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Abstracts of Original Articles

1. A Long-Term Observation on Partial Anodontia with Marked Improvement Following Oral Rehabilitation

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(Prof. Isamu Nakazawa)

A man aged 22 years had congenital partial anodontia. His dentition was as follows:

\[
\begin{array}{c|c|c|c|c}
7 & 6 & E & 1 & 1 \\
6 & 5 & 3 & 2 & 2 \\
\end{array}
\]

Of these the deciduous teeth had to be removed because of caries and imminent exfoliation. His occlusion indicated prognathic position of the lower teeth, and the lower anterior teeth extended considerably above the gingival line of the upper anteriors. The cephalometric analysis revealed that the mandible was retracted in relation to the cranium, while the maxilla was protracted. In the functional analysis, the freeway space was 10.2 mm, and at the physiological rest position the mandible swung downward and backward to approach the edge-to-edge bite.

Initially, in order to correct the acute prognathic relation two kinds of bite planes were worn by the patient for a year and a half to increase the vertical dimension by 5.0 mm. The permanent restorations were constructed at the established vertical position. The maxillary reconstruction was completed utilizing splinted full gold cast crowns on the molars, splinted bounded porcelain veneer crowns on the incisors and a removable partial denture replacing the absent teeth. The mandibular rehabilitation was accomplished utilizing splinted full gold cast crowns on the molars as well as a fixed partial denture that extended from the right second premolar to the left.

After treatment, the anteroposterior relationship of the maxillary and mandibular teeth has been corrected, and with a concave face the position with respect to the cranium is not necessarily abnormal for the maxillomandibular base bone.

These prostheses have been inspected every six months and there have not been postinsertion difficulties for three years after completion of treatment to the time of this writing.

(Kokubyo Z., 40: 17-24, 1973)

2. Changes in the Enamel Protein during Enamel Formation

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It is generally accepted that immature enamel organic matrix is consisted of multi-component proteins. The author intended to elucidate the mechanism of biosynthesis and alteration in these proteins in relation to the course of enamel maturation.

Cheese-like enamel matrix (formation stage, designated stage I) and chalk-like enamel (maturation stage, stage II) were sampled from rat incisors.

Enamel proteins obtained from each sample were examined by chromatography on a column of Sephadex G-100 equilibrated with 0.5 M acetic acid and by electrophoresis on an SDS-polyacrylamide gel at pH 7.2. Main component of enamel matrix in stage I was found to be a protein of molecular weight of approximately 20,000 which was rich in proline, glutamic acid and histidine, but the proportion of this component decreased and that of another protein fraction having molecular weight of less than 15,000 increased during the maturation from stage I to stage II.

Incorporation of {$^3$H}-proline into developing enamel of 150-200 g rat incisors was also investigated.

Animals were killed at 30 min to 15 days after {$^3$H}-proline injection, and stage I enamel was collected. After decalcification with 0.5 M acetic acid, enamel proteins were an-
alyzed by Sephadex G-100 chromatography and by electrophoresis on an acidic polyacrylamide gel. It was found that enamel protein of molecular weight of about 50,000 was synthesized by ameloblasts and secreted into enamel matrix within 30 min after the injection, and then was degraded into smaller fragment of less than 20,000 from 1 day after the injection.

From these results it was concluded that the enamel protein was degraded during its removal accompanying the enamel maturation.

(Kokubyo Z., 40: 25-34, 1973)

3. Study on the Variation of Formen Mandibulac in the Dentulous and the Molar-Premolar Lacking Jaws

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As the mandible has markedly fine bone substance as compared with that of the maxilla, the conduction anesthesia has often been used jointly in the filed of dentistry. For this purpose, it is important to know the right location of the Formen mandibulac. Paying much attention to the shape of its location in the dentulous and edentulous jaws, the author has conducted detailed study using the mandibles of recent Japanese th Mallory-Azan staining were quite coincident over 36 years of age who are going to loose molars and premolars. Materials used for the study are a total of 184 bones made up of mandibles and dentulous jaws of modern Japanese consisting of 82 males and 40 females and molar-premolar lacking jaws of 52 males and 50 females. Th result was as follows.

1) The Formen mandibulac moved to the bottom of the mandible in the direction of up and down as is in the edentulous jaw, while in the direction of anterior and posterior, moving slightly to the ante-margin of ramus mandibulac.

2) The size of Formen mandibulac showed almost no difference between dentulous and molar-premolar lacking jaws in bilateral sides in both sexes. Namely, the size of the both is 4.12-4.18 mm in males and slightly over 3.9 mm in females.

(Kokubyo Z., 40: 35-40, 1973)

4. A Duplication of the Mandibular Bone Specimen Using Polyester Resin and Its Precision

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Replication of bone specimen has been tried only partly in the field of research and the replicas made were often very labile, inaccurate and in adequate for long-term observation and storage. In our present trial in which was employed polyester resin as a replication material, we have succeeded in producing replicas of the mandibular bone with considerable durability, precision and colour stability similar to the original specimen.

