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THE REDUCTION IN FACE HEIGHT OF EDENTULOUS
AND PARTIALLY EDENTULOUS SUBJECTS
DURING LONG-TERM DENTURE WEAR
A LONGITUDINAL ROENTGENOGRAPHIC
CEPHALOMETRIC STUDY

by

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INTRODUCTION

The reduction in face height of denture wearers has previously been analyzed by the author in roentgenographic cephalometric studies (*Tallgren, 1957*). In a cross-sectional investigation covering 45 women who had worn complete dentures regularly for 10 years, marked differences in face height were demonstrable on comparison with a control series with well preserved natural dentitions. The results were indicative of a drastic reduction of the morphologic face height, caused by resorptive changes in the osseous denture-bearing structures, and a consequent, although lesser, reduction of the rest face height, resulting in an increase of the interocclusal clearance.

The initial alterations in face height were investigated longitudinally in subjects wearing complete or partial dentures. In this study the adaptive changes of the rest face height to the increase in occlusal vertical dimension caused by the prosthetic treatment and, subsequently, to the reduction during the first year of denture wear were clearly demonstrated, as well as variations in the rest position in response to the state with and without the dentures in the mouth.

The findings on initial changes in face height due to prosthetic

treatment reported by *Atwood* (1956), and later studies along the same line (*Duncan & Williams*, 1960; *Swerdlow*, 1964 and *Carlsson & Ericson*, 1965) show close agreement with the present author's basic findings and have contributed to a revision of earlier concepts of the stability of the mandibular rest position, advanced by *Thompson* (1943, 1946). However, the reduction in face height in response to protracted use of dentures does not seem to have been clarified.

The purpose of the present investigation is to analyze the continuing changes in morphologic and rest face height due to long-term use of dentures and, furthermore, to make a comparison between the changes in entirely edentulous denture wearers and those observable in partially edentulous subjects during the entire period of denture wear. This was accomplished by re-examining the test subjects from the above-mentioned initial study after 3 and 7 years of denture wear.

MATERIAL

Of the series from the initial study (*Tallgren*, 1957), which comprised 32 subjects at the examination after one year, 31 attended one or both of the checks performed 3 and 7 years, respectively, after insertion of the dentures. All the patients were in good health. The distribution of the test subjects according to age, sex and method of treatment is shown in Table I.

In accordance with the previous criteria, those subjects who during the course of investigation had their dentures remade or

Table I
Distribution of test subjects according to age, sex and method of treatment.

Age in years at the initial stage of study	Complete denture wearers			Partial denture wearers		
	Female	Male	Total	Female	Male	Total
	n	n	n	n	n	n
20—29	1		1	1		1
30—39	1		1	4		4
40—49	5	1	6	6		6
50—59	2	2	4	3	2	5
60—69	3		3			
Total	12	3	15	14	2	16
Mean age	47.6	50.3	48.1	41.5	55.5	43.3

Table II

Distribution of the test subjects over the total period of observation. According to attendance at the follow-up examinations the complete denture wearers are denoted C I, C II and C III and the partial denture wearers P I, P II and P III.

Stage of observation		Initial checks up to 1 year after treatment	3 yrs. after treatment	7 yrs. after treatment
Test subjects		n	n	n
Complete denture wearers	C I	4	4	—
	C II	7	7	7
	C III	4	—	4
	Total	15	11	11
Partial denture wearers	P I	4	4	—
	P II	7	7	7
	P III	5	—	5
	Total	16	11	12
Total number of subjects		31	22	23

relined, were not included. In regard to the number and distribution of the test subjects in the follow-up examinations it should be noted: The observations after 3 years' denture wear were made on a total of 22 subjects. One subject was excluded owing to the fact that the dentures had been remade in the meantime, and in 9 cases the 3-year check could not be performed for various reasons. However, these 9 subjects attended the check after 7 years. The final observations after 7 years' denture wear comprised a total of 23 subjects, since the group on which the 3-year check was performed had in the meantime been reduced by 8 subject: 2 had died, in 3 cases the dentures had been remade and 3 subjects had moved away from the area and could not be traced. Of the total number of test subjects, 14 attended all stages of observation. The distribution of the test subjects over the different stages of the observation period appears in Table II.

According to previous classification, the complete denture wearers comprised subjects with complete upper and lower dentures, whereas the partial denture wearers were provided with a

complete upper denture and a mucosa-borne, acrylic partial lower denture or, as in one case the reverse combination. All the partial dentures were extension-type dentures. Kennedy class I, three of them representing the subdivision Modification 1. Furthermore, it may be mentioned that all dentures, both complete and partial, were furnished with porcelain teeth.

The subjects with abraded natural dentition, referred to in the initial study, are as previously specially marked in the diagrams.

METHODS

In the present follow-up investigation, the roentgenographic technique and the method of measurement used in analyzing the cephalometric roentgenograms were the same as have been described in detail in the initial study (*Tallgren, 1957*), in which the author also reported her systematic studies concerning the errors of the methods. For details regarding measuring points and definitions, the reader is referred to the above-mentioned publication.

The roentgenographic procedure was performed in norma lateralis by the aid of Björk's cephalostat as previously: Two rest position exposures were made with the dentures in the mouth and one without, and finally one exposure in the occlusal position with dentures i.e. intercuspation. The patient remained sitting in the cephalostat until all the exposures had been made. The rest position of the mandible was determined by the method of relaxation previously described by the author (*Tallgren, 1957*).

In accordance with previous definitions, the face height (*n-gn*) in occlusion with dentures is defined as the morphologic face height. The rest face height with and without dentures denotes the same dimension in the rest position, respectively. The inter-occlusal clearance with and without dentures constitutes the difference between the rest face heights, respectively, and the morphologic face height.

The methods employed in the statistical analysis of the data have been described in detail in the above-mentioned study, in which also a description of the orthogonal diagrams is given. For further information the reader is referred to *Hald (1960)*. The statistical analyses were performed with the aid of an electronic computer.

The 5 %, 1 % and 0.1 % levels of significance are denoted probably significant (*), significant (**) and highly significant (***), respectively.

RESULTS

The means for the morphologic and the rest face heights in the total number of test subjects examined at the different stages of the investigation are compiled in Table III and presented graphically in the diagrams in Fig. 10.

The differences between the measurements obtained at different stages of the investigation are shown in Tables IV a and b, V a and b and VII a and b. Tables IV a, V a and VII a demonstrate the changes in the face heights in those subjects who were continuously followed during a period up to 3 years, and from 3 to 7 years. The differences in the face heights in all test subjects examined after 7 years' denture wear are shown in Tables IV b, V b and VII b.

Table III

The face heights (n-gn) in the total number of subjects examined at the different stages of the observation period. Mean (\bar{x}), standard deviation (s) and standard error of the mean (s/\sqrt{n}) are given in mm.

	Stage of investigation	n	Morphologic face height			Rest face height with dentures			Rest face height without dentures		
			\bar{x}	s	s/\sqrt{n}	\bar{x}	s	s/\sqrt{n}	\bar{x}	s	s/\sqrt{n}
Complete dentures	Bef. extr.	15	121.70	8.08	2.09				124.74	6.84	1.77
	Aft. prosth. treatment	15	124.27	7.05	1.82	126.07	6.67	1.72	122.47	6.09	1.57
	½ year a. t.	15	121.90	6.69	1.73	123.66	6.34	1.64	121.60	5.85	1.51
	1 year a. t.	15	120.77	6.54	1.69	123.05	6.02	1.55	121.57	5.93	1.53
	3 years a. t.	11	119.36	6.65	2.01	121.80	6.51	1.96	120.41	6.49	1.96
	7 years a. t.	11	115.09	6.30	1.90	119.64	6.53	1.97	119.27	5.84	1.76
Partial dentures	Bef. extr.	16	120.75	9.29	2.32				123.99	8.68	2.17
	Aft. prosth. treatment	16	123.91	7.58	1.94	125.59	8.00	2.00	123.22	7.77	1.94
	½ year a. t.	16	122.31	7.93	1.98	124.67	7.90	1.97	123.47	7.86	1.96
	1 year a. t.	16	122.06	7.92	1.98	124.48	7.69	1.92	124.16	8.11	2.03
	3 years a. t.	11	121.77	7.54	2.28	124.09	7.33	2.21	123.32	7.72	2.33
	7 years a. t.	12	119.25	8.12	2.34	122.54	7.74	2.23	122.08	8.22	2.37

Furthermore, the changes in face height after 3 and 7 years' denture wear are illustrated by the orthogonal regression diagrams in Figs. 2—4, 6—8 and 11, in which the two orthogonal regression lines indicate the average changes for the complete denture wearers and the partial denture wearers, respectively.

The average changes in those subjects who were examined at all stages are illustrated in Fig. 1.

In the diagrams in Figs. 2—9 and 11, the abrasion cases are indicated by a *triangle, white* for the complete dentures, *black* for the partial dentures.

Morphologic face height

The results show that the changes in morphologic face height during the 7-year period of observation ran similar courses in the two groups of denture wearers, although an obvious difference in the degree of these changes was discernible (Table IV a and Fig. 1).

After the initial conspicuous increase as a result of the prosthetic treatment, the first half year of denture wear, as previously reported, caused a marked decrease, which was highly significant in both groups. During the following half-year, when a much slighter decrease occurred, the rate of reduction became more retarded in the group of partial denture wearers. Hence, the highly significant total reduction noted in both groups after the first year's denture wear was markedly smaller in the partial denture wearers, the differences between the mean values being statistically confirmed.

During the subsequent 2-year period the decrease in both groups was approximately half of the reduction noted after the first year. The reduction in the complete denture wearers was, on an average, twice that observed in the partial denture wearers, with a probably significant difference between the groups.

On comparison with the stage of insertion, the total 3-year period had caused a highly significant reduction in face height in both groups (Fig. 2). For the complete denture wearers the mean reduction was over 5 mm, for the partial denture wearers approximately half this amount, the difference between the groups being significant. Among the individual results, a striking

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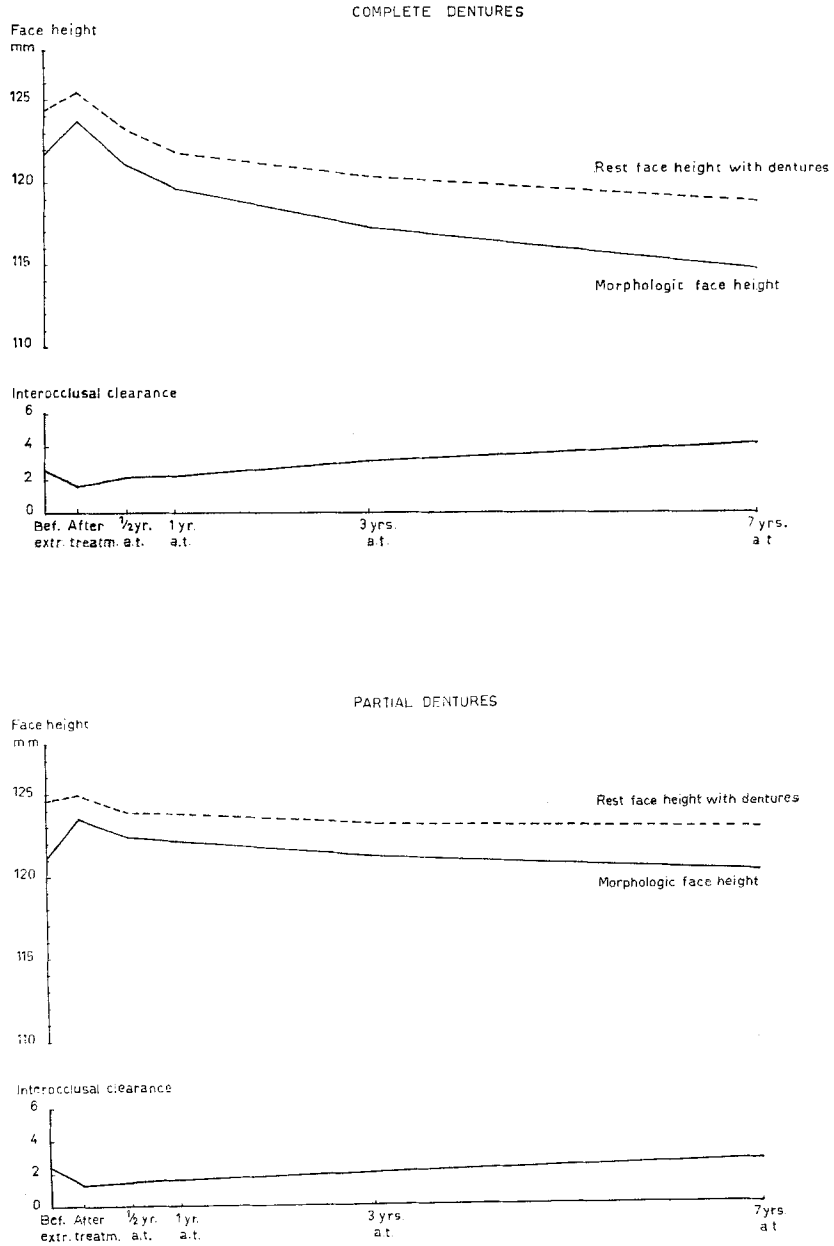


Fig. 1. Average changes in morphologic face height, rest face height and interocclusal clearance in the complete denture wearers and in the partial denture wearers examined at all stages of the investigation.

