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ROENTGENOLOGICAL AND MORPHOLOGICAL FINDINGS IN THE REGION OF THE MANDIBULAR SYMPHYSIS

by

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INTRODUCTION

Following intraoral radiography of the frontal segment of the lower jaw, a radio-opaque circular area with a central dark spot often appears on the picture. It is situated in the midline, beneath the apices of the incisors (Fig. 1). The usual explanation for the appearance of the white circular area is that it is due to the genial tubercles which are the points of insertion of the genio-hyoid and genio-glossus muscles in the symphyseal region on the lingual aspect of the mandible. The dark central spot is supposed to represent the nutrient canal which terminates near the genial tubercles as foramen linguale.

There are but few studies dealing with the contents of the canal. *Novitzky* (1952) demonstrated the presence of an extensive arterial anastomosis at the mental foramen and at the genial tubercles. *Ennis* (1952, p. 311) observed that an artery deriving from the incisal branch of the mandibular artery leaves the lingual foramen in the region of the genial tubercles and intercommunicates with the lingual artery. *Novitzky* (1952) showed by blunt dissection that the mylohyoid nerve enters the mandible on the lingual aspect of the symphysis. Both *Schumacher* (1904) and

Sicher (1951) describe branches from the mylohyoid nerve, but suppose that they enter the lower jaw by the various lingual foramina *beneath* the genial tubercles.

The genial tubercles are described in the textbooks of anatomy, in contrast to the equally regularly appearing lingual foramen. There are, however, some observations pertaining to the

a b c

Fig. 1. a. A routine radiograph of the white circular area with the central dark spot. b. Shows an unusually large dark spot. c. Shows the white circular area containing two dark spots. (The only picture of its kind hitherto observed by the author).

lingual foramen in the literature. Thus, *Lenhossék* (1922, p. 34) wrote: "— — — Die Öffnung hat in 39 % über der Spina ihre Lage, in 34 % ist neben der oberen Öffnung noch eine unter der Spina befindliche vorhanden. In 11 % liegt nur letzere vor. Seltener (5.5 %) sitzt das Foramen mitten auf der Spina; in 7 % sind mehrere um die Spina verteilte Foraminula vorhanden, in 3.5 % fehlt jede Öffnung." — *Shiller & Wiswell* (1954) examined 126 dried mandibles for the frequency of appearance, the size and the localization of the lingual foramen, and showed that in 88.9 per cent of the cases the lingual foramen was located *above* the genial tubercles.

There is, therefore, some reason to doubt whether the traditional interpretations of the white circle and the black spot as they appear on roentgenograms are correct. This article presents a series of experiments which suggest a different interpretation.

I. RADIOGRAPHICAL AND MORPHOLOGICAL INVESTIGATIONS

Material

Thirty-six mandibles originating from material collected from old burial grounds were examined. To some extent they were all defective, but their symphyseal regions were intact. 30 mandibles were from adults, but sex, age and race were unknown. Neither could it be established when the particular individual lived. From the 30 jaws, 11 were selected at random and numbered 1—11. The remaining were numbered consecutively, but in no particular sequence.

The material comprised 6 mandibles from children. The ages were determined on the basis of series of roentgenograms. They were 1½, 2, 2, 2½, 4½, and 9 years, respectively. Whether or not the same relation existed between "dental age" and "chronological age" at the time these children lived as at the present time is not known. Thus, the ages given may be approximations, only. Sex, race and era are unknown. All of the mandibles from children were included in the investigation here presented.

Methods and results

A. Adult material

Roentgenograms were first taken in different projections by the usual "bisecting-the-angle" technique, varying the angle in the horizontal plane from the orthoradial up to 10 degrees of excentric adjustment. The vertical angle was altered by changing the position of the film in relation to the frontal plane of the mandible.

The resulting exposures were recorded as positive when the white circular area including the central dark spot appeared on the radiograms, and as negative when these images were absent. The results are tabulated in Table I.

From Table I it is apparent that the described structures appear regularly on roentgenograms. Except for jaws nos. 3 and 7, there was a positive result (as defined above) in at least 50 per cent of the exposures of each individual jaw. On the average, there was a positive result in 66⅔ per cent of all the exposures. This goes to show that the different projections are not equally favourable for obtaining an image of the white circular area with the central dark spot on radiograms.