The materials used were TOSHIBA silicone TSE 350-5 RTV for the primary casting and Rigolac 2004 W for the replica. The procedures to prepare the primary cast are shown in Figures 1 and 2.

The precision was checked by comparative
measurement of the original specimen and the replicas as to the length and width of the mandibular bone and the height of the coronoid process of mandible. The average values are given in the Table of these measurements obtained on 10 samples each from two different primary casts. A slight contraction was noted on the tenth replica produced in the series from the same primary cast.

(Kokubyo Z., 40: 61–64, 1973)

5. Collagen fibers in the Two Layers of Carious Dentin

1. Histochemical Study

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In order to compare the collagen fibers in the two layers of carious dentin differentiated by 0.5% basic fuchsin-propylene glycol solution staining, 20 natural decays and 5 cavities with artificially decalcified dentin floors were sectioned and stained with the fuchsin solution and the Mallory-Azan staining solution and compared. The Ca density of the artificially decalcified dentin was also measured by the electron microprobe analyser scanning virtually.

The following results were obtained:

1) Two layers were observed on the section from the artificially decalcified dentin. The first decalcified layer was so soft, with very low Ca content and the second decalcified layer contained Ca of an intermediate magnitude between that of the first decalcified layer and that of the normal dentin.

2) The areas stained by the fuchsin and by the Mallory-Azan staining were quite coincident to each other. On the sections of the artificially decalcified dentin, the first decalcified layer was stained red by the fuchsin was also stained markedly red by the Mallory-Azan staining, indicating that the collagen fibers were broken. The normal dentin was not stained at all by the fuchsin and stained deep blue by the Mallory-Azan staining, indicating the existence of sound collagen fibers. The second decalcified layer was stained pink by the fuchsin and orange by the Mallory-Azan staining, indicating that the collagen fibers were nearly sound.

3) On the sections of natural caries, the two areas were distinctly differentiated by either the fuchsin or the Mallory-Azan staining, and the areas were quite coincided. There was no area stained pink by the fuchsin or orange by the Mallory-Azan staining. The superficial layer of carious dentin (the first decalcified layer) was stained red by the fuchsin and also by the Mallory-Azan staining, showing no sound collagen fibers. The deeper layer (the second decalcified layer) and the sound dentin were not stained at all by the fuchsin, and stained deep blue by the Mallory-Azan staining, showing sound collagen fibers.

4) These two layers could not be differentiated by natural discoloration but differentiated by the fuchsin staining distinctly. The staining was especially distinct in the active lesion with slight natural discoloration though not so distinct in the arrested lesion with heavy natural discoloration.

5) The fuchsin staining was thus found to most effectively differentiate the two layers of carious dentin to be removed and saved.

(Kokubyo Z., 40: 65–74, 1973)

6. Electron Microscopic Studies of the Osteoblasts and Osteocytes Appeared in Experimental Tooth Movement

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The molars of mature rats were moved experimentally by orthodontic elastic for four days, and electron microscopic studies were carried out on osteoblasts, osteocytes, and surface areas of the alveolar bone on the tension side. The following results were obtained:

1. Osteoblasts found on the tension side.
   a) Each osteoblast is isolated in the floating state a short distance from the surface of the alveolar bone.
   b) The floating osteoblasts are classified into three groups according to their position.
   i) The first group consists of young osteo-
blasts some distance from the surface of the alveolar bone. Each osteoblast has a large nucleus surrounded by clear marginal chromatin and a limited amount of cytoplasm.

ii) The second group consists of mature osteoblasts scattered at the surface of the alveolar bone. Each osteoblast has a relatively small nucleus and abundant and well-developed organelles in the cytoplasm. The cell also has granules with high electron density.

iii) The third group consists of mature osteoblasts close to the surface of alveolar bone or partly embedded into the newly formed bone matrix. Each cell has a limited amount of cytoplasm.

c) The most active response to the orthodontic force is exhibited by the second group of cells with the ability of rapid production of abundant acid polysaccharides. The most striking characteristic of the cytoplasm of the second group of osteoblasts is as follows:

i) Abundant rough-surfaced endoplasmic reticulum with markedly dilated cisternae.

ii) In the region of the well-developed Golgi apparatus and in other parts of the cell, many granules are found, which may show secretory activity. They occasionally impinge on the surface membrane of the cell as if they were about to pass through it.

iii) The mitochondria is swollen and the cisternae are markedly developed.

II. Osteocytes found on the tension side.

a) In the relatively young osteocytes, the cytoplasm often contains glycogen granules grouped in a cluster. The mitochondria is swollen with well-developed cisternae, indicating active function.

b) Some fibrillar materials are seen in the osteoid layer surrounding the young osteocytes, having embedded in the bone matrix. Some of the fibrils show the collagen fibrils with a banding structure. Roles of the cells resemble that of osteoblasts, polysaccharides and releasing them into the osteoid layer in response to the orthodontic force.

c) No difference is found between the matured osteocytes in this experiment and those under normal conditions.

