THE FORM OF THE HARD PALATE.*

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The subject of this paper is the form of the hard palate. I shall discuss it under the following headings:

- I. The four types of the hard palate.
- II. The normal form of the palate.
- III. The part played by the alveolar process in making the normal arch.
- IV. The causes of variations from the normal form, which are:
 1. Mal-occlusion of the teeth.
 2. Unequal growth between parts of the septum.
 3. Low descent of the antra.
 4. Faulty shrinkage and faulty re-adjustment of the pre-maxillae.
 5. Asymmetry of the halves of the palate.

The most important and so the central idea of the paper is that asymmetry between the halves of the palate is due not always to asymmetry of the head as a whole, but is due nearly as often to asymmetry confined to the bones of the face. Accompanying the inequality in the two sides of the palate there is almost always a vomer spur and a deviation of the septum. When the asymmetry is confined to the face, the teeth are the chief cause in producing it.

Asymmetry between its halves is one of the most important variations in the form of the palate. Since in fifty per cent of the cases this is part of a general asymmetry of the head, it is necessary by way of introduction to refer briefly to the subject of asymmetry of the skull as a whole.

Asymmetry of the Skull.

The most frequent irregularity in the form of the skull is want of symmetry. Probably no skull is perfectly symmetrical. The condition which has been observed to exist most frequently with irregular forms of skull is premature closure or obliteration of cer-

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The illustrations were drawn by the writer.

tain sutures. The cranial bones increase in size mainly at their margins, and when a suture is prematurely closed, the growth of the skull in the direction at right angles to the line of suture is checked and increased growth takes place in other directions in order to supply the defect. For instance, in cases of obliteration of the sagittal suture the transverse growth is prevented and compensatory growth takes place in a vertical direction, resulting in the scaphoid or boat-shaped skull. Similarly, in obliteration of the coronal suture compensatory growth takes place mainly upwards. Oblique deformity of the skull occurs with premature closure of one half of the coronal or lambdoid suture. Independently of this a like deformity may be produced by rickets or wry-neck.

Not only may premature closure of sutures cause asymmetry of the skull but pressure artificially applied in early life may do so. This is best shown in the skulls of Flat Head Indians. These tribes had the well known custom of compressing the heads of their children by an apparatus of boards and bandages. This resulted in severe deformity.

Asymmetry is illustrated in a slighter degree by individual instances where undue pressure has been employed unintentionally. Distortions likewise occur in long buried skulls which have been subjected to pressure and moisture. (Quain Vol. II. Part I, p. 85.)

Differences in the Skull According to Age.

In order to properly appreciate asymmetry in the skull it is necessary to bear in mind the normal periods of growth and to know the differences found in the skull according to age. The most striking fact is that at birth the head is chiefly skull and but little face. At birth the face is scarcely an eighth of the bulk of the cranium, whereas in the adult it has risen to one-half. In the first seven years the skull grows rapidly so that during this time certain parts of it, namely the circumference of the occipital foramen, the body of the sphenoid, and the petrous portion of the temporal bone have attained practically their adult size. The other regions increase but little until the period of the second dentition. With the coming of the second teeth the accessory sinuses enlarge, and in consequence of this the face begins to grow. The growth of the face is due in part, however, to the increased height of the nasal fossae, to the enlargement of the alveolar arches and the growth of the teeth. By puberty the difference

between the size of the skull and the face has in a great measure disappeared. X-ray plates show that the sinuses can be of adult size at puberty.

In old age the skull becomes lighter and thinner. Often it is a little smaller. In some cases, however, it increases in thickness and weight owing to the deposit of bone on the interior of the brain

Fig. 1.

Congenital Occlusion of the Right Choana, resulting in lack of full development of the right side of the head and face. (Courtesy of Dr. Coolidge.)

case. The proportion of the face to the skull is diminished by the loss of the teeth and the absorption of the alveolar processes of the jaws. In consequence of this the upper jaw recedes and the lower jaw comes forward. (Quain, Vol. II, Part I, p. 82.)

How Asymmetry of the Skull Is Shown.