Table I.
Survey of »bisecting-the-angle» exposures

Mandible no.	Number of exposures	Number of positive exposures	Number of negative exposures
1	6	6	0
2	6	3	3
3	6	1	5
4	6	4	2
5	9	6	3
6	6	6	0
7	6	0	6
8	6	5	1
9	6	3	3
10	6	6	0
11	12	10	2
	Total: 75	50	25

The jaws were next radiographed, using the device designed by the author for obtaining "identical", intraoral radiograms (*Benkow* 1956, 1957). The necessary impressions were filed. Each mandible was radiographed from different angles until a positive result, as defined above, was obtained. The impression corresponding to the particular projection which gave a positive result was saved for subsequent radiography. Ten of the eleven selected jaw-bones were positive, according to the definition above. A total of 12 different projections in the case of mandible no. 7 were negative (see also Table I).

Following this radiographical recording, the genial tubercles of each mandible were removed by grinding, using a carbide wheel, to the extent that the lingual aspect of the mandibular symphysis appeared entirely even upon macroscopical examination. Then another radiograph was taken by the author's method, including the use of the stored impressions for the purpose of securing "identical" projections.

The images of the radio-opaque circular area with the dark central spot appeared on all of the radiograms, in spite of the removal of the genial tubercles (Fig. 2).

Following these examinations, radio-contrasting compounds were injected through the lingual foramen by means of a syringe, employing a positive air pressure. This was done with the hope of obtaining an idea of the orientation of the nutrient canal and its possible branches. The contrasting medium injected included *Jodipin* (Merck, 40 per cent, water-soluble) and pure mercury.

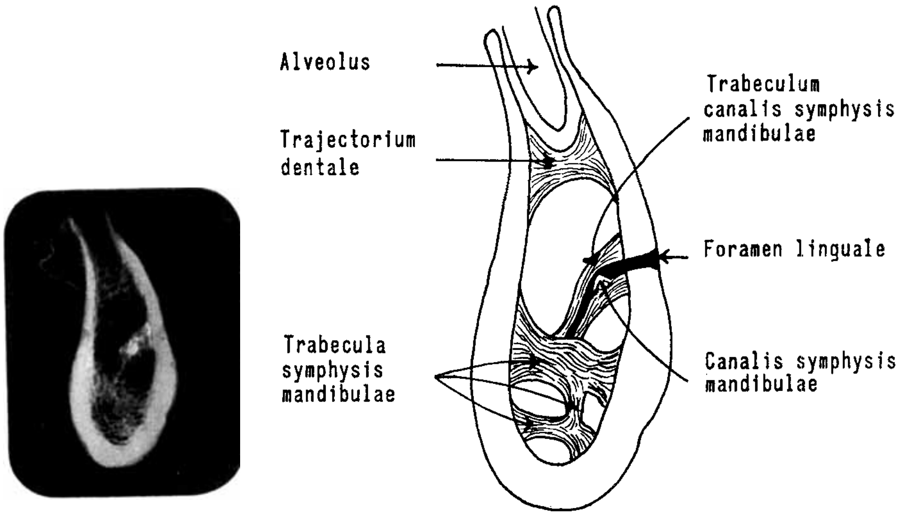
a b

Fig. 2. Identically projected radiographs of mandible no. 5 before (a) and after (b) elimination of the genial tubercles by grinding.

The results were equivocal, although the contrasting substances showed up in the area of the dark spot described (Fig. 3 as compared to Fig. 2). The figures all derive from jaw no. 5, with "identical" projections.

The investigations here presented suggest that the traditional explanation of the "dark spot", being the image of the lingual foramen including a nutritional canal, is correct, whereas the interpretation of the surrounding white circular area is misleading. The radio-opaque area cannot be interpreted as a phototechnical artifact like the "flowmark" or the "Eberhard effect"

Fig. 3. Radiograph of mandible no. 5. Projection identical with that of Fig. 2, but with contrasting medium in the dark spot.



a b

Fig. 4 a. Lateral projected radiograph of a cross section from the symphyseal region of mandible no. 5. Contrasting medium is seen in the canal.
b. Diagram of Fig. 4 a.

