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PERIODONTAL CONDITIONS IN ADULT PATIENTS WITH MONGOLISM (DOWN'S SYNDROME)

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Earlier works on oral manifestations of the pathological picture in patients with mongolism demonstrate marked involvement of the periodontal tissues.

Cohen et al. (1961) found a prevalence of severe periodontal disturbances of 96 % in a group of 100 mongolian patients of both sexes in the 1- 30 year age-group. In an investigation of 151 children with mongolism *Dow* (1951) found that periodontal changes had already appeared at 3 years of age. *Øster* (1953) emphasized that "parodontosis" was a common condition in his group of 526 mongols. *Julku et al.* (1962) found 58 cases of periodontal disease in a clinical examination of 68 patients with Down's syndrome.

The purpose of the present investigation was to obtain more detailed information on the condition of the supporting dental tissues in mongolian patients.

MATERIAL

The group consisted of 71 male patients with mongolism in the 19—25 year age-group, 14 of the patients living at home while 57 were in institutions. A further account of the method of selecting the group will be published later. For the statistical analysis 11 patients were omitted because of absence of teeth; with 1

patient examination proved impossible. The group investigated, therefore, comprised 59 patients. Nine of the twelve patients were living in their homes and were excluded because of extensive carious destruction of teeth.

METHOD

The method used for recording the prevalence of disease in the periodontium was that proposed by *Ramfjord* (1959). According to Ramfjord an expression of the condition of the individual periodontium can be obtained by thoroughly examining the condition of the supporting tissues of six teeth; viz. 6+, +1, +4, 4—, 1—, and —6*). The following circumstances were recorded: gingival findings, amount and type of calculus, degree of occlusal and incisal attrition, mobility, contact conditions, amount of plaque and occurrence of gingival pockets. The examination was carried out following Ramfjord's method very strictly, using his exact criteria for grading, though in this work no index for contact conditions was included.

RESULTS

For the experimental group as a whole a mean index was calculated for periodontal score, mobility, attrition, plaque, calculus and gingivitis. Table I provides the following information about the experimental group: On an average pockets were found extending from 0 to 3 mm below the cemento-enamel junction, slightly increased mobility, attrition which does not penetrate the enamel, large amounts of plaque, and moderate amounts of calculus. Ramfjord's index gives no special information about the gingival conditions when the tooth has pockets below the cemento-enamel junction in any one place. As the latter is the case with the great majority of the teeth in this investigation, a mean index for the gingival findings was calculated for the group. It appears that, on the average, a mild to moderate gingivitis was present affecting the gingiva all around the teeth.

Fig. 1 shows the distribution of the individual indices in the experimental group. One third of the patients exhibited pockets

*) According to the Haderup dental stenography + indicates the upper jaw, — the lower jaw. If the sign is placed to the right of the figure, the right tooth is indicated and vice versa.

Table 1. Mean indices for the group as a whole.

Symptom	N	MEAN INDEX SCORE M
Periodontal score	59	3.57 ± 0.132*
Calculus	59	1.25 ± 0.095
Gingival findings	59	2.13 ± 0.055
Plaque	59	2.91 ± 0.029
Mobility	59	0.31 ± 0.049
Attrition	59	0.84 ± 0.050

* Standard error

extending from 0 to 3 mm below the cemento-enamel junction, while the remainder were apparently evenly distributed on both sides of the mean index. One tenth of the patients had pockets more than 6 mm below the cemento-enamel junction, and 17 had an average pocket depth of less than 3 mm. In fact, only 3 patients had no measurable pockets. As far as the other symptoms are concerned, the distribution around the mean index appears to be uneven.

