septum being produced by the over-growth of one side as compared with the other, making Class Two of developmental bends.

The fact that asymmetry of the posterior choanae, even though small in amount, exists and frequently, as we have found it, by actual measurement among the Sandwich Islanders, and finding that this also takes place in the face leads to the probable assumption that facial asymmetry when naturally produced (as against the artificial form in the Flathead) may also cause changes to take place in the septum nasi.
While these studies were developing a comparison between the Flatheads and the Hawaiians, it was with considerable interest that the work of Bentzen came to our attention. He was certainly most painstaking and thorough in developing the points which he tried to prove. One purpose of his investigation was to develop what effect could be traced to rachitis, first upon the face, and second what proportion of high, narrow faces had high palates, and the reverse. His final summing up showed that he believed that he had no right to put the matter any more strongly than had Brackett, as already quoted, that the highly arched palate is more often found in skulls with high, narrow faces than in the reverse type. To this Bentzen added the interesting observation that before dentition children's skulls are frequently absolutely the reverse. He also stated as his belief that when all was said hereditary tendencies produced a given type at birth. If adenoids or other causes produced nasal disuse and mouth breathing, that that particular palate would become narrower and usually, but not always, higher than it would have been had not such stoppage occurred. In those with a natural tendency to narrowing and in the narrow and high faced this would produce greater changes than in the naturally broad faced, and the amount of narrowing would be in direct relation to the length of time the nasal stoppage existed.

Regarding the deviations of the nasal septum, he found that septum deviations occurred in adults possessed of adenoids, (which assumes that the latter must have existed for many years,) in 16.5 per cent. and in those who had normal conditions in the nasopharynx in 15.6 per cent. "This," he says, "absolutely does not allow of any conclusion. Certainly it can not be assumed that the septum deviation was favored by the increase in the height of the palate." He even asked the question, "May we not assume that the septum deviation was primary rather than secondary?" And inasmuch as in the

![Diagram of nasal septum](image)

**Fig. 1.** Effect of overgrowth of one side shown in horizontal section.
cases where there were no adenoid vegetations there was also found the over-arched palate, in the cases where the septum deviations existed he rather pertinently inquires, "May not the septum deviation actually produce the high palate?" If this is the case, it adds one more to the possible etiological factors.

Regarding the possibility of the leptoprosoptic skull being the cause of the over-arching of the palate as well as concerning the influence of rachitis he believes that there could be in neither a direct connection. Inasmuch, however, as the individuals with deviated nasal septa are in the vast majority of cases leptoprosoptic, we are right in assuming a close connection between the two, and therefore there arises the possibility that the leptoprosoopia may through the production of deviations of the septum play a role in the development of the high palate. It is following this that he comes to the illuminating conclusion that if at the last he mentioned as contributing to the etiology of the over-arched palate the inherited predisposition, he was bringing forward the most potential factor which is doubtless always present.

The last candidate for our consideration is Buser. He has gone at the subject in a very enthusiastic way, but with a distinct mental bias toward the observations of Siebenmann. It is assumed that there is a law of "correlation," as it is called, between the shape of the skull and the form of the face, nose, and palate, and the effort has been to prove that this assumption is correct, using involved reasoning based upon very careful and numerous measurements. He
measured the heads of 514 living persons who were in possession of
good teeth, and on the basis of this believes he has discovered that
there is certainly a "correlation" in the form of the face, skeleton,
the bony nasal openings and the hard palate, and that one may as-
sume the existence of two types of construction in the formation of
the facial skeleton, namely, the leptoprosoptic, high and narrow, and
the chamaeprosoptic, the low and broad. In the former, in connection
with the high and narrow, bony nasal openings you find the high and
narrow palate formation and a narrow dental arch. In these the
second dentition has difficulty in finding the necessary space for the
proper position of the teeth. The second form of face develops, to-
gether with a broad opening to the nasal chambers, a palate of con-
siderable breadth and a broad "U" shaped dental arch.

