

STUDIES ON TOOTH MORPHOLOGY AND OCCLUSION

PIDATO

DIUTJAPKAN PADA PERESMIAN PENERIMAAN DJA-
BATAN GURU BESAR DALAM MATA PELADJARAN
MENGAWETKAN GIGI (CONSERVERENDE TANDHEEL-
KUNDE) PADA FAKULTAS KEDOKTERAN GIGI UNI-
VERSITAS AIRLANGGA DI SURABAJA, PADA HARI
RABU TANGGAL 19 MARET 1958.

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PERPUSTAKAAN
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SURABAJA



Paduka tuan Ketua dan Anggauta-anggauta Dewan Kurator,
 Paduka Tuan Presiden Universitas Airlangga,
 Saudara-saudara Ketua-ketua Fakultas,
 Saudara-saudara Guru-guru Besar, Lektor-lektor, Dosen-dosen dan
 Saudara-saudara mahasiswa,
 Hadlirin jang terhormat,

Perkenankanlah selandjutnja, saja menjampaikan uraian saja ini,
 dengan mempergunakan bahasa Inggris.

STUDIES ON TOOTH MORPHOLOGY AND OCCLUSION.

The human teeth are in a transitional stage, showing a reduction and simplification in number, morphology and size. Evolutionary changes have already taken place and others are still in progress, so that our dentition in its present status is unstable. A study of the dentition will show us differences in various racial groups. In discussing the different modifications it may provide us certain useful data for future investigators in these fields. As a supplemental part we will include data on the torus palatinus.

To collect material is the first thing we have to do, before starting our investigations, but more important is the region or place, from which we receive our material.

Choice of place.

For this kind of work we need a population-group living in a simple situation, uncomplicated by gatgets and specialization of modern civilization more or less isolated from the outer world, especially in such places, where marriages with persons from other places are nearly impossible. We know that islands like Tristan da Cunha, Greenland, islands in the Pacific, the Aleutian islands etc. as population groups are very interesting, because the outside world for all is here equal, climate, cold, heat etc. and mixing with other races is practically impossible, because they are living isolated, far away from the normal traffic.

But also in Indonesia isolated places are numerous, but most of them far away from Surabaya. After surveying the geographical position, we must have our informations about the history of this island and its population. After this introduction, we must say something about the materials used for the impressions.

For the impressions, we always take a „colloid” impression material and after cleaning pour the dental casts in hard plaster of Paris to avoid damage during transport. To protect the casts the „colloid” impression material can be left on top of the models. So it will work like a cushion against outside pressure. This altogether must be covered by small pieces of paper and packed in wooden boxes. We learned that expeditions in which other material like Stents en Kerr impression compound was used, gave many distortions and loss of security, i.e. by making certain measurements, the results are not trustworthy.

Odontometry, tooth measurements.

The best material for tooth measurements is skull material, while the measurement on dental casts may have the disadvantages of distortion, which can be avoided by using the “colloid” impression material. In using impression material we will always have a loss of accuracy, especially in the region of the contact points. Those points are necessary for the determination of the mesio-distal diameters. The measurements taken from casts made from compound impressions are not trustworthy, but the difference between direct measuring in the mouth and indirectly from the “colloid” impressions is only about 0.1 m.m.

For measuring in tenths of millimeters we advice to use the “Boley” Gauge, because the small scale known as the Vernier, a nonius located on the sliding piece, by which the jaws of the instrument are opened, is used.

We have two methods in measuring teeth, following Black-Martin e.o. For the determination of the mesio-distal diameter of the teeth, that is measuring the largest distance between the contact points. The other method applied by de Terra, Remane etc., was measuring the space a tooth occupied in the dental arch. A median line drawn bucco-lingually over the occlusal plane, will not always cross the dental arch outline, forming right angles.

