THE ARCH OF THE PALATE.*

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

Professor of Otology and Laryngology Yale University; Fellow American Laryngological Association.

The study of nasal pathology received a marked stimulus as well as a relief from some previous obscurity of conception when it was explained that the narrowing of one nostril by abnormalities of the septum led in general to unequal use of the two sides, to bad drainage and aeration, as well as to vagaries of pressure, causing by all these, chronic congestion and inflammation of the mucous membrane. It was further explained that some of the changes in the septum, how many it was never quite clear, were entirely due to traumatism, some entirely to developmental processes, and others to both in varying degrees. It was reasoned, *a priori*, that if lack of use on one side and too much on the other produced first chronic catarrhs and variations in the bony nasal frame-work, so prolonged disuse of the nose, following the great law that the proper and perfected growth, would lead to inevitable deformities or variations from the normal both in structure and in function.

An immediate application of this idea was evident when it was thought how through the early years of the growth of some children, owing to the enlargement of the third or pharyngeal tonsil, the nose for long periods would be entirely inoperative; hence not liable to perfect development. Furthermore, by the same reasoning, the mouth being open, it would become larger, i. e., the palate would usually become more arched. This last was the outcome of various observations and might be expressed in the rule that the less the nose was used, the more the palate arched. This latter, and perhaps other causes, it was declared made the septum bend because the vertical distance between the summit of the arch of the palate and the base of the skull was not large enough to allow of placing the full-grown septum therein without bending. This suggestion was offered because it was reasoned or supposed that every septum was destined to grow a given amount before ceasing, no matter how changed the conditions were which surrounded it, a rule which is supposed to work quite reversely in most of the arguments we are later to adduce. Altogether, however, this made a very pretty ex-

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planation, which I have no doubt we, all of us, who teach, annually call into requisition as we unfold to our classes some of the secrets of nasal pathology.

Following out these suggestions it presently seemed rational to put the horizontal bends, especially of the bony septum, into the developmental class, while all others, especially of the cartilaginous portion, were called traumatic, it being, of course, admitted that formative processes might accentuate a traumatic deviation into a grotesque bend, or vice versa.

Having in this sweeping manner explained all the curves of the septum we had in a measure reduced all the problems of nasal disease to simple fractions with a common denominator and were prepared to explain each new phase of clinical experience thereby, for are not vagaries of pressure, aeration, drainage and functional use, the chronic incitors of catarrh, always present in the stenosed nose as a result of that one factor, an erring septum lacking in proper rectitude? In this one paramount idea one sees the excuse of any excess in the way of "cabinet-makers' " surgery provided only that the septum is made more nearly plumb. We are strictly Jesuitical in that the end-sought justifies any means, no matter how severe.

Now, it is not the purpose of this brief sketch to take any broad issue with any of the above statements except, perhaps, to show up an occasional weak spot in the chain of evidence or at least demonstrate some actual exceptions to the purely *a priori* methods of reasoning which we have employed in the above.

The first rude shock which the writer's faith in the orthodox belief suffered was when he observed the palates of young children arching higher than normal when to the positive knowledge of the writer there had never been for more than a few days at a time any difficulty in breathing through the nose, certainly no adenoids. There was, furthermore, the observation that some adenoid children persisted in having normal palates in spite of well-nigh useless noses. This was some years ago, and yet is the reason that you, gentlemen, are at this time suffering under this outburst of eloquence.

Soon to substantiate this phantom of heterodoxy, to prove that other causes than nasal disuse and traumatism must contribute to the excessive arching of the palate and lack of room for the full-grown septum, it was suggested that the shape of the skull determined the kind of arch possessed by any individual. An article by Grosheintz,* in 1898, summed up the previous literature on the subject very carefully, and accepting of the statement as one of fact that

* Grosheintz: Fränkel's Archiv., Bd. VIII, S. 895.

a given number, 45.9, expressed the average index of the height as related to the breadth of European palates, in a certain museum he found 16 skulls of various nationalities which could be considered as having a higher index than the normal, and endeavored by measuring and studying them to draw some deductions regarding the height and width of the face, the shape of the skull and the anomalies of the palate. I will give you a translation of his summary from these observations: "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." The last seemed a strong statement and certainly sufficed to arouse and emphasize my interest in the subject. Subsequently in talking with my erudite friend, Dr. Wright, of Brooklyn, he suggested that much that had been done in the way of measurements needed to be rehearsed, and most important was to get measurements of races who are notably not sufferers from adenoids. Another suggestion was, whether anything in the early life of the child, the use of a spoon, artificial nipple, etc., might not give an added impetus to natural forces resulting in the higher arching of the palate.