(*Kennedy* 1952, *Zimmer* 1960), since the area *surrounds* the dark centre.

Following the above described registrations, the mandibular symphyses were sectioned out from the jaws. These cross-sections measured 0.75 cm in width on the average, and included the genial tubercles, the lingual foramen and the buccal and lingual cortical bone. The sections were placed in contact with an ordinary dental x-ray film. They were then radiographed in a lateral projection, with a target-film distance of 40 cm. In Fig. 4 a, a roentgenogram of this kind (of mandible no. 5) is shown. From the roentgenogram it appears that the nutrient canal begins at the lingual foramen and continues through the lingual cortical bone. From then on it transverses the cancellous bone, forming an arch in a forward and downward direction. Within the canal, the radio-contrasting compound is seen. The canal is in its entirety surrounded by a radio-opaque zone. The width of this zone measures 3.5 mm at the borderline between cortical and cancellous bone. It narrows by and by to a width of 2 mm. These measurements of the image correspond very well to the real width of the structure, as measured in the prepared sections.

The sections of the remaining jaws exhibited by the same method of radiography essentially the same features, apart from mandible no. 7, which will be discussed below.

Fig. 5. Photograph of six of the symphyseal cross sections following the elimination of the lingual cortical bone by grinding.

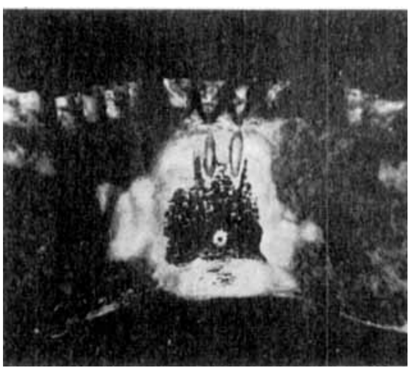


Fig. 6. Photograph of a mandible not included in the material here presented. The mandible was prepared in the same manner as the sections shown in Fig. 5.

The observations here presented suggest that the image of the white circular area represents a bony structure transversing the cancellous bone (see Figs. 5 and 6, which demonstrate the lingual aspects of the symphyseal sections subsequent to the removal of the cortical bone by grinding, thus exposing the cancellous bone;

Fig. 7. Photograph of a symphyseal section not included in the present material in which the spongy bone is removed (seen from the lateral). Parts of the bony "beam"-system are destroyed because of the brittleness of the mandible.

see also Fig. 7). In 10 mandibular symphyseal sections, the diameter of the described bony structure varied between 2.4 and 4.7 mm, the average figure being 3.5 mm, as measured at the borderline between cortical and cancellous bone. The width of the nutrient canal was estimated by the insertion of especially prepared steel cylinders of different diameters varying 0.1 mm from each other. In this manner, the diameter of the canal in the measured specimens averaged 0.8 mm (from 0.5 to 1.0 mm).

B. Child material

The mandibles deriving from children were subjected to the same methods of investigation as was the adult material, excepting the introduction of the radio-contrasting mediums. From all of the six mandibles images of the white circular area including the dark central spot were obtained in at least one projection. Fig. 8 — mandible no. 28 — is entirely representative as an illustration. The described features were found in all of the material deriving from children, as well as following the grinding procedure to remove the genial tubercles, using "identical" projections in the manner described by the present author (*Benkow*, 1956, 1957).

Fig. 8. Radiograph of a 2 year-old child mandible (no. 28) projected according to the "bisecting-the-angle" technique.

All radiographs of the mandibles of children revealed a condensation of the cancellous bone in the symphyseal line.

Further examination, however, of symphyseal sections (0.5 cm in width) by lateral radiography revealed some differences in comparison with the adult material. On the lateral exposures of the 4 youngest individuals (1½ to 2½ years old), the nutrient canal and the surrounding bony structure were hardly discernible. On the lateral radiographs there appeared an image of a dense structure of cancellous bone without any particular orientation. In the older material (4½ and 9 years) an image of a nutrient canal surrounded by a definite bony organization as in the adult material described could be definitely discerned.

