

Effects of 0.2% chlorhexidine spray applied once or twice daily on plaque accumulation and gingival inflammation in a geriatric population

Javier Clavero, Pilar Baca, Pilar Junco and M^a Paloma González
School of Dentistry, University of Granada,
Campus de Cartuja, Colegio Máximo s/n.
18071, Granada, Spain

Javier Clavero, Pilar Baca, Pilar Junco, M^a Paloma González. Effects of 0.2% chlorhexidine spray applied once or twice daily on plaque accumulation and gingival inflammation in a geriatric population. J Clin Periodontol 2003; 30: 773–777.

© Blackwell Munksgaard, 2003.

Abstract

Background/aims: Chlorhexidine (CHX) spray has proven to be an easily applicable method for the chemical control of plaque in elderly and handicapped patients. A randomized double-blind cross-over placebo-controlled trial was undertaken to compare the effects of 0.2% CHX spray applied once or twice daily on the plaque and gingival indexes in 13 institutionalized elderly patients.

Method: The study subjects were randomly assigned to one of two groups. During the first 30-day period, one group received 0.2% chlorhexidine spray twice daily and the other received 0.2% CHX spray once daily plus placebo spray once daily. A washout period of 42 days then followed, after which the groups were interchanged and the process was repeated for another 30-day period. Plaque index and gingival index were determined at the beginning and end of each period. The patients continued with their usual oral hygiene practices throughout the study.

Results: A significant reduction in plaque and gingival indexes was produced in both the groups. There were no significant differences in index scores between the groups.

Conclusions: The results of the present study suggest that a single-daily application of 0.2% CHX spray is equally as effective in reducing plaque accumulation and gingival inflammation in institutionalized elderly patients as are two-daily applications of the same spray.

Key words: chlorhexidine spray; elderly; plaque index; gingival index

Accepted for publication 7 November 2002

Elderly patients now retain their teeth for a longer time and are, therefore, increasingly susceptible to oral disease, including periodontal disease. Moreover, the reduced manual dexterity of some elderly groups compromises their ability to control plaque. Poor oral hygiene is a common finding in institutionalized elderly populations (Kiyak et al. 1993, Rodríguez Baciero et al. 1998). The chemical control of plaque and gingivitis is an effective method to complement or replace mechanical removal (Mann et al. 1984). Chlorhexidine (CHX) (0.2% or 0.12% w/v) has

proven efficacious in the control of plaque and gingivitis (Axelsson & Lindhe 1987) and would seem to be of particular value in patients with reduced ability to perform adequate oral hygiene procedures. Supervised CHX mouth rinse regimens in the elderly and in populations with special needs have produced reductions in plaque levels and gingivitis (Persson et al. 1991, Al-Tannir & Goodman 1994).

Although the mouth rinse is a simple and acceptable method to deliver CHX into the oral cavity, some individuals, including many elderly patients, find its

use time-consuming and difficult. The method of CHX application is critical in individuals with diminished mechanical capabilities, because the degree of its acceptability will impact on long-term compliance with treatment programs.

The spray form offers a very simple method of applying CHX and is usually well accepted by patients and caregivers. It is not the most clinically effective system (Francis et al. 1987a, b), but it is associated with fewer adverse effects (Francetti et al. 2000). Various studies on the efficacy of 0.2% CHX spray applied twice a day as the

sole means of plaque and gingivitis control have shown it to be equally as effective as a mouth rinse at the same concentration, despite the fact that the spray delivers one-seventh the dose administered in the mouth rinse form (Kalaga et al. 1989a, b, Francis et al. 1987b). Applications of CHX spray twice daily at lower concentrations, such as 0.12% (Burtner et al. 1991) and even 0.06% (Steelman et al. 1996), or once daily at 0.2% (Dever 1979), have also been shown to control plaque and gingivitis efficaciously in the disabled.

We could find no study that evaluated the efficacy of this spray in the elderly or that compared the effects of using one application per day instead of two, which would evidently simplify the treatment protocol. The present investigation aimed to determine whether a once-daily application 0.2% CHX spray is as efficacious as a twice-daily application to control plaque and gingivitis in a group of institutionalized elderly as a complement to their usual oral hygiene practices. In these individuals, the delivery of the correct dose of CHX to the tooth surface should be optimized through the judicious use of a specific regimen.