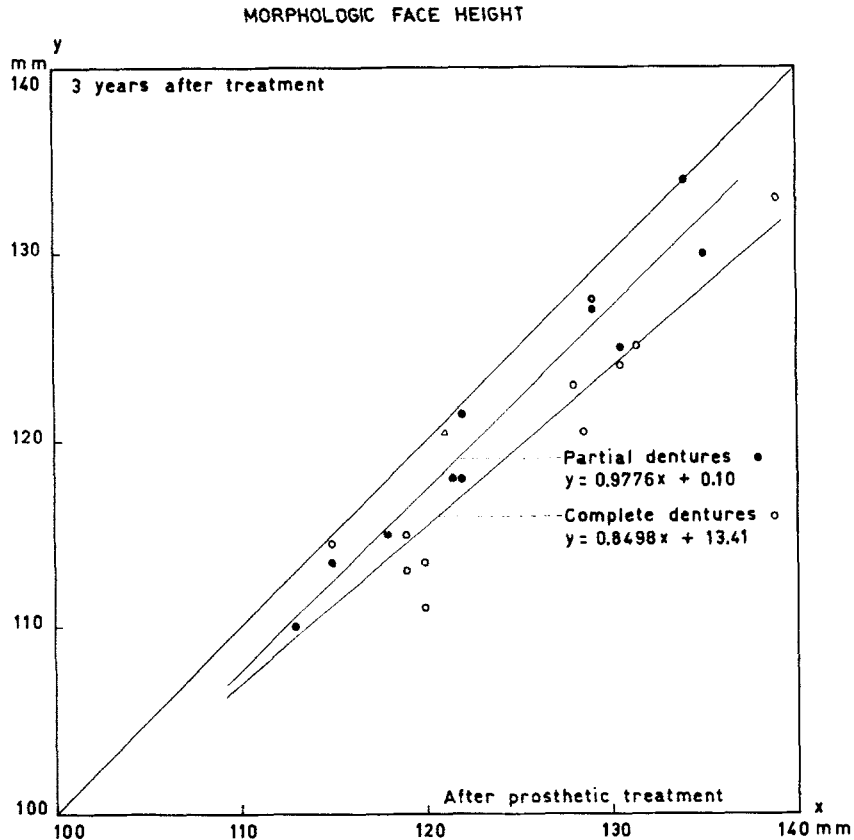


Fig. 2. Reduction in morphologic face height after 3 years' denture wear.

reduction in 4 complete denture wearers is noteworthy, which as illustrated in Figs. 13—16, bore no relation to the degree of increase in face height caused by the prosthetic treatment. On the other hand, in 2 of the subjects, (Figs. 17 and 18), the morphologic face height remained practically unchanged throughout the 3-year period in spite of a marked increase beyond the pre-extraction rest face height.

At the 3-year stage of observation, the mean face height in the complete denture wearers was markedly less than the pre-extraction dimension. In the group of partial denture wearers, on the other hand, it was not until this stage that the mean face height had been reduced to the pre-extraction level (Table IV a).

Tables IV a and b. Differences in morphologic face height in the same subjects between different stages of the observation period. The mean of the differences (\bar{d}), standard deviation (s) and standard error of the mean (s/\sqrt{n}) are expressed in mm. a stands for the earlier, b for the later stage between which the comparisons are made.

Table IV a

	b	After prosth. treatm.	½ yr. a. t.	1 yr. a. t.	1 yr. a. t.	1 yr. a. t.	3 yrs. a. t.	3 yrs. a. t.	3 yrs. a. t.	7 yrs. a. t.
		Bef. extr.	After prosth. treatm.	½ yr. a. t.	After prosth. treatm.	Bef. extr.	1 yr. a. t.	After prosth. treatm.	Bef. extr.	3 yrs. a. t.
Complete dentures CI CII	n	11	11	11	11	11	11	11	11	7
	\bar{d}_1	3.32**	-2.32***	-1.14***	-3.45***	-0.14	-1.86***	-5.32***	-2.00	-2.57**
	s	3.49	1.45	0.84	1.85	4.34	1.31	2.72	5.20	1.57
	s/\sqrt{n}	1.05	0.44	0.25	0.56	1.31	0.39	0.82	1.57	0.59
Partial dentures PI PII	n	11	11	11	11	11	11	11	11	7
	\bar{d}_2	2.91**	-1.45***	-0.32*	-1.77***	1.14	-0.91*	-2.68***	0.23	-0.93*
	s	2.43	0.93	0.40	1.03	2.24	1.24	1.76	2.10	1.06
	s/\sqrt{n}	0.73	0.28	0.12	0.31	0.67	0.37	0.53	0.63	0.40
	Diff. $\bar{d}_1 - \bar{d}_2$			**	**		*	**		*

Table IV b

	b	After prosth. treatm.	1 yr. a. t.	7 yrs. a. t.	7 yrs. a. t.	7 yrs. a. t.
		Bef. extr.	After prosth. treatm.	1 yr. a. t.	After prosth. treatm.	Bef. extr.
Complete dentures CII+CIII	n	11	11	11	11	11
	\bar{d}_1	1.41	-3.86***	-4.55***	-8.41***	-7.00***
	s	2.63	0.98	2.14	2.32	2.55
	s/\sqrt{n}	0.79	0.29	0.64	0.70	0.77
Partial dentures PII+PIII	n	12	12	12	12	12
	\bar{d}_2	3.00**	-1.71***	-2.29**	-4.00***	-1.00
	s	3.19	1.20	2.16	2.97	2.33
	s/\sqrt{n}	0.92	0.35	0.62	0.86	0.67
	Diff. $\bar{d}_1 - \bar{d}_2$		***	*	***	***

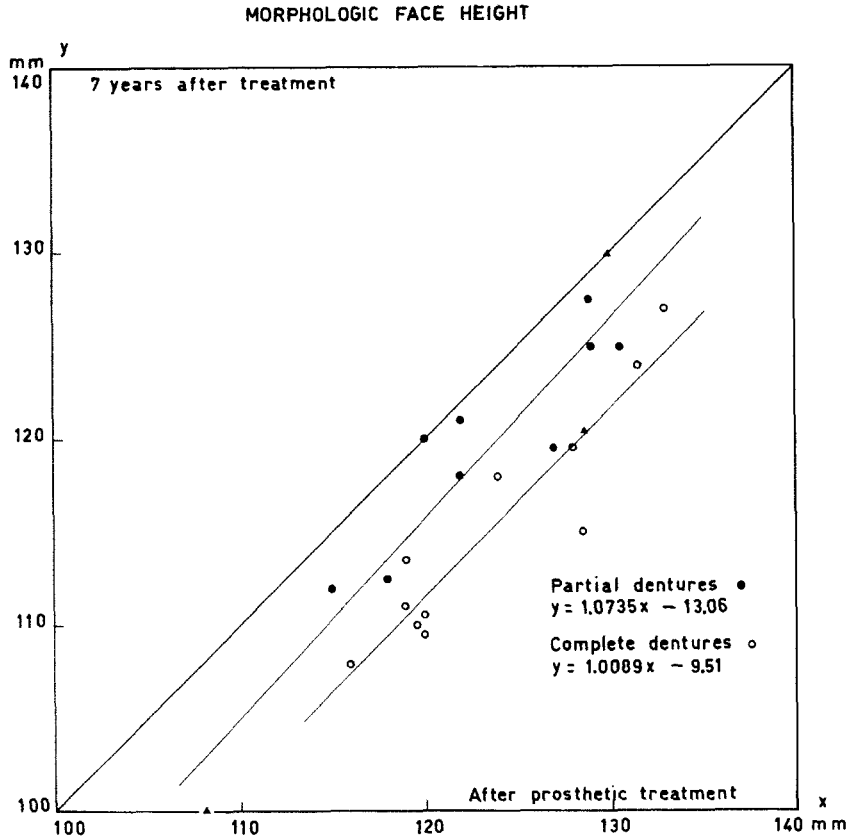


Fig. 3. Reduction in morphologic face height after 7 years' denture wear.

The results obtained 7 years after insertion of the dentures revealed a highly significant total reduction in both groups (Table IV b and Fig. 3). The mean reduction in the complete denture wearers was almost 8.5 mm with a range between 5.5 mm and 13.5 mm, which was approximately twice as large as the result for the partial denture wearers.

At this stage the morphologic face height in all the complete denture wearers was markedly lower than the pre-extraction dimension (Fig. 4), the mean reduction of 7 mm being highly significant. By contrast, in the partial denture wearers the face height was reduced below the pre-extraction level in only half of the patients, the difference for the whole group being insignificant.

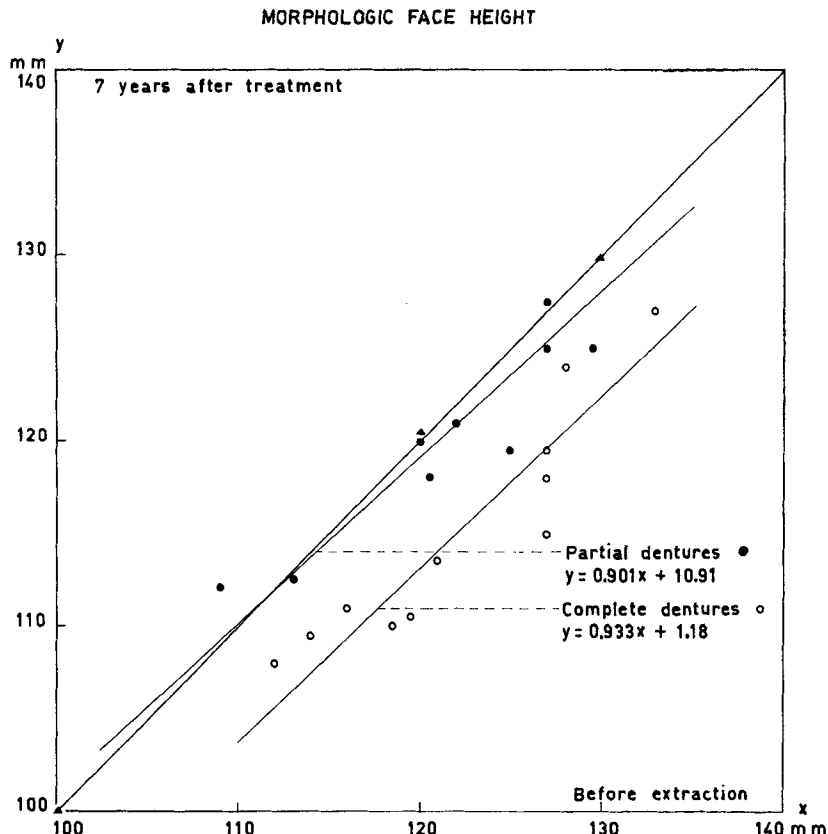


Fig. 4. Reduction in morphologic face height after 7 years' denture wear as compared with the pre-extraction dimension.

Since the reduction in face height showed considerable individual variations within both groups of denture wearers, it was considered of interest to investigate the relationship between the decrease in face height and the increase caused by the prosthetic treatment. This analysis, as well as the tests, reviewed in the following paragraphs, were performed both numerically and graphically.

The coefficients of correlation between the increase resulting from the prosthetic treatment and the reduction after half a year, one year, 3 years and 7 years were calculated for the complete and the partial denture wearers respectively. In the complete denture wearers no significant relationships were demonstrable between the increase and the decrease during the subsequent periods. In

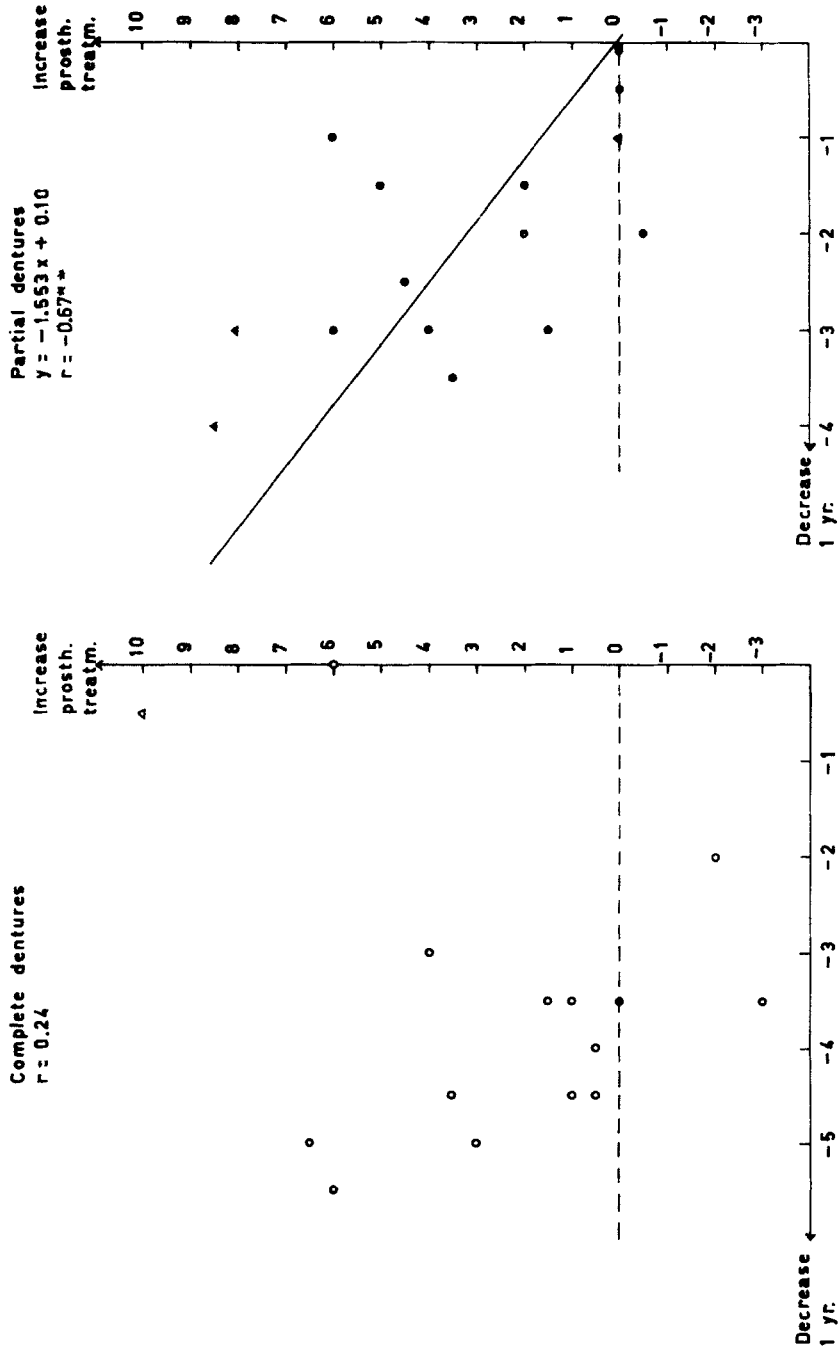


Fig. 5. Graphic illustration of the increase in morphologic face height resulting from the prosthetic treatment and the decrease occurring during one year of denture wear in complete and partial denture wearers. Cf. text on p. 207.

regard to the partial denture wearers, on the other hand, the results revealed significant correlations for the stages half a year, one year and 7 years ($r=-0.62^{**}$, -0.67^{**} and -0.72^{**}), which seems to indicate that in this group a certain relationship existed between the increase and the decrease. The results for the first period of one year are graphically depicted in the diagram in Fig. 5.