Following complete removal of the lingual cortical bone by grinding, the bony structure enveloping the nutrient canal appeared to have become cross sectioned, and was surrounded by the cancellous bone. This method of examination as well revealed a difference between the mandibles of the two age groups. In the youngest specimens the bony "beam" could be followed for a short distance only within the cancellous bone. In the older material, the bony structure extended several millimeters into the cancellous bone.

The diameter of the bony "beam" measured in the child material from 0.9 mm to 2.3 mm with an average of 1.6 mm. The average diameter of the nutrient canal was 0.5 mm (variation limits: 0.2—0.6 mm). Thus the impression gained from the radiographs that the white circular area of children's and adult jaws were of different dimensions, was verified by these measurements.

II. STUDIES ON THE ORIENTATION OF THE NUTRIENT CANAL

In order to obtain a sharp and definite image of the nutrient canal on the radiograph, the "central ray" must be directed so as to follow the canal for as long a distance as possible. Therefore, an estimation of the orientation of the nutrient canal both in the horizontal and vertical planes is required.

Material

Twelve dry mandibles were selected at random from the collections at the Anatomical Institute, University of Oslo. Age, sex, race and era were not considered in this particular study.

Methods and measurements

The two planes of orientation were:
a) a *horizontal* plane, defined as the plane onto which three or more points of the mandibular inferior border touches simultaneously by the exertion of occlusal pressure on the first premolar or its alveolus;

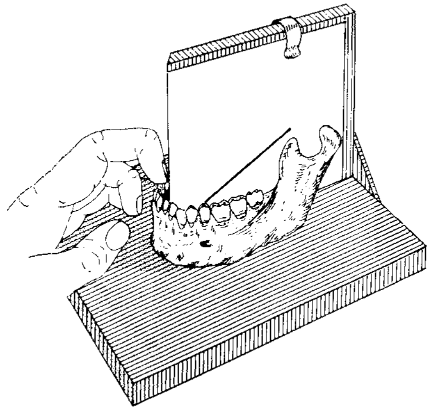


Fig. 9. Measurement of the vertical orientation of the nutrient canal.

b) a *vertical* plane (the median sagittal plane), defined as the plane vertical to the horizontal plane and oriented through the mandibular symphysis and the centre of a line connecting the lowest points of the sigmoid notches.

The vertical angle was determined by means of a set of steel pins of different dimensions and a wooden device, as shown in Fig. 9. For each mandible a pin was selected which provided for a well defined angle, and which, when inserted, could not easily become dislocated. The pin was inserted into the lingual foramen and then pushed into the nutrient canal to an extent when further insertion met with resistance. The mandible was next placed onto the horizontal construction of the device and carefully positioned in such a manner that the entire length of the steel pin (apart from the inserted portion) just touched a sheet of paper covering the vertical part of the device. The paper was placed with one edge onto the horizontal plane, and was folded across the anterior margin of the vertical part of the device. The end-point of the pin along with a second reference point, chosen immediately adjacent to the lingual foramen, were next marked off onto the paper sheet. The paper was then removed. On the paper, a line was drawn through the two points, terminating at the edge of the paper representing the horizontal plane. The angle between this

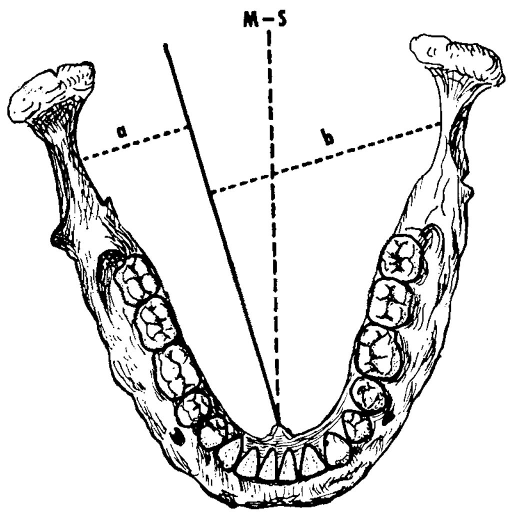


Fig. 10. Diagram demonstrating the horizontal deviation of the nutrient canal in relation to the median sagittal plane (M-S).

line and the paper margin was measured with a goniometer and taken to represent the vertical angle of the nutrient canal (Table II). The measurements were repeated two months later. The standard deviation of the difference between the individual measurements undertaken with the 2 months interval was 1.4

Table II.