To obtain an idea of the condition of the periodontal tissues for the different groups of teeth recorded, the mean index for

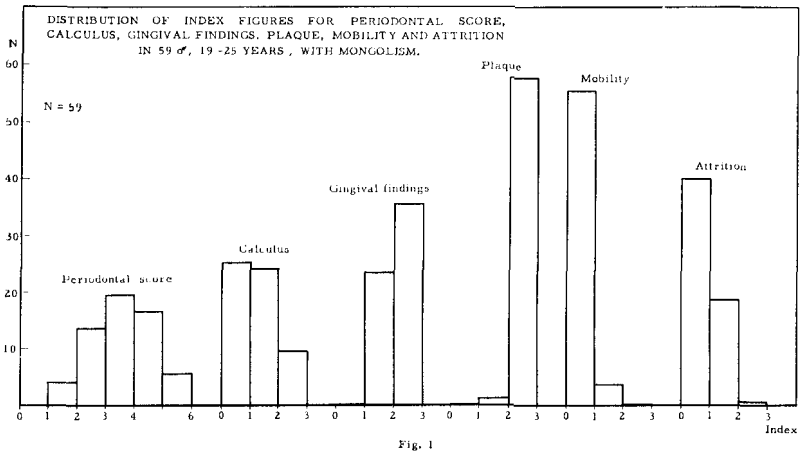


Fig. 1. Distribution of index figures.

Table II. Mean indices for the individual groups of teeth (periodontal score, calculus, gingival findings and plaque).

	MEAN INDEX SCORE							
	Periodont score		Calculus		Gingival findings		Plaque	
Tooth	N[1])	M	N[1])	M	N[1])	M	N[1])	M
6+	55	4.31 ± 0.153*	55	1.56 ± 0.118*	55	2.15 ± 0.083*	55	2.93 ± 0.035*
—6	55	3.60 ± 0.161	55	1.27 ± 0.117	55	2.07 ± 0.073	55	2.93 ± 0,043
+1	56	3.38 ± 0.179	56	0.95 ± 0.118	56	2.14 ± 0.065	56	2.95 ± 0.040
1—	51	4.14 ± 0.203	51	1.53 ± 0.126	51	2.31 ± 0.086	51	2.96 ± 0.027
+4	55	3.13 ± 0.176	55	1.16 ± 0.125	55	2.07 ± 0.073	55	2.80 ± 0.066
4—	59	2.93 ± 0.172	59	1.08 ± 0.124	59	2.03 ± 0.076	59	2.92 ± 0.044

[1]) Variations in N are due to the fact that some scores on certain teeth with periapical disease or severe carious destruction are uncertain.

* Standard error.

each of the conditions tested was calculated for each single group of teeth.

Table II shows that the indices for periodontal score were highest for 6+ and 1—, the pockets on these teeth extending from 3 to 6 mm below the cemento-enamel junction. Following these in descending order are —6, +1, +4 and 4 , all of which on an average showed no measurable pockets. It further appears that all the teeth exhibited a large amount of plaque and that the amount of plaque was approximately the same for the various groups of teeth. The amount of calculus, on the other hand, was greatest for 6+ and 1- , with —6, +4, 4— and +1 following in descending order. Mean indices for periodontal score and calculus were similarly distributed over the individual groups of teeth, except that the calculus index for +1 was the lowest, while the index for periodontal score was higher for +1 than for +4 and 4—. The index for gingival findings was, by and large, the same for all groups of teeth, except that it was slightly higher for 1— than for the remainder of the teeth.

Table III shows that the degree of mobility and the attrition were not great for any of the groups of teeth. The degree of mobility was highest for 1— and low for 6+ and —6.

Table III. Mean indices for the individual groups of teeth (mobility and attrition).

	MEAN INDEX SCORE			
	Mobility		Attrition	
Tooth	N [1])	M	N [1])	M
6+	55	0.25 ± 0.079*	55	1.04 ± 0.052*
−6	54	0.09 ± 0 040	54	1.06 ± 0.077
+1	56	0.46 ± 0.105	56	0.93 ± 0.091
1−	49	0.98 ± 0.135	51	0.67 ± 0.082
+4	55	0.11 ± 0 042	55	0.82 ± 0.069
4−	59	0.07 ± 0.041	59	0.61 ± 0.064

[1]) Variations in N are due to the fact that some scores on certain teeth with periapical disease or severe carious destruction are uncertain.