A complementary analysis was performed in order to ascertain whether the decrease in morphologic face height during the first year was dependent on the amount of increase in relation to the size of the interocclusal clearance at the pre-extraction stage. For this purpose the multiple correlation coefficient between these three quantities was calculated. In regard to the complete denture wearers no significant correlation was demonstrable. For the partial denture wearers the correlation coefficient obtained $r_{1,2,3}=0.67^*$, was of the same magnitude as in the foregoing analysis, which indicates that the third factor, the interocclusal clearance, played no part in this connection, or in other words that the reduction was not dependent on whether the increase exceeded the pre-extraction interocclusal clearance or not. The findings are illustrated by the individual diagrams in Figs. 13—25.

Furthermore, it was considered of interest to investigate whether the reduction during the first year was possibly dependent on whether the occlusal face height at the stage of insertion of the dentures was larger or smaller than the rest face height without dentures, or in other words whether "the interocclusal clearance without dentures" at that stage was negative or positive. The results revealed no significant correlation in either complete or partial denture wearers ($r=0.04$ and $r=0.14$).

Interest was also attached to the question of whether the reduction during one period of observation was possibly dependent on the reduction demonstrable during the preceding stage. This point was tested by calculating the correlation coefficients between the reductions noted during the first two half-year periods, respectively, during the first year and the two subsequent years, and during the first year and the 6 subsequent years. In neither group of denture wearers were any significant correlations demonstrable between the reductions in morphologic face height during the observation periods in question.

Finally, the relationship between the age of the subjects and the decrease in morphologic face height was analysed. For both groups the correlation coefficients were calculated between age and the reductions during the following periods: the first half-year, the second half-year, 1—3 years, 1—7 years, and 1 year, 3 years and 7 years. In neither group of denture wearers was any significant correlation demonstrable between age and the reductions during the periods in question.

Rest face height with dentures

In the two groups of denture wearers the changes in the rest face height with dentures followed a more or less similar course in relation to the changes in the morphologic face height, the rest

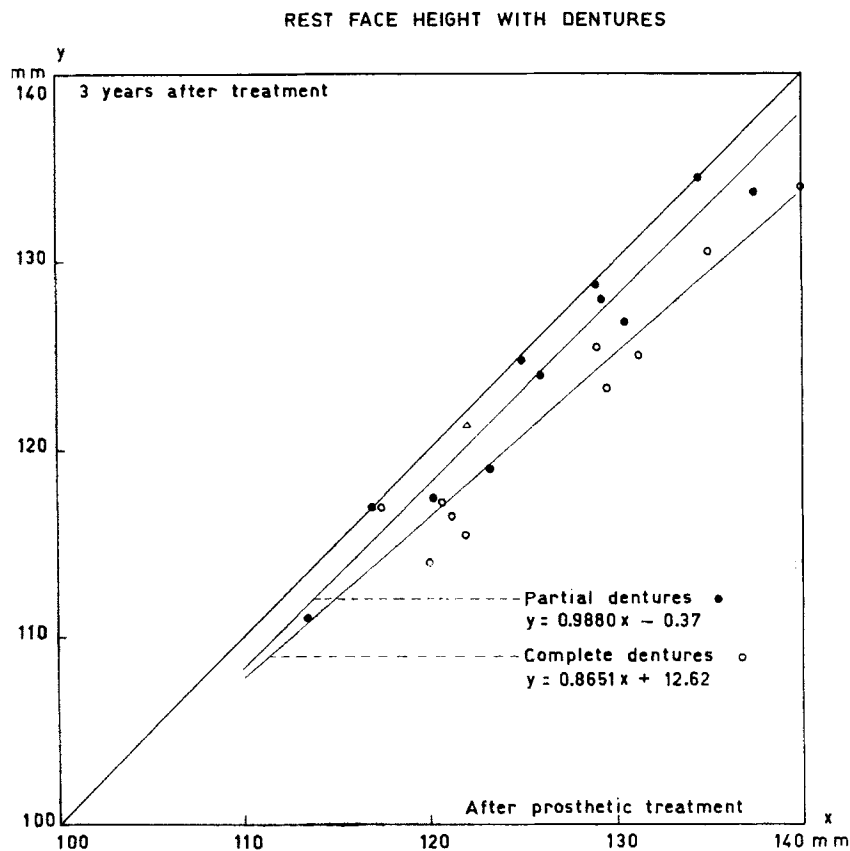


Fig. 6. Reduction in rest face height with dentures after 3 years' denture wear.

Tables V a and b. Differences in rest face height with dentures in the same subjects between different stages of the observation period. The mean of the differences (\bar{d}), standard deviation (s) and standard error of the mean (s/\sqrt{n}) are expressed in mm. a stands for the earlier, b for the later stage between which the comparisons are made.

Table V a

	b	After prosth. treatm.	½ yr. a. t.	1 yr. a. t.	1 yr. a. t.	1 yr. a. t.	3 yrs. a. t.	3 yrs. a. t.	3 yrs. a. t.	7 yrs. a. t.
		Bef. extr.	After prosth. treatm.	½ yr. a. t.	After prosth. treatm.	Bef. extr.	1 yr. a. t.	After prosth. treatm.	Bef. extr.	3 yrs. a. t.
Complete dentures CI CII	n	11	11	11	11	11	11	11	11	7
	\bar{d}_1	1.77*	-2.15***	-0.94**	-3.09***	-1.33	-1.32**	-4.41***	-2.64*	-1.43*
	s	2.52	1.26	0.81	1.54	3.38	1.06	2.16	4.12	1.68
	s/\sqrt{n}	0.76	0.38	0.24	0.46	1.02	0.32	0.65	1.24	0.64
Partial dentures PI PII	n	11	11	11	11	11	11	11	11	7
	\bar{d}_2	2.16**	-1.25**	-0.07	-1.32**	0.84	-0.57**	-1.89**	0.27	-0.39
	s	2.13	1.33	0.94	1.53	1.63	0.49	1.63	1.81	1.28
	s/\sqrt{n}	0.64	0.40	0.28	0.46	0.49	0.15	0.49	0.55	0.48
Diff. $\bar{d}_1 - \bar{d}_2$				*	**	*	*	**	*	

Table V b

	b	After prosth. treatm.	1 yr. a. t.	7 yrs. a. t.	7 yrs. a. t.	7 yrs. a. t.
		Bef. extr.	After prosth. treatm.	1 yr. a. t.	After prosth. treatm.	Bef. extr.
Complete dentures CII+CIII	n	11	11	11	11	11
	\bar{d}_1	0.66	-3.23***	-2.61**	-5.84***	-5.18***
	s	2.52	0.97	2.10	2.08	3.78
	s/\sqrt{n}	0.76	0.29	0.63	0.63	1.14
Partial dentures PII+PIII	n	12	12	12	12	12
	\bar{d}_2	0.93*	-0.90*	-1.40**	-2.29***	-1.36**
	s	1.79	1.46	1.44	1.95	1.73
	s/\sqrt{n}	0.52	0.42	0.42	0.56	0.50
Diff. $\bar{d}_1 - \bar{d}_2$			***		***	**

REST FACE HEIGHT WITH DENTURES

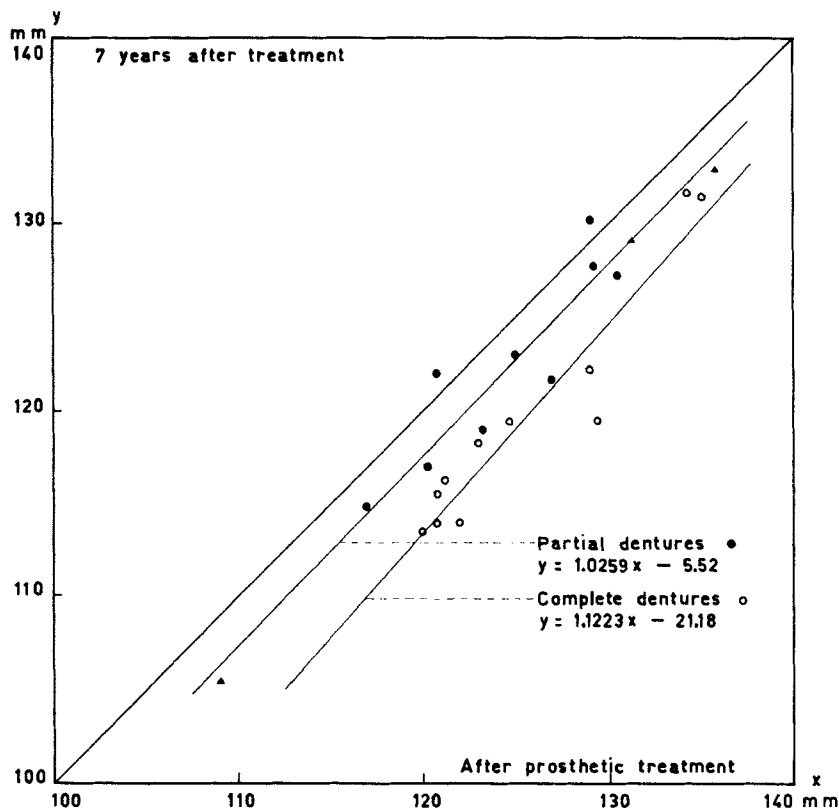


Fig. 7. Reduction in rest face height with dentures after 7 years' denture wear.

height exhibiting a smaller reduction than the morphologic face height. The retardation of the process already observable during the first year of denture wear, is clearly noticeable during the later course (Tables V a and b, Fig. 1 and Fig. 10).

The total reduction after 3 years' denture wear is shown in Fig. 6. In the complete denture wearers the highly significant mean reduction amounted to 4.4 mm. In the partial denture wearers the mean decrease was somewhat less than half this value, the difference between the groups being statistically confirmed.

At this check the rest height with dentures was lower than the pre-extraction rest dimension in the majority of the complete denture wearers. By contrast, in the partial denture group the mean rest height corresponded to the pre-extraction value.

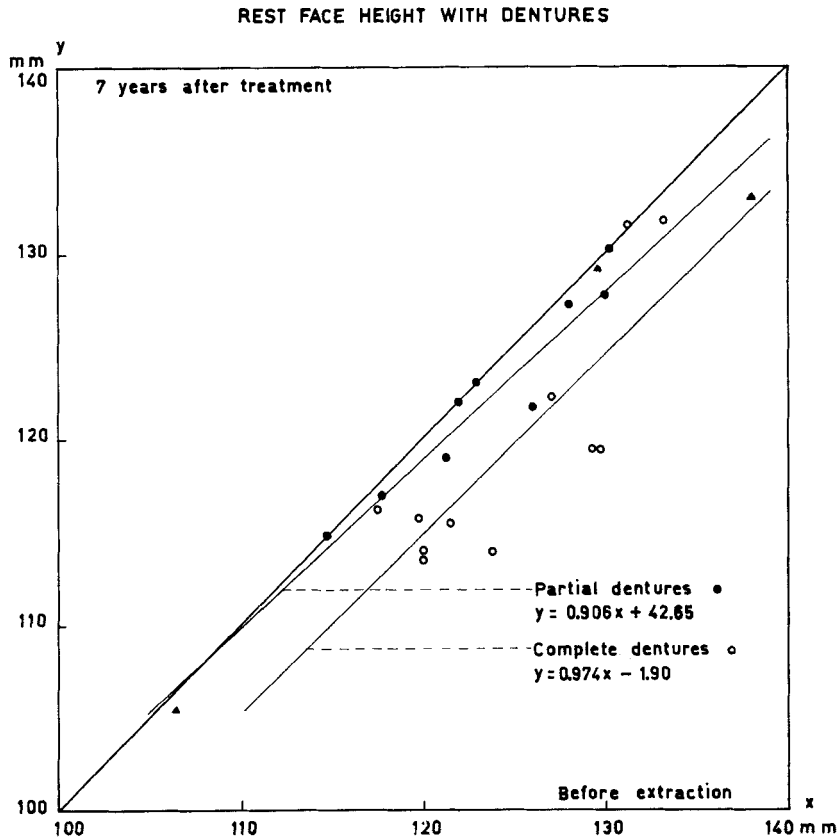


Fig. 8. Reduction in the rest face height with dentures after 7 years' denture wear as compared with the pre-extraction rest dimension.

The total reduction after 7 years' denture wear, which in both groups was highly significant, is illustrated in Table V b and Fig. 7. The mean reduction in the complete denture wearers — almost 6 mm — was more than twice the mean in the partial denture wearers, and as with the results for the morphologic face height, the difference between the two groups proved to be highly significant.