Material and Methods

Study subjects

Thirty elderly individuals were initially recruited for the study from a residential home for the elderly in Granada (Spain), a city with low fluoride content (0.07 ppm F ion) in the drinking water. From this group 16 individuals (six male, 10 female) were selected, who could give informed consent and fulfilled the following inclusion criteria: age over 65 years, possession of at least six teeth, no serious disease, and no intake of antibiotics 4 weeks before the study or during the study period. Thirteen elderly individuals did not meet all the criteria and one who fulfilled them refused participation.

The study was approved by the Ethics Committee of the School of Dentistry of Granada University. There was no preventive dental program (brushing, fluoride rinse, fluoride tablets, etc.) and none was implemented during the study period. Subjects were instructed to maintain their regular oral hygiene habits.

Study regimen

The clinical trial was a double-blind cross-over study. The elderly were assigned by a simple randomization method to one of two groups. One group received one application daily of 0.2% CHX spray (Perio Kin Spray, Laboratorios Kin, Barcelona, Spain) plus another daily application of a placebo spray of the same taste and color supplied by the same laboratory. The other group received two-daily applications of 0.2% CHX spray (Perio Kin Spray[®]). After a 30-day application period, there was a 6-week period without spray applications. After this washout period, the groups were interchanged and the process was repeated.

Two sprays were assigned to each patient, labeled to indicate which was to be taken in the morning and which in the evening. The subjects and caregivers were instructed that applications should be made twice daily, after breakfast and evening meal, using five bursts of spray at each application, all directed at the buccal surface of the teeth at the following localizations: upper right posterior, lower right posterior, upper left posterior, lower left posterior and a single spray to the anterior region keeping the teeth occluded. The spray was applied without removing prostheses. This regimen was maintained regardless of the absence of teeth in any of these areas. The solution was left to act for about 1 min, moving the tongue to obtain greater distribution of the solution, after which the excess liquid was expectorated. Each burst of spray delivered approximately 0.2 ml of solution (1 ml in each application). The patients themselves applied the spray under the supervision of their caregivers, who helped those with any difficulties.

Clinical examination and statistical procedures

Two study subjects were lost during the first study period (one died and the other left to live with family due to illness) and one during the second period (absent on holiday). The present study reports only the results for the 13 subjects followed up for the entire study period.

The data and clinical variables collected at baseline included the subject's age, gender, current medication and relevant medical history, number of

teeth, number of caried and filled teeth, plaque index, and gingivitis index. The last two indexes were gathered again at the end of the first treatment period, at the end of the intervening washout period, and at the end of the second treatment period. All examinations were performed under standardized conditions and at the same time of day throughout the study, using an explorer and a flat mirror. Caries was scored according to World Health Organization criteria (WHO 1988). The plaque index of Silness & L oe (1964) was used to assess the dental plaque accumulation, and the gingival index of L oe & Silness (1963) was used to measure gingival inflammation. After the baseline examination, the subjects were issued a report on any restorative treatment needed.

The final study population comprised nine females and four males with a mean age of 76.77 years, ranging from 66 to 99 years. The mean number (\pm SD) of teeth was 18.53 ± 7.81 , and the mean number of decayed and filled teeth was 4.53 ± 2.96 and 1 ± 1.87 , respectively. Only four women wore prostheses, all removable: two partial upper and lower, one partial upper, and one complete upper.

All clinical measurements were determined in a blinded fashion by a single examiner. Before the beginning of the study, the examiner received training in making clinical measurements for plaque accumulation and gingival inflammation. He was calibrated against another experienced examiner, with the requirement for a κ value of at least 0.60.

In order to study the decrease of both plaque and gingival indexes from baseline state, a one-tail Wilcoxon test was determined. On the other hand, a two-tail Wilcoxon test was also applied to compare the effect between the groups. The significance level was $\alpha = 0.05$.

Results

By the end of the washout period, the plaque and gingival indexes had increased to reach similar values to those at baseline, with no statistical differences (results not shown).

The mean (\pm SD) plaque and gingival scores at baseline were 1.98 ± 0.77 and 1.77 ± 0.53 , respectively, in the CHX1/day+placebo group, and 2.13 ± 0.71 and 1.69 ± 0.47 , respectively, in the CHX2/day group. After

30 days of CHX spray applications, the reductions in plaque and gingival indexes were significant in both the groups (Table 1). Neither the reduction in plaque index ($p = 0.19$) nor the reduction in gingival index ($p = 0.72$) was significantly different between the groups.