Sometimes there is a rotation of the tooth, resulting in a crossing of the dental arch outline and this bisecting occlusal line now forming acute angles. There will be some differences in the results of both measurements, especially in molar and pre-molar regions. In the calculations about the “robustness” ,we will also get a too high amount of square millimeters. We prefer to use the distance between the contact points. Then the metrical findings must be collected and analysed statistically, because most published series of tooth measurements lack statis-

tical analysis. Also if possible it is better to distinguish between the sexes too. The meaning of this statistical analysis is to see, if the same values are calculated by other investigators in their reports on other racial groups. The formulas used for our statistical work, are next to the S.D. Standard Deviation, the Mean and Standard Error, a Critical Ratio and the Coefficient of Variation. We advice to add to those formulas the crown index of Retzius and the crown area or (robustness), i.e. by multiplying length and breadth to get an idea of the surface of the crown by cross section. This method is of course not exact, but gives us an approximative measure and is given for investigators, who like to compare their findings. The crown area is introduced by Kajava.

Variable and more stable teeth.

As known from the coefficient of variation we have an indicator about the variability in size. Comparing molars (M. 1, M. 2, M. 3), we will find a difference in C. V., which means, a stability of an element in size, in case of a small C. V. and a variability in size of unstable elements if an increase in C. V. is found. The unstable tooth shows an increase of the C. V. in length, breadth, crown index and robustness. All depends on the S. D. Changing of the human dentition is shown in a tendency to decrease the number of teeth, in a reduction of cusps or size. Next to this, morphology can change by other diameters, which is expressed in $\text{breadth} \times 100 / \text{length}$, the index of Retzius and also by other crown areas. Some changes in the human dentition took place long ago and now in the present stage of evolution we see other changes, which are still in progress and not yet finished. Out of this we know that the state of our teeth is unstable. Bolk already pointed in the direction of a reduced dentition and stated that the probable dental formula in future would be I. C. P. M. 1 - M. 2 / I. C. P. M. 1 - M. 2. In a more progressive form we would only see edentulous mouths.

Some investigators suppose that the way followed by evolution, like here, is going on till the last tooth has disappeared. But we never know whether after thousands of years probably a standstill in the process of reduction will occur. A typical thing is that lists of families are given, in which the reduction and agenesis of the I. 2 sup. can be followed in the members of this family. If such a person has married somebody out of a family in which I. 2's are normal, it is possible that descendants are all in possession of a I. 2. We learned from different investigators, that the mode of inheritance of the I, 2 sup. is dominant,

while others think it is recessive. Mijsberg's investigations in Holland gave him the idea that there is no fear of losing our I. 2 sup. in the future, except if more children are born in families, in which agenesis of the I. 2 is common, than in families with normal I. 2 's, so that the former number of children will exceed the latter. Another possibility is mutation, in which we see an interruption in tooth development and a loss of the I. 2. So far there is no tendency for the I. 2 to disappear.

Super-numerary teeth.

We know, that like in missing teeth, there is a mode of inheritance here, but for this kind of work we need genealogies. People are not interested in things like genealogies, only in the history of the different kingdoms, reigning in different parts of Indonesia they write down the names of the descendants.

Morphology.

In the evolutionary reduction and simplification it is not only the size and number of cusps which is diminished, but also the occlusal pattern of the Molars for instance is pointing to certain changes in human dentition. The publications of Gregory and Hellman are known. They drew our attention to those morphological features of the teeth. Because the changes took place in different populations, they sought a study in human dentition especially in racial investigations to be more complete and had a certain value in seeing how far the progressive changes showed themselves on the occlusal planes. Not only the reduction of the cusps, but also a simplification of the fissure pattern in the mandibular molars was brought into the method of analyses. Those changes will not always show themselves in the same way; there may be a certain degree of modification in the different populations, seen by the frequency of more evolutionary configurations.

Both investigators gave us a method, in which we can compare the various findings of different investigators. Other investigators compared the number of cusps in complete mandibular and maxillary molar series. A description of the total amount of cusps can include extra cusps like the protostilids of Dahlberg (mesio buccal prominence of de Jonge). For Indonesia we have already given a description.

Next to this we can have secondary cusps between entoconid and metaconid and between entoconid and hypoconulid. Sometimes both

secondary cusps appear at the same time. In this chapter of extra cusps the Carabelli cusp also can be included in the discussions. Sometimes a bifid cusp of Carabelli may be in evidence. Together with this a divided lingual root can be formed. But this is not a general rule and in one of our publications we demonstrated a case in which the Carabelli cusp was divided into two separate cusps without any splitting of the lingual root. The height of the Carabelli may come up to the level of the lingual cusps, but will never reach the occlusal plane.