There exists in New Haven the Marsh collection of the skulls of various races, in some cases the numbers being very large, and along the lines of Dr. Wright's suggestion, with the kind permission and help of Professor Beecher and Dr. MacCurdy, we took a series of 102 skulls of the presumably original Hawaiians. Twenty-four were selected as being normal and possessed of all their teeth, *i. e.*, belonging to young vigorous adults, and were measured by the same methods as those of Grosheintz in his work. The index as calculated out of Brackett* was 45.7. This, you see, is very close to what had been accepted as normal by Grosheintz and the observers who antedated him. The index is found by dividing the height by the breadth and multiplying by 100. These measurements were very carefully taken, and the shape of the skull was also taken into consideration in the same way that Grosheintz had done, and developed some of the same conclusions. Brackett differed slightly, however, when he observed that there could be no direct connection established between the height of the palate and the shape of the skull. Evidently a non-adenoid race developed a palate of the European standard shape.

* Brackett, E. S.: Graduating Thesis, 1902, Med. Dept., Yale.

While these investigations had been going on, by a strange misfortune, the loss of a certain periodical in the mails, I had been unaware of Alkan's* work, which seems to me, up to date, to be the most thorough and satisfactory of any that I have found. He made very careful observations upon the living subjects, both children and adults, and found that an average of adults with normal plates would give an index of 45.7. These were presumably of the Saxon race, as the doctor's investigations were conducted in the city of Leipsic. He, however, conducted his measurements in a slightly different way so that when he came to measure skulls a slightly higher index was obtained. For instance, he took 30 European skulls representing some twelve nationalities and found, as an index, 52.6, which you see is very close indeed to the measurements of Grosheintz, who also took from a collection of various nationalities, those where the index was over 46, and got his index 53.9, leaving the inference that the skulls as found in European museum collections had a slightly higher index than the average. Alkan then measured 12 negro skulls, and contrary to the natural expectation found the palate to average considerably higher, the index being 59. Eighteen Malays were found to have an index of 54.3, very close to the Europeans. He then went into the question of how much children who suffered from adenoids would differ in palate measurements from those who possessed normal nasal conditions. He found an average normal index for children from three to fourteen years of age to be represented by the figures 43.5, while those with nasal stoppage had an index of 50, showing that there were undoubted alterations as a result of the pernicious influences. Strangely enough, there is no apparent difference in the length-breadth index. In all these measurements he very carefully compared the shape of the palatal arch with the shape of the skull, and from the number of his observations and the care with which they were taken would seem to be entitled to as much credence as speaking with authority as any observer that I have consulted. His final conclusions will bear a moment's consideration:

"First, 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. Second, 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. Third, the shape of the hard palate has no connection with the shape of the skull. Fourth, anomalies in the

* Alkan, Fränkel's Archiv, Bd. X, S. 441.

position of the teeth are of frequent occurrence in those afflicted with deformities of the palate or the upper jaw and may be looked upon as due to the latter."

It would seem as though enough had been done to assume from the study of the various races as well as conditions of man that the shape of the skull and the different environment during early life had but little or nothing to do with the arching of the palate, but in general all observers agree with Brackett, who concluded from his observations of the Sandwich Island skulls that "while the height

Fig. 1. Showing the comparison of the breadth of the two palates.

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 a low one."