Through the interference in breathing which occurs most fre-
cently with the hypertrophy of the pharynx tonsil and the accompa-
nying swelling of the nasal mucous membrane, there occurs a
narrowing of the small respiratory openings in the leptoprosoptic
skull, while the same condition occurring in the chamaeprosoptic often
has no influence whatever upon the calibre of the wide nasal chan-
nels, so that naturally you find mouth breathing in the leptoprosoptic
oftener that in the chamaeprosoptic. This "correlation" in the struc-
ture of the facial skeleton explains with the least difficulty the ex-
tremely frequent occurrence of mouth breathing with the high palate,
the narrow and "V" shaped bending of the dental arch, and the
anomaly of the position of the teeth. He believes that "correlation"
in the facial skeleton is the reason why observers find among those
that have an enlarged pharynx tonsil so often the high palate and
narrow arch and deformed teeth rather than that the hypertrophy it-
self is the cause of it. He believes that the anatomical conditions
absolutely negative the possibility of the compressing influence of
the slightly tightened cheek and mastication muscles producing
changes in the shape of the facial skeleton.

Consequently we can briefly sum up his ideas in the statement that
inherent racial peculiarities of the skull produced the conditions,
rather than that any possible change could result from the fact of the
nasal stoppage altering or even exaggerating the changes in the
growth of the face.

Taking it all in all, his position is the most radical of any of the
observers that I have thoroughly studied. Leaving aside his views
as regards the palate, it certainly would seem impossible that the
nasal stoppage should exist through the growing period of the child
and have absolutely no effect whatever upon the facial development.
Whether the septum deviates independently from the arch of the
palate or not we will, also, lay aside for the present, but it seems to me that the arguments brought forward by Buser leave one in a very helpless condition, and fail to explain certain facts that are positively observed. For instance, I have no doubt that a careful observation of nasal conditions existing previous to and following the work of the modern orthodontist will show that changes in the dental arch do widen the palate and do give added nasal space and better nasal breathing. If that is the case, then the opposite must be equally true, that changes do take place in the face from pathological conditions, and I still for the present incline to Bentzen's more moderate view as before expressed in this article.

Alkan observed in his paper that among new-born children there were certain palates that had already begun to assume a tendency toward high-arching. Buser very properly concluded that, there-

![Fig. 3. Peculiar distortions of dental arch which are also accompanied by equivalent changes in the hard palate.](image)

fore, all high-arched palates can not by any means be said to depend upon the presence of adenoids. It does not follow that adenoids which exist for a long time have no influence upon the nose, but it is certain that that effect has been over-estimated in years past, and that by all such studies as these a more correct estimate may eventually be brought about.

Now to return to the anatomical make-up of the face, the nose, and the septum. The septum is the last of the bones to completely ossify. The facial bones, including the superior maxillary and the turbinate bones, all are ossified before it.

It has been shown that among the Flatheads and among the Hawaiians at least facial asymmetry does exist, and that with facial asymmetry you have a change in the septum not from effects on the
palate alone, but by the over-growth of one side overpowering and bending around the smaller and weaker side.

Since the discovery, nearly a year ago, of this relation, the possibility of facial asymmetry contributing toward bends in the deviations of the septum, I have been greatly impressed by the enormous number of people the one side of whose face is different from the other. In a great many instances, without attempting to tabulate or estimate in figures, I have observed that bends of the septum exist bearing a certain relationship to the greater side. This facial irregularity is almost invariably present in the markedly leptoprosopic and would readily account for the existence of asymmetrical arching of palates and nasal narrowing. The observation of any large number of faces in any gathering of people will show you that there are frequent instances where not only is one side of the skull and face greater in one direction but also in all, so that it is perfectly easy to see that vertical as well as the anterio-posterior and the lateral dimensions differ, in which case the same line of reasoning as we deduced, which makes it possible for horizontal deviation to occur, would render it also possible for vertical deviation. This fact, together with Bentzen's belief and Buser's very radical conception, would tend to add to the possible causes of septum deviation this other factor, namely, an inherited destined shape of the skull, which without necessarily bringing into the discussion at all nasal stoppage, may bring about septum changes. We may have, therefore, septum deviations occurring without trauma, without over-arching of the palate, and without adenoids interfering with nasal respiration. Admitting these factors as possible, immediately the consequences of a hanging jaw as producing a narrowing of the face sinks into complete insignificance. It would seem impossible that, with the strongly buttressed bones which are made to stand the strain of the strong mastication muscles, the mere weight of the slightly depressed lower jaw should drag the face out of proportion and distort parts which withstand the stronger action of the other muscles. Yet this is just what is the fact if we lay any weight to the idea that mouth breathing causes changes in the bony framework of the face and palate by the mere lateral pressure of the cheek muscles. Talbot strongly contends this point, and well says that by no possible stretch of the imagination could it be conceived that the irregular curves of the dental arch, which means, of course, also changes in the shape of the palate, were produced by a perfectly equally divided weight pulling equally on both sides of the face, as is the case of the hanging lower jaw. There are no muscles or bands which could possibly be considered as performing this distor-
tion when you take into proper estimation the attachments of the muscles themselves.