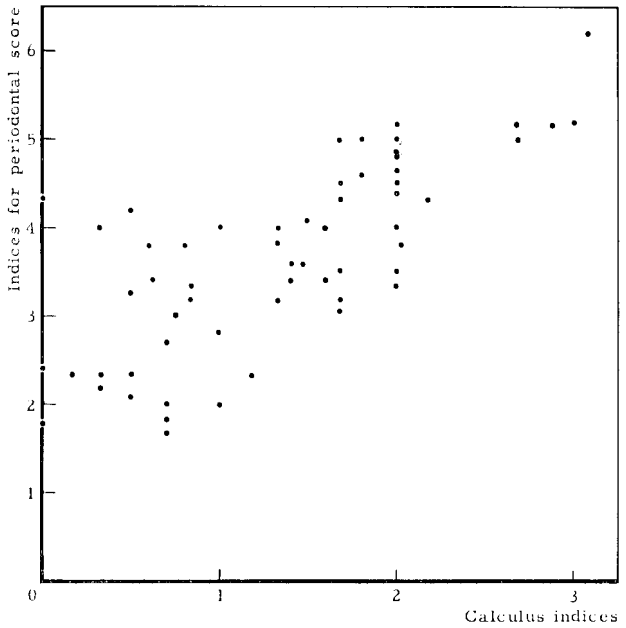
* Standard error.

For purposes of clarity, the six groups of teeth were arranged according to decreasing mean indices for periodontal score, calculus, gingival findings and plaque (Table IV). To the extent considered desirable, significance tests on the mean indices for the individual groups of teeth were performed. As dependent vari-

Table IV. The groups of teeth arranged according to decreasing mean indices for periodontal score, calculus, gingival findings and plaque.

Periodontal score	6+	1−	−6	+1	+4	4−
	4.31	4.14	3.60	3.38	3.13	2.93
Calculus	6+	1−	−6	+4	4−	+1
	1.56	1.53	1.27	1.16	1.08	0.95
Gingival findings	1−	6+	+1	−6	+4	4−
	2.31	2.15	2.14	2.07	2.07	2.03
Plaque	1−	+1	6+	−6	4−	+4
	2.96	2.95	2.93	2.93	2.92	2.80

ables occurred, and as in general the distribution was not normal, the χ^2-test was used with significance at the 1 % level (**).



Mean indices for calculus and periodontal score in 59 ♂, 19-25 years, with mongolism.

Fig. 2

Fig. 2. Graphic correlation between periodontal score and calculus.

For periodontal score and calculus there was no difference between 6+ and 1—, while for the same two conditions these teeth deviated significantly from the remaining four groups of teeth. Between —6, +1, +4 and 4— no significant difference was found as to calculus, and as to periodontal score a significant difference

Table V. Numerical correlation between periodontal score and calculus.

		Index for periodontal score		
		≤4	>4	
Index for calculus	>1.99	3 (7.5%)	11 (57.9%)	14
	1—1.99	17 (42.5%)	6 (31.6%)	23
	<0.99	20 (50%)	2 (10.5%)	22
		40 (100%)	19 (100%)	59

$\chi^2_2 = 19.6^{***}$

Table VI. Numerical correlation between calculus and gingival findings.

Index for calculus	Index for gingival findings ≦2	Index for gingival findings >2	
>1.99	2 (16.1%)	12 (46.2%)	14
1—1.99	11 (33.3%)	12 (46.2%)	23
<0.99	20 (60.6%)	2 (7.6%)	22
	33 (100%)	26 (100%)	59

$\chi^2_2 = 21.4^{***}$

Table VII. Numerical correlation between the amount of plaque and gingival findings.

Index for gingival findings	Index for plaque <2.85	Index for plaque ≧2.85	
>2	2 (16.7%)	23 (48.9%)	25
≦2	10 (83.3%)	24 (51.1%)	34
	12 (100%)	47 (100%)	59

$\chi^2_1 = 4.0^{*}$

Table VIII. Numerical correlation between the amount of plaque and periodontal score.

Index for plaque	Index for periodontal score <3	3—4	>4	
≧2.85	13 (76.5%)	19 (82.6%)	15 (78.9%)	47
<2.85	4 (23.5%)	4 (17.4%)	4 (21.1%)	12
	17 (100%)	23 (100%)	19 (100%)	59

$\chi^2_2 = 0.2$

only existed between —6 and 4—. The only groups of teeth showing significant difference in the gingival findings were 1— and 4—.

