Incidence of, and reasons for, tooth mortality among mentally retarded adults during a 10-year period

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The aim of the study was to investigate the reasons for, and incidence of, tooth mortality over a 10-year period in mentally retarded adults receiving regular dental care. The number of teeth present in 115 individuals (mean age in 1984 was 41.0, range 19–83 years) was registered in 1984 and 1994. The reasons for tooth mortality, medication utilization, frequency of dental care visits and cooperation during dental treatment were registered and related to tooth loss. The average incidence of tooth mortality was 3.72 teeth during the 10-year period. The mean number of dental care visits per year was 6.6. Most of the 428 teeth (58%) were lost due to periodontal disease. The preventive dental care given was not sufficient to arrest oral diseases. The data indicate, however, that achievement of cooperation in dental care situations not only makes dental treatment possible, but also leads to a decreased incidence of tooth mortality. □ *Cooperation; dental caries; longitudinal study; periodontitis; prevention*

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Oral health is an important aspect of quality of life. Our teeth influence our biological, psychological and social functioning. We use the mouth for chewing, biting, smiling and kissing, for breathing and for speaking. It is esthetically enhancing and sometimes it is a source of pain. In 1992, the United Nations Expert Group for Disabled Persons (1) agreed on a policy of normalization, integration, equality and full participation in society for mentally retarded persons. At the same time as the oral health of the normal Swedish adult population has been improving markedly during the last two decades (2–4), efforts have been made to achieve comparable dental health for mentally retarded adults.

Up until 1994, mentally retarded people in Sweden were offered dental care free of charge and also frequent preventive measures. In the process of their integration into society, dental care has led to improved oral health in some handicapped people (5, 6). Where improved oral health has not been achieved, the differences that remain may be a barrier to equality and participation in social life. In such cases, deteriorated dental health can lead to insufficient nutrition, inadequate esthetics, a lack of social relations and stretched finances.

Knowledge of the number of remaining teeth is one measure of dental health status. A cross-sectional study of the remaining teeth in mentally retarded persons will expose teeth lost during periods of neglect and teeth lost after dental care has become regular. Therefore a longitudinal study of the incidence of tooth mortality, limited to the period of regular dental care, can supply more information. Knowledge of the reason for tooth mortality can indicate if the preventive dental care has been successful in arresting dental caries and periodontal disease.

Longitudinal studies of tooth mortality in individuals with mental retardation are few. The incidence of tooth mortality during a 5-year period in young adults with Down's syndrome compared to persons with other forms of mental retardation has been studied by Saxén and Aula (7). Tooth mortality in normal Swedish populations has been examined in several longitudinal studies (2, 8). An average loss of 0.15 teeth per year was registered in both studies referred to.

The number of missing teeth in mentally retarded adults without regular dental care has been studied in several cross-sectional studies, and is shown to be high irrespective of living conditions (9–11). When mentally retarded persons, living integrated within society, have received regular dental care (5, 6, 12) the number of teeth missing has been observed to be similar to that of the normal population (2, 3, 8).

The reason for tooth mortality in adults with mental retardation has been described in only a few studies. In young adults with Down's syndrome, periodontitis was the main reason for tooth loss (7). In the normal population, caries has been observed to be the main reason for tooth mortality (8, 13–15). After 50 years of age, the significance of periodontitis as the reason for tooth mortality increases (13, 14). Periodontitis seems to have become more predominant in the last 20 years, probably due to the decreased prevalence of dental caries (15). The aim of this study was to investigate the reasons for, and incidence of,