If I then stop and sum up what may logically be deduced from this series of studies which we have made on the skulls of the Hawaiian and the Flathead, together with much which has in the meantime appeared in literature, we can not escape the following conclusions:

Adenoid stoppage does not always, and may never, cause over-arching of the palate. Over-arching of the palate does not always produce bends of the septum. Over-arched palates and bent septa often occur together, and each is more frequent in skulls which are leptoprosopic. Leptoprosopic skulls and faces almost never exist in a marked degree without some distortion or over-arching in the palate and changes in the nasal cavity. In a young child about to develop into marked leptoprosopia, pronounced or complete nasal stoppage by adenoids can not fail to add to the degree of the deformity by interfering with the normal growth of the superior maxillary bones, not the least item in which is the stunted growth of the maxillary sinuses from lack of proper aeration and air interchanging in the nose.

If the first teeth are early removed and the dental arch disturbed, then the palate will usually more easily become narrowed and pointed in its own arch.

We would rule out of the causative influences toward over-arching of the palate the dragging on the cheek muscles, resulting from a dependent lower jaw in mouth breathers, although in a previous paper some slight weight is placed on this item.

When, as a result of inherent tendencies, aided and abetted by nasal stoppage, there has been produced a smaller nose than normally would be correlated, then the septum nasi, as the last bone to be fully ossified, may cease to be perfectly straight, because it must find a place in a structure harder than itself. It must therefore yield to the irregularities in the growth of the other bones.

The study of the Flatheads has demonstrated how great an influence the distortion of the shape of the whole skull may have upon the nasal cavity as a whole and also upon the palate, and that the asymmetry of the skull appears to have produced not only a difference in the size of the two parts of the nose, but also bends in the septum. Observations of the living show exactly such bends to be present when there is marked facial asymmetry, and that facial asymmetry is very often present.

This all brings us back to what Welcker is reported by Bentzen to have said, in 1889, that asymmetrical development of the entire bony nasal cavity, together with the hard palate, was the cause of
septum deviations, and to this we will add that the causes of asymmetrical development are more often inherited or congenital than acquired.

**SEPTA AND POSTERIOR NARES COMPARATIVE TABLE.**

**Summary of results as Measured by Dr. J. H. Hurst.**

<table>
<thead>
<tr>
<th>RACE</th>
<th>Y. H.</th>
<th>A. H.</th>
<th>Y. F.</th>
<th>A. F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skulls measured</td>
<td>9</td>
<td>39</td>
<td>36</td>
<td>169</td>
</tr>
<tr>
<td><strong>SEPTA.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight septa</td>
<td>19%</td>
<td>50%</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Posterior deflection</td>
<td>10%</td>
<td>9%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Mid deflection only</td>
<td>71%</td>
<td>41%</td>
<td>68%</td>
<td></td>
</tr>
<tr>
<td><strong>POSTERIOR NARES.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical average</td>
<td>18.3</td>
<td>20.9</td>
<td>16.0</td>
<td>19.1</td>
</tr>
<tr>
<td>Horizontal average</td>
<td>12.8</td>
<td>13.9</td>
<td>12.4</td>
<td>14.2</td>
</tr>
<tr>
<td>Index</td>
<td>69.9</td>
<td>65.4</td>
<td>77.5</td>
<td>74.3</td>
</tr>
<tr>
<td>Vertical asymmetrical</td>
<td>nil</td>
<td>25.0%</td>
<td>2.6%</td>
<td>46.7%</td>
</tr>
<tr>
<td>Horizontally asymmetrical</td>
<td>nil</td>
<td>61.1%</td>
<td>36.1%</td>
<td>76.9%</td>
</tr>
<tr>
<td>Average vertical asymmetry</td>
<td>nil</td>
<td>.28</td>
<td>.02</td>
<td>.53</td>
</tr>
<tr>
<td>Average horizontal asymmetry</td>
<td>nil</td>
<td>.60</td>
<td>.27</td>
<td>.90</td>
</tr>
</tbody>
</table>