Correlation analyses were made for certain of the factors which characterize the condition of the periodontal tissues. The com-

Table IX. Nummerical correlation between the amount of plaque and calculus.

		Index for calculus			
		<0.99	1 – 1.99	>1.99	
Index for plaque	≥2.85	18 (81.8%)	18 (78.3%)	11 (78.6%)	47
	<2.85	4 (18.2%)	5 (21.7%)	3 (21.4%)	12
		22 (100%)	23 (100%)	14 (100%)	59

$\chi^2_2 = 0.1$

parison was undertaken for the group as a whole. Fig. 2 shows the correlation between periodontal score and calculus. Table V shows the numerical correlation, $\chi^2 = 19.6$, i.e. $P < 0.001$. This value is clearly significant; there was therefore, a highly significant correlation between periodontal score and calculus in these patients. There was also a highly significant correlation between calculus and gingival conditions, $\chi^2 = 21.4$ (Table VI). No correlation was found between the amount of plaque and gingival conditions, between the amount of plaque and periodontal score or between the amount of plaque and calculus (Tables VII, VIII and IX).

DISCUSSION

Ramfjord's index was chosen as the basis for scoring in this investigation in preference to *Russell's* (1956) index and *Schour & Massler's* (1947) P.M.A.-index, the reason being that Ramfjord's index, which includes the pocket measurements, gives a better idea of periodontal disease when as advanced as is commonly found in patients with Down's syndrome.

So far as is known, there is no material available to serve as a basis for comparison with this investigation. *Marshall-Day & Russell* (1955) write that pocket formation is not found in males before 19 years of age, and that loosening of the teeth is seldom observed before the age of 27. *Greene* (1960) found distinct pockets in only 3 out of 577 males in the 11—30 year age-group. Considering the high indices for periodontal disease in the present, rather young group of mongols there is no doubt that the tenden-

cy to destruction of the dental supporting tissues is strikingly great for patients in this category. Systemic causes for this have been discussed by *Dow* (1951) and by *Cohen et al.* (1961). *Dow* (1951) is of the opinion that the cause is the mongol's poor blood circulation, particularly in that the peripheral arterioles and capillaries are inadequate. *Cohen et al.* (1961) consider that since neurodystrophic processes in general alter pathologic processes it may be thought that pathologic processes in the brain in mongol patients reduce, one way or another, the resistance of the periodontal tissues to local irritation. Regarding the relationship of special local factors to periodontal pathologic processes, *Geiger* (1962) draws the following conclusions in a paper on occlusal studies in 188 cases of periodontal disease: Cross bite is not responsible for the general severity of the disease, although, on the other hand, cross bite is a significant etiologic factor for teeth directly involved in this type of malocclusion. It should be mentioned that in the present material with its high indices for periodontal disease the prevalence of cross bite is 100 %. Since Ramfjord's index does not include criteria for occlusal anomalies, the possible influence of occlusal anomalies on the index for periodontal disease has not been taken into account in this work.

The index for tooth mobility is surprisingly low for this group of patients, in keeping with the fact that the symptom of mobility can only be used to a limited extent as an indicator of periodontal disease, *Ramfjord* (1959). The mobility index is much higher for 1— than for 6+, even though the indices for periodontal score for these two teeth are nearly the same. Considerable difference in the size of the root surface areas may explain this condition.

Ramfjord (1959) emphasizes that examinations of attrition must be included in an investigation of the prevalence of periodontal disease as a possible indicator of functional and non-functional activity. Attrition is not particularly marked in any group of teeth in the present material. Only one patient exhibits pronounced grinding of his teeth, and a correspondingly high attrition index between 2 and 3 (Fig. 1). In many cases atypical attrition facets are found, even in places where contact between the teeth involved is no longer possible. The value of recording lack of contact according to Ramfjord's criteria is maybe question-

able especially in a material like the present one where drifting and tilting is very pronounced because of loss, retention and aplasia of teeth.