The orientation of the nutrient canal in relation to the horizontal and the median sagittal planes of the mandible.

Mandible no.	Vertical orientation in degrees		Deviation from the median sagittal plane					
			by measuring a and b in mm (see Fig. 10).				By subjective estimation*	
			1. measurement		2. measurement		1. estimation	2. estimation
	1. measurement	2. measurement	a	b	a	b		
1	0.5	3.0	44.7	53.6	36.1	60.5	R	R
2	28.5	27.5	48.8	44.5	45.1	40.5	L	L
3	36.5	35.5	45.7	48.8	47.4	54.0	R	R
4	29.0	27.5	52.4	43.1	57.9	39.0	L	L
5	29.0	29.0	59.7	39.7	53.7	44.7	L	L
6	31.0	30.5	44.7	50.2	35.3	60.5	R	R
7	25.5	24.5	50.0	48.3	48.6	49.5	O	O
8	24.0	23.5	50.7	43.4	54.1	39.8	L	L
9	33.5	32.0	55.3	50.3	56.2	50.0	L	L
10	24.0	25.0	47.7	41.4	46.6	42.8	L	L
11	34.0	34.0	41.0	57.5	36.3	53.7	R	R
12	33.0	32.0	50.1	54.4	39.4	49.3	R	R

*R and L are used to designate right or left deviations, respectively, from the median sagittal plane.

degrees. The estimated standard deviation of a single measurement amounted to 1.0 degree.

The orientation of the nutrient canal in relation to the median sagittal plane was established by measuring the distance from the lowest point of the sigmoid notch to a vertical plane through the inserted steel pin (Fig. 10, a and b). It is evident that when a equals b, the nutrient canal is situated in the median sagittal plane. When a > b, the orientation of the canal is displaced to the left hand side, and in the case where a < b, there is a deviation in the orientation of the canal to the right, in relation to the median sagittal plane. Control measurements were carried out after two months. The direction of the inserted pin deviated from the median sagittal plane to an extent which left no doubt about the orientation of the canal (Table II). The measurements definitely demonstrate an orientation of the nutrient canal either to the right or to the left of the median sagittal plane. Statistical analysis confirms this.

DISCUSSION

The observations here presented show that the white circular area regularly appearing on radiographs of the frontal segment of the lower jaw in the cancellous bone below the apices of the teeth is due to a comparatively thick bony structure which runs in a linguo-buccal direction in the cancellous bone of the mandibular symphysis. The central dark spot of the appearance is the image of a nutrient canal which is enveloped by the bony structure, and which terminates in the lingual foramen.

The structures here described appear on radiographs in articles published by *Hirschfeld* (1927, p. 626) and *Paatero* (1958, p. 13). They appear on a lateral projected radiograph of a cross section of the mandibular symphysis and on a orthoradial jaw pantomogram, respectively. These radiographs confirm that the bony structure surrounding the nutrient canal is positioned in the cancellous bone.

The mandible no. 7 from the burial ground material, however, warrants particular comments. On none of 18 (6 + 12) exposures did the white circular area show up. This indicated an absence of the above described bony structure forming the anatomical basis for the appearance of this area on radiographs. Repeated radiography in combination with progressive grinding as described and inspection revealed that the canal terminating in the lingual foramen in this specimen was comparatively short. It was situated within the cortical bone, and prior to entering the cancellous bone the canal split into a number of narrow branches which merged with the cavities of the marrow of the cancellous bone.

Fig. 11. Photograph of a tiny fragment of the symphyseal region of mandible no. 7 from the burial ground material. The lingual cortical bone is only partially removed. (Enlargement × 10).