III. Surface structure of alveolar bone found on the tension side.

a) In these areas, there are many fine collagen fibrils and banded collagen bundles. New capillaries are seen clearly with pores of the endothelial cells. The surface of new alveolar bone is covered by a bell-shaped structure consisting of small dense spherical-shaped structures.

b) Osteoclasts are rarely seen, but the original function of the cells appears to be almost inactive, indicating that this area represents an area of rapid and intense bone formation.

(Rokubyo Z., 40: 75-102, 1973)

7. Studies on the New Orthodontic Rubber Materials

Part 3: Clinical application of tooth positioner made of castable type polyol cure polyurethane rubber

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In orthodontic treatment, metal and rubber materials are utilized chiefly for orthodontic force to move teeth. Since the advent of the full banded technique, the need to use rubber materials has increased. However, those which have been used to date did not fulfill the requirement for orthodontic treatment.

At this point, the need to develop a better product. After a series of experiments, a castable type polyol-cure polyurethane rubber was found to be the most practical due to its favorable characteristics. This material was clinically used to construct a tooth positioner. Very favorable results were obtained.

The following is an outline on the construction of this new material:

1) By use of a face-bow, a set-up model and cranio-facial position were accurately transferred onto the articulator.

2) Position of the tooth was adjusted by the indicator before and after repositioning.

3) Articulation from the patient’s mouth was transferred onto the articulator and was adjusted according to articulation of the com-
pleted set-up model.

4) A good method of casting and an effective pressure cure technique of the polyurethane rubber was developed. Through this method, the physical characteristic of the material was not lost. Precise and easy construction of the tooth positioner was made possible.

5) The positioner was finished with a surface coating material which preserved the transparency of the product. Thus, direct observation of teeth contact to the material was possible.

More than 40 patients were fitted with this polyurethane rubber positioner with satisfactory results.

Tooth positioner materials used in the past had some unsatisfactory characteristics. However, the positioner made from the polyurethane rubber had no unpleasant taste or odor. It also was resistant to cracks and did not discolor.

(Kokubyo Z., 40: 105-122, 1973)

9. A Study on Objective Gustometry Using Six Polygraphical Responses

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Ten healthy male and ten healthy female subjects ranging from 22 to 27 years of age were examined for polygraphy as objective gustometry. Polygraphy was made up of electroencephalography (abbreviated as EEG), respirography (Resp), electroneystagmography (ENG), galvanic skin reflex (GSR), action electric current of the parotid gland (Parot) and electrocardiography (ECG). As gustatory stimuli the following six solutions were chosen: water, 1/2 M sucrose, 1/2 M acetic acid, 1 M sodium chloride, 1/32 M quinine hydrochloride and whisky. These solutions were given to dorsum of the tongue by drop method. Every polygraph was recorded simultaneously and continuously from 30 sec. before the stimulation to 30 sec. after stimulation and results were checked in both of the following periods:

1. before gustatory stimulation (PRE)

2. after gustatory stimulation (ON-effect)

1) EEG

Alpha-blocking by gustatory stimulation was recognised in ON-effect. And the experimental results were in accordance with the following formula:

\[ y = Ae^{-k(100-x)} \]

where \( y \) = number of subjects for x%\%

\( A, k \) = constants

2) Resp.

In respiration curves three types of changes in response to gustatory stimulation were observed:

1. frequency change of respiration
2. shape change of respiration curves
3. irregularity of respiration rate

3) ENG

Appearance of rapid eye-movements was observed by gustatory stimulation.

4) GSR

Responsive GSR to gustatory stimuli was obtained.

5) Parot

Two types of action current of the parotid gland were:

1. comparatively low-frequency, large amplitude wave and
2. comparatively high-frequency, small amplitude wave.

6) ECG

No wave change was observed, but pulse-rate change was recognised some times.

7) In regard to the frequency of positivity in polygraph, effectiveness of each way was evaluated as follows:

1. Male

EEG (82.9\%)
Parot (72.3\%)
Resp (48.2\%)
GSR (46.5\%)
ENG (54.2\%)

2. Female

EEG (80.4\%)
Parot (67.4\%)
Resp (56.5\%)
ENG (52.8\%)
GSR (41.3\%)

So the author conclude that EEG, Parot and Resp were most useful way in these six objective gustometries.

(Kokubyo Z., 40: 146-161, 1973)
10. Corrosion-Anatomical Studies on A. Maxillaris in the Japanese Fetus

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Observations were made on the branches of a. maxillaris of 76 corrosion-specimens (male 36, female 40) of the Japanese fetus (4 to 9 months).