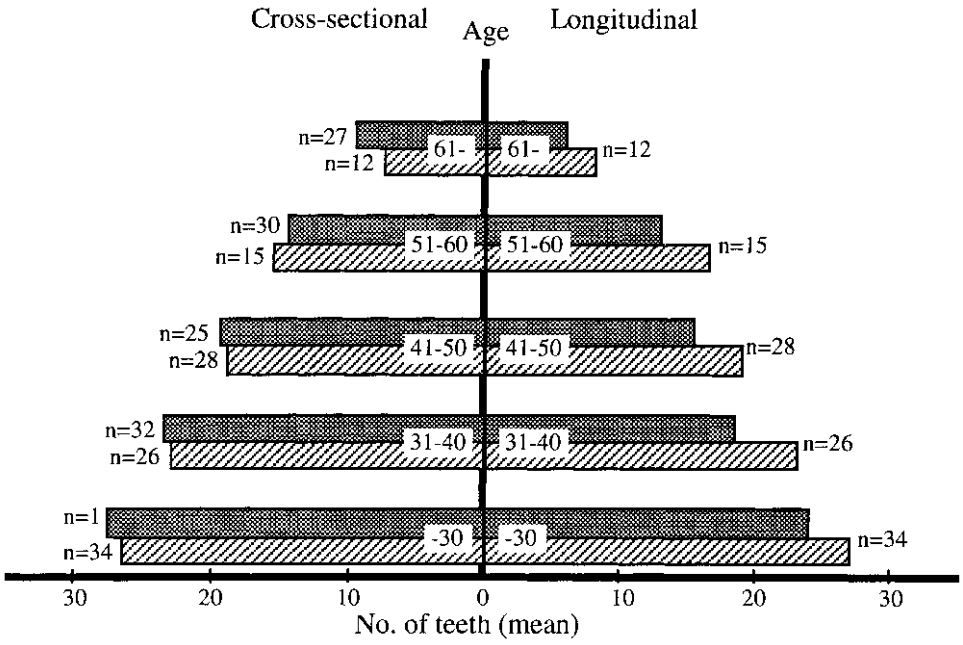

Fig. 1. Number of remaining teeth in 1984 and 1994 in different age strata (years). The left part of the figure shows the material used as a cross-sectional study. The paired bars show subjects in the same age strata ($n = 115$). The right part of the figure shows the material as a longitudinal study. The age (years) shown is the age of the subject at the examination 1984 ($n = 115$). (■ = 1994; ▨ = 1984).

tooth mortality over a 10-year period in mentally retarded adults who had received regular dental care.

Material and methods

At the end of 1983, there were 147 persons residing in an institution for the mentally retarded in Uppsala, Sweden. All of them were examined between September 1983 and October 1984. Ten years after the first examination it was still possible to re-examine 126 of them. During this period, 19 had died and 2 could not be traced. Eleven subjects were edentulous in 1984 and therefore excluded from the study. Thus the sample in this longitudinal study consists of the 115 re-examined subjects, all with their own natural teeth.

All the examinations in 1984 were carried out by one hospital dentist. The examinations in 1994 were done by a different hospital dentist. The clinical examinations were performed as part of a regular recall program using a mirror and dental probe.

The mean and median ages in 1984 were 41.0 (SD ± 13.47, range 19–83) and 40 years respectively; in 1994 they were 51.2 (SD ± 13.58, range 29–94) and 50 years. The age distributions in 1984 and 1994 are shown in Fig. 1. There were 65 men and 50 women in the study, 9 of whom were diagnosed as having Down's syndrome. Of the subjects studied, 60% were estimated to have a severe degree of mental retardation, 34% a moderate and 6% a mild mental retardation. The subjects studied had a total number of 2388 teeth in 1984.

All lived in an area with 1 ppm fluoride in the drinking water. Since 1984 or earlier, they had received an annual examination and dental treatment by the dentist. In addition, all subjects, on an individual dental caries and periodontitis risk level basis, visited a dental nurse or dental hygienist as often as the dentist estimated was necessary. The preventive dental care consisted of professional tooth cleaning, scaling, treatment with chlorhexidine and/or local applications of fluoride. The attendants accompanying the patients were given advice on diet and dental hygiene with the purpose of improving the subject's dental health.

Age, medication utilization and number of visits for preventive measures per year were registered from the patients' records. It was noted if cooperation during dental treatment was so poor that the patient required both physical restraint and premedication or general anesthesia. The total number and distribution of the remaining teeth were noted in 1984 and 1994. When teeth were lost during the 10-year period, the reason for the extraction was noted from the patient's record as one of the following diagnoses: 1. Dental caries (including pulpitis and apical periodontitis). 2. Periodontitis (including third molars extracted to prevent hygiene problems). 3. Other reasons.