Asymmetry shows itself in the face externally by unequal width of the two halves, by unequal height of the eyebrows and by deviation of the nasal bones and of the nose. In the internal structure of

the face asymmetry is shown by unequal size of the antra, by inequality of the nasal fossae, and by the unequal height of the two halves of the hard palate.

In many cases the asymmetry includes each half of the head as a whole, in other cases casts indicate that the lack of parallel growth occurs only in the bones of the face. My observations go to show that asymmetry confined to the bones of the face is common, and but a little less so than asymmetry of the head as a

Fig. 2.

Congenital Occlusion of the Right Choana. Side view.

whole. When you stop to consider the conditions which can cause asymmetry of the face, you find that there are more which are common to the face than to the skull. The development of the face depends upon the expansion of the accessory sinuses, and the development of the sinuses depends upon the teeth. The face is made for the teeth and by the teeth. There are two sets of teeth and the bones of the face are concerned with the development and eruption of these two sets for the first twenty years.

I wish at this point to give an example of the two chief forms of asymmetry of the skull.

1. Asymmetry of the whole half of the head. (See Figs. 1, 2.)

This photograph is taken from a boy of 17 who had congenital occlusion of the right choana. He is a patient of Dr. Coolidge. The picture shows that the right half of the head and the right half of the face are smaller than the left half of the head and

Fig. 3.

Photograph of a case of Asymmetry of the Palate (Tuttle). The right side of the palate is higher than the left, but the asymmetry does not show in the face. Front view. See figures 4, 5, 6, 7.

face. A cast made of the brow and one made of the occiput show the same differences between the right and left sides of the head as are shown in the photograph. An impression of the hard palate shows that the right side is higher than the left. The septum is deviated to the right with a marked vomer spur on the left.

2. Asymmetry of the two halves of the face.

In this case the right half of the face is less developed than the left. The impression of the palate shows that the right half is the higher, and the X-ray shows that the right nasal notch is higher than the left. In the cast of the forehead the right frontal sinus is more prominent than the left, but the two frontal eminences are equal. In other words, the asymmetry stops with the frontal sinuses. The frontal sinus is really a part

Fig. 4.

Photograph of a case of asymmetry of the palate (Tuttle). Side view.

of the face. It begins to enlarge with the coming of the second dentition, at the same time that the antrum enlarges, and from now on its growth is intimately related to the growth of the antrum. Usually in asymmetry of the face the superciliary ridge on the side of the palate which is the higher is more prominent than the other, and the frontal sinus of this side is usually the larger. (Figs. 3, 4, 5, 6, 7.)

What I have said about the general subject of asymmetry of the head has been necessary because asymmetry figures so largely in certain important variations of the form of the hard palate. I come now to speak of the form of the palate. In the palate we have to do with two arches, the arch made by the palatal processes of the palate bones and the superior maxillae and the arch made by the teeth. Both the palatal arch and the dental arch are equally important in determining the form of the palate. Of both there are four types.

Fig. 5.

Impression in modelling compound from a case of asymmetry of the halves of the palate. In this instance the right side of the palate is higher than the left.

The Four Types of the Dental Arch. (Fig. 8.)

1. The curve described by the dental arch is quite variable. These variations have been classified according to temperament. This is a rather loose, unscientific method, but quaint and expressive and undoubtedly has a certain amount of truth in it. In the first type the dental arch is well rounded anteriorly, the circle being continued backward through the region of the molars. The distance in a straight line from the center of the second

molar on one side to the center of the corresponding molar tooth on the other side, is about equal to the distance from either of these points to a point in the median line between the central incisors. Such an arch is found according to the old phraseology in connection with the sanguine temperament.

Fig. 6.

View from above of the impression figured in No. 5. Notice that on the right side, which corresponds to the high side of the palate the dental arch is almost a straight line while on the other side it has its normal curve.

2. The second type of arch is narrower than the first and is shaped more like the three sides of a parallelogram. It is almost straight across in front and the sides run back with very little curve. The inter-molar line is much reduced in length. The old name for this is the bilious type. (Fig. 9.)