The results were as follows.
1) The a. alveolaris inferior originated from a. maxillaris in front of the a. meningeal media, in the majority of cases (84.8%-91.2%) regardless of sex and location (right or left sides).
2) The a. temporais profunda posterior originated in front of the a. alveolaris inferior in all cases.
3) The a. buccalis originated the a. temporalis profunda anterior in 8.1% to 7.1% regardless of sex and location (right and left sides).

(Kokubyo Z., 40: 185-188, 1973)

11. Pathologic Change of the Collagen Fiber in Osteolathyrism, with Special Reference to Histopathological and Enzyme Histochemical Change of the Periodontal Membrane in Rats

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Recent biochemical studies revealed that the fundamental change in osteolathyrism due to $\alpha$-aminopropionitrile, aminocetoycitril (AAN) etc., is a defect in maturation of the tropocollagen molecules to the insoluble collagen. However, there has been no histological study on the defective maturation of the newly synthesized tropocollagen to the insoluble collagen.

The present study was performed to clarify morphologically the fundamental change of the collagen fibers of the periodontal membrane in the rat with AAN induced osteolathyrism. AAN, at the dose of 20 mg/100 g body weight was injected subcutaneously to the 140 male young Wistar strain rats (about 80 g at the start of the injection) for 3 to 14 days. The animals were sacrificed at intervals from 3 to 14 days after the start of injection and 2, 3, 4 as well as 6 days after cessation of AAN injection for 14 days. The mandibles including the periodontal membrane of the molars were removed from the experimental and control animals, respectively. For histological observation of the insoluble collagen in the periodontal membrane, the mandibles were fixed in 10% formalin after extraction of the NaCl soluble collagen, then decalcified, embedded in paraffin, sectioned mediodistally and stained with van Gieson mixture and periodic acid methenamine silver staining solution. For histochemical investigation of the periodontal membrane, the mandibles underwent decalcification with EDTA and then histochemical reaction for succinate dehydrogenase, isocitrate dehydrogenase, malate dehydrogenase, glutamate dehydrogenase, NADH dehydrogenase and cytochrome oxidase. In addition, RNA of the fibroblasts, osteoblasts and cementoblasts was stained with methyl green and pyronin.

The following results were obtained:
1) The fundamental pathologic change of the periodontal membrane in the osteolathyrism is neither an impaired metabolism of fibroblasts nor a defect in biosynthesis of the neutral salt soluble collagen, but a defect in maturation of the soluble collagen to the insoluble collagen fiber bundles.
2) So-called lathyric change of the periodontal membrane, appearance of hyaline-like substances in specific arrangement may be due to a reactive formation of abnormal osteoid and cementoid matrices resulting from decrease in the supporting ability of the periodontal fibers and fixation of the roots associated with multiple compression necrosis of the periodontal membrane in the bifurcation area.

(Kokubyo Z., 40: 189-214, 1973)
12. Histopathological Study on the Alteration in Insoluble Collagen of Epiphyseal Cartilage in Lathyrysm

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The present study was carried out to clarify the morphological change in insoluble collagen fiber of the epiphyseal cartilage in osteolathyrysm due to aminoacetonitrile (AAN) and its pathogenesis. One hundred and forty young rats of the Wistar strain were used. AAN was daily injected subcutaneously at doses of 20 mg per 100 g body weight during period from 3 to 14 days. Many animals were sacrificed at intervals from 3 to 14 days. The remaining animals were sacrificed 2, 4 and 6 days after cessation of the injection done for 14 days. Humerus, femur and tibia were removed immediately after decapitation. For histological observation of insoluble collagen some of the long bones were subjected to extraction of soluble collagen with 1 M NaCl or citrate buffer at 4°C for 48 hrs. For histochemical study some of the long bones were decalcified in EDTA 2Na at 4°C for 2 days and sectioned in cryostat. For histological study of disturbed calcification formalin fixed non-decalcified long bones were embedded in paraffin, sectioned and stained according to v. Kossa method. Moreover v. Gieson staining for demonstration of collagen fiber, toluidine blue metachromasia for acid mucopolysaccharide and hematoxylin-eosin stain were made.

The results obtained were summarized as follows: Decrease in number and irregular disappearance of the insoluble collagen fibers occurred in the cartilage matrix of the transitional area extending from the zone of proliferating cartilage cells to that of hypertrophic cartilage cells in the epiphyseal cartilage in osteolathyrysm due to AAN. The decrease and disappearance of the insoluble collagen showed rapid repair soon after cessation of AAN administration. Total collagen fiber in the cartilage matrix mentioned above histologically did not decrease. There was no close correlation between metachromasia in the cartilage matrix and change in insoluble collagen fiber. Histochemical reaction did not demonstrate decrease in enzymatic activity of succinate dehydrogenase, malate dehydrogenase, NADH dehydrogenase, cytochrome oxidase, alkaline and acid phosphatase of the cartilage cells, osteoclasts and osteoblasts. Calcification in the zone of provisional calcification was disturbed since 3 days after the start of AAN injection resulting in thickening of the epiphyseal cartilage plate and disturbance of enchondral ossification. However increase in osteoid tissue in metaphysis and diaphysis as in ricket was not found. Basing on these results it is concluded that AAN does not cause disturbance in enzymatic activity of the cartilage cells and in biosynthesis of the soluble collagen and acid mucopolysaccharide, but induce primarily impairment in formation of insoluble collagen fiber in the epiphyseal cartilage resulting in disintegration of columnar arrangement of the proliferating and maturing cartilage cells. Disturbed calcification in the zone of provisional calcification may be not ascribed to disturbed maturation of the cartilage cells, but secondary disturbance of calcification resulting from increased calcification in the newly formed osteoid in the systemic exostosis.