In the primary teeth special small Zuckerkandl cusps may be formed on the mesio buccal planes of the first deciduous molars. We can mention also the intermediate cusp found as a cusplet on the buccal triangular ridges of the premolars and on the distal oblique ridge of the molars, most of the time mentioned as a metaconule of Osborn or I. cusp of Bolk. We found the paraconule too on the lingual side of the mesio buccal cusp. But we do not intend to discuss it here, because we are giving only a summation of the extra cusps. Another cusp is the interstitial cusp. In following this way of description of extra cusps, we could follow de Terra, but we think it better not to go into too much details and look after the occlusal pattern only. In my opinion the secondary cusps are more frequently seen in the races of Indonesia than in the white races. We can give no percentages, but only our opinion after what we have seen during our observations in the clinics. For more exact figures we must wait until a more complete report is obtained by other investigations. According to Bolk (1915) tubercles on the first deciduous molar occur in 10% on the second dec. molar in 88 per cent on the first permanent molar in 61 per cent ; on the second molar in 12 per cent and on the third molar in 0.5 per cent.

About the etiology of the super-numerary cusp, probably some of them are simply overgrowths-localised hyperplasias. Other theories speak of folding of the dental epithelium (Euler), which is due to various forces exerted on the tooth germ, when the teeth are in a crowded position. We think however that a potentiality to differentiate into more cusps is embedded into the tooth germ and depends on the impulse given before differentiation starts. What kind of force it is, is unknown to us. Another thing is, that heredity has its influence on the tooth pattern.

The occlusal pattern of the mandibular molars.

Gregory and Hellman proposed to use the four individual types of mandibular molars in determination between the inferior molars.

Gradually changes can be seen in this occlusal pattern starting with the original *Dryopithecus* pattern, the most primitive pattern, which they indicated by Y. 5. This is followed by a type represented by Y. 4 meaning a cusp reduction and the loss of the posterior limb of the Y. A third type in which the cusp formula is still the same, but the groove formation in cruciform (+). They indicated this form as + 5. In the last type the cusps are reduced to four and the groove formation is in cruciform. + 4; They also suggested to give the buccal cusps a numbering of 1,3,5 mesio-distally and the lingual cusps the numbers 2,4 mesio distally. In the original *Dryopithecus* groove system, in which the grooves are imitating the letter (Y) cusp No. 1 and 4 are separated by the cusps No. 2 and 3. In all three *Dryopithecus* mandibular molars the original 1st. type was in evidence. In ancient man this Y type is reported by Gregory and Hellman, but later the Y. type molars changed their pattern and more modern formations came in its place by reduction of the number of cusps and changing of the groove configuration. The more stable elements like the M. 1 will show this Y. pattern in all higher percentages than the M. 2 and M. 3. Hellman reports that the most advanced changes will be seen in the mandibular molars of the white races and most original types are existing in Australian aborigines and in West African Negroes. About symmetrical or asymmetrical findings, there will be a change that in samples of large amounts of mandibles more asyms will be found.

Combination of cusp numbers in mandibular and maxillary molars.

The combination in complete series of mandibular molars mostly found is 5-4-4. Combinations in the maxillary molars are normally 4-4-4. But as we mentioned in our description about the reduction in the number of cusps a 4-3-3 combination would be possible. In exceptional cases the number of cusps of the max. molars can be increased to 5-5-4. This fifth cusp is situated on the buccodistal side. Zuckerkandl gives in his combinations only 4-4-4 as highest cusp number sequence. In general more modifications are found in the white populations but in case of extra supernumerary cusps I think the other racial groups will have higher percentages (Adloff and Hellman).

Europeans. (Zuckerkandl).			Non Europeans (mostly negroids and Malayans.	
1st.	Molaris sup.	4 cusps 100%.	100%.	
2nd.	"	sup. 4 cusps 45,6 %.	73,5 %.	
3rd.	"	sup. 4 cusps 10,2 %.	29,5 %.	

3rd.	„	sup. 4 cusps	10,2 %.	29,5 %.
3rd.	„	sup. 3 cusps	71,4 %.	62,3 %.