3. The third type of arch is the angular. In this the two sides of the arch are straight lines, not curved or bowed and in front they almost meet in a point. The segment of the arch made by the anterior teeth is much smaller than in the other two types and amounts to but little. The line between the molars is much shorter than the line to the space between the incisor teeth. The old name for this type is the nervous. (Fig. 10.)

4. The fourth type of arch is an arch made like the first, of two equally bowed halves. It is simply a wider and larger form of the first type. The arch is well rounded and broad, the seg-

Fig. 7.

Tracing from an X-Ray of a case of Asymmetry of the Palate. The plate is looked at from behind. The right side of the palate is higher than the left. (Tuttle.) The asymmetry in this case is confined to the face. Figures 3, 4, 5, 6, 7 are from the same case.

ment being that of a much larger circle than is found in any of the other types. The inter-molar line is longer than the molar-incisor line. The old name for this is the lymphatic type. (Broomell, p. 106.) (Fig. 8.)

The Palatal Arch.

The palatal arch is practically a duplicate of the dental arch. It occurs in the same four types. If the dental arch is reproduced in wire and this wire is placed upright like a wicket, the upper half of the wire would represent the palatal arch and the lower half the alveolar process and the teeth.

Fig. 8.

The dark line represents the dental curve of the normal palate. A palate which has this curve is classed as Type No. 1. The dotted line represents diagrammatically the wide form of palate, or Type No. 4.

Fig. 9.

Type No. 2. The Quadrilateral Palate.

The Normal Arch.

Heads group themselves into two classes; the high narrow head, and the short broad head. In the high narrow head the arch of the palate tends to be of the second or third type, that is, it is

high and narrow, and has the parallelogram or the acute angle for its geometrical basis. The short broad head has a wide, flat, equally curved arch more like type four. The ideal and so the normal arch is a smaller form of the fourth type. Such an arch is represented most nearly by type one. This type as you remember is supposed to be associated, according to the old and prettily descriptive phraseology, with the sanguine temperament. In a way however, each of these four types is normal for a certain type of head. (Fig. 8.)

Fig. 10.

Type No. 3. The V-shaped or Angular Palate.

The Palate Seen in Longitudinal Section.

A longitudinal section of the hard palate at birth shows that the median line gradually rises and reaches its highest point about a third of the distance back. From this point it slopes a little downward. This downward slope of the posterior two thirds of the median line of the palate is found up to ten years of age. In the adult the highest point of the palate occurs between the first and second bicuspid teeth or between the second bicuspid and the first molar. From the highest point the normal adult palate does not slope downward as happens in the infantile palate, but continues backward in a horizontal line. The highest point in the arch corres-

Fig. 11.

Side view of the palatal arch of a boy of twelve years. Notice how the line of the palate after reaching its maximum height about a third of the distance back slopes gently downward for the rest of its course.

Fig. 12.

Side view of the palate of a negro boy thirteen years of age. Notice that the highest point of the arch comes about half way back instead of a third of the distance back as is the usual custom. Behind the highest point the line of the palate slopes downward very markedly. The steep slope of the posterior half of the arch is an infantile characteristic.

Fig. 13.

Front view of a noticeably square form of arch from a young man of eighteen years of age.

Fig. 14.

Side view of the same arch which is shown in figure No. 13.

Fig. 15.

Of the two lower diagrams the upper one represents the side view of the palate of a negro boy thirteen years old. The lower drawing represents the side view of an adult negro palate. The second palate is a marked example of the V-shaped arch. The diagrams are larger than life size.

ponds in the adult to the anterior limit of the fully developed antrum. In herbivorous animals there is a toothless space between the incisor teeth and the premolars. This gap is not conspicuous in carnivora but it is never wholly obliterated until man is reached. This gap or the diastema, as it is called, corresponds in man to the highest part of the palate. Roughly speaking, the portion of the palate in front of the highest point is made from the premaxillae, and the portion of the palate behind is made from the superior maxillae. If you start with the flat animal palate and trace the changes which have occurred in the palate down to man, you find that one of the greatest changes is the tilting downward of the premaxillae. The bending downward of the premaxillae and their proper shrinkage is accomplished to a certain extent in monkeys, but is not accomplished fully except in man. (Figs. 11, 12, 13, 14, 15.)