My attention having been called while working with the Sandwich Island skulls to a collection from the Flat-head Indians, who, it will be remembered, have for generations deformed the heads of their children by a binding process during the first year of their lives, it seemed to me that if any disturbance of the skull could influence the shape of the palate, this must. H. S. Arnold* undertook a series

* Arnold, H. S., Graduating Thesis, 1903, Med. Dept., Yale.

of measurements on a large number of these skulls, being particularly careful to follow the methods of Alkan. His results show that we have a much broader, flatter, and shorter palate than in any of the other races which have been so far measured. The height-breadth index is 33.0, while the length-breadth index is 73.2. It will be remembered that the average for European races was 52.6 and 63.5, making evident a very marked difference. Arnold has photographed an average Flat-head with an average Hawaiian skull, and Figure I shows a comparison of the breadth of the two palates,

Fig. Showing the comparison of the height of the two palates.

and Figure II of the height, and in both cases the difference is very apparent. Here, therefore, we have the apparent absolute contradiction of what has gone before, and is therefore an extremely interesting and valuable observation and may be accepted as a proof positive that some agencies outside of the merely respiratory or nasal, can change the shape of the hard palate. A comparison of the skulls as shown in the photograph shows that the vertical diameter of the nose is very notably shortened in the case of the Flat-head, as well as broadened. Attention should also be called to the fact that while

the vertical diameter of the nose in this case is so much shorter, the septum is as straight as in the splendid specimen of the Hawaiian skull. Is not this an apparent contradiction of the rule which we noticed earlier in the article and which was used to explain why the septum bent when the palate arched too high? If, as supposed, the septum always grows to the full size intended as normal for that individual independent of what is transpiring and influencing the neighboring bones, why does it not in this instance of the Flat-head also have "to stoop to conquer" when such a notable shortening of the entire nasal cavity takes place. Evidently there are circumstances when even the stiff-necked septum becomes convinced of the error of its way and conforms to the rules governing its environment. It will be noticed that while the Hawaiian skull is an extremely fine and well-developed specimen of its kind, normal apparently in every measurement, it is much narrower than is the skull of the Flat-head, indicating how great the pressure was which produced this amount of deformity.

Another interesting fact is that the adult Flat-head skulls (understanding under the term "adult" those over 14 years of age) show apparently more deformity than the child skulls, showing that the nutritive processes have been so altered as to influence those changes which take place and are so apparent in the skull bones near the time of puberty. As, of course, this may be considered in every sense of the word a measurement of a deformity, it does not materially alter or vitiate any of the statistics that have been given before, merely weakening the statement that there is absolutely no connection between the shape of the palate and the shape of the head.

Alkan's measurements of children, however, seem to contradict the final conclusions as given by Grosheintz that the shape of the palate was not materially influenced by extra-uterine conditions, for by actual measurement there is not the slightest doubt that when adenoids exist in the naso-pharynx of children they can and do alter the shape of the hard palate. They may not always do it, just as there may be also high arched palates which have absolutely no connection with this naso-pharyngeal stoppage. These latter two exceptions to the rule are, however, not numerous.

Let us now consider for a moment what are supposed to be the influences or forces which are operative in these cases of nasal stoppage and disuse, in the growing child, and which may be said to bring about the abnormal arching of the palate. The forces are numerous and are of a decidedly complex nature. Many of the most ingenious explanations have been offered by various observers, but it

will be safe to assume that only certain forces are really potential and that no one single suggested explanation quite covers all the points that may be brought up. As we together look the matter over to-day it seems to me that one point of view should ever be in mind and that is that we are dealing with an organ, the nose, which is either imperfectly functioning or is non-operative, and consequently the observations fall under the rule deduced earlier in the paper that the proper physiological activity of any organ or part is necessary to its proper and perfected growth. A nose, therefore, through which during the growing years but little or no air passes and a mouth through which no respiratory air is supposed to habitually pass, cannot develop along the normal lines. A closed nose and an open mouth are the reverse of the natural order. Why should not all the developmental processes in the nose be retarded and all the natural forces leading to growth and expansion of the mouth be increased? If, for example, the nose has but little air passing through it, the call of blood to it cannot be anywhere nearly as great as when it has to warm and moisten a normal quantity of air. If this is the case the entire process of growth and mucous membrane formation are bound to be influenced by the decreased blood supply. The converse is true in the case of the mouth.