The maxillary premolars are from the 2 cusp type, 1 buccal and 1 smaller lingual. In the descriptions of the anatomical forms of the mandibular premolars we always find a description of the 2 cusp and the 3 cusp type and most of the authors suggest that the 3 cusp type is the oldest form, from which by reduction the 2 cusp type is derived. We have an other opinion, which is the reverse of the first meaning, i.e. that the 2 cusp type is the original form and the 3 cusp type a variation developed by reduction of the 2 cusp type. It sounds paradoxal, but to explain this, de Jonge gave us another nomenclature. The 2 cusp type is a sextitubercular tooth and the 3 cusp type a quinitubercular type (de Jonge) Like in the theory of Bolk we found a normal tooth built up out of protomere and deuteromere and additional cusps showing the following formula I. P. 2/3. D. 4. But also in the theory of Taviani we hear about 6 elements building up a tooth. From this original sexacuspoid form the other tooth forms are derived. Following the explanation of de Jonge the formula for the quinitubercular premolar can be written : 1. P. 2/3. D. or 1. P. 2./D. 4., depending on which cusp has disappeared.

The grooves between the 2 lingual cusps are pointing resp. mesio lingually or disto-lingually. In the scheme given here the reduction is from 6 to 5 cusps and according to the opinion of other investigators the reduction is the reverse of this scheme and passes from the 3 cusp type to the 2 cusp type. Another cusp reduction is found in the L. 2 superior from 3 mamelons to 2 mamelons.

Shovel shape.

The shovel shape tooth form has been described by Hrdlicka. It seems that this feature shows a higher incidence in Mongoloids than in Negroids and white races. The percentages of shovel shape found by other investigators are confirming the findings of Hrdlicka. Even the Japanese and Eskimos and other groups belonging to the Mongoloid stock show a lower percentage of shovel shape than the Mongoloids. In Sinanthropus or Peking man, Weidenreich observed the shovel shape on the lingual surfaces of the incisors. The explanation given by Hrdlicka, that the marginal ridges would give more strength to the tooth, is not accepted by all investigators. Also the idea that those ridges are more and more lost in modern men, because those elements are less used in mastication, is questionable.

The cross section of the tooth shows a pronounced dentin ridge, which is covered by not "abnormally" thick enamel layers. The classification used by Hrdlicka is "Trace"- "semi shovel" and „shovel”.

The numeral deviations.

From our material in Surabaya, which we collected from the clinics, many times mesiodontes and super-numerary teeth were detected by X-rays. A special case in which we found 10 super-numerary elements in the premolar regions, is published by us. It will not be possible to speak about hyperodontia here without the help of skiagrams. Also in cases of hypodontia in our material we avoid for the same reason giving a percentage of missing teeth. Usually genialogies are needed to explain the agenesis of hereditary missing teeth, otherwise the explanation is unsatisfactory.

Heredity of racial characteristics.

The shape of the skull and the proportions of the size, shape and structure of the jaws, which may have been the outcome of environment, are inherited by groups of people, who originated under similar conditions. (K. Thoma).

Numerical reduction.

In the permanent teeth this is ascribed to Vitamin deficiencies or disturbances in the secretions of the endocrine glands. Also the interrelation between the hormones of these glands is important. Overproduction may also influence the activity of the other glands and in this way affect the growing tissues. Also diseases are named, being the cause in missing teeth. It is not our intention to give a long description and list of literature on this subject, but next to all the reasons mentioned here, heredity plays a role according to investigations of other authors. But it seems that certain teeth are first or more affected than others, and so we think stabile teeth are not eliminated so easily ; Like in the scheme of Bolk only the most stable elements of every group will stay and the more variable fall to reduction and agenesis. The stability in the different groups subjected to modifications decreases mesio distally. The first one of every group being the more stable with the exception of the mandibular second incisor which is more stable than I. 1 inf. As to the

opinion that missing teeth are genetically determined, all investigators are not of the same opinion and concerning this problem they come to discordant results. Böök comes with another explanation and thinks that hypodontia is due to mutations and furthermore states that hypodontia is not only caused by different genes with varying degrees of penetrance in different pedigrees, causing sometimes aplasia of a special toothgroup or even individual teeth may be transmitted in one family as an "autosomal dominant" and in another as a "recessive" or "sex-linked trait".