Fig. 16.

Diagrammatic drawing to illustrate the occlusion of the teeth.

The Part Played by the Alveolar Process in the Formation of the Normal Arch.

In the normal palate the alveolar process is responsible for much of the arch effect. If the teeth are lost and the alveolar process is absorbed the arch in a great measure disappears. When the teeth are long and the amount of the alveolar substance about their roots is small, the arch of the palate appears to be high. In such a palate the roof rests upon the half naked tooth roots as if supported upon stilts, and the lines made by the half bare tooth roots stand out clearly on the sides.

The mounding of the alveolar process about the teeth may be compared to the mounding of earth about celery stalks. The

higher the earth is piled about the celery the deeper the furrow between the rows. When the celery is pulled up the earth falls in and the ridge which it formerly made is partially obliterated and the furrow between any two rows becomes less deep and the sides less steep. The likeness between the behavior of the earth mounded about two rows of celery and the halves of the alveolar processes of the superior maxillae and the premaxillae is almost perfect.

Fig. 17.

Tracing from an X-Ray of a case of high V-shaped palate due to narrow nasal fossae and to low descent of the antra.

In certain animals we have a chance to see how much of the arch of the palate depends upon the alveolar process. The Great Ant Eater, as you know, is distinguished by his long cane like snout and the absence of teeth. The palate of the Ant Eater is absolutely flat. The palate of the bear with the teeth extracted is flat, except for a slight tendency to arch formation where the alveolar process mounds down to support the very large canine

teeth. In herbivorous animals that have large and complicated molars, the palate has posteriorly a distinct transverse arch. This is made by the mounding down of the alveolar process about the molars so that they may be firmly supported for the heavy grinding which they are called upon to perform. There is no arch about the anterior teeth. The teeth of a bear and of a dog are used mostly for grasping and tearing and have but little mounding of the alveolar process about their roots, and so the palate in these animals is not arched.

The Palate At Birth.

There are no teeth at birth; nevertheless, the palate has a very marked arch. It would not seem as if the alveolar process could play any part in the formation of this. However it does, though a bit indirectly. There is no such thing as a toothless baby. Only an adult can be really toothless. At birth the alveolar process is filled to bursting with two sets of tooth germs. Owing to this the alveolar process mounds down into a ridge on either side of the palate and makes its share of the palatal arch just as much at birth as in the adult. The teeth at birth mound down inside of the alveolar process instead of outside of it. (Fig. No. 15.)

So far I have described the usual types of the alveolar and palatal arches. I have described the characteristics of the normal arch and brought out the importance of the alveolar process in making the normal arch. This brings me to the next division of my subject, the causes of variation from the normal type. These, as I stated at the beginning of the paper are:

1. Mal-occlusion of the teeth.
2. Unequal growth between the parts of the septum.
3. Low descent of the antra.
4. Faulty shrinkage and faulty re-adjustment of the pre-maxillae.
5. Asymmetry of the halves of the palate.

1. Mal-Occlusion of the Teeth.

The dental arch made by the upper teeth is larger than the dental arch made by the lower teeth. On this account the upper teeth project a little beyond the lower teeth, and the upper incisors overhang the lower ones. With the rest of the teeth each upper tooth fits between or partially over two lower teeth. Unless the cusps of the teeth fit accurately there is a wedge-like action between the two sets. When this is excessive it is capable of producing

marked deformity. This deformity shows in the alveolar process and in the shape of the arch. For a long time it has been known that the normal growth and placing of the molar teeth depends upon the normal growth of the antrum. It has been shown also that the normal growth of the premaxillae depends upon the normal growth of the incisor teeth. The teeth, there-

Fig. 18.

