ORIGINAL ARTICLE

RS Keukenmeester DE Slot NAM Rosema GA Van der Weijden

Authors' affiliations:

RS Keukenmeester, School of Dental Hygiene, Inholland University of Applied Sciences, Amsterdam, The Netherlands RS Keukenmeester, DE Slot, NAM Rosema, GA Van der Weijden, Department of Periodontology, Academic Center for Dentistry Amsterdam (ACTA), University of Amsterdam and VU University, Amsterdam, The Netherlands

Correspondence to:

D.E. (Dagmar Else) Slot Department of Periodontology Academic Centre for Dentistry Amsterdam (ACTA) University of Amsterdam and VU University Amsterdam Gustav Mahlerlaan 3004 1081 LA Amsterdam The Netherlands Tel.: +31 20 59 80 179 E-mail: d.slot@acta.nl

Dates: Accepted 28 May 2012

To cite this article:

Int J Dent Hygiene 10, 2012; 169–174 DOI: 10.1111/j.1601-5037.2012.00565.x Keukenmeester RS, Slot DE, Rosema NAM, Van der Weijden GA. Determination of a comfortable volume of mouthwash for rinsing.

© 2012 John Wiley & Sons A/S

Determination of a comfortable volume of mouthwash for rinsing

Abstract: Aim: The purpose of this study was to assess patient comfort when rinsing for 30 s with 5, 10, 15, 20 or 30 ml volumes of mouthwash, with the goal of establishing the most agreeable volume. Material and methods: The study was designed as a single-blind, clinical trial with duplicate assessments. Participants were asked to rinse with five different volumes of mouthwash in randomized order. All participants received a questionnaire to evaluate their attitudes. towards the volumes used based on a Visual Analogue Scale (VAS). The extremes of the VAS were 0 (far too little) to 10 (far too much), with a score of five representing the optimal score. After 1 week, the participants returned, and the assessment was repeated to evaluate the validity of the estimate. Volumes were tested for differences regarding participants' perceptions of comfort using ANOVA and paired t-tests, and the duplicate answers of the participants were analysed for validity by calculating the Pearson correlation coefficient. Results: In total, 62 participants completed both assessments, which provided valuable data. The 15-ml volume resulted in a mean score of 5.40. whereas the 5, 10, 20 and 30 ml volumes resulted in mean scores of 1.89, 3.71, 6.54 and 8.65, respectively. The differences between the mean scores for all five tested volumes were statistically significant. A correlation between the first and second VAS scores was 0.4-0.6. Conclusion: On the basis of the results of this experiment, it can be concluded that 15 ml is perceived as the most comfortable volume.

Key words: amount; mouthrinse; mouthwash; volume

Introduction

Maintaining an adequately low level of plaque via daily toothbrushing is often difficult. Less than half of the total plaque is removed after a single brushing exercise (1). An antimicrobial mouthwash, as an adjunct to oral hygiene regimens, has been considered to enhance plaque removal (2). Several mouthwashes are available on the consumer market with different active ingredients (3). The effects of some of the available mouthwashes have been reviewed recently, including cetylpyridinium chloride (4), chlorhexidine (5, 6), hexetidine (7), hydrogen peroxide (8), delmopinol (9), stannous fluoride (10), sodium fluoride (11) and essential oils (12, 13). In addition, rinses containing fluoride are available for the prevention of root surface caries. The manufacturers of such various mouthwash products recommend different durations for the rinsing procedure. Moreover, different volumes are recommended, ranging from 10 to 20 ml. In terms of rinsing times, a previous study concluded that rinsing for 30 s with 10 ml of mouthwash was sufficient for all plaque-covered surfaces of the dentition to come into contact with the mouthwash (14). Moreover, when rinsing with 0.2% chlorhexidine, even 15 s appeared to be long enough to reduce plaque levels (15). However, no studies are available that assess the volumes of mouthwash with respect to patients' perceptions of comfort. To assure the optimal compliance, it seems relevant to have information about the mouthwash volume that is well appreciated by the patient.

The aim of this study was to investigate volunteers' subjective perceptions of comfort while rinsing with different volumes of mouthwash (5, 10, 15, 20 and 30 ml volumes) and to assess the most comfortable volume of mouthwash with which to rinse.

Materials and methods

Ethical procedures

The study followed instructions based on the Helsinki principles. The study was registered with the Dutch Trial Register (NTR2775). Participation in this study was voluntary. Before enrolment, all participants were given oral and written instructions as well as a description of the aim, rationale and duration of study participation. All participants willing to participate signed an informed consent form prior to the study procedures. The study was performed at the ACTA Department of Periodontology in February 2011.

Participants

The participants were recruited via email and flyer advertisement. In total, 66 participants were included at the start of this study. The inclusion criterion was that the participants were ≥ 18 years of age. The exclusion criterion was the use of a removable prosthesis (partial denture).