Now what arches the palate? In the new born babe the hard palate at the height of the arch is considerably above the level of the Eustachian tube. In the child at puberty it is considerably below the Eustachian tube. Consequently the palate has grown away from the base of the skull. What has accomplished this? It has been the downward growth of the superior maxillary bone, the septum and the pterygoid processes of the sphenoid, so that in a certain sense of the word the palate of the young child is supposed to grow down instead of up. It is safe to assume, therefore, that this downward growth is an extremely important process in our present consideration, and it may be looked upon as a part of the normal growth of the superior maxillary bone. Suppose, then, that anything should happen to retard the downward growth of the superior maxillary bone or lessen its increase in all directions. It would be easy to conceive this to be operative under the general law that the nose is not functioning and hence the component parts are not subject to that subtle powerful influence of proper growth stimulated by proper function. The septum, however, is also supposed to grow along the same lines and *pari passu* with the superior maxillary bone. If, then, the superior maxillary bone did not grow and the septum did, with similar conditions influencing both, it must be assumed that some-

thing specifically operated to retard the development of the superior maxillary, and this I would suggest might be conceived to be the fact, that inasmuch as air is not streaming back and forth through the nose, in fact it being sometimes impossible for the little patients to blow any air out through the nose, the stoppage from the adenoids being so great, how could the air within the maxillary sinuses be properly changed? Might not it be supposed that the openings could become entirely closed by pressure from deformed septum, or swelling, or otherwise, and without the proper change of air from the cavity of the maxillary sinus there must be an atrophy of it.

Some observer, I think Ziem, has produced some of these changes by the blocking up of the nose in young animals for a long period with cotton, the alteration produced being most obvious when only one nostril was blocked. There was produced a large arrest of development not only of the upper jaw, but of the palate bone, and even of the whole side of the face. If, therefore, the septum grew faster than the superior maxillary and palate bones that would account for the bends in the septum without it being necessary to bring in the arching of the palate as a necessary feature. Another point is that septa are rarely bent behind. This is readily to be accounted for by the fact that the pterygoid processes against which the posterior part of the superior maxillary and palate are securely articulated grow to their full stature irrespective of nasal conditions, consequently the palate behind is carried down and the septum has plenty of room to develop downward in a straight line. If this explanation be true it would transpire that the highest point of the palate would be often in front, which observation, you will all concur, you have often made.

Now we are bound to consider the fact that the child who goes around with his mouth open tends to have the muscular force, the weight of the jaw, the lack of the restraining influence of the upper lip, and the streaming of the air through the mouth which adds to the buccal tension and removes the tongue away from exercising any influence upon the upper jaw, all tending in the one direction of drawing down the outer side of the superior maxillary bone, thus pressing together or approximating the alveolar processes of the two sides, and as this takes place in an elastic bone buttressed behind against the pterygoid processes of the sphenoid but one result could follow, namely, that the arch of the palate would become narrower. As the palate bone and palatal process of the superior maxillary are bound to follow the same law as we consider holds true in the septum they must grow to a certain width, and must necessarily bend

upward in order to come between the narrowed arch. Now the lower jaw when closed requires very little or no muscle force to keep it in place. When, however, the mouth is open the strain and weight falls largely upon the muscles of the cheek when the process of mastication is not operative, and consequently there is a steady, never-ending tension upon the buccal muscles and a dragging downward by this weight. It seems to me that these features are sufficiently powerful to produce the results that we observe. It is surely to be assumed that from the time the child begins to open its mouth in this way and have the pressure and weight brought upon the superior maxillary bone, even if it did not make it actually grow narrower it must exercise a restraining influence toward the actual and normal broadening out.

Then we have to consider that when the mouth is open the upper lip is drawn upward and above the alveolar processes so that if we took the resultant of these forces and calculated what would be the result upon a soft bony structure which was subject to just the forces that we are here considering, we would reason that not only could the palate not grow to its full breadth, but it would also have to grow in some other direction in order to satisfy the tendency to growth inherent within itself. As by this assumption it has only two possible ways of growing, it must either grow long or grow high. It is restrained from growing broad. The lengthening process first takes place in front rather than behind because the upper lip is not operative to restrain the projection forward, and the pterygoid processes which are behind prevent growth backward. We have therefore here the explanation of the projecting incisor teeth and of the arching of the palate under the same heading. The extreme effects of this deformity would be those cases of projecting teeth and V-shaped arch of plate which we have all seen.