At this stage the rest face height was lower than the pre-extraction rest dimension in 10 of the 11 complete denture wearers and equalled with that level in one subject (Fig. 8). The mean reduction amounted to about 5 mm and was highly signifi-

Table VI

The interocclusal clearance with dentures in the same subjects at different stages of the observation period during (a) 3 years and (b) 7 years of denture wear. The mean (\bar{x}) and standard deviation (s) are expressed in mm.

Interocclusal clearance with dentures							
		Complete dentures (C I + C II)			Partial dentures (P I + P II)		
		n	\bar{x}	s	n	\bar{x}	s
a	Bef. extr.	11	3.08	3.10	11	2.27	1.92
	Aft. prosth. treatment	11	1.52	0.98	11	1.52	1.46
	½ year a. t.	11	1.69	0.85	11	1.73	1.42
	1 year a. t.	11	1.89	1.15	11	1.98	1.69
	3 years a. t.	11	2.43	1.60	11	2.32	1.67
b		(C II + C III)			(P II + P III)		
	Bef. extr.	11	2.73	3.19	12	3.65	3.14
	Aft. prosth. treatment	11	1.98	1.90	12	1.58	1.70
	½ year a. t.	11	2.05	0.66	12	2.46	2.09
	1 year a. t.	11	2.61	1.74	12	2.40	1.95
7 years a. t.	11	4.55	2.52	12	3.29	2.09	

cant. In spite of the considerably slower rate of reduction in the partial denture wearers, the pre-extraction rest level was reached by all subjects in this group also, and in 8 of the 12 subjects the readings were lower. The mean reduction for this group, about 1.5 mm, proved to be significant.

The gradual increase of the interocclusal clearance with dentures is shown in Table VI, Fig. 1 and Fig. 10. The course was fairly uniform in the complete and the partial denture wearers and no significant differences could be demonstrated between the groups at the different stages of the study. On comparison with the stage of insertion of the dentures, the increase of the interocclusal clearance at the 3-year and 7-year checks was statistically confirmed for both groups.

A comparison of the interocclusal clearance with the pre-extraction dimension (Fig. 9), shows that at the 7-year stage the latter dimension had been exceeded in 9 of the 11 complete denture wearers. However, the mean increase for the whole group,

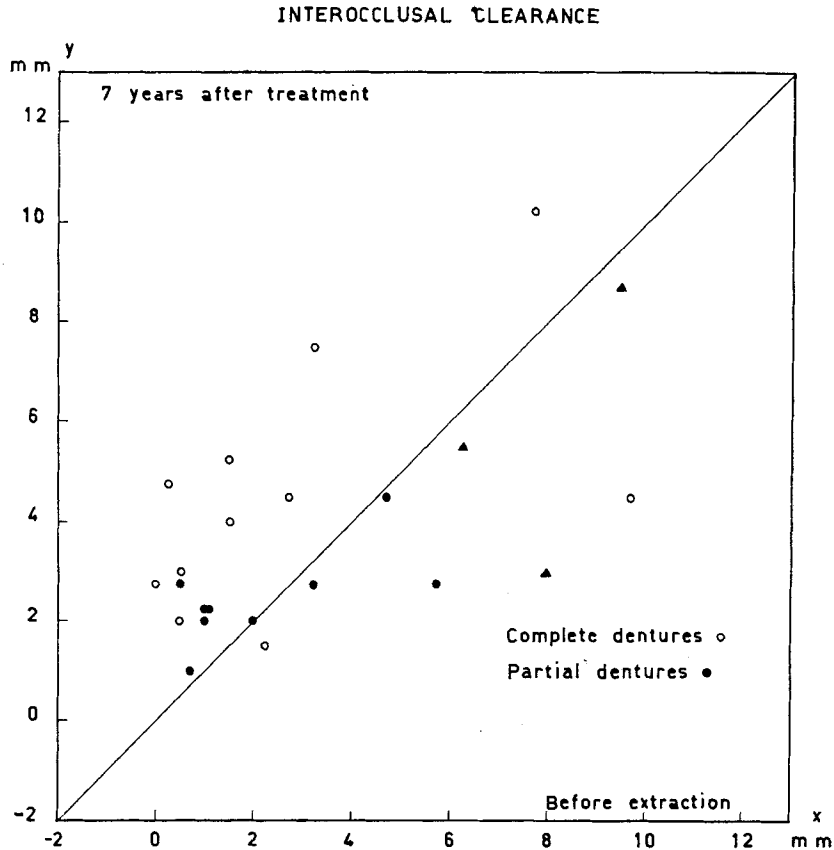


Fig. 9. The changes in the interocclusal clearance with dentures after 7 years' denture wear as compared with the pre-extraction dimension.

1.8 mm, did not prove to be significant. In the partial denture wearers the pre-extraction interocclusal clearance had been re-established in 7 of the 12 subjects and exceeded in 5 of them, the mean for the group being almost the same as before extraction of the teeth.

Rest face height without dentures

The changes in the rest face height without dentures exhibited greater variations both within and between the groups than did the rest height with dentures.

Previous investigations (*Atwood, 1956; Tallgren, 1957* and

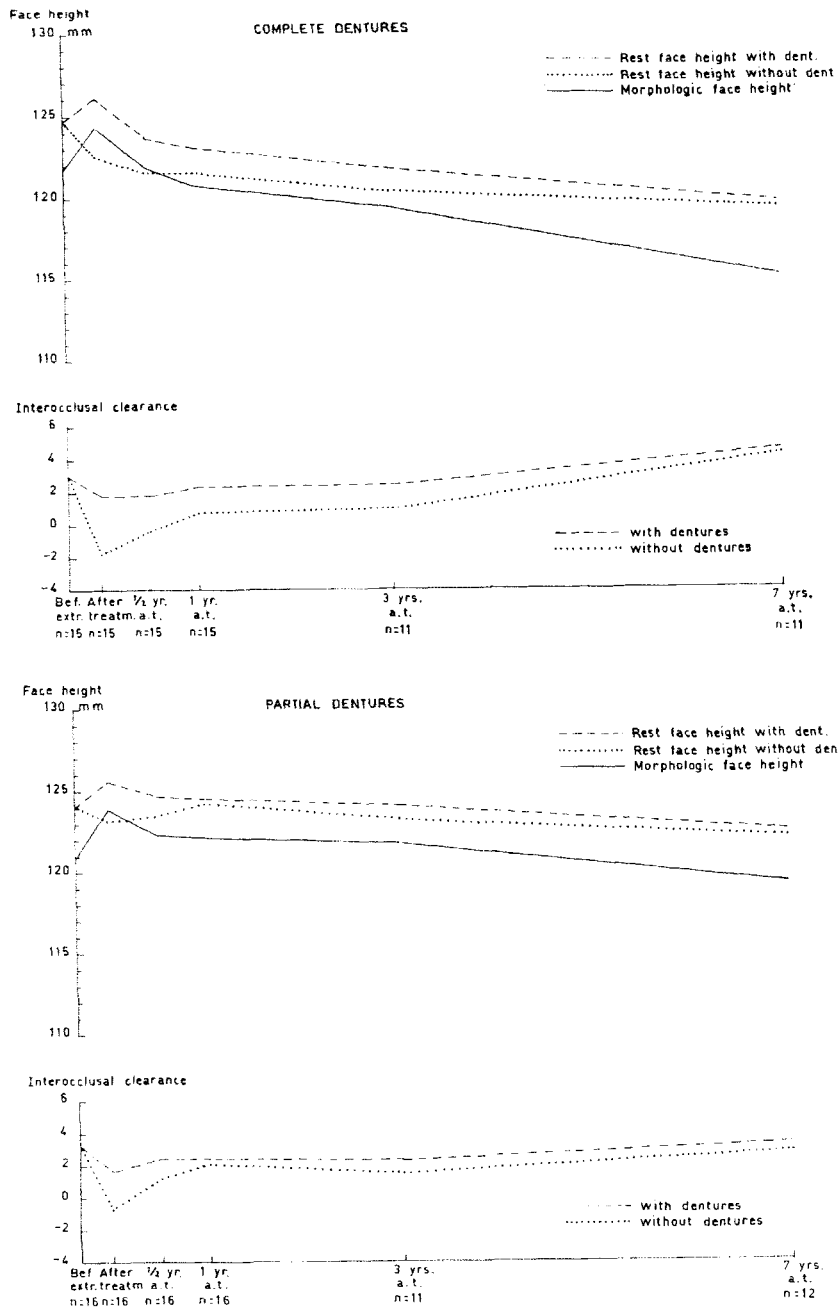


Fig. 10. Graphic illustrations of the means for the face heights and interocclusal clearances in all complete and partial denture wearers during the total period of observation.

Tables VII a and b. Differences in rest face height without dentures in the same subjects between different stages of the observation period. The mean of the differences (\bar{d}), standard deviation (s) and standard error of the mean (s/\sqrt{n}) are expressed in mm. a stands for the earlier, b for the later stage between which the comparisons are made.

Table VII a

	b	After prosth. treatm.	½ yr. a. t.	1 yr. a. t.	1 yr. a. t.	1 yr. a. t.	3 yrs. a. t.	3 yrs. a. t.	3 yrs. a. t.	7 yrs. a. t.
		Bef. extr.	After prosth. treatm.	½ yr. a. t.	After prosth. treatm.	Bef. extr.	1 yr. a. t.	After prosth. treatm.	Bef. extr.	3 yrs. a. t.
Complete dentures CI CII	n	11	11	11	11	11	11	11	11	7
	\bar{d}_1	-2.10**	-0.61	-0.32	-0.93	-3.03**	-1.00**	-1.93**	-4.03***	-0.21
	s	2.49	1.42	1.25	2.15	2.91	0.95	2.19	2.84	1.44
	s/\sqrt{n}	0.75	0.43	0.38	0.65	0.88	0.29	0.66	0.86	0.54
Partial dentures PI PII	n	11	11	11	11	11	11	11	11	7
	\bar{d}_2	-0.27	0.18	0.41	0.59	0.32	-0.82*	-0.23	-0.50	-1.07*
	s	2.85	1.80	1.09	2.32	2.02	1.25	2.07	2.13	1.02
	s/\sqrt{n}	0.86	0.54	0.33	0.70	0.61	0.38	0.62	0.64	0.38
Diff. $\bar{d}_1 - \bar{d}_2$						**		*	**	

Table VII b

	b	After prosth. treatm.	1 yr. a. t.	7 yrs. a. t.	7 yrs. a. t.	7 yrs. a. t.
		Bef. extr.	After prosth. treatm.	1 yr. a. t.	After prosth. treatm.	Bef. extr.
Complete dentures CII+CIII	n	11	11	11	11	11
	\bar{d}_1	-2.20*	-1.39**	-1.95***	-3.34***	-5.55***
	s	2.79	1.42	1.52	1.94	2.85
	s/\sqrt{n}	0.84	0.43	0.46	0.59	0.86
Partial dentures PII+PIII	n	12	12	12	12	12
	\bar{d}_2	-1.24	1.38	-1.96**	-0.58	-1.82**
	s	2.42	2.70	1.83	2.64	1.98
	s/\sqrt{n}	0.70	0.78	0.53	0.76	0.57
Diff. $\bar{d}_1 - \bar{d}_2$			**		**	***

Duncan & Williams, 1960) have shown that after the loss of occlusal contacts the rest face height undergoes a change, with individual variations in regard to increase and decrease. The above-mentioned authors were, however, able to demonstrate an average reduction of this dimension. *Swerdlow* (1964), on the other hand, upon immediate insertion of dentures after extraction, found no change of the pre-extraction rest dimension, when compared with the rest height without the dentures in mouth 3 weeks post-extraction.

Of the present groups of study, the completely edentulous subjects exhibited a larger mean decrease of the rest height after an edentulous period of some 3 months, but the difference between the groups was not significant (Tables VII a and b and Fig. 10). During the first year of denture wear, slight, although insignificant, tendencies towards a continued decrease was observable in the completely edentulous subjects and towards an increase in the partially edentulous patients, but no significant difference between the groups was demonstrable. On comparison with the pre-extraction dimension, the rest face height without dentures after the first years' denture wear was, however, significantly reduced in the complete denture wearers, while in the partial denture wearers the pre-extraction level had on an average been re-established.

The difference between the rest face heights with and without the dentures in the mouth, which was conspicuous and highly significant in both groups upon completion of the prosthetic treatment, subsequently showed average tendencies to diminish, particularly in the partial denture wearers. In this group the mean difference between the two rest face heights after the first year's denture wear was no longer significant (Table VIII).

During the following periods of observation the rest height without dentures in both groups tended to decrease more or less in conformity with the rest face height with dentures (Fig. 10). At the 3-year check the mean rest height without dentures in the complete denture wearers was still significantly lower than the rest height without dentures, while in the partial denture wearers the difference was insignificant as at the previous stage (Table VIII).

The reduction after 7 years of denture wear is illustrated in

Table VIII

Differences between the rest face heights with and without dentures in the total number of subjects examined at the different stages of the observation period. The mean of the differences (\bar{d}), standard deviation (s) and standard error of the mean (s/\sqrt{n}) are expressed in mm.

		After prosth. treatm.	½ yr. a. t.	1 yr. a. t.	3 yrs. a. t.	7 yrs. a. t.
Complete dentures	\bar{n}	15	15	15	11	11
	\bar{d}_1	3.60***	2.06***	1.48***	1.39**	0.36
	s	2.26	1.73	1.40	1.62	2.28
	s/\sqrt{n}	0.58	0.45	0.36	0.49	0.69
Partial dentures	\bar{n}	16	16	16	11	12
	\bar{d}_2	2.38***	1.20**	0.33	0.77	0.46
	s	1.92	1.74	1.94	1.69	2.33
	s/\sqrt{n}	0.48	0.43	0.48	0.51	0.67
	Diff. $\bar{d}_1 - \bar{d}_2$			*		

Table IX

The interocclusal clearance without dentures in the same subjects at different stages of the observation period during (a) 3 years and (b) 7 years of denture wear. The mean (\bar{x}) and standard deviation (s) are expressed in mm. The significance of deviation of \bar{x} from zero is denoted in the table.