Sonneborn shows that the cytoplasm may be more important than has been supposed and that in the cytoplasm are "gene-like determiners that control hereditary traits". These may be "a heterogenous group, manifesting diverse properties and diverse relations to the genes". They have been given a variety of names: Cytogenes, Cytoplasmic factors, Plasmagenes etc. By the plasmagene is meant a gene like determiner, located in the cytoplasm, so it is believed that the genes exist both in the nucleus and in the cytoplasm of the cells and probably those plasmagenes play a role in the varied demands of cellular differentiation.

Torus mandibularis and palatinus.

The first description is probably of J. Fox-1814. From the different authors who gave their opinion about the etiology of the torus palatinus, some thought that in connection with diseases like syphilis and rachitis, a torus palatinus formation was appearing along the palatinal sutura mediana. Others described this bone formation as an anatomical variation (Carabelli), Näcke regarded the torus as one of the stigmas of degeneration. Van den Broek attributed the bone deposits along the palatinal sutura mediana to irritation of the mucous membrane. The findings of Weidenreich of torus palatinus formations in rhesus monkeys, is not confirmed by other authors, like van den Broek who studied a large number of skulls of primates and Woo-Ju Kang, who investigated anthropoids. Neither found any trace of torus palatinus in their material and in this way could not agree with Weidenreich, who saw a primitive feature in the appearance of a torus in man.

Torus palatinus is according to the observations in the different races most common in Mongoloids and more frequently seen in females. Eskimos are very often affected and high percentages are reported. About the classification of the torus palatinus we find different proposals. Hooton (E. A.) used the words ridge, mound and lump, to differentiate in the degrees of presence of the torus palatinus. Others made 3-dimen-

sional measurements length-breadth and height, to express the actual size. This can be done both in living material and also in skull material.

The difference between living and dead material is, that we get a more exact measurement in skulls since the mucous membrane is no hindrance here, because laterally the mucosa is often padded by the underlying mucous glands and areolar tissue. In the classification of Thoma we will give here his own descriptions :

1. The flat torus. This is a broad thickening causing a flat, slightly convex, smooth prominence, symmetrically distributed on both sides of the median raphe, destroying the arch form of the roof of the mouth. It has a wide base and it is not pediculated and may be classified as a hyperostosis of the palatal processes.
2. The nodular torus presents small protuberances or bony exostose, which usually occur bilaterally. When closely united they may form a single swelling, although grooves may be present, indicating the multiple origin. It may progress to the lobular type.
3. The spindle shaped torus, which is also called cresta palatina, produces a ridge in the median line. A groove often indicates its dual derivation. It varies in length and may extend from the papilla palatina to the end of the hard palate.
4. The lobular torus produces an overhanging tumorous growth due to continual expansion. Often the entire palate is filled by the mass, so that it may even come in contact with the alveolar process laterally. Woo came to the conclusion that there were no special sex-differences and secondly that the narrower palate had a larger torus and the broader palate had a smaller torus. This hypothesis is not valid according to Thoma, because he saw many cases in which tori were combined with well developed arches. So we see that the conclusions after so many investigations differ considerably.

Torus Mandibularis.

The torus mandibularis cannot be studied in our dental casts. An intraoral investigation in the living individual is always better and will give probably a higher percentage of incidence.

Relation of the teeth.

The relation of the molars, introduced by Angle (1907), will be used. Next to this, disturbances in the relation of the anterior teeth must be

given, if they probably appear in some of the dental casts. In this description we will follow the classification by Neustadt (1935), i. e.

1. The horizontal overbite (overjet).
2. Edge to edge bite.
3. The reversed horizontal overbite.
4. The cross bite.
5. The vertical overbite.
6. The open bite.- apertognathia.-

The method of Neustadt is added to the classification of Angle, to give a more complete description concerning the anterior teeth. Like in the horizontal overbite or overjet, we consider the abnormal projection of the maxillary teeth over the mandibular teeth. The same can happen in maxillary protusion and mandibular retrusion or even in class I cases to displacements of the incisors. In the dental literature sometimes terms like "minimum overbite" and "considerable overbite or overjet" and "normal" and "abnormal overbite" are used. Apart from this, measurements can be made, but in our present report, where orthodontic treatment is of no concern, both the classification by Angle and that of Neustadt will suffice. Angle's classification for the molar relationship in the sagittal plane and Neustadt's classification for the anterior teeth relationship in the horizontal and vertical plane. The elevation of the teeth can be seen in the vertical plane. If we get afterwards a certain number of categories, it does not mean that there are no differences between the elements of one group. We expect that there will be corresponding and not corresponding components and in one way or other they are not homogeneous. To make more groups or sub-divisions would make the problem intricate.