In stating some of these facts before the New Haven Dental Association there came out during the discussion the expression of a very great belief among them that the shape of the adult palate as well as the alignment of the second teeth was dependent upon the preservation of the deciduous or milk teeth and in general upon the care of the teeth of the young child. This was to me a somewhat novel view, and is not often stated in purely medical works.

We had been accustomed to view the disturbed eruption of the second teeth as due to the fact that the palate was narrower and there was not space enough for the teeth to come out in line and consequently there were crooked, twisted and deformed teeth. The present idea carries this point further and says that the circumference

of the horizontal arch and the perfect anterior curve are influenced by the retention of the first teeth as long as possible. When, for example, the first teeth are early lost, the six-year molars which are permanent teeth being unrestrained by a row of teeth between and in front of them tend to crowd forward and thus lessen the space in which a greater number of larger teeth are to arrange themselves as the second dentition takes place. Furthermore, the removal of the teeth retards the alveolar process in its growth, and it might even suffer some resorption as we are familiar in the case in old people. And thus at the very time when the bones need to be most carefully nourished in order to develop out the full round, anterior curve of the alveolar process, at this very time, it suffers retarding influences. It is easy to conceive that removing the deciduous teeth might not only make the alveolar process thinner, but the whole bone might have its nutrition so interfered with as to be softer and less resilient.

Now suppose this condition exists where there is nasal stoppage, and it is easy to see that the forces which usually act to narrow and arch the palate will have aid and abettance in this weakened condition of the horizontal buttresses. It is not difficult to conceive that not only will the horizontal curve suffer by the moving forward of the six-year molars and the pressure in from the sides, but that as the incisor teeth project forward by the growth of the intermaxillary bone there will be also a motion toward each other of the sides of this horizontal arch whose keystone, the unrestrained intermaxillary bone, has been thrown out of its proper line of support. We have before mentioned how the palate behind cannot give way, as the pterygoid processes are so solid and firm, so that the effect of this must be instead of having the palate develop round and U-shaped in the horizontal direction, it must be more or less V-shaped with the apex ending in the incisor teeth, sometimes twisting the latter so that their posterior surfaces look toward one another. If this change takes place in the horizontal curve from the U- to the V-shape, some alteration is bound to take place in the vertical direction in the arch of the palate proper. Now, to further substantiate this, we are assured by our friends, the dentists, that an analogous process takes place in the lower jaw where there is nothing in the surroundings to influence the altered growth of the bone as is the case in the upper jaw. Furthermore, when the individual in question grows older if the upper jaw grows narrower and smaller than the lower, the latter may bite outside rather than inside of the upper, and constant pressure of this prognathism in chewing tends to still further limit the spread and growth of the palate arch.

Of all the arguments presented by the dentists, the strongest evidence is that which appears when we consider the trifling force they are constantly using in the shape of a spring of piano wire and rubber bands to spread the abnormally contracted jaw in order to give space for replacing the teeth that are out of line. If with these comparatively insignificant forces in the period of from six months to a year they are able to produce space which did not exist and to straighten out deformities that were so much in evidence, then there is hereby given to the explanation previously offered a greater show of probability, because if a slight force in one direction corrects it is reasonable to suppose that in the reverse direction deformities are produced by forces so slight and subtle as would otherwise be scarcely thought potential or harm-producing. And it is only by continuous and combined action of these various factors that gross changes are produced. From the present study we may conclude that it has been demonstrated:

First, that it is possible by deforming processes which artificially alter the shape of the skull to produce a change in form and shape of the hard palate.

Second, that under these above mentioned conditions the septum seems to conform itself to the altered development of the rest of the face, rather contrary to our previous ideas regarding the habits of this structure.

Third, that if from arrested or retarded development of the superior maxilla the palate fails to descend to its proper level, a bent septum is as liable to be produced as when the palate is arched too greatly by an unnatural narrowing process. Hence a palate of perfectly normal height as compared to breadth may produce a bend in the septum.

Fourth, that in considering the various causes which produce the abnormalities of the palate, we must lay more stress upon the lack of proper aeration of the maxillary sinuses retarding their development and hence that of the whole superior maxilla.

Fifth, the conservation and general care of the deciduous teeth help to produce a normal horizontal curve in the hard palate and lessen the tendency to narrowing.