Interocclusal clearance without dentures							
		Complete dentures (C I + C II)			Partial dentures (P I + P II)		
		n	\bar{x}	s	n	\bar{x}	s
a	Bef. extr.	11	3.08**	3.10	11	2.27**	1.92
	Aft. prosth. treatment	11	-2.34**	2.54	11	-0.91	2.84
	½ year a. t.	11	-0.64	2.24	11	0.73	2.02
	1 year a. t.	11	0.18	2.33	11	1.45*	2.42
	3 years a. t.	11	1.05	2.63	11	1.55*	2.57
b	Bef. extr.	11	2.73**	3.19	12	3.65***	3.14
	Aft. prosth. treatment	11	-0.89	2.38	12	-0.58	2.79
	½ year a. t.	11	0.50	1.66	12	1.33*	1.78
	1 year a. t.	11	1.59*	2.59	12	2.50**	2.27
	7 years a. t.	11	4.18***	2.67	12	2.83**	2.75

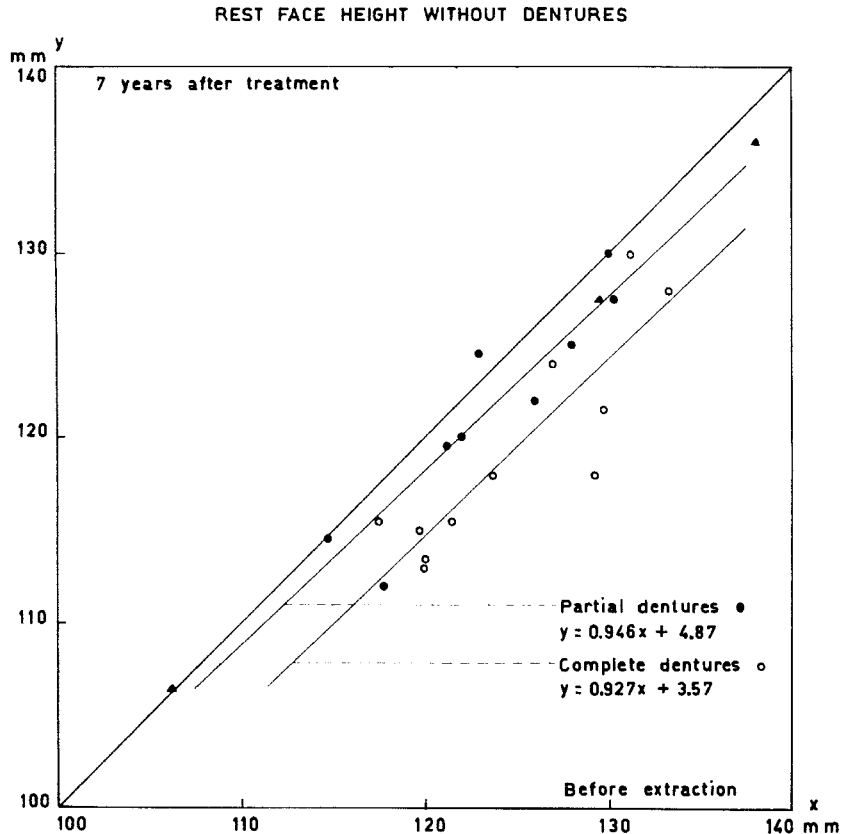


Fig. 11. Reduction in the rest face height without dentures after 7 years' denture wear as compared with the pre-extraction rest dimension.

the diagram in Fig. 11, which shows that, analogous with the general development, the rest face height without dentures in all the complete denture wearers was markedly lower than the pre-extraction rest dimension, the mean reduction amounting to about 5.5 mm. The partial denture wearers also exhibited a significant drop to below the pre-extraction level, on an average 1.8 mm (Table VII b).

During the later course of observation, the mean difference between the rest face heights with and without the dentures in the mouth tended further to diminish, and was at the 7-year stage insignificant in both groups (Table VIII).

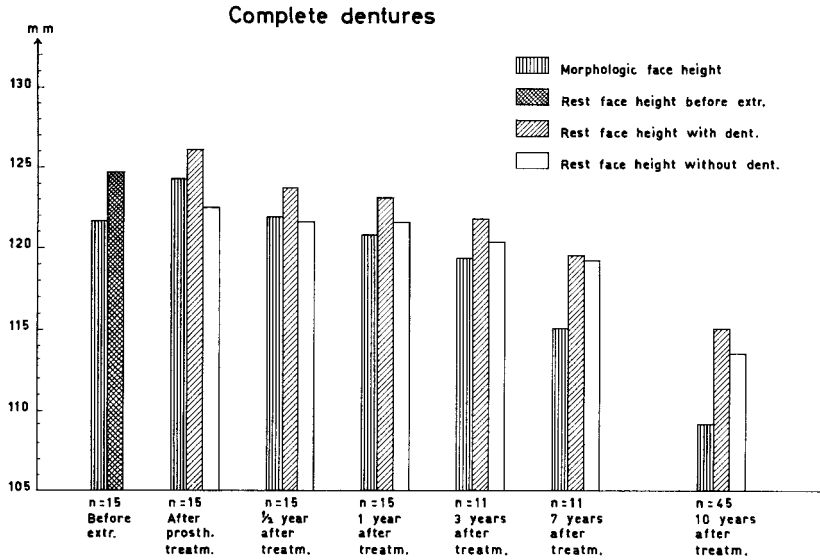


Fig. 12 Means for the face heights in all complete denture wearers during the total period of observation. The diagram also illustrates the mean values for the face heights after 10 years' denture wear in 45 complete denture wearers examined in a previous cross-sectional investigation.

The consequent changes in the interocclusal clearance without dentures during the period of observation are shown in Table IX and Fig. 10.

DISCUSSION

A longitudinal study like the present one offers an opportunity for analyzing individual variations during the course of denture wear and thus constitutes a valuable complement to cross-sectional investigations on larger series. A long-term study of denture wearers always entails a greater risk of reduction in the number of patients, however, than corresponding investigations carried out on subjects with natural dentitions. That 72 per cent of the test subjects from the initial study were available for a check-up examination after 7 years of denture wear must therefore be accepted as satisfactory. On the other hand, the fact that 9 of these subjects failed to attend the check at 3 years necessitated a more extensive treatment of the data.

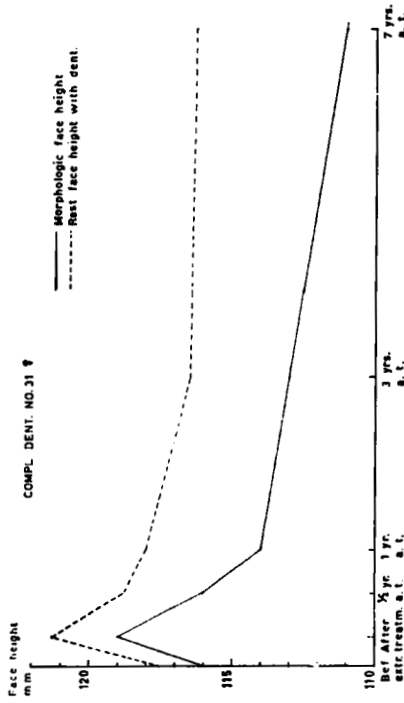


Fig. 13.

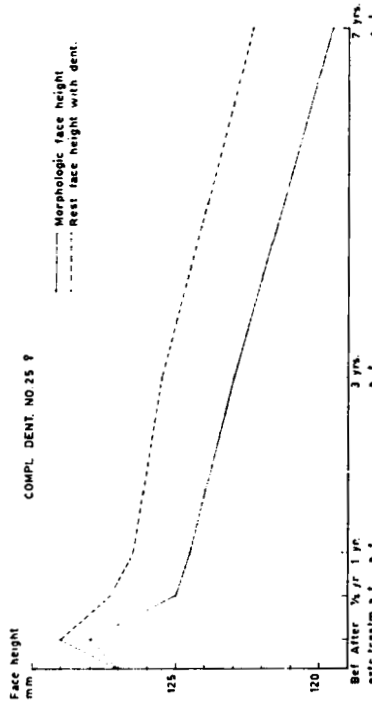


Fig. 14.

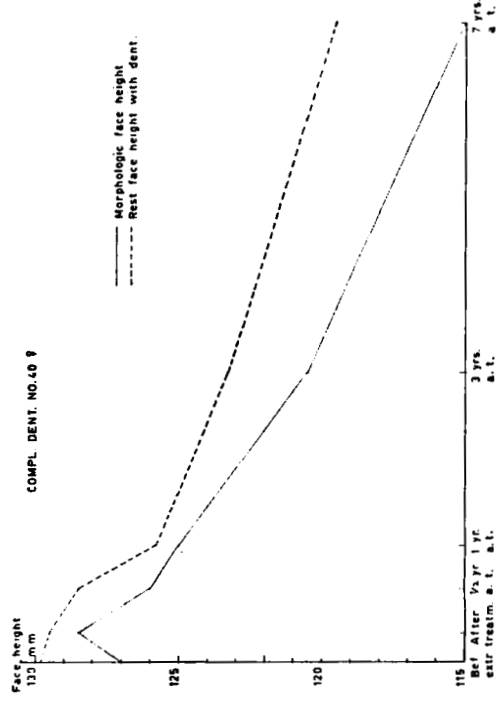


Fig. 15.

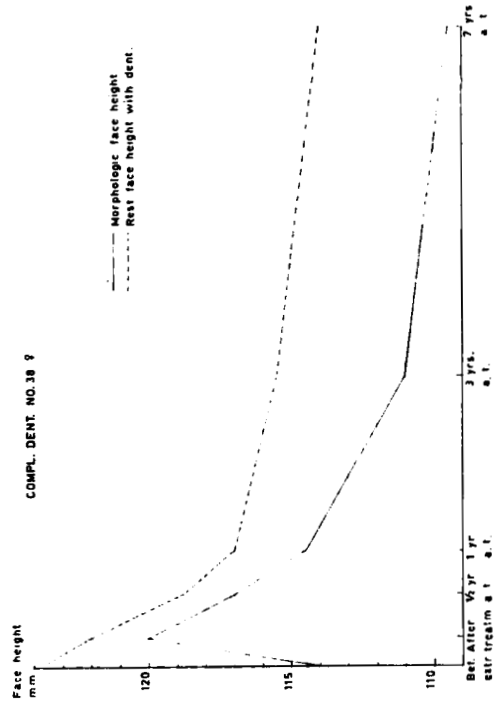


Fig. 16.

Figs. 13—16. Marked reduction in face height independently of whether the increase in morphologic face height caused by the prosthetic treatment exceeded the pre-extraction rest face height or not. Cf. text on p. 202 and 207.

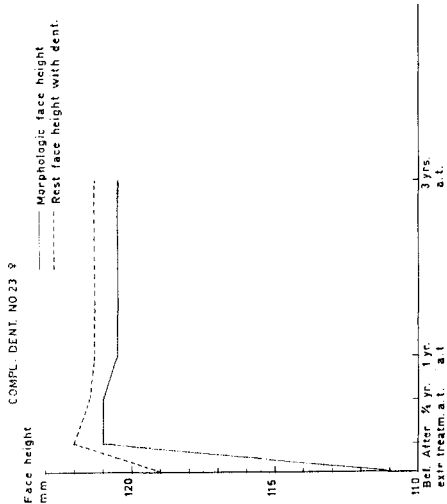


Fig. 18.

Figs. 17—18. No appreciable reduction during a 3-year period of observation in spite of a marked increase in morphologic face height beyond the pre-extraction rest dimension. (Fig. 18. A previous abrasion case). Cf. text on p. 202 and 207.

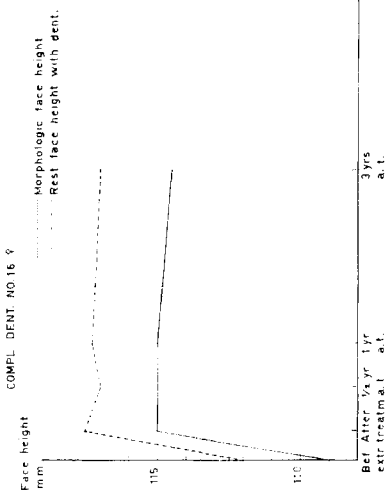


Fig. 17.

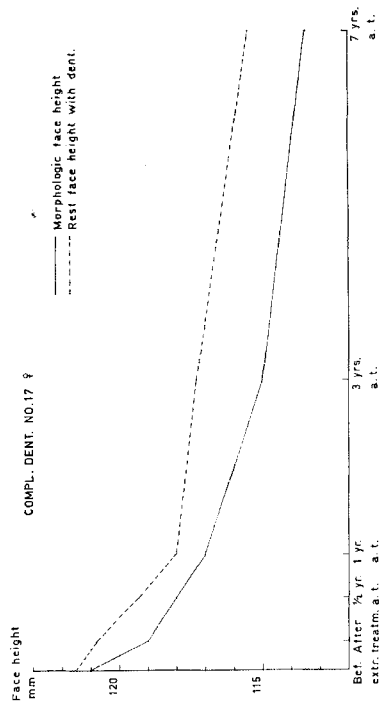


Fig. 19. Marked decrease in face height in spite of a reduction in morphologic face height caused by the prosthetic treatment. The age of this patient at the initial stage was 20 years. Cf. text on p. 207.