(Kokubyo Z., 40: 215-241, 1973)

13. The Influence of Ovariectomy, Soft Diet and Nefunction on the Periodontium of the Hamster

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The purpose of this study was to know the influence of ovariectomy, soft diet and loss of occlusal function on the periodontium. The experiment was performed on fifty young adult female Golden hamsters, which were divided into four groups as follows: Group I and II consisted of non-ovariectomized animals and group I was fed on chow and group II was fed on soft diet; Group III and IV were bilaterally ovariectomized and group III was fed on chow and group IV was fed on soft diet. The first and second molars of the left maxilla were extracted from all ani-
mals. They were sacrificed at intervals from 10 days to 6 months after ovariectomy and extraction of the teeth. The histological observations were performed mainly for the first molar regions of the bilateral mandible.

1. In the ovariectomized animals, deepening of the bottom of the gingival sulcus and downgrowth of the attached epithelium at the mesial side of the first molar were more severe than those of non-ovariectomized animals. This may be related to the decreased resistance to bacterial infection due to the ovariectomy. In the area between the first and second molars, marginal changes were slighter than that of the mesial side in the first molar, and they were not so different between the ovariectomized and the non-ovariectomized animals. The difference of findings in the periodontium except marginal area was not evident between the former and the latter.

2. In the animals fed on soft diet, deposits of plaque, deepening of the bottom of the gingival sulcus and downgrowth of the attached epithelium at the mesial side of the first molar were more prominent than those of animals fed on chow. This may be the result from increase of plaque formation by the intake of the soft diet.

3. Comparing the functional and non-functional sides, downgrowth of the attached epithelium at the mesial side of the first molar was more severe in the non-functional side than that of the functional. This may result from decrease of the mechanical cleansing effect by the loss of occlusal function. In the area between the first and second molars, marginal changes were more severe in the functional side than that of the non-functional. This is thought to indicate that the effect of the mechanical stimulation to the marginal periodontium by occlusion, such as food impaction, is stronger than the influence of decrease of the mechanical cleansing effect.

4. The effect of ovariectomy, soft diet and loss of occlusal function was compared mutually and the changes which were caused by combination of them were also observed and the significance of these findings was discussed.

(Kokubyo Z., 40: 242-263, 1973)

18. Collagen Fibers in the Two Layers of Carious Dentin

2. Electron microscopic study

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The organic and inorganic structures in the two layers of carious dentin differentiated by the 0.5% basic fuchsine-propylene glycol solution staining were studied extracted human teeth having natural decays or cavities with artificially decalcified dentin floors. They were prepared in ultra-thin sections. These sections were observed by electron microscopy, a part of them after decalcified and stained by 10% phosphomolybdate acid.

Findings were as follows:

1. The deeper layer of carious dentin adjacent to the normal dentin (second decalcified layer) was not stained by fuchsin. The intertubular dentin in this layer was immediately decalcified but the crystals were found fringily bound to and covering the sound collagen fibers showing distinct cross-bands and inter-bands. The peritubular dentin reduced its thickness from inside but the network of organic matrix and Tomes fibers remained distinctly.

2. The superficial layer of carious dentin (first decalcified layer) was clearly stained red by the fuchsin. The intertubular dentin in this layer was highly decalcified showing granular crystals irregularly scattered. Indistinct cross-band no interbands were observed on the degenerated collagen fibers. The structure of peritubular dentin was completely broken showing very few crystals scattered with neither organic matrix nor Tomes fibers.

3. The layer having heavy natural discoloration between the first and second layers was difficult to be stained by the fuchsin but the structure observed by the electron microscopy was characteristic to the first decalcified layer.

(Kokubyo Z., 40: 306-315, 1973)
19. Surface Roughness of Nickel-Chromium Alloy Casts Made by Using Various Investments

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In order to find a method to get the best casting surface of Ni-Cr alloy, two gypsum-bonded investments and two phosphate-bonded investments were compared using three commercial alloys. The cleaning technique was first investigated and then cleaned casting surfaces were observed with the naked eye, and optical microscope and a magnifying projector and also subjected to a surface analyzer. A scanning electron microscope was used for the detailed observation of casting surfaces and investment mold walls. The relation between the surface roughness and the crystal grains was also observed on the profil sections of the castings by an optical microscope.