A TABLE OF MEASUREMENTS OF THE PALATES FROM 33 SKULLS OF THE
FLAT-HEAD INDIANS BY H. S. ARNOLD.

	LENGTH	MOLAR I-II WIDTH	AVERAGE	L. W. INDEX	MEASURED INDIRECTLY HEIGHT	W. H. INDEX	PREMOLAR I-II WIDTH	
2	57.	39	36	37.5	65.7	1.3	37.3	
3	53.	42	37	39.5	74.5	1.5	30.8	
4	52.	41	40	40.5	80.6	1.0	29.4	
5	51.50	37	34	35.5	68.9	1.3	36.6	
6	56.	41	38	39.5	70.5	1.1	27.9	
7	56.	41	38	39.	69.9	1.6	41.0	Very high alveolar processes.
8	61.50	44	40	42.	68.2	1.0	23.7	Very low alveolar processes.
9	55.	43	47	40.	72.7	1.4	35.0	
10	56.	43	39	41.	73.2	1.3	31.7	
11	48.	37	32	34.5	72.8	1.1	31.4	
12	54.	37	35	36.	66.7	1.4	38.8	
13	47.	46	39	42.5	89.3	1.4	33.3	Very wide.
14	59.	44	38	41.	69.5	1.5	36.5	
15	57.	38	32	35.	61.4	1.7		Borders covered with exostoses.
16	53.	42	34	38.	71.7	1.5	39.5	Very high—impossible to measure.
17	50.	39	33	36.	72.0	1.3	31.7	
18	55.	39	36	37.5	67.3	1.1	29.7	
19	55.	43	38	40.5	74.5	1.3	31.7	
20	50.	39	37	38.	76.0	.9	25.0	
21	47.	44	38	41.	87.2	1.2	29.2	Wide.
22	56.	44	36	40.	71.5	1.3	33.7	
23	53.	40	34	37.	69.9	1.2	32.5	
24	49.	37	35	36.	73.5	1.4	38.8	
25	54.	44	39	42.	77.7	1.2	30.0	
26	56.	42	35	38.5	78.7	1.4	36.3	
27	54.	42	37	39.5	72.2	1.5	39.9	
28	50.	44	36	40.	80.	1.3	32.5	
29	48.	42	33	37.5	78.1	1.2	32.0	
30	51.	46	41	43.5	85.3	1.2	27.5	
31	52.	38	35	36.5	69.4	1.4	38.7	
32	46.	35	30	32.5	70.5	1.00	30.8	
33	49.	39	35	37.	75.5	1.3	35.0	
		Average	Index			Average	Index	
		W. L.	73.2			W. H.	3.30	

DISCUSSION.

DR. D. BRYSON DELAVAN referred to the work of the late Dr. Harrison Allen who had undoubtedly devoted more time and attention to this subject than anyone else. He regarded Dr. Swain's paper as an admirable contribution to it. He has seemed to establish satisfactorily very many points which had been previously advanced but not proved; he had also brought up several points of very great importance, among them the proper alignment of the teeth and care of the first teeth. This fact had not been sufficiently emphasized.

It was of interest to note how as case after case was reported, we were finally brought back to a very old idea, namely, the effect on the palate of obstructed nasal respiration. In the ideas advanced by Dr. Swain we seem to have a fair explanation of the facts as we find them. Now the aim should be to pay more attention to the young child and to the early recognition of the various factors affecting palatal formation.

DR. GLEITSMANN found in the views expressed by Dr. Swain a corroboration of the views advanced by himself in a paper read before the Academy of Medicine, New York City, in 1895, entitled "Influence of Adenoid Vegetations on the Growth of the Upper Maxilla in Young Children." In that paper he drew attention to the effect of nasal obstruction, adenoids and the obstruction of the choanæ. His views had met with opposition but he felt convinced he was right and Dr. Swain had corroborated the opinions before expressed by him. Others had denied the influence of anterior and posterior nasal obstruction on palate formation.

DR. J. PRICE-BROWN stated that three or four years ago he examined the Indian skulls in the Archeological Museum of Toronto. There were about two hundred in all, but only half that number were sufficiently well preserved to found any pathological data upon. In about fifty per cent of these the septum and hard palate formation was normal. Among them were a few skulls of Flat-head Indians and Mound Builders; and in these also the proportion was about the same.