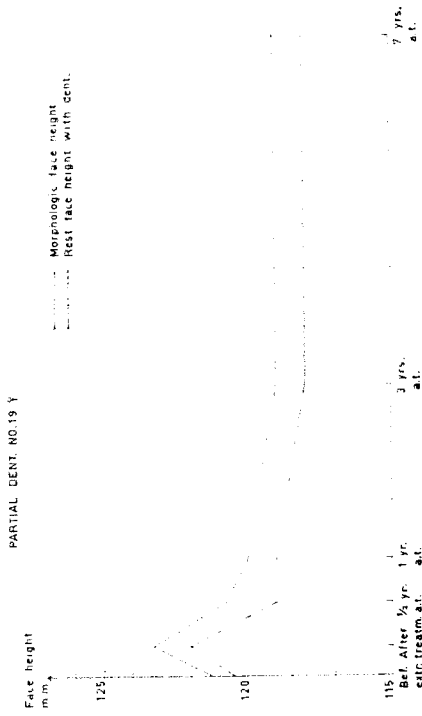


Fig. 21.

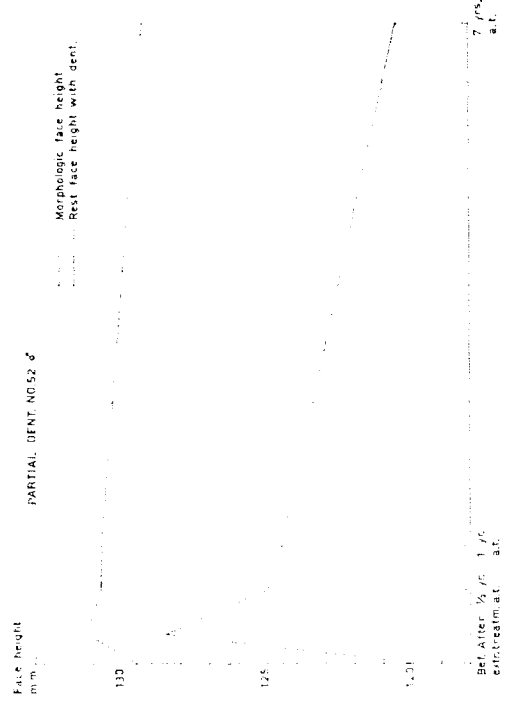


Fig. 23.

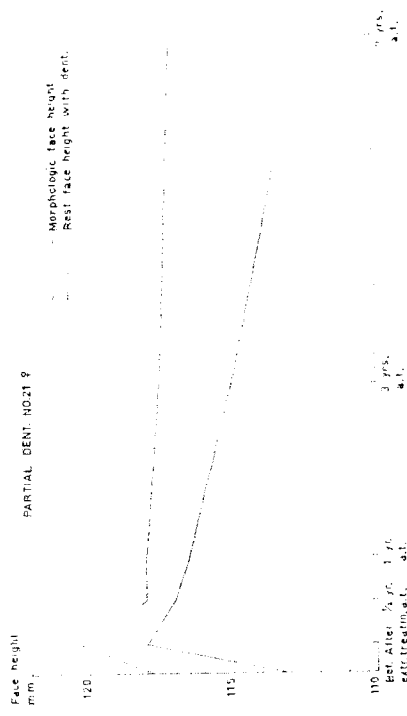


Fig. 20.

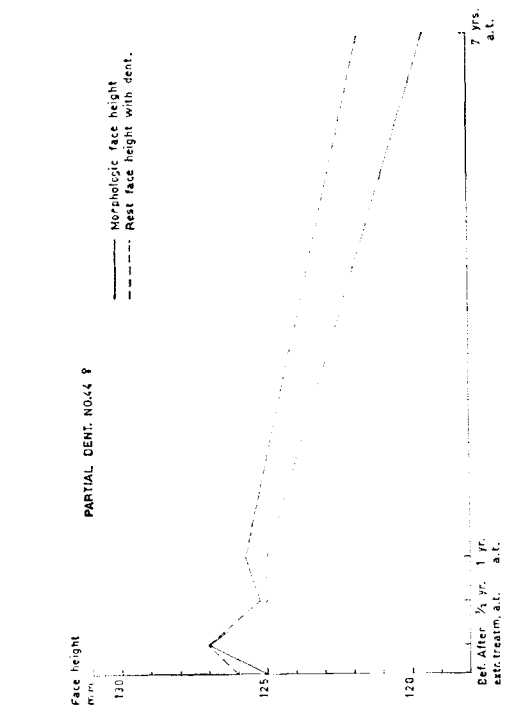


Fig. 22.

Figs 20—23. Note that the reduction in face height was independent of whether the increase caused by the prosthetic treatment exceeded the pre-extraction rest face height or not. (Fig. 23. A previous abrasion case). Cf. text on p. 207.

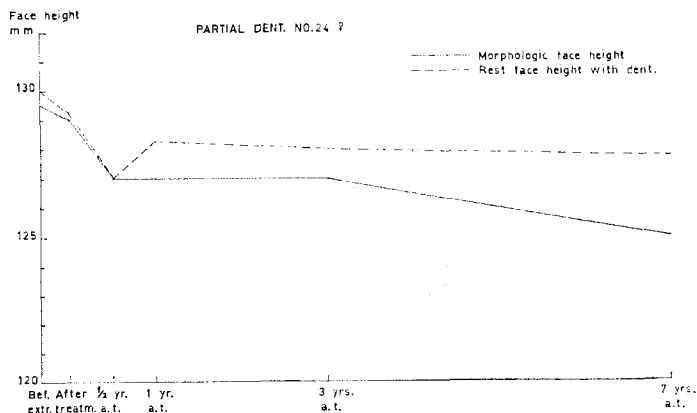


Fig. 24. Marked decrease in spite of a slight reduction in morphologic face height caused by the prosthetic treatment. Cf. text on p. 207.

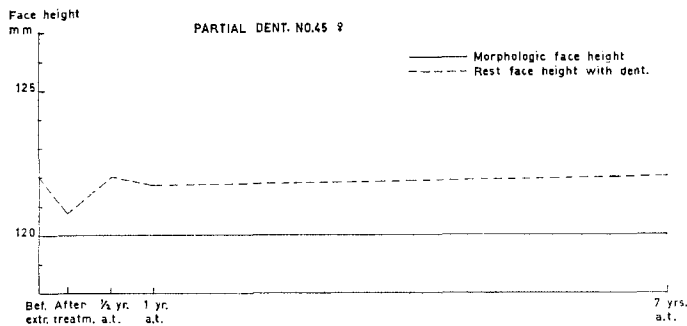


Fig. 25. No change in morphologic face height upon completion of the prosthetic treatment and no reduction during 7 years of denture wear.

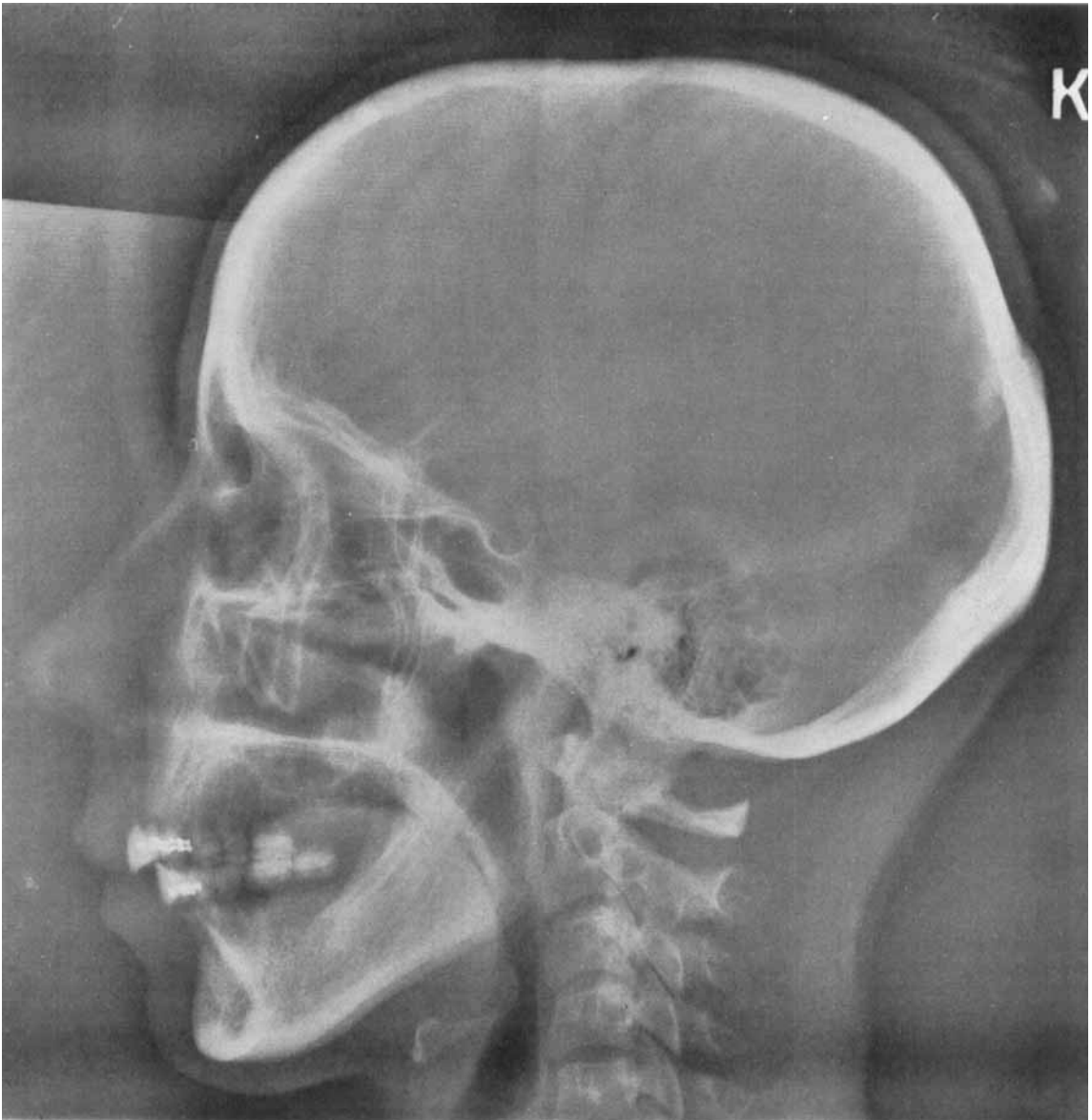


Fig. 26 a. Profile radiograph in occlusal position upon insertion of complete dentures 3 months after extraction of the teeth.

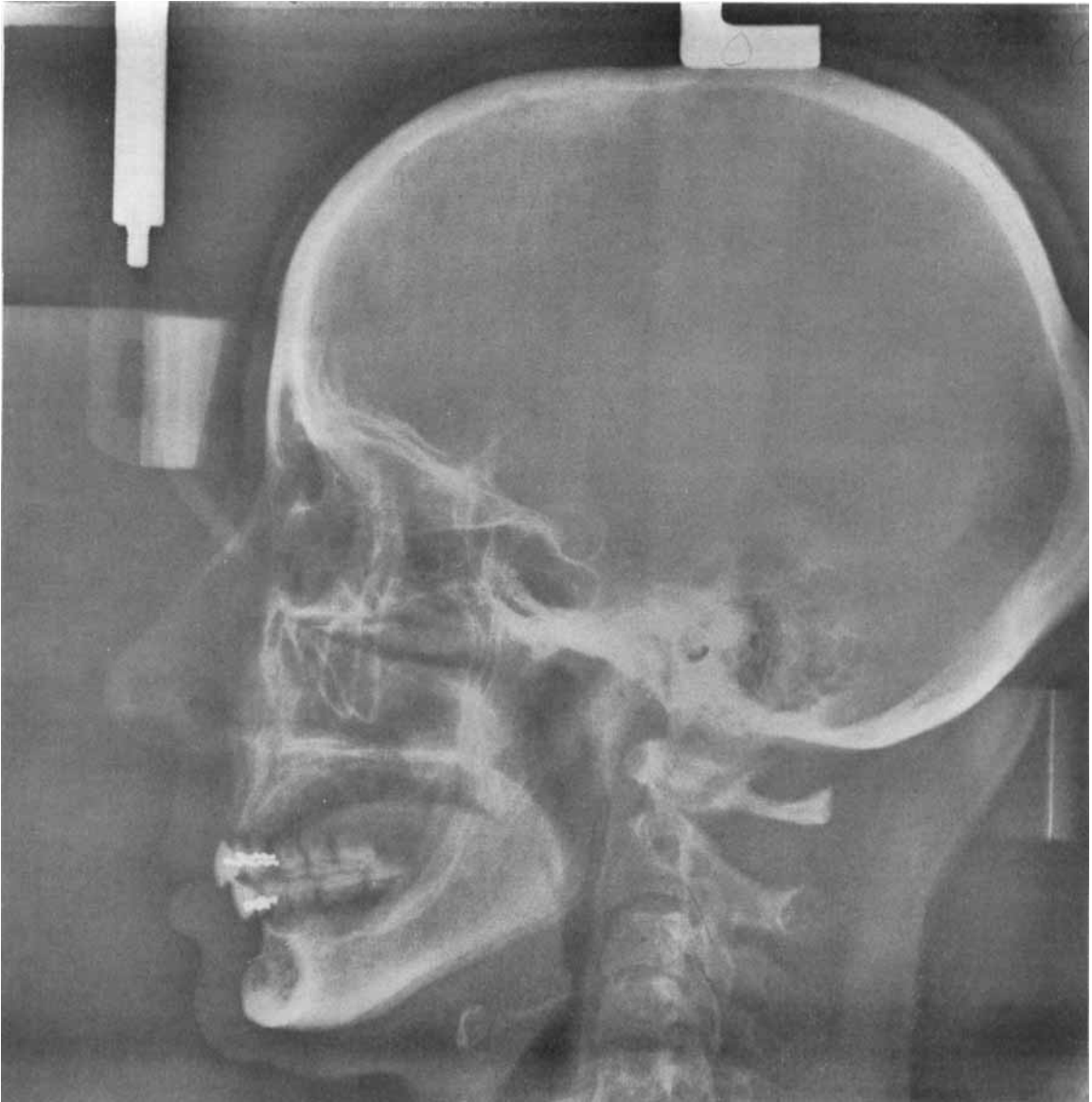


Fig. 26 b. Profile radiograph of the same subject (Fig. 26 a) in occlusal position after 7 years of denture wear.