Tracing from a cross section of the head and face showing a V-shaped palate due to low descent of the antra. In this case the nasal fossae are of normal width, they are not narrow as is usually the case when the antra are low and the arch of the palate V-shaped. Tracing seen from behind. Out of a hundred heads from the dissecting room, only three examples of the V-shaped arch were found. Two of the subjects were white and one was colored.

fore, are responsible more than any one single cause, for the form of the palate. Mal-occlusion is one of the most common deformities of the teeth, and so one of the most important methods of changing the form of the hard palate. (Fig. No. 16.)

2. *Low Descent of the Antra.*

Where the arch of the palate is high and pointed, in a majority of cases the X-Ray shows that the antra descend well below the floor of the nose into the alveolar process. Normally the antrum descends a quarter of an inch below the floor of the nose, but in cases of high arch the floor of the antrum may be one-half inch below the floor of the nose. (Fig. No. 17.) Out of one hundred heads from the dissecting room I have been able to find

Fig. 19.

Tracing from a cross section of the head and face showing marked inequality in the size of the antra. The left antrum is much smaller than the right. The antra do not descend below the floor of the nasal fossae, and their inequality in size has not resulted in any inequality of the two sides of the palate. Tracing seen from behind. The arch of the palate is flat and wide. This is due to the thickness of the alveolar process not to the excessive width of the nasal fossae.

only three examples of the V-shaped arch. In all of the three specimens the nasal fossae were narrow and the antra descended well below the floor of the nose. In one of these cases, the nasal fossa at its floor was only a quarter of an inch wide. The normal width is nearer a half of an inch. While in extreme cases it may be three quarters of an inch. Where the nasal fossae are narrow

Fig. 20.

1. V-shaped palate, due to narrow nasal fossae and to low descent of the antra.
2. Horizontal section of Fig. 1, showing the narrowness of the nasal fossae.
3. Horizontal section of Fig. 4 showing the width of the nasal fossae.
4. Broad, flat palate, due to wide nasal fossae and to small high antra.

and the antra descend well below the floor of the nose the slope of the inner side of the floor of the antrum gives the slope of the sides of the palatal arch. (See figs. 18, 19.) Numerous examples show that the converse of this is true, that is, where the nasal fossae are wide and the antra are on a level with the floor of the nasal fossae or above them, the arch of the palate is wide and flat. (See fig. No. 20.) The two prominent, if not the two chief factors in determining the height of the palatal arch, are, therefore, the width of the nasal fossae and the degree of the descent of the antra.

3. *Unequal Growth Between the Parts of the Septum.*

I have seen the statement that a marked median ridge of the palate is a characteristic of Peruvian skulls. The impression that it occurs chiefly in early races must be supplemented by the

Fig. 21.

Diagrammatic drawing of an impression of a palate with a median ridge.

statement that it is common also at the present day. I have found it frequently in skulls from thirteen years on. Modern dentistry has taught us what slight but continuous pressure will accomplish in changing the form of the alveolar arches. Some such explanation is the best one which I am able to offer for the occurrence of this peculiarity of the palate. At birth the premaxillary wings and the nasal spine are very small. When the second teeth appear the premaxillary wings grow rapidly in order to keep control of the tip of the septum. The nasal spine grows equally rapidly. At birth also there is no crest on the palatal processes of the palate bones and the superior maxillae, but with the growth of the premaxillary wings and the nasal spine the crests of these bones likewise develop and grow upward. If, now, there is a disproportionate growth between the crests of the palate bones

and the superior maxillae and the downward growth of the upper and larger part of the septum, the median line of the palate might be forced down into a median ridge. More than this happens in some animals. (See fig. No. 21, 22.) In certain whales, for instance, the lower edge of the septum makes a free ridge in the center of the palate, the palatal processes not uniting with it. Sometimes instead of a median ridge the whole central part of the palate moulds down in a plateau. I have one example

Fig. 22.

Impression from the palate of a boy of twelve years. There is a marked median ridge in the center of the palate. The side view of this impression is shown in figure No. 11.

of this formation. The X-ray shows that the nasal fossae in this case are excessively wide. Thus it would look as if excessive outward and downward growth of the nasal fossae was responsible in this instance, for the peculiarity of the palate. (See Figs. Nos. 23, 24.) There is another explanation for this median ridge. It can be due to exostoses along the central suture line. Partial ridges due to this cause are common. In one skull which showed elsewhere

very marked arthritic changes I found a large median ridge. How often this median ridge accompanies rheumatism I do not know. It would be interesting to determine if it is common.