On the basis of the study here presented and an additional investigation to be published separately (*Benkow,* 1961), it appears that there are individual variations with respect to the orientation of the nutrient canal and its enveloping bony structure both in the horizontal and vertical planes, and, moreover, that the canal only occasionally is situated in the median sagittal plane. According to the measurements here presented, the vertical angle, except for one specimen, varied between 24 and 36.5 degrees.

The inner structural design of bones reflects the functional and mechanical stresses to which they are exposed (*Weinmann & Sicher,* 1952). Thus, increased stress within certain limits results in thickening of the cortical bone and/or a condensation or thickening of the trajectories of cancellous bone. These trajectories, furthermore, become directionally oriented, corresponding to stress lines of functional and mechanical influences, the classical exemple being the architecture of the cancellous bone in the proximal end of the femur (*Dixon,* 1910).

Sicher & Tandler (1928) described the trajectories of the mandible as follows (translated from German): "... In the region of the chin there are ascending trajectories that pass obliquely from left to right, and vice versa. These will cross almost at right angles, and represent without doubt reinforcements against the bending forces in the most exposed areas." The description by *Sicher & Tandler* appears to represent an over-simplification of the system of trajectories in the region of the chin. Figs. 4 and 7 show marked trajectories also in the bucco-lingual plane. Such lines appeared in all of the cross-sections of the examined material. The compact bony wall about the nutrient canal of the symphyseal region appeared to constitute an integral part of the general system of trajectory lines (Figs. 4 and 7). Another typical feature of the trajectory lines was that they originated in a fan-like fashion towards both the buccal and lingual cortical bone, as well as towards the inferior margin of the mandible and towards each other. The same picture is presented by the spongiosa in the proximal end of the femur, where the fan-like trajectory lines are commonly regarded as an expression of stress lines. Statistics on mandibular peace-time fractures (*Reither* 1956, *Enghoff & Siemssen* 1956, *Köhler* 1958, *Lindström* et. al. 1960) reveal the symphyseal area to be the area least susceptible to fracture (1—3 per cent), except for the coronoid process. On the basis of the material here presented, the cortical bone of the symphyseal region appeared no thicker than in other sections of the mandible. For that reason, it is suggested that it is the described trajectory lines in the bucco-lingual plane which account for the resistance of this area to fracture, as compared to other areas of the mandible.

The described nutrient canal along with the enveloping dense bony wall and the accompanying trajectory bundles are — on the basis of this study — rather regular anatomical features of the symphyseal region of the human mandible. For that reason, it is proposed that they ought to be described in specific anatomical terms (Fig. 4 b). Tentatively, the nutrient canal might be termed: "Canalis symphysis mandibulae", the trajectory bundles: "Trabecula symphysis mandibulae", and the bony wall enveloping the nutrient canal: "Trabeculum canalis symphysis mandibulae".

SUMMARY

On intraoral radiographs of the anterior region of the lower jaw a radio-opaque circular area and a central dark spot are often seen in the midline, some distance below the apices of the incisors (Fig. 1). The common explanation of this phenomenon is that the dark spot is the image of a nutrient canal which ends in the lingual foramen, and that the white circular area is due to the genial tubercles which represent the skeletal insertion of the genio-hyoid and genio-glossus muscles.

The author has shown (by injecting contrasting media), that the old interpretation of the dark spot is correct, whereas the explanation of the white circular area is incorrect. By radiographing dry mandibles the same image of the circular area was obtained before (Fig. 2 a) and after (Fig. 2 b) eliminating the genial tubercles by grinding. The exposures were identically projected by means of an appliance designed by the author. Cross sections of the mandibular symphysis were radiographed in a lateral projection and revealed a radio-opaque ribbon or zone on each side of the nutrient canal (Fig. 4). This indicated that the white circular area was the image of a dense bony structure which passes through the cancellous bone in the mandibular symphysis and surrounds the nutrient canal as a thick bony wall. This was confirmed by grinding away the lingual cortical bone. Thus, the nutrient canal and the bony "beam" appeared in the middle of the cancellous bone (Figs. 5, 6, and 7).

Similar findings were made by the same methods on dry mandibles of children of 1½ up to 9 years old. A roentgenogram of the mandible of a 2 year-old child is shown in Fig. 8.