The Mann-Whitney U-test was used for statistical analysis when comparing the number of teeth in persons

Table 1. Incidence of tooth mortality (mean ± SD) between 1984 and 1994 in relation to cooperation in dental treatment. Class 1: patient requires no special consideration in dental treatment. Class 2: patient requires mild physical restraint or premedication. Class 3: patient requires general anesthesia, conscious sedation or physical restraint for difficult treatment. Class 4: patient requires general anesthesia for all kinds of treatment (n = number of subjects)

	n	Incidence of tooth mortality	
Class 1	48	2.79*	(3.36)
Class 2	27	4.41	(5.40)
Class 3	30	3.47	(2.66)
Class 4	10	7.10	(3.90)

* Statistically significant at 95% Kruskal-Wallis test: class 1 vs class 4 ($P = 0.0162$).

of the same ages in 1984 and 1994. When three or more groups were compared, the Kruskal-Wallis test was used, verified by ANOVA. The difference between numbers of teeth in 1984 and 1994 was analysed by paired t test. The relationship between several variables was analysed using a standard multiple regression test. The analysis took the incidence of tooth mortality as the dependent variable and the following variables as independent: the number of visits for dental care, age, gender, cooperation during dental treatment and the number of teeth in 1984. The analysis was made using StatView 4.01 (Abacus, Berkeley, CA, USA) on a Macintosh Performa 5400/160. A 5% level of significance was used.

Results

Of the subjects studied, 35% had serious difficulties cooperating during dental treatment (the patient required both physical restraint and premedication or general anesthesia). Ten subjects needed general anesthesia for all kinds of dental treatment, including preventive dental care (Table 1). The majority of the mentally retarded individuals (63%) were on medication. Neuroleptics and anticonvulsants were predominant (Table 2). Only the subjects who used medication during the entire period

Table 2. Incidence of tooth mortality (mean ± SD) between 1984 and 1994 in relation to use of medication. Only subjects with medication during the entire 10-year period were registered as medication users (n = number of subjects)

	n	Incidence of tooth mortality	
Neuroleptics	34	2.35*	(3.17)
Anticonvulsants	23	3.48	(4.80)
Combination anticonvulsants and neuroleptics	8	4.00	(2.67)
Other medication	8	2.13	(1.64)
No drugs	42	5.21	(4.18)

* Statistically significant at 95% Kruskal-Wallis test: neuroleptics vs no drugs ($P = 0.0028$).

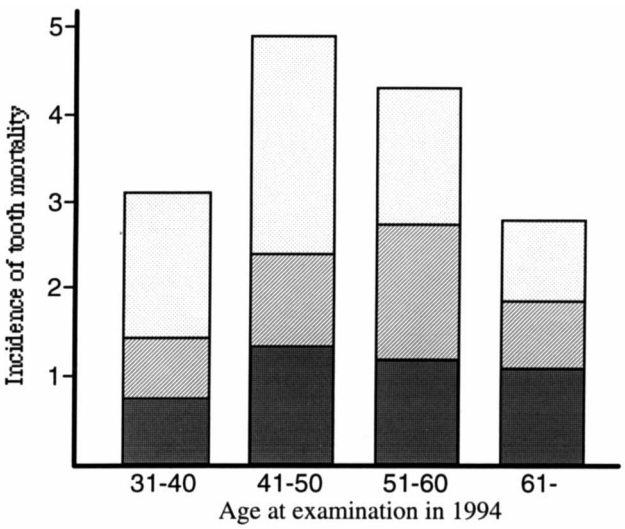

Fig. 2. The incidence of tooth mortality between 1984 and 1994 related to tooth type and age at examination 1994 (n = 114). One subject without incidence of tooth mortality and less than 31 years is excluded. (■ = Anterior teeth; ▒ = premolar; □ = molars.

studied were registered. Most had visited the dentist, the dental hygienist and/or the dental nurse frequently for preventive measures (Table 3).

The mean number of teeth remaining in 1984 was 20.7, compared to 17.0 teeth in 1994 ($P < 0.0001$). There was continuous incidence of tooth mortality during the period studied. Using the material as a cross-sectional study, and comparing the same age strata between 1984 and 1994, the mean number of remaining teeth after the 10-year period was higher in all age strata except ages 51–60 years (Fig. 1). This improvement was not statistically significant. On the second examination, 4 subjects had lost all their teeth.