The amount of plaque is high for all the dentitions. This is not surprising in this group, where toothbrushing is neglected and inadequate, where dental treatment is very difficult to carry out, and where masticatory activity is distinctly reduced.

The amount of calculus is fairly small, and the mean index for gingival findings is actually less than expected; the latter may be due to the scoring. The gingival findings in this group are characterized by increase in volume caused by the permanently open mouth with the resulting drying of the gingiva. The tendency to bleeding and ulceration is less marked. On the basis of the criteria laid down, this fact may possibly have given a systematically too low scoring of the gingival index. Since the disease is comparatively far advanced in this group of patients, one might perhaps expect the gingival disease to be of an ostensibly more chronic character. The criteria for the most severe finding scored for the gingiva according to Ramfjord, characterize a different form of gingivitis. *King* (1945) warns against attaching too much importance to the symptom of bleeding tendency in the final evaluation of the gingival findings.

As is well known, statements on the prevalence of gingivitis vary considerably, in part because the criteria upon which the gingival evaluation is based differ. The prevalence of gingivitis in young males in an age group corresponding to the present one was given by *Westin & Wold* (1943) at 69 %, by *Rognerød* (1949) at 46 %, by *P. O. Pedersen* (1949) at 80 %, by *Pindborg* (1951) at 80.2 % for draftees and at 72.9 % for sailors on active service, and by *Forsberg* (1954) at 90.3 %. In the present group the prevalence of gingivitis was 100 %.

Miller & Seidler (1942), in their material of 500 patients of both sexes with a mean age of 39.7 years, divide the teeth into three groups according to their predisposition to progressive periodontosis. Group 1, with the least predisposition, includes +4 and 4- , in group 2 —6 is found, with +1, 1- and 6+ in group 3. Since in the present material no significant difference is found in the mean indices for periodontal score between —6

and +1, the results of this present investigation is in accordance with those of Miller & Seidler.

Marshall-Day (1955) emphasizes that the alveolar bone is more resistant in the premolar than in the molar regions. This is also born out in the present investigation.

As in this group no significant correlation between the indices for plaque and calculus exist, there is nothing to indicate that a plaque necessarily leads to hard deposits. Observations agreeing with this are found in a study by *Greene* (1960), in which he compares the results of periodontal examinations of the populations in the city of Atlanta and in India. Greene finds larger amounts of plaque in patients in Atlanta than in those in India and, conversely, more calculus in India.

In the present work significant correlation is found between the indices for periodontal score and calculus, which agrees closely with Greene's findings in India. Greene found, furthermore, significant correlation between the occurrence of plaque and periodontal score. In the present material no significant correlation is discovered between the amount of plaque, on the one hand, and periodontal score, gingival condition and calculus, on the other. When one considers the condition of this particular group of patients, it is not surprising. Their plaque index is very high and very constant, whereas the other indices may be high but exhibit great variation from one patient to another. Moreover, the results put forward here may perhaps justify a consideration of whether Ramfjord's index for recording the amount of plaque is adequate for material such as this.

CONCLUSIONS

(1). The predisposition to periodontal disease is very marked for a group of 19 to 25 year-old male patients with Down's syndrome.

(2). There is significant correlation between the indices for calculus and gingival findings and between those for calculus and periodontal score.

(3). There is no significant correlation between the indices for the amount of plaque, on the one hand, and for calculus, gingival findings and periodontal score, on the other.

(4). Upper molars and lower incisors are significantly more involved than all other groups of teeth.

(5). There is no significant difference between the indices for periodontal score for upper molars and lower incisors.

SUMMARY

The prevalence of periodontal disease has been investigated in a group of patients with Down's syndrome (mongolism). The group examined consisted of 71 male patients from 19 to 25 years of age. Twelve of these were excluded because of destruction of their teeth.

The method of the investigation and the scoring system used were those proposed by *Ramfjord* (1959).

All the patients suffered from periodontal disease, and only three of them displayed no pockets below the cemento-enamel junction. The prevalence of gingivitis was 100 %.