4. *Faulty Shrinking and Faulty Readjustment of the Premaxillae.*

The arch with projecting premaxillae is characteristic of the negro race. It is an animal peculiarity and gives a very distinctive form to the face. The proper shrinkage and readjustment of the premaxillae play a very important part in the formation of the

Fig. 23.

Wide arch with a plateau like mound in the center. The width of the arch is due to wide nasal fossae, small high antra, and possibly to retention of the canine teeth.

palate. In the evolution of the skull of man from the skull of his animal predecessors there are two great changes, the increase in the size of the cranium in order to accommodate the larger brain, and the disappearance of the snout and the shrinkage of the jaw owing to the lesser importance in man of the sense of smell and the fact that the teeth are no longer used for obtaining food and for defense. The enlargement of the cranium is a much easier mechanical problem than the obliteration of the snout and the

proper readjustment of the parts of the hard palate. In order to realize what must be accomplished before man is reached take, for instance, the hard palate of a bear. (See Fig. No. 25.) In the bear the largest part of the hard palate is made up by the palatal processes of the palate bone. The palatal processes of the superior maxillae make the next largest part, and the premaxillae the smallest. When the palate of the bear is compared with the palate of man, the bones which have changed the most are found to be the palatal processes of the palate bones and the two premaxillae. The

Fig. 24.

Tracing from an X-Ray of a case of wide, flat palate, with a plateau-like mound in the center. The wide arch in this case is due to wide nasal fossae, small high antra and possibly to retention of the canine teeth. See Fig. No. 23.

palate shrinks from before and from behind, the middle changes but little.

In man the premaxillae not only shrunk in size, but they turn downward so that the incisor teeth become nearly vertical. In order to have a normally formed palate, these two changes, shrinkage and downward tilting of the premaxillae must both be accomplished to the proper degree. Often, however, the premaxillae fail to accomplish one or both of them. When both fail

to occur the negro form of palate results. In this case the premaxillae are large and shoot markedly forward. In other respects the arch is very symmetrical. In still other cases the premaxillae remain large, but they change their position properly and bring the incisor teeth nearly to a vertical line, so that there is only the normal overhang. It is a peculiarity of the dentition of man that when the teeth are fully erupted they all reach down to the same level. The anterior teeth reach this level first and the molars last. In

Fig. 25.

The palate of a bear.

other words the anterior teeth give the level which the other teeth must attain. If, now, the premaxillae are longer than they should be owing to lack of proper shrinkage, the palatal arch will be deep anteriorly, and when growth is completed and the rest of the teeth have reached the level set for them by the incisors, the arch will also be deep posteriorly. Non shrinkage of the premaxillae, therefore, is one cause of the high arch. Such an arch is

Fig. 26.

The upper figure represents a palate in which there has been normal shrinkage and readjustment of the premaxillae. The other figures are from cases in which these changes have been faulty. (The figures are larger than life size).

not usually pointed, but has a narrow symmetrically curved dome. (See fig. No. 26.)

5 *Asymmetry of the Palate.*

In the clinic asymmetry of the two halves of the palate is seen very frequently. It is found from ten years of age onward, and it can be demonstrated very prettily by impressions of the palate taken in modeling compound and by the X-Ray. (Fig. 5, 6, 7, 27, 28.) On examining carefully a palate where this occurs, one side is seen to be higher than the other. One antrum also usually is higher than the other. I have, however, found the reverse of this. The asymmetry of the two sides of the palate may be a part of asymmetry of the two sides of the head as a whole, or the

Fig. 27.

Diagrammatic drawing to illustrate asymmetry of the palate. The left side of the palate is higher than the right.

asymmetry may be confined to the face. In the cases of asymmetry of the palate which I have collected, facial asymmetry and asymmetry of the halves of the head have occurred about the same number of times. In one case the inequality of the two sides of the palate was due to asymmetry confined to the superior maxillae, the rest of the face and the head being perfectly symmetrical.