Altogether 428 teeth were lost during the period studied. The subjects had an average incidence of tooth mortality of 3.72 teeth between 1984 and 1994. There were minor differences between the age strata. Subjects between 41 and 50 years (the age at examination in 1994) had lost the most teeth and subjects older than 61 the least (Figs. 1 and 2, Table 4). Subjects who used neuroleptics during the 10-year period had lost significantly fewer teeth than those who did not use medication at all or just

Table 3. Incidence of tooth mortality (mean ± SD) between 1984 and 1994 in relation to the number of dental visits per year (n = number of subjects)

Visits/year	n	Incidence of tooth mortality
0–2	4	6.50 (3.51)
3–5	39	3.72 (4.76)
6–9	46	3.07 (3.32)
10–	26	4.46 (3.72)

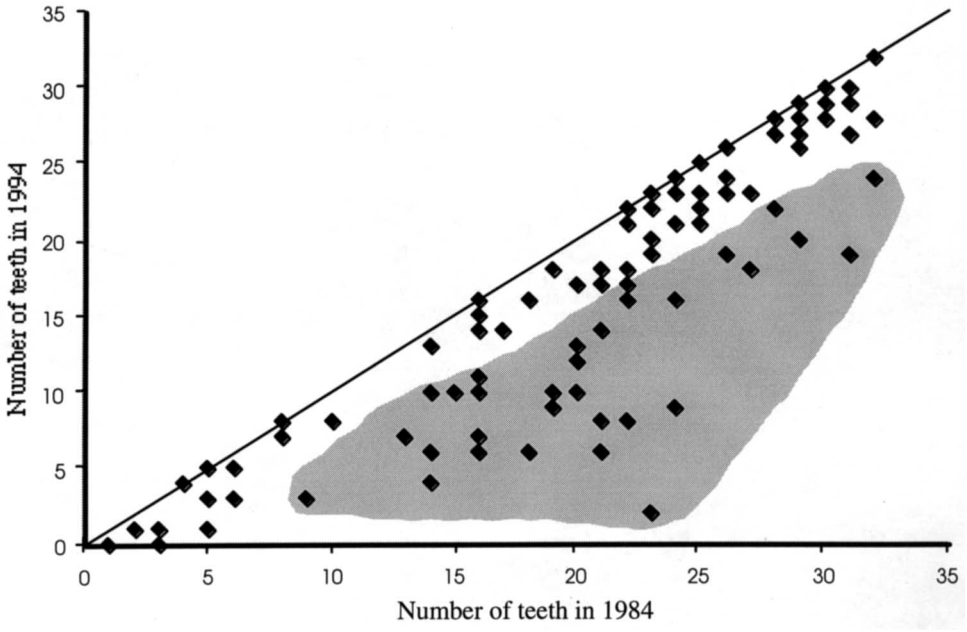

Fig. 3. The number of teeth in 1994 in relation to the number of teeth in 1984. Subjects on the line have no tooth mortality and subjects in the marked area have lost 5 teeth or more during the period studied ($n = 115$).

medicated during part of the period studied. No other clear differences could be observed between individuals on different medication (Table 2). Individuals who had dental care twice a year or less had lost more teeth than those who had more frequent visits. The difference was not statistically significant ($P = 0.08$). No differences in incidence of tooth mortality could be seen between the groups who visited the dental clinic more often than twice a year (Table 3). Subjects who did not cooperate at all lost more teeth than individuals who readily accepted dental treatment (Table 1). The incidence of tooth mortality is related to tooth type and age in Fig. 2. Even in the youngest age strata anterior teeth were lost.

Individuals who had lost the most teeth in 1984 continued to have a relatively higher incidence of tooth mortality during the 10-year period (Table 4). Of the subjects studied, approximately 25% had no tooth mortality at all between 1984 and 1994. The same proportion of individuals had a serious loss of teeth (5 or more teeth during the 10-year period) (Fig. 3).

Of the 428 teeth extracted, 58% were lost due to periodontitis, 36% due to dental caries and in 6% there was another diagnosis for tooth loss. Individuals under 50 years of age had lost twice as many teeth due to periodontitis as due to dental caries. However, the distribution was unequal. Eight individuals had lost 87 of the 136 teeth lost as a result of periodontitis. Individuals over 50 years of age had lost an equal number of teeth due to dental caries as due to periodontitis. An equal number of individuals had lost teeth due to caries as due to periodontitis, but if the subject had lost a high number of teeth, the reason was usually periodontitis (Fig. 4). Nine teeth (2%) were lost because of trauma.