The following findings were obtained:

1) The best cleaning technique removing only foreign substances was to boil the castings in a 50% NaOH solution for 90 minutes and then in a pure water and ultrasonically clean in a water. A sand blasting may, however, be preferred in clinical when slight reduction of surface does not affect accuracy.

2) The surfaces of Ticon and Wiron solidifying in adhesive to mold walls produced the higher roughness with the bigger particle size of investments. The Ceragold investment having the biggest particle size was thus unacceptable and the surface roughness was comparably smooth with all other investments gypsum-bonded and phosphate-bonded.

3) Sancolium, which was most liable to be oxidized, solidified partially separating from the mold walls, producing considerable especially rough parts. Ceragold investment, phosphate-bonded and colloidal silica-reinforced, caused least oxidation and the smoothest casting surfaces with Sancolium.

(Kokubyo Z., 49: 316-337, 1973)

20. A Clinical Study on the Use of Sono-Explorer

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Sono-Explorer has been said to be an apparatus to measure the length of root canal by sound. It was studied clinically on this experiment how the value mentioned in the manual of Sono-Explorer would consist. Root Canal Meter having been used widely was employed as control. X-ray were taken on 81 canals to measure the position of the tip of reamers gaining access to the root apex. The following results were obtained.

1) On measuring in 67 teeth, MAKER value did not show a definite value, 80, but it varied from 50 to 80. 78% of teeth was concentrated between 70 to 80 without a definite value.

2) By the manual, when the reamer was inserted into the canal to the value of MAKER, the tip of reamer would have reached the surface of root apex and at 10 lowered value of MAKER reached the narrowest part of apical canal (0.5-1.0 mm short of the apex). The consistency were obtained 29% of teeth at MAKER value and 20% of root canals at 10 lowered value of MAKER.

(Kokubyo Z., 49: 338-343, 1973)

21. Collagenase Activity in Human Gingiva with Periodontal Diseases

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Collagen is the major constituent of periodontal tissue and the destruction of collagen fiber may be concerned in the progress of periodontal diseases. Collagenase detected in human gingiva may play a role in degradation of gingival collagen. For this reason, the relationship between collagenase activities and condition of periodontal diseases has
been investigated.

Eighteen gingival biopsies were obtained from the patients with periodontal diseases by gingivectomy. The periodontal conditions of the portion were estimated by several ways: clinical findings (PMA index, pocket depth, Russell index) X-rays and clinical photographs.

The gingival specimens were immediately placed in antibiotic Eagle MEM and diced into about 1 mm cubes and cultured in roller tubes. After three days, enzyme was extracted from culture fluid and added to 0.2% 3H-prolin labelled rat skin collagen gel. The incubation was carried out for one hour at 37°C. Collagenase activity was assayed by measuring the release of soluble radioactivity from 3H-labelled reconstituted collagen fibrils.

A part of the gingival biopsies was fixed 10% neutral formalin, embedded in paraffin, sectioned at 6 µm and stained with H-E and Giemsa's stain. The numbers of the infiltrated inflammatory cells (mainly plasma cells and lymphocytes) and mast cells were measured.

A positive correlation was found between the mean depth of the periodontal pocket of the portion and collagenase activity (r=0.54, P<0.05). The correlation between mean PMA index and collagenase activities was statistically significant (r=0.68, P<0.05). Mean bone loss and collagenase activities were also correlated (r=0.54, P<0.05). The correlation between P.I. (Russell) and collagenase activities was significant (r=0.72, P<0.01). The mean difference in collagenase activity between the gingivitis group (G) and periodontitis group (P) was not statistically significant at the 0.05 level (G group: P.I.>4, P group: P.I. 4) but the tendency that the mean activity in P group was higher than that in G group was found.

In histological features leukocytes could be found scarcely. No correlation was found between the numbers of infiltrated inflammatory cells and collagenase activities. The number of mast cells and collagenase activities were correlated (r=0.49, P<0.05).

(Kokubyo Z., 40: 344-355, 1973)

23. Clinical Study of Viscosity and Elasticity on Periodontal Tissue (Relationship between the Conditions of Periodontal Disease and Viscoelasticity of Periodontal Tissue)

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The mechanical impedance of human teeth was measured using vector locus method to qualify the viscosity and elasticity of periodontal tissue. The measurements were performed on the normal periodontal tissue and the diseased periodontal tissue. On the diseased periodontal tissue, the effect of the treatment was evaluated by this method. To confirm, the reproducibility of this method, the repeated measurements were made on a mechanical standard and experimental teeth.

1) Viscosity and elasticity of normal tissue.