DR. EMIL MAYER thought that the weight of the lower end of the superior maxillary bone was one factor in palate deformity. Regarding the influence of the deciduous teeth as a factor in addition to those previously named, while he believed it might be possible, yet at the same time it was a question for further consideration and determination.

DR. G. H. MAKUEN called attention to the fact that probably seventy per cent of all people were more or less addicted to mouth breathing. In many instances not calling for operative procedure he had tried the practice, with success, of placing a strip of silk isinglass court plaster over the mouth. The strip would be about an inch wide. It is well borne and acts as a reminder to the patient. Mouth breathing occurs in many instances in which it is really unnecessary and is only the sequel of a habit formed in childhood and adolescence. If attention is called to this habit, as happens with the court plaster, it may be corrected.

DR. W. K. SIMPSON desired to ask Dr. Swain as to the relative effects of nursing, both breast and bottle, in the formation of the arch of the palate, as it undoubtedly had some influence. Nearly all people were mouth-breathers under circumstances requiring extra exertion, thus, the runner is always more or less of a mouth-breather. He regarded mouth breathing at night as often a matter of the position of the child. Children would breathe through the mouth when lying on the back, but if they were turned on the side the mouth breathing would often cease.

DR. G. A. LELAND called attention to the pushing up as it were of the palatal arch in which process the negative air pressure in the nose and the positive in the mouth perhaps may be important factors which of course would but add to the influence of the improper development of the hard palate. This latter having an inherent power of growth had to bend upward because of the failure to spread of the alveolar processes, they being held inward by constant pressure of the cheeks in mouth breathers. The arch therefore assuming more or less the gothic form, shortened the space between the intermaxillary ridge and the top of the nose, *i. e.*, the vertical space taken from the nose is added to the mouth. Now the dentist in his processes of orthodontia by means of a wire spring fastened to the teeth either inside to push, or outside to pull on these alveolar processes, sought to quickly overcome the results of this retarded development by broadening the arch, which in the nature of things ought to increase the space in the nose by diminishing the sharpness of the arch. This resulted in giving more space for the septum, and it might be found that certain forms of deflection of the septum, especially those not evidently traumatic, may by thus reversing their etiological process, be corrected without resort to radical intranasal operation. He was free to say that these ideas came to him in conversation with a general practitioner and that he was watching the process in the daughter of a brother physician.

It went without saying that if success could attend such a procedure, the younger the subject the better, though the marvelous changes produced in the upper jaws by some dentists, even in patients of middle life, would seem to promise that under 35 years or perhaps 40, much might be accomplished.

DR. GORDON KING called attention to the racial characteristics of the negro as of interest in the present discussion. The negro has a broad palate; it is rare to see in that race any marked palatal deformity from adenoids. Septal deviation in the child is rare as com-

pared with the white child. The negro palate is larger and wider, as is also the nose, in comparison with the white race, so that even voluminous adenoid masses do not cause the same obstruction.

DR. R. C. MYLES would like to ask Dr. Swain if he had any statistics of the septal deviations at birth, in other words, was septal deformity a condition beginning in utero?

DR. SWAIN in closing the discussion remarked that no accurate series of comparisons had ever been made as to the effect of either the natural or artificial nipple in nursing. Statements on this point were merely the result of casual observation. The skulls of the Sandwich Islanders, a race that used neither spoons or artificial nipples, did not vary from normal Anglo-Saxon measurements. He should think that constant suction of empty nipples as some mothers allowed would have a certain downward effect on the side walls of the face, but it must be remembered that the empty nipples did not allow the passage of any air and that while they were in use, the little people usually breathe through the nose.

In reply to Dr. Leland he would state that the question of straightening out the septum by palatal changes was still under discussion. Dentists were keeping casts of their patients made at different times. There is no doubt but that under proper mechanical treatment the palate may be greatly widened out, but the condition of the septum in these cases of palatal improvement has not been noticed.

Concerning Dr. King's observations, it was well known that the deciduous teeth in the negro lasted better than in white people and this might have some effect on the palatal development.

As to Dr. Myles' question concerning intrauterine changes, it must be stated that in some patients there seems an inherent tendency to palate malformation. This does not explain matters but merely states a fact.