The standard multiple regression test showed a relationship between number of dental care visits per year ($P = 0.013$) and cooperation in dental treatment

Table 4. Incidence of tooth mortality (mean ± SD) between 1984 and 1994 in relation to the number of teeth in 1984, described as counts and per cent (n = number of subjects)

No. of teeth in 1984	n	Age in 1984 (mean)	Incidence of tooth mortality 1984–1994	Incidence of tooth mortality in relation to present teeth 1984 (%)
1–8	16	58.1	1.69 (1.35)	47.94 (39.73)
9–16	19	48.8	4.58 (3.61)	32.26 (25.11)
17–24	35	40.7	5.49 (5.22)	25.80 (24.52)
25–32	45	31.8	2.71 (2.94)	9.56 (10.48)

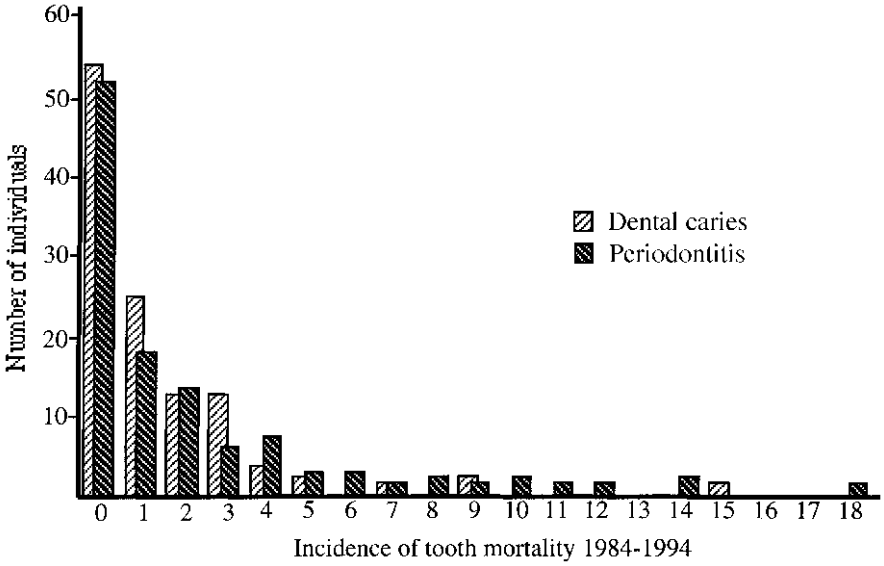

Fig. 4. Distribution of subjects according to incidence of tooth mortality between 1984 and 1994 and the reasons for tooth mortality ($n = 115$).

($P = 0.047$) and the incidence of tooth mortality due to dental caries. The only variable related to the incidence of tooth mortality due to periodontal disease was cooperation in dental treatment ($P = 0.044$). The more the visits for dental care per year, and the worse the cooperation during dental treatment, the higher the incidence of tooth mortality registered.

Discussion

The study shows that the incidence of tooth mortality in adults with mental retardation was equal in all age strata and that the majority of teeth were lost due to periodontal disease. The number of remaining teeth in the present study in both examinations was higher than has been reported in several other studies of mentally retarded individuals (9–11). One possible explanation for this difference could be that the investigations included subjects both with and without regular dental care. In a Norwegian study of mentally retarded persons with regular dental care, the number of teeth remaining is similar to that found in the present study (16). Other studies have shown that individuals with mild mental retardation, but without Down's syndrome, living integrated within society and with regular dental care have a number of remaining teeth comparable to the normal population (5, 6).

A reduction in tooth mortality in the normal Swedish population has been reported repeatedly in cross-sectional studies (2–4). If this present study is taken as a cross-sectional study, the mentally retarded individuals showed the same trend, the only difference being that they had fewer teeth than the normal population in all age strata except in the age group 20–30 years.

The mentally retarded subjects lost an average of 3.72 teeth during the period studied. The only longitudinal study of mentally retarded subjects that we found is that of Saxén and Aula (7), where individuals with Down's syndrome were compared with individuals with another diagnosis of mental retardation. The mean number of teeth lost was low, 0.7 teeth during a 5-year period. The low mean age of the Finnish subjects (approximately 20 years) may partly explain the differences in tooth loss compared with our study. In the Saxén and Aula study, subjects with Down's syndrome were responsible for 89% of the tooth loss. In our study, the 9 individuals with Down's syndrome (mean age 30.6 years in 1984) had lost an average of 8.67 teeth during the period studied.