In cases of asymmetry of the palate the impression taken in modelling compound shows that one side is higher than the other, and the X-Ray shows that one nasal notch is higher than the other. If a cast is taken of the brow the superciliary ridge on the high side of the palate is more prominent than the one of the other side. If the asymmetry includes the whole half head the frontal eminence on the side of the higher half of the palate is larger than

that on the other side. When the asymmetry is confined to the halves of the face the frontal eminences are equal but the swelling of the superciliary ridges are not, the ridge on the high side of the palate being the more prominent. Growth in the frontal sinus seems to take place forward instead of upward.

The Effect of Asymmetry On the Dental Arch.

When one-half of the palate is higher than the other the line of the teeth on the side of the palate which is the higher, loses its curves and becomes straight. On the other side the curve of the dental arch is rounded and more nearly normal. (See Fig. No. 6.)

CONCLUSIONS.

The most frequent cause of asymmetry of growth between the two halves of the face I believe to be some fault in the eruption or

Fig. 27.

Impression showing a plateau-like mounding in the center of the hard palate.

placing of the teeth. In the upper jaw ten milk teeth have to erupt, perform their function and then disappear. They are replaced by sixteen permanent teeth. Twenty-six separate bones therefore, are developed in connection with the upper jaw. There are consequently just twenty-six chances for development to go wrong. It goes wrong so often that a separate speciality has arisen in dentistry to deal with deformities of the teeth due to faulty development.

In a paper published about a year ago I brought up an observation which had long lain dormant. This observation, due to Potiquet, is that faulty descent of the central incisor teeth is associated with deviation of the septum. On reviewing the

subject, I satisfied myself that this was true and came to the conclusion that the unequal descent of the central incisor teeth and the consequent disturbance of the premaxillary wings was one of the chief causes of deviation of the septum. In that paper I stated that unequal descent of the antra resulting in inequality of the two halves of the palate was another cause of deviation of the septum, and especially that it was a cause of vomer spurs. Continued observations during the last twelve months have convinced

Fig. 28.

Impression from a case of asymmetry of the two halves of the palate. The left half of the palate is higher than the right.

me of the truth of these statements. In other words, whenever there is an inequality between the two halves of the hard palate there will be a vomer spur on the side of the septum corresponding to the low side, and with the spur there is, in the majority of cases, a deviation of the septum towards the high side. The septum attempts to follow down and to attain its full growth. In so doing it slips out of the vomer groove toward the low side and bends outward one leaf of the vomer

and makes a spur. I now would place asymmetry of the two sides of the hard palate due to unequal descent of the antra or to unequal growth of the superior maxillae as of equal importance with faulty eruption of the incisor teeth in causing deviations of the septum.

I believe that we have in faulty eruption of the posterior teeth as well as the anterior, and in their faulty occlusion, the explanation of fully a half of the cases of asymmetry of the hard palate. In a measure this paper is a continuation of my paper of last year. With the results of that article and of this one in mind we have, then, as causes of deviations of the septum, trauma and faulty eruption and occlusion of the teeth. The practical application of both papers is obvious. It is first: To avoid trauma. This we all do instinctively. It is second: To look after the proper eruption and spacing of the teeth. In the past, pardonable vanity and toothache have sent most of us to the dentist. In the future there should be another and a more scientific reason, namely, the attempt to avoid the harmful effect of poorly erupted and placed teeth upon the septum, and upon nasal respiration.

828 Beacon street.

Atresia of the External Canal. RUDOLF LEIDLER. *Archiv f. Ohrenheilkunde*, May, 1905.

In addition to a review of the literature of the subject, and reports of a number of cases, most of which were associated with chronic middle-ear suppuration, the author describes the methods practiced at Politzer's clinic. The operation is performed as follows: A post-auricular incision is made, and the canal exposed as in the radical operation. The canal is then enlarged with a chisel, and the obstruction removed. When a sufficiently large opening in the bone has been formed, the operation is completed with a plastic similar to the radical operation.

YANKAUER.