Discussion

The present study aimed to evaluate whether one-daily application was as effective as two-daily applications of 0.2% CHX spray for the control of plaque and gingivitis in the institutionalized elderly who continued with their usual oral hygiene practices. When medicines or therapeutic regimens are prescribed to dependent elderly populations who may require the assistance of caregivers, careful consideration should be given to the degree of acceptance by the patient and the compliance of caregivers. The simpler the procedure, the greater is the acceptance (Burtner et al. 1996).

In our study, it is possible that the population selected for study after applying the inclusion criteria had lower plaque and gingival indexes than the other elderly people living in the residential home. However, our study group had high baseline plaque and gingivitis scores, in common with findings of other studies of the institutionalized dentate elderly (Simons et al. 2001). These results clearly show the need for more aggressive oral hygiene or chemical plaque control efforts, which should be maintained in order to preserve the benefits over time. Although a residual beneficial effect has been reported 4 weeks after the final

administration of chemical plaque control (Burtner et al. 1991), we found that plaque and gingival index scores returned to baseline levels during the 42-washout period after the treatment ceased. On the one hand, our results confirm that the washout period was adequate, and on the other, they indicate that the spray treatment must be continued.

The usual CHX mouth-rinse or spray regimen is for two applications daily. We aimed to compare the efficacy of a one-daily application, which (1) would decrease treatment costs, (2) may reduce adverse effects, (3) would be easier to include in the daily routine, improving long-term compliance. It has already been reported that one-daily application of a 0.2% CHX spray reduces plaque levels and gingival inflammation in mentally handicapped children (Dever 1979) and even a weekly application of 0.2% CHX mouth rinse was shown to improve periodontal conditions in a geriatric population (Persson et al. 1991).

The 0.2% concentration of CHX was selected because it has been shown to have greater effect than lower concentrations (Jenkins et al. 1994) and because of the low amounts of the product that we planned to deliver. The spray application delivered a total of 1 ml (0.2% CHX1/day+placebo) or 2 ml (0.2% CHX2/day), a total of 2 or 4 mg of CHX, i.e., one-fifth or one-tenth of the oral rinsing dose for effective plaque reduction. Other studies of spray applications in the handicapped used doses within the same range, always distributed in two-daily applications (Burtner et al. 1996, Steelman et al. 1996, Francis et al. 1987b, and Kalaga et al. 1989b).

A limitation imposed by the choice of a cross-over design without a control was that only between-treatment differences could be analyzed with confidence. Within-treatment analysis would have to be interpreted with care. The use of the 0.2% CHX spray for 30 days produced significant reductions in the plaque and gingival indexes, both when applied once daily and when applied twice daily, and no differences were found between the two regimens. There may be three possible reasons for this finding: (1) the composition of the CHX and placebo spray solutions may have played a role. The CHX may have been inactivated by other components of the solution, although this seems unlikely given the major reductions in plaque and gingival indexes. On the other hand, it is possible that another component of the sprays besides CHX had antimicrobial action, so that the placebo might also have acted against the bacterial plaque. However, the composition of the spray did not include alcohol or any other active principle; (2) a Hawthorne effect may have occurred, so that when the subjects used the spray they also improved their hygiene practices, which could have contributed to the reduction in their plaque and gingival indexes; (3) the caregivers maintained a high level of supervision and the acceptance of the spray by the elderly was very good, ensuring good compliance with the regimen. In relation to mouth rinses, the first reports indicated that once-daily rinses of CHX are less effective than twice-daily ones (Löe & Schiott 1970). In contrast, and somewhat surprisingly, Persson et al. (1991) obtained similar reductions in plaque and gingival indexes when they compared the outcomes of one-weekly application with one-daily application of 0.12% CHX mouth rinse. It has been demonstrated that the use of 0.2% CHX spray twice daily reduces plaque and gingival index scores (Francis et al. 1987b, Chikte et al. 1991). Similar effects have been shown with a once-daily application. A cross-over double-blind study (Dever 1979) showed a significant reduction in plaque levels and gingival inflammation when 0.2% CHX spray was applied once daily, although the amount of CHX solution (5 ml) was much greater than that used in the present study.