The upper first molar and the lower central incisor were significantly most involved. There was no statistically significant difference between the findings for these two teeth. As to calculus, the remainder of the teeth showed no statistically significant differences, but as to periodontal score, a significant difference was found between the lower first molar and the lower first premolar.

Highly significant correlation existed between the periodontal scores and the scores for calculus, and between those for calculus and gingival findings. But no significant correlation existed between occurrence of plaque, on the one hand, and gingival findings, periodontal score and calculus, on the other.

RÉSUMÉ

AFFECTIONS DU PARODONTE CHEZ DES PATIENTS ADULTES ATTEINTS DE MONGOLISME (SYNDROME DE DOWN).

Le fréquence des affections du parodonte a été étudiée chez un groupe de patients présentant le syndrome de Down (mongolisme). Le groupe considéré comprenait 71 patients du sexe masculin âgés de 19 à 25 ans, dont 12 devaient être exclus pour cause d'absence de dents.

La méthode utilisée pour l'examen et le système utilisé pour l'enregistrement ont été ceux proposés par *Ramfjord* 1959.

Tous les patients étaient affligés d'affections du parodonte, et trois d'entre eux seulement étaient exempts de culs-de-sac dépassant la jonction émail-cément. La fréquence des gingivites était de 100 %.

L'atteinte plus particulière de la première molaire supérieure et de l'incisive centrale inférieure s'est manifestée d'une manière significative. Il n'y avait pas de différence significative du point de vue statistique entre ces deux dents. En ce qui concerne les dépôts de tartre, les autres dents n'ont pas présenté de différences significatives du point de vue statistique, mais, pour l'enregistrement concernant le parodonte, une différence significative a été trouvée entre la première molaire inférieure et la première prémolaire inférieure.

Une corrélation hautement significative existait entre les enregistrements concernant le parodonte et ceux concernant le tartre, et entre les enregistrements concernant le tartre et les symptômes gingivaux. Mais il n'existait pas de corrélation significative entre les plaques d'une part et les symptômes gingivaux, les enregistrements concernant le parodonte et ceux concernant le tartre d'autre part.

ZUSAMMENFASSUNG

PARODONTALVERHÄLTNISSE BEI ERWACHSENEN PATIENTEN MIT MONGOLISMUS (DOWN'SCHEM SYNDROM)

Die Häufigkeit von Parodontalkrankheiten wurde bei einer Gruppe von Patienten mit Down'schem Syndrom (Mongolismus) untersucht. Die untersuchte Gruppe bestand aus 71 männlichen Patienten im Alter von 19 bis 25 Jahren. Zwölf hiervon mussten wegen Mangel an Zähnen ausscheiden.

Die angewandten Untersuchungs- und Registrierungsmethoden waren die im Jahre 1959 von Ramfjord vorgeschlagenen.

Alle Patienten litten an Parodontalkrankheiten, und nur drei von ihnen hatten Zahnfleischtaschen, die sich nicht apikal von der Schmelzzementgrenze erstreckten. Die Häufigkeit von Gingivitis betrug 100 %.

Die Gegend des ersten Molares im Oberkiefer und des zentralen Schneidezahnes im Unterkiefer war signifikant am stärksten angegriffen. Es gab keinen statistisch sichergestellten Unterschied zwischen den Verhältnissen der Umgebungen dieser beiden Zähne. Hinsichtlich Zahnstein wiesen die restlichen Zähne keinen statistisch sichergestellten Unterschied auf, aber in bezug auf den Schwerheitsgrad der parodontalen Krankheit wurde ein statistisch sicherer Unterschied zwischen dem ersten Molar des Unterkiefers und dem ersten Prämolar des Unterkiefers festgestellt.

Zwischen dem Schwerheitsgrad der Parodontalkrankheit und dem Zahnsteinvorkommen sowie zwischen dem Schwerheitsgrad des Zahnsteinvorkommens und den Zahnfleischbefunden wurde eine hochsignifikante Korrelation festgestellt, während zwischen den Belegen auf der einen Seite und dem Schwerheitsgrad der Zahnfleischbefunden, der Parodontalkrankheiten und dem Zahnsteinvorkommen auf der anderen Seite keine signifikante Korrelation festgestellt wurde.

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