The author has also investigated the orientation of the nutrient canal and the surrounding bone wall on a material of dry mandibles from an anatomical collection for the purpose of achieving an idea of the most favourable projection for obtaining the images of the white circular area and the dark spot. The direction of the nutrient canal in relation to the horizontal plane exhibited a variation of angles of 24 to 36 degrees. The canal was seldom found in the median sagittal plane, but deviated to the right or to the left.

One of eleven jaws exhibited no white circular area or dark

spot. In this case the anatomical basis for the image was missing, because no dense bony structure could be found in the cancellous bone, even subsequent to grinding.

The bony "beam" is not the only trajectory in the bucco-lingual plane of the mandibular symphysis. It is an intregal part of a well developed system of trajectory bundles. The author has advanced the hypothesis that these trajectories are reinforcements of the frontal segment of the lower jaw stemming from functional and mechanical stresses, and that they account for the resistance of the symphyseal region to fracture. The most important trajectories of the anterior region of the mandible appear to be positioned in the bucco-lingual plane of the symphysis, and not in the frontal plane as formerly believed.

RÉSUMÉ

DECOUVERTES RADIOGRAPHIQUES ET MORPHOLOGIQUES SUR LA SYMPHYSE MANDIBULAIRE

Sur les radiographies intraorales de la région antérieure du maxillaire inférieur, un "anneau blanc" et un "point central sombre" apparaissent souvent sur la ligne médiane, légèrement sous les apex des incisives (fig. 1). L'explication courante de ce phénomène est que ce "point" est l'image du canal nourricier se terminant dans le foramen lingual, et que "l'anneau" est l'image des apophyses géni représentant l'insertion osseuse des muscles génio-hyoïdiens et génio-glossiens.

L'auteur a démontré que l'ancienne interprétation du "point" est correcte (par injections de moyens de contraste) tandis que l'explication de "l'anneau" est eronnée. Par la radiographie de maxillaires non vitaux, une image identique de "l'anneau" a été obtenue avant (fig. 2a) et après (fig. 2b) avoir fait disparaître les apophyses géni par meulage. Les clichés ont été faits suivant des projections identiques, à l'aide d'un instrument créé par l'auteur. Des coupes de la symphyse mandibulaire ont été radiographiées en projection latérale et ont montré un ruban radioopaque encerclant le canal nourricier (fig. 4). "L'anneau blanc" était donc l'image d'une condensation osseuse traversant l'os réticulaire dans la symphyse mandibulaire, et encerclant le canal nourricier comme une épaisse paroi osseuse. Cela fut confirmé par le meulage de la partie corticale linguale de l'os. Ainsi le canal

nourricier et la "poutre" osseuse apparaissent au milieu de la structure osseuse réticulaire. Cela ressort dans les photographies des fig. 5, 6 et 7.

Par les mêmes méthodes ont été faites des découvertes semblables sur les maxillaires non vitaux d'enfant âgés d'un an et demi à neuf ans. La radiographie d'un enfant de 2 ans est montrée sur la fig. 8.

De même l'auteur a étudié l'orientation du canal nourricier et la paroi osseuse environnante sur des maxillaires non vitaux, faisant partie d'une collection anatomique, afin de découvrir un principe pour la projection la plus appropriée permettant d'obtenir l'image de "l'anneau blanc" et du "point sombre". La direction du canal nourricier par rapport au plan horizontal a montré une variation d'angle de 24—36 degrés. Le canal a rarement été trouvé dans le plan sagittal médian, mais devié soit à droite, soit à gauche.

Une des onze mâchoires ne montrait ni "anneau" ni "point". Dans ce cas, la base anatomique des images était absente parce qu'aucune condensation osseuse ne fut découverte dans l'os spongieux, même après meulage.

La "poutre" osseuse n'est pas la seule travée sur le plan vestibulo-lingual de la symphyse mandibulaire. C'est une partie intégrante d'un système bien développé de travées. L'auteur a avancé l'hypothèse que ces travées sont des renforcements de la partie frontale de la mâchoire inférieure, venant des tensions fonctionnelles et mécaniques et qu'elles sont la vraie cause de la résistance aux fractures de la région de la symphyse. Les travées les plus importantes de la région antérieure de la mâchoire inférieure semblent être situées dans la plan vestibulo-lingual de la symphyse mandibulaire, et non pas dans le plan frontal, comme on l'a cru auparavant.