Y. H.—Young Hawaiian.
A. H.—Adult Hawaiian.
Y. F.—Young Flathead Indian.
A. F.—Adult Flathead Indian.
All measures are expressed in millimeters.

**DISCUSSION.**

Dr. John O. Roe considered this subject extremely interesting. He said Dr. Swain has very clearly pointed out the conclusions which have previously been reached, that the purer the race, the straighter the septum; the more composite the race, or the ancestral tree, the more often is encountered a deflected septum. Heredity, therefore, plays an important part in this connection. It is a well recognized fact that a child may inherit from one parent one peculiar feature and from the other another peculiar feature. If the child should therefore happen to inherit the nose from one parent, and the mouth and jaws from another, the septum may not therefore fit the place assigned to it, nor have sufficient room for proper development, and therefore of necessity becomes deformed. In the evolutionary changes that take place in the mixture of the races, we might well say with Pontiquet, "that a man has only exceptionally the septum which belongs to him."

Defective development also plays an important part in the etiology of the deviations of the septum. The septum, as we know, is composed of two plates, each having its centre of development. If
these plates grow unequally, because of hyper-nutrition of one, or
defective nutrition of the other, according to the law of compensa-
tion, a deflected septum results. Also, if a disproportionate develop-
ment of the bones of the face takes place, we may have what has been
designated as a "scoliosis of the face," with which is invariably as-
associated a deviated septum.

There are a great many conditions to be considered as etiological
factors, the most important of which, however, are hereditary and
defective development. Diseases of the nose and naso-pharynx often
play an important part in the proper development of the nose. Ob-
structions of the nasal passages interfering with the respiratory
function of the nose play a very important part in the influencing of
its developments. This is often seen in children afflicted with ade-
oids. Dr. Roe has in many instances seen one child in a familiy
which had adenoids and which also had a deviated septum, an im-
perfectly developed nose and a high arched palate, whereas none of
these conditions were present in those having unobstructed nasal
respiration.

Dr. A. Coolidge, Jr., stated that when the Association met in
New Haven cases were reported by him of congenital occlusion of
the posterior choane by bony plates. Some of these cases were
unilateral, others bilateral. As this condition was congenital there
had been absolutely no breathing up to the time the patients came to
be treated, at which time the bony plate was found and removed. If
mouth breathing or breathing through one side only of the nose
always influenced the shape of the skull, these cases would be
markedly deformed. All of these patients were adults and had either
not breathed through the nose at all or only through one side, yet
they did not show any particular tendency to high arch or deviation
of the septum. One or two cases of bilateral occlusion were observed
in which there was marked deviation of the septum, which deviation
must therefore have been due to some other cause than obstructed
nasal breathing. If complete occlusion of the nares does not always
cause high arching of the palate, adenoids may easily fail to produce
this result.

BIBLIOGRAPHY.
2 Alkan: Fraenkel's Archiv, Bd. x, S. 441.
3 Grosheints: Fraenkel's Archiv, Bd. viii, S. 395.
   or The LARYNGOSCOPE, October, 1903.
6 Bentzen: Fraenkel's Archiv, Bd. xiv, S. 203.
7 Buser: Fraenkel's Archiv, Bd. xv, S. 503.
8 Talbot: The LARYNGOSCOPE, May and June, 1902.