The mean tooth loss in normal Swedish populations has been reported to be low; 1.5 teeth in 11 years and 0.9 teeth in 5–7 years (2, 8). Thus the mentally retarded individuals in the present study lost more teeth than would be expected in a normal Swedish population. In contrast to our data, Håkansson (2) reported a low number of lost teeth for subjects younger than 50 years of age compared to subjects older than 60 years of age. One explanation for the lower number of tooth mortality in individuals older than 60 in the present study could be that they had less than half of the number of teeth when the study started compared to the normal population older than 60 years of age.

Frequent visits for preventive dental care might have decreased the number of teeth lost. Our results show no differences in tooth mortality when the number of visits per year is taken into account, except for subjects who

received dental care twice a year or less. One explanation could be that the right individuals were selected for frequent visits. Those who came less frequently for dental care may have had less dental disease activity and consequently lost approximately the same number of teeth as the frequent visitors. Of the persons who received dental care frequently, treatment may not have been adequate to stop the disease, but without treatment the loss of teeth may have been even greater. It is also possible that the frequent dental care visits increased the treatment cooperation, and that teeth could be treated conservatively instead of being extracted. On the other hand, it cannot be excluded that the frequent dental care given had no, or only limited, influence on the tooth mortality.

Individuals who did not cooperate at all in the dental treatment situations had lost more teeth than those who cooperated well. Subjects who had difficulty cooperating, but could manage simple treatment, such as preventive dental care, had lost fewer teeth than individuals who offered no cooperation at all. Poor cooperation may have led to the fact that fewer affected teeth were diagnosed and treatment of these teeth was delayed. Sedation or general anesthesia was required and extraction of teeth instead of restorative therapy became the treatment of choice. Individuals who used neuroleptics had lost significantly fewer teeth than those who did not medicate at all. One possible explanation could be that the medication helped the individuals to cooperate, and that restorative treatment became possible. Of the subjects classified as non-drug-users, 17 would have belonged to other medication groups if use of medication during a part of the 10-year period had been the basis for classification.

Molars have been reported to be lost more often than other teeth in normal populations (2, 13). In a normal Swedish population, loss of anterior teeth in individuals younger than 40 years of age is extremly rare (2). In our study, persons between 31 and 40 years of age had a mean loss of 0.7 anterior teeth during the period studied. A possible explanation may be that subjects with Down's syndrome were responsible for the majority of the lost anterior teeth. Another explanation could be that esthetic considerations had less influence on treatment in mentally retarded persons.

To register the reason for tooth extraction, a retrospective study of the patient's dental records was carried out. When more than one reason for extraction was stated, the most imported diagnosis was estimated. In this study, periodontitis was the main diagnosis for tooth extraction, which is in line with the study by Saxen and Aula (7). In other studies, non-dental reasons for tooth extractions have been reported to be important (17). The subjects in this study had no financial limitations and a request for a certain treatment from the patient/family was unusual.

The reasons for tooth extraction differed in mentally retarded individuals compared with what has been reported in the normal population. In contrast to the normal population, in ages under 50 years, most of the teeth lost during the period studied was due to periodontal disease. Our observation that periodontitis was the main reason for tooth mortality is supported by data from other studies (7, 9, 10, 16). The high prevalence of periodontal disease may be explained by the difficulties mentally retarded individuals have maintaining good oral hygiene. Furthermore, there are genetic defects in some mentally retarded individuals that may decrease the resistence to periodontal diseases (18). This may explain why young individuals had lost several teeth due to periodontitis. The severe mental retardation of subjects living in an institution leads to a more structured life with less opportunity to eat snacks between meals. Thus life in an institution and severe retardation correspond with a low incidence of caries and a high incidence of periodontal disease.

The results of this study indicate that the preventive care the subjects received was insufficient to prevent loss of teeth due to oral diseases such as caries and periodontal disease. The data also indicate that the achievement of cooperation in dental care situations not only makes dental treatment possible, but also leads to a decreased incidence of tooth mortality. There is thus a need for improved methods for achieving cooperation for individuals with mental retardation. Behavioral science and adapted pedagogy could increase possibilities of managing dental treatment for the mentally retarded. Individuals unable to learn to cooperate are in the greatest need of more efficient preventive and treatment measures.

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