The action mechanism of the CHX spray may in part explain the effect of a single-daily application. Bacteriostatic

Table 1. Effects of spray CHX 1/day+placebo and spray CHX 2/day on changes in plaque and gingival indexes (means \pm SD)

Variable	Spray CHX 1/day+placebo	Spray CHX 2/day	Comparison <i>p</i> -value**
Plaque index $n = 13$			
Baseline	1.98 (0.77)	2.13 (0.71)	$p = 0.53$ (NS)
Decrease	0.78 (0.52)	0.97 (0.54)	$p = 0.19$ (NS)
Signif. of decrease*	$p = 0.0013$	$p = 0.0008$	
Gingival index $n = 13$			
Baseline	1.77 (0.53)	1.69 (0.47)	$p = 0.97$ (NS)
Decrease	0.60 (0.52)	0.42 (0.31)	$p = 0.72$ (NS)
Signif. of decrease*	$p = 0.0011$	$p = 0.0017$	

CHX: chlorhexidine. SD: standard deviation. NS.: not significant.

*One-tail Wilcoxon test for decrease from baseline data.

**Two-tail Wilcoxon test for comparison of groups.

concentrations of CHX can be maintained in the mouth for 24 h after an application (Bonesvoll & Gjermo 1978) and acid formation by established plaque may be similarly reduced (Oppermann 1979). In addition, the spray is applied directly on the teeth, and it has been suggested that a possible action mechanism of CHX derives from its adsorption on the tooth surface, from where it exerts its antiplaque effect (Jones 1997).

When we analyzed the reductions in plaque and gingival indexes in each group, we observed that major statistically significant reductions were obtained in both the groups, even greater reductions than expected, as no prior prophylactic treatment was given. CHX is more effective in preventing the formation of plaque than in reducing already established plaque. The causes of these reductions and of the lack of difference between one and two active spray applications may be similar, i.e., the composition of the sprays, the strengthening of the effect by the fact of participation in the study (Hawthorne effect), and the excellent program compliance. Major reductions were previously reported in patients with high plaque and gingival index scores, although by studies using two-daily applications. Corbet et al. (1997) obtained a marked improvement in subjects with poor oral health using supervised mouth rinses of 0.2% CHX mouth rinse. A spray application of 0.2% CHX also significantly reduced established plaque and gingivitis in a handicapped population (Kalaga et al. 1989b, Burtner et al. 1996).

The CHX spray offers a simple and rapid method to use very small doses of CHX to obtain the same beneficial plaque-inhibiting effects as achieved with the CHX mouth rinse (Burtner et al. 1991). This delivery method may have the additional advantage of reducing some of the local side effects of CHX, such as tooth-staining and unpleasant taste. In our study, the spray was very well accepted by the elderly individuals and the caregivers, who described it as simple, fast, and even pleasant, because it acted as a breath-freshener. Although not quantified, no brown stains were observed on the soft or hard tissues in any of the groups during the study, possibly due to the small volume of CHX solution utilized. This form of chemical prophylaxis

seems to have a promising role in the prevention of oral diseases among all population groups with diminished mechanical capabilities.

In conclusion, taking into account the small sample size, one-daily application of 0.2% CHX spray in the institutionalized elderly appears to reduce plaque and gingivitis as effectively as is achieved by two-daily applications of the same spray. This simplified regimen is easier to incorporate into the daily routine at the residence.

Acknowledgements

The authors are grateful to all the elderly and the caregivers who participated in the study and thank Kin laboratories for supplying the sprays. This research was partially supported by FISS Project No. PI 020997.

Zusammenfassung

Wirkung von 0.2%-Chlorhexidinspray bei täglich ein- oder zweimaliger Applikation auf die Plaqueakkumulation und die Gingivaentzündung einer geriatrischen Population

Grundlagen/Ziele: Es hat sich herausgestellt, dass Chlorhexidinspray eine leicht zu handhabende Methode der chemischen Plaquekontrolle bei älteren und behinderten Patienten ist. Um die Unterschiede zwischen ein- oder zweimaliger Applikation von 0.2%-Chlorhexidinspray auf die Plaque- und Gingiva-Indizes zu vergleichen wurde an 13 institutionalisierten älteren Patienten eine randomisierte Placebo-kontrollierte Crossover-Studie unternommen.