The central incisors with clinically healthy periodontal tissue from 8 males and 7 females were studied. Mean value of the viscosity was 3.68×10^4 dyn/sec/cm and the range was 3.38-3.98×10^4 dyn/sec/cm mean value of the elasticity was 3.24×10^4 dyn/cm and the range was 2.99-3.50×10^4 dyn/cm.

2) Viscosity and elasticity of diseased tissue.

The central incisors with 41 patients with periodontal diseases were measured. The ranges of viscosity and elasticity were 1.09-3.60×10^4 dyn/sec/cm and 0.50-8.68×10^4 dyn/cm respectively. The viscoelasticity related with the severity of the disease.

Especially, in the case of alveolar bone loss more than 40% and periodontal pocket more than 5 mm, the significant correlation was observed between the viscoelasticity and periodontal condition.


In 2 cases with excessive tooth mobility, viscosity and elasticity were decreased after the treatments with plaque control, scaling and occlusal adjustment and clinical conditions were observed to be better.

In 8 cases, it was observed that viscosity and elasticity were not changed after the treatments of plaque control, scaling and flap operation, but the periodontal conditions were
improved.

From these results, it is suggested that quantitative analysis of viscosity and elasticity of the periodontal tissue using this method could be utilized one of the tools for periodontal diagnosis.

(Kokubyo Z., 40: 367–388, 1973)

24. Hemolysis of Oral Mycoplasmas

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The author is interested in relationship between oral mycoplasmas and periodontal disease. At the present situation where little is known of biological activity of the organisms, the role which is supposed to be played by them in the pathogenesis to periodontal disease is not elucidated yet. On this point of view, the present study was concerned in hemolysis of freshly isolated strains of oral mycoplasm under various conditions. At the same time, it was studied whether there was any definite relationship between hemolysis and egg yolk reactions presumed to be due to lecithinase.

All of 141 strains of M. salivarium and 55 of M. orale 1 hemolyzed red cells from sheep and guinea pigs under various conditions. Accordingly, it was thought that these mycoplasmas had some other hemolysin than peroxide.

131 of 141 M. salivarium strains produced a strong reaction on egg yolk agar. But any of 55 M. orale 1 strains did not decompose egg yolk.

From these results, it was concluded that there was no relation between hemolysis and egg yolk reactions.

Protective effect on red cells was, also, observed in 69 of 75 M. salivarium strains and only one of 55 M. orale 1 strains. In some of M. salivarium strains, the effect was observed on agar plates after incubation of 48 hours at 37°C without storage at 4°C.

As M. salivarium strains were divided into 2 groups in that they decomposed egg yolk or not, representative strains from each group were compared by electrophoresis of cell pro-
teins in polyacrylamide gel and immuno-diffusion tests. As a result, it was demonstrated that there were not any differences between these two groups in electrophoretic patterns of cell proteins, while there were minor differences in antigenic construction.

(Kokubyo Z., 40: 589–403, 1973)

25. Studies of Abrasion Resistance of Various Materials Used for Artificial Teeth and Crowns


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Abrasion against themselves of acrylic resin was measured by impact and sliding abrasion testing machine, which was designed Dr. E. Masuhara and Dr. T. Hirasawa, and abrasion was tested under use of each glycerin suspension of Calcium monohydrated phosphate dihydrate (CaHPO₄·2H₂O), iron sesqui oxide (Fe₂O₃), aluminium oxide (Al₂O₃), and di-chromium trioxide (Cr₂O₃), between two pair acrylic resin specimen.

The results of these test are following.

(1) Increase of temperature, rate of stroke, and roughness of surface produced a little increase of abrasion loss.

(2) Abrasion loss, in the early, less than about 2 mm² by volume was linearly in proportion to numbers of stroke and load.

(3) Abrasion loss increased in proportion to concentration of each abrasive in glycerin suspensions, then that decreased when after through maximum abrasion loss. Concentration of suspensions which produced each maximum abrasion loss were 26.7, 12.0, 12.0, 18.9 per cent by volume for suspensions of CaHPO₄·2H₂O, Fe₂O₃, Al₂O₃, and Cr₂O₃, re-
spective.

(4) Abrasion loss, under 1 kg load, 76 times per minutes rate of stroke, 10,000 times number of stroke and concentration of suspensions produced maximum abrasion loss at 57°C were 1.76 mm² (upper specimen) and 203 mm² (lower specimen), 1.49 and 3.07 mm², 4.47 and 5.86 mm², and 7.20 and 8.38 mm² for suspensions of CaHPO₄·2H₂O, Fe₂O₃, Al₂O₃, and Cr₂O₃, respectively.

(5) Viscosity of suspension produced concentration of abrasive.

(6) Abrasion loss was influenced of hardness and form of abrasive and increased proportional to these hardness. Abrasion loss increased in order of suspensions of CaHPO₄·2H₂O, Fe₂O₃, Al₂O₃, and Cr₂O₃ in compare with similar concentration.