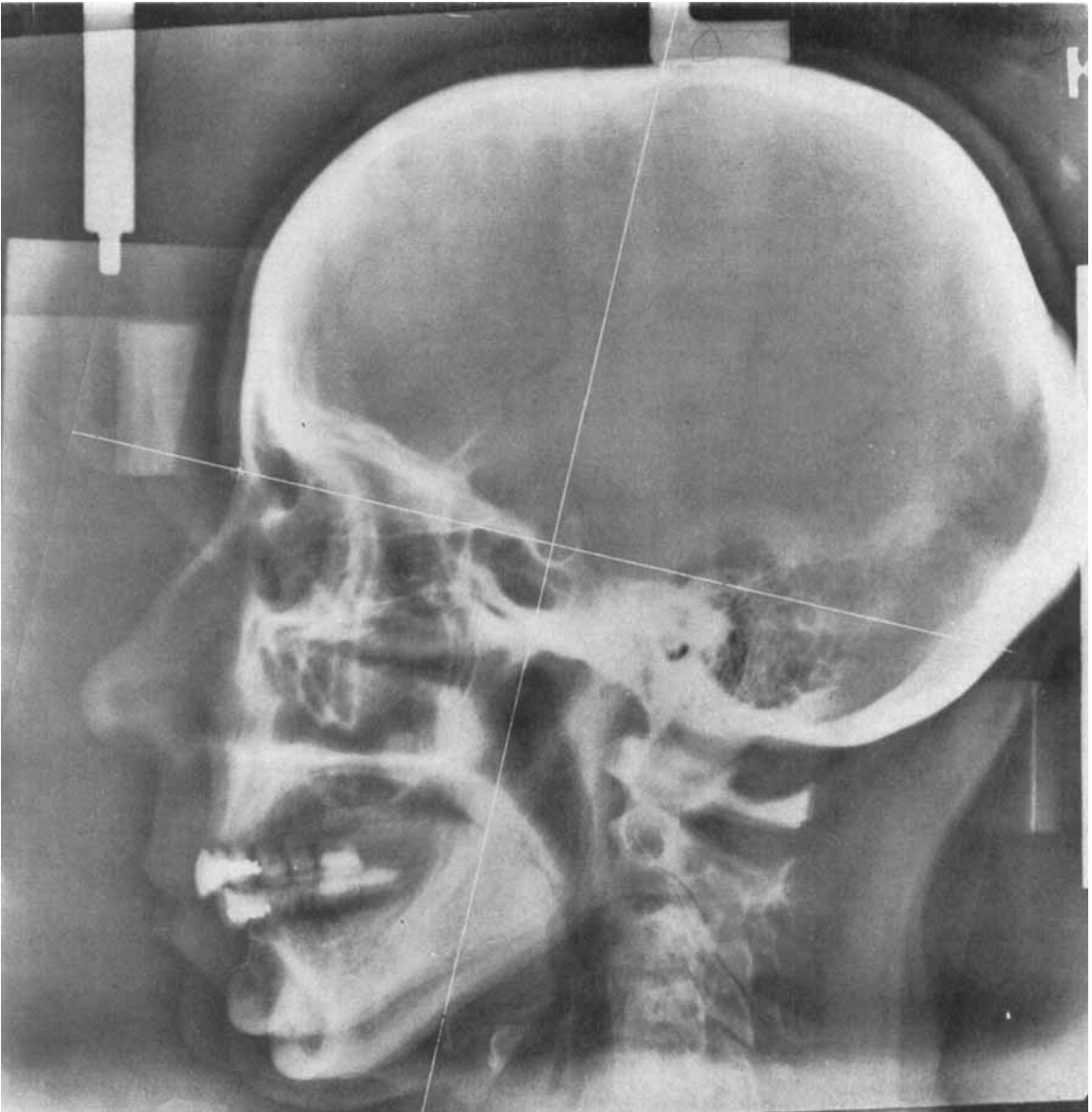


Fig. 26 c. Combined radiograph of Figs. 26 a and b illustrating the reduction in morphologic face height after 7 years of denture wear. This composite is produced by Logetronic technique, described by Björk (1966). For reduction in face height in this subject, see also the diagram in Fig. 14.

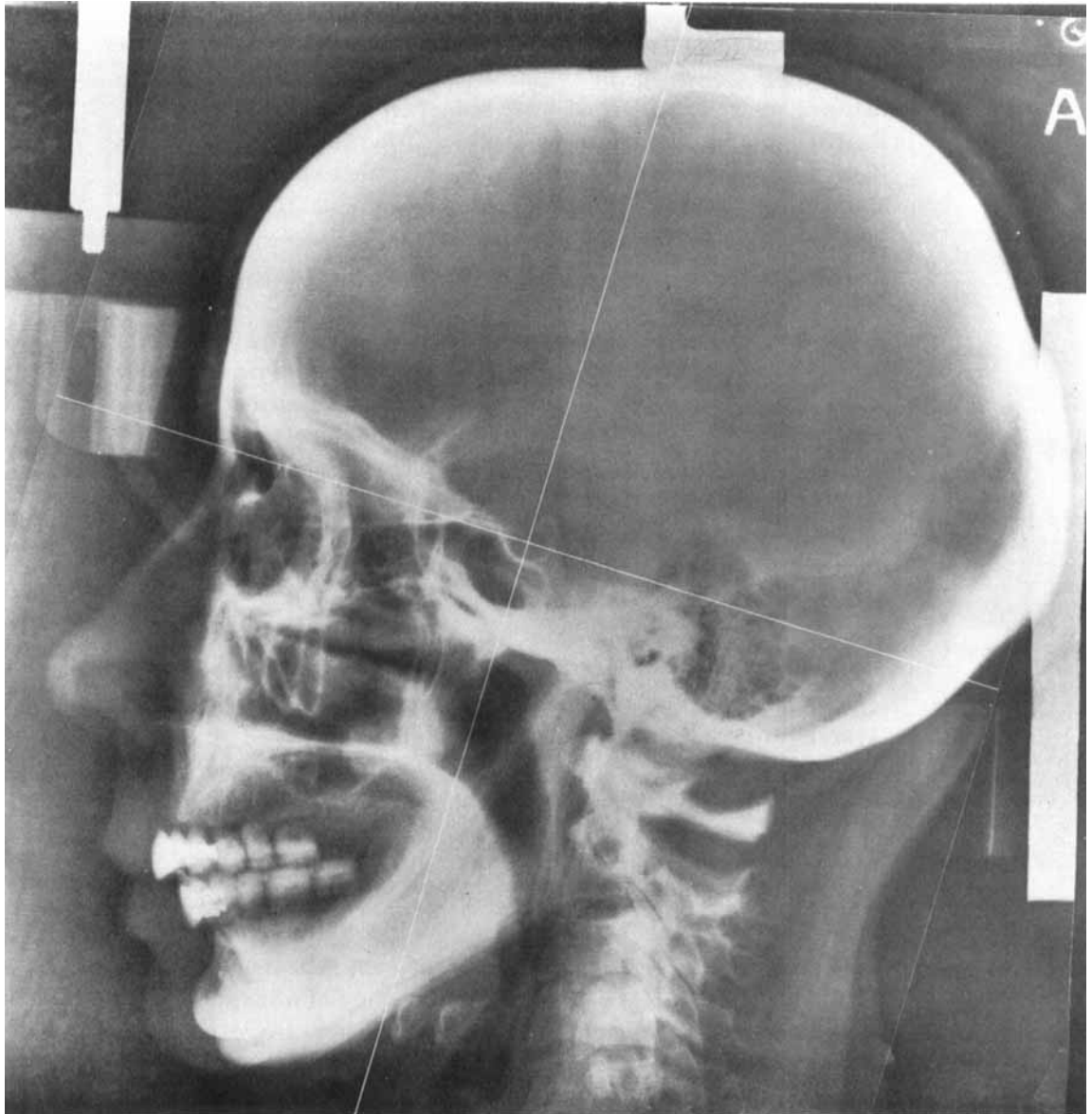


Fig. 27. Combined profile radiographs of the same subject (Figs. 26 a, b and c) in rest position with dentures illustrating the reduction in rest face height 7 years after insertion of the dentures.

The findings revealed a steady reduction of the morphologic face height following the initial decrease during the first year of denture wear. The marked total reduction noted in the complete denture wearers, which after 7 years of denture wear implied a highly significant drop to below the pre-extraction level, confirms the author's previous results in a cross-sectional study (*Tallgren, 1957*), according to which long-term regular wear of complete dentures leads to a considerable reduction in morphologic face height (Fig. 12).

On comparison of the reductions recorded during the 7-year period of observation it was found, as was already indicated in the initial study, that the most rapid and most extensive decrease occurred during the first half year of denture wear. Similar findings in various categories of denture wearers have recently been reported by *Swerdlow (1964)*, *Coccaro & Lloyd (1965)* and *Carlsson & Ericson (1965)*, the total period of observation being half a year, 1 year and 2 years, respectively. Thus, in the last-mentioned study, a considerable initial reduction was observed even in individuals wearing remade complete dentures after a previous denture experience of at least 5 years.

In the present study the mean decrease in the complete denture wearers during the first half year was about one third and in the partial denture wearers about half the total reduction noted after 7 years, the following periods exhibiting a gradual retardation in the rate of reduction.

As was already emphasized in the initial study, the main cause of the marked reduction obviously is attributable to resorptive changes of the osseous alveolar ridges. In light of the present findings, it seems reasonable to assume that this strong process of breakdown is a reaction against the variety of alien influences to which the osseous denture-bearing tissues are exposed to through the insertion and wearing of the dentures.

The morphologic changes related to long-term denture wear are not entered in the present study. It may, however, be pointed out here, as also illustrated in the Figs. 26 a, b and c, that the drastic reduction in the face height of the complete denture wearers after the 7-year period of observation was attributed to an extensive resorption of the mandibular alveolar process, and particularly the anterior region, whereas the maxillary ridge, as

a rule, exhibited surprisingly small changes. In the partial denture wearers the decrease in the face height was only half of that in the complete dentures wearers, although it too was considerable. In this group the reduction obviously was attributed to resorptive changes of the anterior maxillary ridge, which would imply a certain relationship to the remaining dentition in the opposite jaw.

In both groups of denture wearers the reduction in face height showed wide individual variation. It is difficult, however, to identify the factors responsible for this phenomenon.

In the complete denture wearers no correlation was demonstrable between the reductions during the different stages and the change in face height caused by the prosthetic treatment, a finding which is further borne out by the individual results (Figs. 13—19). That the correlation in the partial denture wearers was significant is probably due to the fact that the reduction was slower and less extensive than in the complete denture wearers. Thus, a certain direct proportionality resulted between the degree of increase and decrease (Figs. 20—25).

The results further indicated that the increase in occlusal vertical dimension in relation to the rest position of the mandible, determined by comparison with the interocclusal clearance both before and after extraction of the teeth, in neither of the groups played an essential part. The concept advanced by *Thompson* (1943, 1946), that an increase of the occlusal vertical dimension beyond the pre-extraction rest dimension is the initiating and decisive factor in regard to the resorption of the edentulous ridges, and that the resorption proceeds until the pre-extraction face height has been re-established, is not corroborated by the present findings.

In this connection it is interesting to note that in later studies along the same line as the present author's, *Swerdlow* (1964), as a result of immediate denture treatment, also found an increase of the pre-extraction morphologic face height, in spite of the use of various current methods for securing of the occlusal vertical dimension. *Carlsson & Ericson* (1965) likewise reported a considerable increase of the previous occlusal vertical dimension with dentures, the methods of determination, however, not been described. Furthermore, *Coccaro & Lloyd* (1965) in a study of complete denture wearers reported both increase and decrease

of the pre-extraction dimension, whereas *Duncan & Williams* (1960), using solely the rest position as a guide, found a marked average decrease.

These intriguing findings constitute evidence that the current methods for assessment of the occlusal vertical dimension in denture construction are not reliable and that the rest position, due to its inconstancy, further confirmed by the present study, is a hazardous reference position, if not properly judged.

In further accordance with the present author's findings, *Coccaro* and *Lloyd* in their 1-year study reported a decrease of the occlusal face height below the pre-extraction level irrespective of the alterations noted at the stage of insertion. *Swerdlow*, in his study of immediate denture wearers found a reduction of the pre-extraction dimension as soon as half a year after the insertion, the decrease likewise not being related to the degree of change caused by the prosthetic treatment.

The present results further indicate that the decrease during the different periods of observation was not dependent on the preceding or the initial reduction. The findings yield no evidence either, of any dependence of the resorption on age. In addition, it may be mentioned that no deviating tendency was observable in the abrasion cases, nor was there any evidence of deviation by sexes.

Although the results suggest that none of the factors analyzed decisively influenced the extent of the reduction, their roles in a wider causal context must not be overlooked. The variations between individuals, as well as within the individual during different observation periods, indicate that no single factor can be responsible for the development. As previously emphasized by *Atwood* (1957, 1962) the reason probably is to be sought in a complexity of factors, both anatomic, metabolic, neuromuscular, functional and prosthetic. Most probably the individual resistance factor, which may undergo change, determines the response to the various influences resulting from denture wear.

The results of the previous, cross-sectional investigation suggest that continued wearing of the dentures over a succession of years, will entail further resorption, and may lead to complete resorption of the alveolar ridges. An acceleration of this process may ensue from the combined effect of various factors. Thus, the loading

conditions may become more and more unfavourable owing to impaired fit and stability of the dentures and consequently impaired occlusal relationships. In this connection attention should also be paid to an increased response of the jaw musculature, as was indicated in electromyographic studies on long-term denture wearers (*Tallgren, 1963*), which in part may be a result of the closed vertical height, in part owing to a need to stabilize the dentures by biting hard.