Methode: Die Studienteilnehmer wurden randomisiert einer von zwei Gruppen zugeteilt. Während der ersten 30-Tageperiode erhielt eine Gruppe zweimal täglich 0.2%-Chlorhexidinspray und die andere Gruppe einmal täglich 0.2%-Chlorhexidinspray und einmal täglich einen Placebo-Spray. Es folgte eine Auswaschperiode von 42 Tagen, nach der die Gruppen vertauscht wurden und der Prozess für weitere 30 Tage wiederholt wurde. Zu Beginn und am Ende einer jeden Periode wurden Plaque-Index (PI) und Gingival-Index (GI) bestimmt. Während der ganzen Studienperiode praktizierten die Patienten ihre üblichen Mundhygienemaßnahmen.

Ergebnisse: In beiden Gruppen ergab sich eine signifikante Reduktion der Plaque- und Gingiva-Indizes. Zwischen den beiden Gruppen gab es keine signifikanten Unterschiede der Indexwerte.

Schlussfolgerungen: Die Ergebnisse der vorliegenden Studie lassen annehmen, dass bei institutionalisierten älteren Patienten eine einzige Applikation pro Tag von 0.2%-Chlorhexidinspray bei der Reduktion der Plaqueakkumulation sowie der Gingivaentzündung genauso effektiv ist, wie die

täglich zweimalige Applikation des gleichen Sprays.

Résumé

Effet d'un spray de chlorhexidine 0.2 % appliqué une ou deux fois par jour sur l'accumulation de plaque dentaire et la gingivite dans une population gériatrique

Le spray de chlorhexidine (CHX) a prouvé sa facilité d'application pour le contrôle chimique de la plaque dentaire chez les patients âgés et handicapés. Un essai clinique contrôlé, croisé, en double aveugle, randomisé et placebo-contrôle a été entrepris pour comparer les effets d'un spray de CHX 0.2% appliqué une ou deux fois par jour sur la plaque dentaire et les indices gingivaux de patients âgés de douze institutions. Les sujets ont été répartis en deux groupes. Durant une première période de 30 jours, un groupe recevait un spray de CHX 0.2% deux fois par jour tandis que l'autre recevait un spray de CHX 0.2% un fois par jour plus un spray placebo une fois par jour. Une période sans traitement de 42 jours a ensuite été établie suivie à la suite de laquelle les groupes ont été interchangés et le processus répété pour une nouvelle période de 30 jours. L'indice de plaque dentaire et l'indice gingival ont été déterminés au début et à la fin de chaque période. Les patients ont continué leurs habitudes d'hygiène buccale habituelles durant toute l'étude. Une réduction significative des indices de plaque et de gencive ont été relevés dans les deux groupes. Il n'y avait aucune différence significative de scores entre les deux groupes. Les résultats de l'étude présente suggèrent qu'une application unique d'un spray de CHX 0.2% est tout aussi efficace dans la réduction de la plaque dentaire et l'inflammation gingivale chez les patients âgés qu'une double application du même spray.

References

- Al-Tannir, M. A. & Goodman, H. S. (1994) A review of chlorhexidine and its use in special populations. *Special Care in Dentistry* **14**, 116-122.
- Axelsson, P. & Lindhe, J. (1987) Efficacy of mouthrinses in inhibiting dental plaque and gingivitis in man. *Journal of Clinical Periodontology* **14**, 205-212.
- Bonesvoll, P. & Gjermo, P. (1978) A comparison between chlorhexidine and some quaternary ammonium compounds with regard to retention salivary concentration and plaque-inhibiting effect in the human mouth after mouthrinses. *Archives of Oral Biology* **23**, 289-294.
- Burtner, A. P., Low, D. W., McNeal, D. R., Hassell, T. H. & Smith, R. G. (1991) Effects of chlorhexidine spray on plaque and gingival health in institutionalized persons with mental retardation. *Special Care in Dentistry* **11**, 97-99.
- Burtner, A. P., Smith, R. G., Tiefenbach, S. & Walker, C. (1996) Administration of chlor-