(Kokubyo Z., 40: 404–419, 1973)

26. Removal of Infected Dentin Using Puchsin Staining as a Guide

1. Experiment with Extracted Carious Teeth

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In order to evaluate the 0.5% basic fuchsin-propylene glycol solution staining as a guide for removal of infected dentin, the solution was applied to the cavity of freshly extracted carious teeth and the stained area was removed. The depth of such an excavation and the bacterial invasion observed with Gram stained sections were compared.

The following results were obtained:

1. No bacterial invasion was left in the cavity floor dentin after all fuchsin-stainable area and distinct natural discoloration were removed.

2. The depth of excavation guided by the fuchsin staining was always deeper than the bacterial invasion front. The distance between the removal front and the bacterial front was greater in the acute caries with obscure discoloration and smaller in the chronic caries with distinct discoloration.

(Kokubyo Z., 40: 420–427, 1973)

28. Cellular Responses of Condylar Cartilage Induced by Mandibular Displacement in Rats

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Immature and mature female Wistar strain rats were utilized to study the effects of a distal occlusion on the condylar cartilage of the mandible. The experimental period was ten days. Cellular proliferation, matrix formation and matrix resorption of the condylar cartilage were revealed by radioautography (⁴H-thymidine and ³H-proline) and HE stain quantitatively. The following results were obtained:

1. The number of chondrocytes decreased slightly in both young and mature rats.

2. In the young animals, the thickness of each zone of condylar cartilage decreased significantly. This decrease was especially noticeable in the hypertrophic zone, but very little in the transitional zone. Adult animals in comparison with the young ones showed little changes in the thickness of each zone.

3. One hour after injecting ²H-thymidine, most of the labeled cells were found primarily in the embryonic zone.

4. Labelling index of chondroblasts was greatly decreased at the central and posterior region of the condyle in the young animals. In the mature rats, however, a slight decrease was observed only at the central region.

5. Most numerous number of grains indicating the uptake of ³H-proline was counted in the transitional zone one hour after injection of ³H-proline. This suggests active collagen formation of cartilage matrix in this zone.

6. Extrinsic stimulus influenced not only the mitosis of chondroblasts, but matrix formation of cartilage. Among the young rats, the grain count indicating the uptake of ³H-proline to the condylar cartilage was markedly decreased in the entire region. This fact suggests the reduction of collagenous formation. In the adult group, however, the number of grains decreased only in the posterior region.
7. The number of chondroclasts observed in the erosion zone had decreased in both the young and mature rats.

8. Immature cartilage contained many hypertrophic cells, but the mature cartilage contained only a few. This fact means that the hypertrophic zone has an important role in the condylar growth.

9. In the adult animals, comparing with the young ones, cellular activity of proliferation, matrix formation, and matrix resorption were reduced strikingly. Therefore, the adult animals responded only a little to the extrinsic stimulus.

(Kokubyo Z., 40: 457-475, 1975)

29. A Roentgencephalometric Study of Dento-craniofacial Morphology of Repaired Complete Unilateral Cleft Lip and Palate Individuals after Adolescent Growth Spurt

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The purpose of this study was to determine the characteristics of the dento-craniofacial morphology of the Japanese with cleft lip and palate after the adolescent growth spurt. The sample consisted of 35 males and 31 females of over 16 years old with the complete unilateral cleftings of both the lip and palate was chosen. Additional criteria were: all were Japanese with no known additional congenital anomalies, and had a successful cheiloplasty and palatoplasty followed by no orthodontic therapy.

Cephalometric radiographs in the lateral view taken from all those subjects were used for 71 direct measurements, linear and angular, and for the construction of average facial diagrams.

The findings in this study pertaining to the cleft palate sample, as compared with the data for non-cleft subjects and between the two sexes, seem to warrant the following conclusions;

1. There was no significant difference in the length and angle of the cranial base between the cleft palate and non-cleft palate values in both the male and female, however there was a tendency to shortening and flattening of the cranial base.

2. An antero-posterior deficiency in the middle one-third of the face was observed both in the male and female.

3. A comparison of the components contributing to the mandible showed the following significant differences:

a) A shorter ramus height and a larger gonial angle were observed in both the male and female.

b) The total mandibular length ( pogonion-articulare) and the body of the mandible ( pogonion-gonion) were deficient in the male.

c) The mandibular plane was steeper accompanied with the posterior positioning of the chin in both the male and female.

4. An antero-posterior jaw discrepancy (<ANB) was considerably large in minus values in both the male and female. The tendency was more definite in the male.

5. The maxillary incisal height and the mandibular molar height were significantly smaller in both the male and female, however the mandibular incisal height was observed significantly larger only in the female.

6. Both the maxillary and mandibular incisors were extremely tipped lingually.

7. As compared with the data before the adolescent growth spurt, the growth of the craniofacial complex of an individual with the complete unilateral cleft lip and palate seemed to be restrained mainly antero-posteriorly as an increase in age.

(Kokubyo Z., 40: 476-497, 1973)