Neutroocclusion.

S. Thomsen has found an edge to edge relation in older people and above 25 years of age. And more in males than in females. The changing from overlapping into edge to edge bite is not clear, but it appears to be associated with wear of teeth, which permits a mesial placement of the mandible. As is known with the Eskimo people toothwear is very excessive and here we see the edge to edge bite like in more primitive populations. At the same time the curve of Spee is reduced to a more shallow curvature. Bimaxillary prognatism is a characteristic often found in Malaysians and Negroids. It can be made visual in profile photographs. The bimaxillary prognatism can be divided in a prognatism of the

alveolar bone, a prognatism of the jaws or both and is the result of an excessive growth of the prae-maxilla, maxilla and mandibular. Bi-maxillary retrusion. Here we get a distal placement of the arches to their normal position. Compared with the facial profile, the lips are retruded. Sometimes we see a lingual version of the maxillary incisors associated with an overbite.

The arch form.

In the literature the normal dental arch has a (parabolic) form, which can be divided into 3 segments, anterior, middle and post. The anterior segment includes the anterior teeth and first premolars, is hardly a half circle; the middle segment includes the second premolars and mesial half of the first molar; the posterior segment includes the 3 molars. This last segment is nearly parallel to the median plane. The buccal surfaces of the maxillary molars curve more inward toward the median plane than the mandibular buccal outlines do. This is caused by the fact that the second and third molars are set lingual to the first molar and secondly by the greater convergence to the distal of the buccal surfaces of the maxillary molars, which to the distal of course will lessen the bucco-lingual measurements distally. Variations are the (hyperbolic) arch, in which a broad parabolic form is to be seen and diverging posterior segments. The "ovoid" arch is parabolic in form with converging posterior segments. The other forms known as "v-shaped", "trapezoid", "omega" etc. may be considered more abnormal archforms. Here in our field of investigations we must consider also another archform, the "wadjacoid". This archform described by E. Dubois was found in the skulls of *homo wadjakensis*. The 3 molars lying on a parabolic line of larger parameter than the anterior teeth. In the upper jaws this narrowing of the dental arch in the premolar region is more evident in males than in females, Dubois said. The Korkhaus lengths and breadths measurements can be used in our material. Stanton and Goldsteins (1935) average widths in the alveolar arches of children from 1 to 11 years (combined sexes), can be used to determine how wide these arches should be for children from 1 to 11 years. The distances are given from C - C between cuspid tips. The distances e - e are the distances between the central pits of the second primary molars and the third distance between the central pits of the first permanent molars (6 - 6).

In the original tables Stanton and Goldstein used the centroids of the cuspids and molars, but the distances are here taken from a nearby

but more fixed point, like the central pits from the molars or the central grooves from the premolars, the cuspid tips etc. The distance W. is the maximum distance between the buccal aspects at the gumline of the primary second molars. A. M. Schwarz has changed also the place of measurement as used by Pont, to get a more stable point for his instruments. After the opinion of Schwarz the Pont's index is too large for small faces. So his advice is to use the Korkhaus indices, because they are more corresponding to small faces and apart from this, special indices for broad faces are given. Schwarz thinks the differences between the Pont's index and Korkhaus table is a difference in the material used i. e. resp. the population from South France and Rhône-land. Then the dental arches of our casts are compared with the constructed arches of Herbst to see how much the deviation between both arches is. The next measurements are the medio sagittal lengths of the arcus alveolaris dentis sup. of the ante-molar part and the lengths of the whole arcus.

Crowding of the teeth.

The disharmony between arches and teeth has been analysed by different authors. Ritter after his experiments with dogs concluded that there was no correlation between tooth size and jaw size. Each was determined by a different hereditary factor. Kadner found at least 5 hereditary factors in the composition of our dental apparatus. Abel investigated the different races in South Africa. His opinion was also that there must be separate factors in causing so many disturbances in the alignment of the teeth. When members of different races married, much crowding was to be seen in the jaws of their children. Also the work of Korkhaus, Schwarz and so many others should be mentioned, but up till now we have sufficiently learned that the discrepancy between tooth size and jaw size, is the result from interior or hereditary factors and paratypical or exterior factors.