- hexidine to person with mental retardation residing in an institution: patients acceptance and staff compliance. *Special Care in Dentistry* **16**, 53–57.
- Chikte, U. M., Pochee, E., Rudolph, M. J. & Reinach, S. G. (1991) Evaluation of stannous fluoride and chlorhexidine sprays on plaque and gingivitis in handicapped children. *Journal of Clinical Periodontology* **18**, 281–286.
- Corbet, E. F., Jow, T., Zee, K. Y., Wong, M. C. M., Lo, E. C. M., Mombelli, A. W. & Lang, N. P. (1997) Therapeutic effects of supervised chlorhexidine mouthrinses on untreated gingivitis. *Oral Diseases* **3**, 9–18.
- Dever, J. G. (1979) Oral hygiene in mentally handicapped children. A clinical trial using a chlorhexidine spray. *Australian Dentistry* **24**, 301–305.
- Francetti, L., del Favor, M., Testori, T. & Weinstein, R. L. (2000) Chlorhexidine spray versus chlorhexidine mouthwash in the control of dental plaque after periodontal surgery. *Journal of Clinical Periodontology* **27**, 425–430.
- Francis, J. R., Addy, M. & Hunter, B. (1987a) A comparison of three delivery methods of chlorhexidine in handicapped children. II. Parent and houseparent preferences. *Journal of Periodontal Research* **58**, 456–459.
- Francis, J. R., Hunter, B. & Addy, M. (1987b) A comparison of three delivery methods of chlorhexidine in handicapped children. I. Effects on plaque, gingivitis, and toothstaining. *Journal of Periodontal Research* **58**, 451–455.
- Jenkins, S., Addy, M. & Newcombe, R. G. (1994) Dose response of chlorhexidine against plaque and comparison with triclosan. *Journal of Clinical Periodontology* **21**, 250–255.
- Jones, C. G. (1997) Chlorhexidine: is it still the gold standard? *Periodontology 2000* **15**, 55–62.
- Kalaga, A., Addy, M. & Hunter, B. (1989a) Comparison of chlorhexidine delivery by mouthwash and spray on plaque accumulation. *Journal of Periodontology* **60**, 127–130.
- Kalaga, A., Addy, M. & Hunter, B. (1989b) The use of 0.2% a chlorhexidine spray as an adjunct to oral hygiene and gingival health in physically and mentally handicapped adults. *Journal of Periodontology* **60**, 381–385.
- Kiyak, H. A., Grayston, M. N. & Crinean, C. L. (1993) Oral health problems and needs of nursing home residents. *Community Dentistry and Oral Epidemiology* **21**, 49–52.
- Löe, H. & Schiott, C. R. (1970) The effect of mouth-rinses and topical application of chlorhexidine on the development of dental plaque and gingivitis in man. *Journal of Periodontal Research* **5**, 79–83.
- Löe, H. & Silness, J. (1963) The periodontal diseases in pregnancy prevalence and severity. *Acta Odontologica Escandinavica* **21**, 533–551.
- Mann, J., Wolnerman, J. S., Lavie, G., Carlin, Y. & Garfunkel, A. A. (1984) Periodontal treatment needs and oral hygiene for institutionalized individuals with handicapping conditions. *Special Care in Dentistry* **4**, 173–176.
- Oppermann, R. V. (1979) Effect of chlorhexidine on acidogenicity of dental plaque *in vivo*. *Scandinavian Journal of Dental Research* **87**, 302–308.
- Persson, R. E., Truelove, E. L., LeResche, L., LeResche, S. & Robinovitch, M. R. (1991) Therapeutic effects of daily or weekly chlorhexidine rinses on oral health of geriatric population. *Oral Surgery, Oral Medicine and Oral Pathology* **72**, 184–191.
- Rodríguez, Baciero G., Goirierna, de Gandarias F. J. & Mallo, Pérez L. (1998) *La salud bucodental de los ancianos institucionalizados en España*, p. 95. Bilbao: Eguía.
- Silness, J. & Löe, H. (1964) Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontologica Scandinavica* **22**, 121–135.
- Simons, D., Brailsford, S., Kidd, E. A. M. & Beighton, D. (2001) The effect of chlorhexidine acetate/xylitol chewing gum on the plaque and gingival indices of elderly occupants in residential homes. A 1-year clinical trial. *Journal of Clinical Periodontology* **28**, 1010–1015.
- Stelman, R., Holmes, D. & Hamilton, M. (1996) Chlorhexidine spray effects on plaque accumulation in developmentally disabled patients. *Journal of Pediatric Dentistry* **20**, 333–336.
- World Health Organization. (1988) *Oral health surveys. Basic methods*, p. 52. Geneva: World Health Organization.

Address:
Pilar Baca
c/ Isaac Peral 2
18198 Cajar (Granada),
Spain
E-mail: pbaca@ugr.es