ZUSAMMENFASSUNG

RÖNTGENLOGISCHE UND MORPHOLOGISCHE BEFUNDE IM BEREICH DER MANDIBULAREN SYMPHYSIS

Auf intraoralen Röntgenaufnahmen aus dem anterioren Bereich des Unterkiefers sind oft, etwas unterhalb der Wurzelspitzen der unteren Schneidezähne, ein röntgenundurchlässiger Ring und ein zentraler dunkler Punkt zu erkennen (Bild 1). Diese

Erscheinung wird gewöhnlich dadurch erklärt, dass der dunkle Punkt die Abzeichnung eines Gefässkanales darstellt, der in dem Foramen linguale endet, während der weisse Ring der Schatten von Spina mentalis sein soll, die den Muskelansatz des M. geniohyoideus und M. genioglossus vertreten.

Durch Injektion von Kontrastmitteln zeigt der Verfasser, dass die allgemein übliche Deutung des dunklen Punktes tatsächlich richtig ist, wogegen die Erklärung des weissen Ringes nicht haltbar ist.

Röntgenaufnahmen von trocknen Unterkiefern vor (Bild 2 a) und nach (Bild 2 b) dem Wegschleifen der Spina mentalis ergeben das gleiche Bild des weissen Ringes. Die Bilder wurden mittels einer vom Verfasser selbst entwickelten Vorrichtung identisch projiziert.

Weitere Röntgenbilder sind mit lateraler Projektion auf Querschnitte der mandibularen Symphysis aufgenommen und zeigen ein röntgenundurchlässiges Band, das sich zu beiden Seiten des Gefässkanals erstreckt (Bild 4). Das deutet darauf hin, dass der weisse Ring der Schatten eines dichten Knochengefüges ist, das durch die Spongiosa der mandibularen Symphysis läuft und den Gefässkanal als dicke, kompakte Knochenwand umgibt. Durch Wegschleifen der lingualen Corticalwand wurde dies bestätigt. Auf den Bildern 5, 6 und 7 lassen sich Gefässkanal und Knochenbalken somit mitten im spongiösen Knochengefüge erkennen.

Ähnliche Befunde wurden durch dasselbe Verfahren an trocknen Unterkiefern von Kindern zwischen 1½ und 9 Jahren festgestellt. Bild 8 zeigt die Röntgenaufnahme an einem zweijährigen Kind.

Zwecks Erfassung des günstigsten Projektionswinkels zur Erzielung der Abzeichnungen des weissen Ringes und des dunklen Punktes hat der Verfasser an einem Material aus einer anatomischen Sammlung auch die Lage des Gefässkanals und der umgebenden Knochenwand untersucht. Die Richtung des Gefässkanals im Verhältnis zur Horizontalebene schwankte zwischen 24° und 36°. Der Kanal lag nur selten in der mittleren Sagittalebene, sondern weichte meistens nach links oder rechts ab.

Von elf Unterkiefern ergab einer weder Ring noch Punkt auf dem Röntgenbild. In diesem Falle zeigte es sich, dass die anatomische Voraussetzung einer Abzeichnung nicht vorlag, weil kein

Knochenbalken in der Spongiosa vorzufinden war, auch nicht nach sorgfältigem Schleifen.

Dieser Knochenbalken ist nicht das einzige Trajektorium in der bucco-lingualen Ebene der mandibularen Symphysis. Er ist ein integrierender Teil eines gut entwickelten Systems von Trajektorienbündeln. Der Verfasser stellt die Hypothese auf, dass die Trajektorien durch funktionelle und mechanische Beanspruchungen entstandene Verstärkungen des frontalen Unterkiefersegments sind und dessen Wiederstandsfähigkeit gegen Symphysenfrakturen ausmachen. Die wichtigsten Trajektorien im anterioren Bereich des Unterkiefers scheinen in der buccolingualen Ebene der Symphysis und nicht, wie früher angenommen, in deren frontaler Ebene gelegen zu sein.

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