Next to the inheritance the outside world has more or less influence on the toothform (endocrine glands and metabolism). Lundström stressed that the apical base is very important because tooth position is to a large degree, dependent on the form and size of this apical base. So we have to do with two variables bone size and tooth size. By different authors the first or second variable is the most important, but both can have a certain influence on the crowding. Moorrees gives as his opinion, that principally crowding is the result of a large tooth size and only in extreme cases of crowding, there is a diminished arch size. An other

attempt is made by S. Thomsen to compare tooth size in crowded and non-crowded cases. They can be divided in different age groups (3 or more) 12 - 17, in which M. 3 has not erupted and from 17 - 35 for the second group. 35 is arbitrarily chosen, because between 20 and 50, crowding is increasing.

Wear of the teeth.

In hardness tests executed by Pickerill, hardness was measured by the sclerometer method i. e. by scratching and by the graphite test to see if penetration of this material was more in one case than in another. Pickerill divided the teeth in "sclerotic" and "malakotic" teeth, depending on their hardness. Furthermore he thought the tooth colour was indicating a well calcified tooth in case of a yellow colour and in case of bluish colour the less calcified tooth. We know that no indication can be given, exactly about the tooth colour.

Excessive use like in Eskimo teeth can diminish the lifetime of the teeth and shuffle the class of wear to an early stage. Of course a prolongation in mastication time or by chewing on leather boots like Eskimo women do, will increase the attrition. Bruxism as a cause of abnormal attrition is also a reason for abnormal tooth wear, but will mostly be less than the abnormal use of the teeth like in the Eskimo population. In the prehistoric skulls, the abrasion of the teeth is sometimes attributed to the unsufficient clearing of the food, so that abrasives (sand particles) are left inside. The more the teeth are worn the shallower the curve of Spee will be and the more the edge to edge bite will be in evidence. In our material we will see if age and sex are associated with tooth wear. S. Thomsen takes 12 to 21 years in the first, 22 to 39 in the second group and 40 to 80 years in the third group.

Diastema between the teeth.

Specific diastemata are to be seen in macroglossia which results in general spacing of the teeth. A central or median diastema is sometimes observed. Now and then a lateral diastema is to be seen in the Indonesian upper jaws, especially between the I. 2 and C. sup. It will not be discussed here, but we only mention this because in the dental literature speaking about the relationship between the teeth, only the median and the solitary diastema, caused by torsoversion, unerupted supernumeraries, retention of roots broken off at extraction or by tumors and some-

times by agenesis of tooth germs etc. are discussed. Also in racial investigations the relationship between jaws and teeth ; like large jaws and small size teeth will cause the formation of diastema between the teeth. As we mentioned already, different investigators have pointed out that there is no correlation between tooth size and jaw size, but that there are hereditary factors working on both parts. (Abel and Ritter).

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Saudara-saudara mahasiswa putera dan puteri :

Bilamana saudara nanti, sebagai dokter gigi jang baru lulus dan menerima tugas sebagai dokter gigi, dipekerdjakan pada tempat-tempat atau pulau-pulau jang terpentjil, maka hal itu adalah untuk mengabdikan pada Nusa dan Bangsa ditempat-tempat jang dianggap perlu oleh Pemerintah.

Sesudah 3 tahun, saudara bebas untuk memilih, akan meneruskan bekerdja pada Pemerintah ataukah akan meninggalkan Dinas Kesehatan. Hendaknja masa 3 tahun itu dianggap sebagai masa beladjar untuk lebih dapat mengetahui pekerdjaan dan keadaan penderita. Keahlian saudara akan bertambah dan pengetahuan tentang djiwa seseorang lebih luas adanja. Lebih banyak saudara mempunyai minat terhadap pengetahuan Kedokteran Gigi, lebih banyak pula kesenangan jang akan saudara dapatkan daripada pekerdjaan jang telah saudara pilih. Hendaknja tidak sadja memperhatikan ilmu pengetahuan, tetapi djuga penghidupan dalam masyarakat, pendeknja berikan pertolongan, dimana sadja pertolonganmu itu dapat diberikan.

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Sekian.