The changes occurring in the rest face height during the long period of observation constitute further evidence that the rest face height adapts itself to alterations in the morphologic face height, as has been demonstrated in previous studies on different series (*Tallgren, 1957*). In addition, the marked total reduction after 7 years of denture wear confirms previous results in the cross-sectional study of long-term denture wearers, according to which the rest face height will continue to decrease even after re-establishment of the pre-extraction rest dimension.

These important findings further prove the inconstancy of the mandibular rest position, documented in the author's above-mentioned investigations and in an increasing number of reports, referred to in this paper.

In the two groups of study, the decrease in rest height with dentures accompanying the reduction in morphologic face height, followed a more or less similar course, resulting in a gradual increase of the interocclusal clearance. However, in spite of the significant differences between the two groups, in regard to the reduction in face height, no significant differences in interocclusal clearances could be demonstrated between them.

This finding further supports the author's previous opinion, that the changes in the rest position of the mandible due to alterations in occlusal vertical dimension or marked changes in the oral status, are attributable to a demand for maintenance or establishment of an appropriate rest space between the jaws. This oral rest space, with all probability, is regulated by the postural relationship between the oral components concerned, thus constituting the optimal condition for all physiologic functions commencing and terminating in posture.

In this connection the role of the tongue is of particular interest. The relation of the tongue at rest to the palate and

particularly to the lower incisors, and the change in its position due to loss of teeth and upon insertion and removal of the dentures, has previously been emphasized as a contributing factor to variations in the mandibular rest position due to the abovementioned conditions (*Tallgren, 1957, 1958, Atwood, 1958 and Berry & Wilkie, 1961*). *Fish (1964)*, in a study of complete denture wearers, demonstrated changes in the position of the tongue related to variations in rest position due to the state with and without dentures in the mouth, which confirmed his opinion "that the rest position of the mandible is determined by the demands of the tongue in performing its respiratory function of completing the anterior wall of the pharyngeal part of the respiratory tract".

In connection with this functional adaptation of the rest position, attention should also be directed to a variety of contributory factors — anatomic, muscular, neurophysiologic and prosthetic. Individual variations in the rest position as well as variations within the individual are probably, as emphasized by *Atwood (1958)*, accounted for by the complex interaction of these factors.

The muscular adjustment to variations in the mandibular rest position may be explained by a wide resting range in the muscles concerned, as indicated in electromyographic studies, i.e. by *Garnick & Ramfjord (1962)*. Thus, in electromyographic recordings of certain facial and jaw muscles in complete denture wearers (*Tallgren, 1961, 1963*) a normal, minimal postural activity, as a rule, was readily recorded both with and without the dentures in the mouth.

In this connection it is interesting to note that in the present series the difference between the rest face heights with and without dentures, which was considerable in both groups at the stage of insertion of the dentures, tended to diminish more rapidly in the partial denture wearers. This seems to indicate that the remaining dentition, perhaps as a mediator of impulses, but more likely as a stabilizer for the tongue at posture, contributed to the equalizing of the difference in the oral rest space with and without the dentures in the mouth.

The fact that during the continued course the rest face height without dentures decreased in both groups largely in conformity with the rest height with dentures would seem to imply, that an

adaptive shortening of the muscles due to the reduction of the occlusal vertical dimension had affected also their resting length. That during this course the difference between the two rest face heights tended to diminish also in the complete denture wearers, further suggests, as also indicated in electromyographic investigations on long-term denture wearers (*Tallgren, 1963*), a gradual neuromuscular adaptation to the change in oral conditions caused by the protracted denture wear.

CONCLUSIONS

The clinical consequences arising from the present study may be summarized as follows:

Protracted wearing of complete dentures causes a marked reduction of the morphologic face height due to resorptive changes of the osseous alveolar processes, which reduction is accompanied by a considerable decrease of the rest face height.

As previously emphasized, pre-extraction records of the occlusal vertical dimension as a guide for the determination of this dimension at denture construction are required and, furthermore, a regular control of this dimension after the first half year of denture wear is necessitated. The present results strongly indicate that the checks should be continuously performed at least once a year.

In order to enable correct adjustments, pre-extraction occlusal records by the roentgenographic cephalometric technique are recommended.

The rest position of the mandible, due to its inconstancy, further confirmed by this study, constitutes an unreliable reference for assessment of the occlusal vertical dimension.

SUMMARY

The changes in face height occurring in complete and partial denture wearers were studied in a longitudinal roentgenographic cephalometric investigation covering 7 years of denture wear. Of the test subjects in an initial study (*Tallgren, 1957*), who numbered 32 at a check after one year, a total of 31 attended at either or both of the later examinations, performed 3 years and 7 years

after insertion of the dentures. At the 7-year check the number of subjects examined was 23. For the distribution of the test-subjects over the different stages of the observation period a detailed account is given.

The results, which have been subjected to thorough statistical analysis, are shown in tables and diagrams.

After a marked reduction during the first half year of denture wear, an obvious, continuous decrease in morphologic face height was discernible in both groups. In the partial denture wearers the mean reduction was about half the reduction noted in the complete denture wearers, the difference between the groups being statistically confirmed.

After 7 years of denture wear, the complete denture wearers exhibited a marked total reduction of the morphologic face height, which at this stage was on average 7 mm lower than the pre-extraction dimension. In the partial denture wearers it had dropped to under the pre-extraction level in half the number of test subjects, the mean for the group being insignificant.

In both groups the reductions during the periods of observation showed wide individual variation. Correlations with several different factors indicated that none of the factors analyzed decisively influenced the extent of reduction.

The rest face height with dentures decreased in both groups in a similar way in relation to the reduction in morphologic face height, whereby a less marked decrease in the rest dimension was associated with an increase of the interocclusal clearance.

At the 7-year stage the rest face height with dentures was significantly lower than the pre-extraction rest dimension in both groups. In the complete denture wearers the mean difference of 5 mm was about four times greater than in the partial denture wearers.

The rest face height without dentures exhibited wider variations. After an initial reduction it was markedly lower than the rest face height with dentures in both groups, but the difference tended to diminish more rapidly in the partial denture wearers. During the later course the rest height without dentures in both groups decreased more or less in conformity with the rest height with dentures. Accordingly, at the 7-year stage it was reduced to below the pre-extraction rest level in both groups.

The findings of the present study call attention to undesirable changes in the masticatory system introduced by denture wear. The importance of regular examinations and necessary adjustments is further emphasized in order to reduce the risks associated with long-term denture wear.

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RÉSUMÉ

RÉDUCTION DE HAUTEUR DE LA FACE CHEZ DES SUJETS TOTALEMENT ÉDENTÉS ET PARTIELLEMENT ÉDENTÉS PORTEURS DE PROTHÈSES PENDANT UNE PÉRIODE PROLONGÉE

Les modifications de la hauteur de la face se produisant chez des porteurs de prothèses partielles et complètes ont été observées dans une étude longitudinale céphalométrique par radiographies, s'étendant sur 7 années de port des prothèses. Sur les 32 sujets qui s'étaient présentés à un contrôle effectué un an après l'étude initiale (*Tallgren*, 1957), 31 sujets au total se sont présentés soit aux deux examens ultérieurs effectués 3 ans et 7 ans après la pose des prothèses, soit à l'un de ces examens. Le contrôle au bout de 7 ans portait sur 23 sujets. Un compte-rendu détaillé est donné en ce qui concerne la distribution des sujets au divers stades de la période d'observation.

Les résultats, qui ont été soumis à une analyse statistique approfondie, sont présentés sous forme de tableaux et de diagrammes.

Après une réduction marquée pendant les six premiers mois du port des prothèses, une diminution continuelle manifeste de la hauteur morphologique de la face était perceptible dans les deux groupes. Chez les porteurs de prothèses partielles, la réduction moyenne par rapport à la hauteur immédiatement après la pose des prothèses était d'environ la moitié de la réduction

observée chez les porteurs de prothèses complètes, et la différence entre les deux groupes a été confirmée statistiquement.

Après 7 ans de port des prothèses, les porteurs de prothèses complètes présentaient une réduction totale marquée de la hauteur morphologique de la face, qui était à ce stade en moyenne de 7 mm inférieure à la dimension avant les extractions. Chez les porteurs de prothèses partielles, la valeur atteinte était inférieure à son niveau avant les extractions chez la moitié des sujets, la moyenne pour le groupe n'étant pas significative du point de vue statistique.

Dans les deux groupes, les réductions pendant les périodes d'observation présentaient des variations individuelles étendues. Des études de corrélation avec divers facteurs ont indiqué qu'aucun des facteurs analysés n'influçait de manière décisive le degré de réduction.

La hauteur de la face en position de repos avec prothèses a diminué dans les deux groupes de façon analogue par rapport à la réduction de la hauteur morphologique de la face, de sorte qu'une diminution moins marquée de la dimension en position de repos était associée à une augmentation de l'espace d'inocclusion au repos.

Au bout des 7 ans, la hauteur de la face en position de repos avec prothèses était significativement moins élevée que la dimension en position de repos avant les extractions dans les deux groupes. Chez les porteurs de prothèses complètes, la différence moyenne de 5 mm était environ quatre fois supérieure à celle trouvée chez les porteurs de prothèses partielles.

La hauteur de la face en position de repos sans prothèses présentait des variations plus étendues. Après une réduction initiale, elle était notablement inférieure à la hauteur de la face en position de repos avec prothèses dans les deux groupes, mais la différence tendait à diminuer plus rapidement chez les porteurs de prothèses partielles. Pendant la dernière période, la hauteur de la face en position de repos sans prothèses dans les deux groupes diminuait plus ou moins de la même manière que la hauteur en position de repos avec prothèses. Ainsi, au bout de 7 ans, elle atteignait une valeur inférieure à celle de la hauteur en position de repos avant les extractions dans les deux groupes.

Les résultats de la présente étude attirent l'attention sur les

perturbations introduites dans le système masticateur par le port de prothèses. L'auteur souligne encore l'importance que soient effectués des examens réguliers et les rectifications nécessaires, pour diminuer les risques associés au port prolongé de prothèses.

ZUSAMMENFASSUNG

DIE REDUKTION DER GESICHTSHÖHE BEI ZAHNLOSEN UND BEI TEILWEISE ZAHNLOSEN PATIENTEN WÄHREND LÄNGEREM PROTHESEN- GEBRAUCH

Die Veränderungen der Gesichtshöhe wurden bei sowohl Vollprothese- als auch bei Partiellprotheseträgern über sieben Jahre lang röntgencephalometrisch untersucht. Von 32 Versuchspersonen einer früheren einjährigen Untersuchung (*Tallgren, 1957*) nahmen 31 entweder an der einen oder auch beiden Nachuntersuchungen teil, die teils drei Jahre teils sieben Jahre nach Einsetzen der Prothesen vorgenommen wurden. Die Zahl der Nachuntersuchten nach sieben Jahren war 23. Die Verteilung der Versuchspersonen in den verschiedenen Untersuchungsphasen wird eingehend erläutert.

Die Ergebnisse, die statistisch analysiert wurden, werden in Tabellen und Diagrammen wiedergegeben.

Nach einer merkbaren Reduktion während des ersten halben Jahres war bei beiden Gruppen eine kontinuierliche Verringerung der morphologischen Gesichtshöhe sichtbar. Bei den Partiellprotheseträgern war die Reduktion durchschnittlich nur halb so gross wie bei den Vollprotheseträgern. Der Unterschied zwischen beiden Gruppen wird statistisch bewiesen.

Nach der siebenjährigen Periode war die Reduktion bei den Vollprotheseträgern 7 mm verglichen mit der Gesichtshöhe vor der Extraktion. Bei den Partiellprotheseträgern war eine Totalreduktion ebenso deutlich, doch kam diese bei der Hälfte der Versuchspersonen nicht unter die Präextraktionshöhe.

In beiden Gruppen offenbarte die Reduktion grosse individuelle Unterschiede. Vergleiche von verschiedenen Faktoren zeigten jedoch, dass keiner von diesen entscheidend für die Reduktion verantwortlich gemacht werden konnte.

Die Gesichtshöhe in der Ruhelage mit Prothesen wurde in beiden Gruppen in gleichem Verhältnis geringer wie die morpholog-

ische Gesichtshöhe, wobei jedoch eine geringere Verminderung der Ruhelagegesichtshöhe mit einer Vergrößerung des Interokklusalabstandes verbunden war.

Nach sieben Jahren war die Ruhelagegesichtshöhe beider Gruppen sichtlich geringer als vor der Extraktion. Die Verminderung der Präextraktionsruhehöhe war bei den Vollprotheseträgern durchschnittlich mit 5 mm ungefähr viermal so gross als bei den Partiellprotheseträgern.

Die Gesichtshöhe in der Ruhelage ohne Prothesen offenbarte grössere Variationen. Nach einer anfänglichen Reduktion in beiden Gruppen war sie ansehnlich niedriger als die Ruhelagegesichtshöhe mit Prothesen, bei den Partiellprotheseträgern schien sich der Unterschied jedoch schneller zu vermindern. Während des weiteren Verlaufs verminderte sich die Gesichtshöhe in der Ruhelage ohne Prothesen in beiden Gruppen mehr oder weniger in Übereinstimmung mit der Ruhelagegesichtshöhe mit Prothesen. Nach der siebenjährigen Periode war diese damit auch bis unter die Präextraktionsruhehöhe gesunken.

Die gegenwärtige Untersuchung lässt die Aufmerksamkeit gegenüber ungewünschten Veränderungen im Kauapparat auf Grund von längerem Gebrauch von Prothesen hervorrufen. Die Notwendigkeit regelmässiger Kontrolle und nötiger Korrekturen wird hervorgehoben, um ungünstigen Veränderungen bei längerem Prothesengebrauch entgegenzugehen.

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