Design and procedures

The study was designed as a single-blind, clinical trial with duplicate assessments to evaluate the validity of the VAS score estimate. The participants were instructed to rinse with five different volumes of mouthwash (5, 10, 15, 20 and 30 ml volumes) in randomized order. Randomization was performed using true random numbers obtained by RSK via www.random.org. The concealment of the rinsing order assignment was the responsibility of the study coordinator (RSK). No one else was aware of the randomization order, which was kept in a sealed opaque envelope. Case record forms only included participant numbers and made no references whatsoever to any rinsing order assignment. Elmex Sensitive (GABA, Weesp, The Netherlands) was used as the mouthwash product, which is a colourless solution that contains no alcohol and has a fluoride content of 250 ppm. The different volumes were measured with measuring cups and subsequently presented in five identical white cups. The participants could see the mouthwash but were unaware of the volume. They were instructed to take the total amount of liquid inside the cup into their mouths and were asked to rinse laboriously without swallowing for 30 s. This was performed under the supervision of the study coordinator, who kept track of time with a digital stopwatch and gave instructions regarding expectoration. All participants received a questionnaire to evaluate their opinions towards mouthwash volumes using a Visual Analogue Scale (VAS) as the primary outcome measure. After rinsing with each volume, the participant immediately answered the related question. The study coordinator then gave the next mouthwash volume for rinsing, and the participant answered the next related question. This was repeated for all five different volumes. The participants answered the questions by placing a vertical mark on a 10-cm-long uncalibrated line; the left extreme represented 'far too little' (0), whereas the right extreme represented 'far too much'. The participants were asked to mark on each line a point that they felt best represented their perception of their current state of comfort. As such, a mean score of five would represent the most comfortable volume. Finally, the participants also answered questions concerning taste sensation, pungent feeling, rinsing time and foaming effect of the mouthwash product to assess the secondary outcome measures. On the second visit (1 week later), a repeat assessment was performed to evaluate the validity of the VAS score estimate.

Data analysis

After all of the rinsing procedures for the two assessments were completed, the mean VAS scores were calculated. Data were analysed by N.A.M.R., who was blinded to the allocations. In total, data from 62 participants were analysed. The overall mean VAS score for each volume and the separate mean score for each assessment were calculated. The mouthwash volumes under investigation were tested for differences regarding the participants' perceptions of comfort using an ANOVA. Post-testing in search of the origins of the differences was performed using t-tests. The VAS scores were analysed for the validity of the estimate by calculating the Pearson correlation coefficient between duplicate assessments (1 week apart). Correlation coefficients between 0 and 0.3 were considered weak, those between 0.3 and 0.7 were considered moderate, and those between 0.7 and 1.0 were considered high (16). P < 0.05 was accepted as statistically significant. Scatter plots were generated where appropriate. Post hoc power calculations were performed with PS Power and Sample Size Program (17).

Results

Participants

Figure 1 presents a flow chart of the outline of this study. Of a group of 66 participants who started the study, four participants did not show up for their second appointment for reasons unrelated to the study or the product. Subsequently, a total of 62 participants completed the study. Table 1 provides the demographics of the participants. No adverse events were reported.



Fig. 1. Flow chart of participant enrolment.

Table 1. Age and gender of participants

	Total	Male	Female	
n =	62	19	43	
Age in years: mean (SD)	35.3 (14.06)	39.7 (16.52)	33.3 (12.54)	
Range	20-66	20–66	2061	

Visual analogue scale

Table 2 presents the mean scores with standard deviations for all volumes for assessments 1 and 2 separately and the overall mean of the two duplicate assessments. The data refer to the questions that evaluated the mouthwash volumes on a 10point scale from 'far too little' to 'far too much'. The 15-ml volume had an overall mean score of 5.40, which came closest to the most comfortable score of 5. The 10-ml volume had an overall mean score of 3.71, whereas the 20-ml volume had an overall mean score of 6.54. The 5-ml volume and 30-ml volume, with scores of 1.89 and 8.65, respectively, produced results that were closest to the extremes. Statistical analysis revealed that there was a significant difference between the five rinsing volumes and participants' perceptions, ANOVA (P < 0.001). Figure 2 provides the distribution of the individual scores of the means of the two assessments for all five volumes, which reveals that the distribution of individual scores for 5 and 30 ml is closest to the extremes. The line in the middle represents a score of 5. Figure 2 clearly shows that 15 ml had the greatest number of scores closest to this optimal level (i.e. neither 'too little' nor 'too much'). The correlation

coefficients of the results of the duplicate VAS assessments (1 & 2) varied between 0.4 and 0.6, showing a moderate level of reproducibility (Table 2). Table 3 presents the results of posttesting by comparisons of the different volumes. For the results to the other questions related to the mouthwash used, as secondary outcome parameter from the VAS questionnaire, see Table 4. On a scale of 0–10, where 10 is very comfortable, the taste sensation received a mean score of 6.1. Pungent feeling of the mouthwash received a mean score of 5.0. For the rinsing time of 30 s, the mean score was 5.3, where a score of 5 was considered to be the most comfortable score (Table 4). The foaming effect of the mouthwash had a mean score of 4.2.

Power calculation

The post hoc power calculation was performed with the 62 subjects, the smallest mean difference (1.14 between 15 and 20 ml), the corresponding standard deviation of 1.16 and alpha set at 0.01. This provided a power of 99.9%.

Discussion

The aim of the present study was to investigate perceptions of the most comfortable volume of mouthwash for rinsing. The results showed that there was a significant difference in the appreciation of the participants with respect to the various volumes. The 15-ml volume had an overall mean score of 5.40 on a VAS scale where 5 represented the optimal score. Therefore, 15 ml appears to be the most comfortable mouthwash volume with which to rinse. The 5-ml volume was obviously considered to be 'too little' (1.89), whereas 30 ml was considered to be 'too much' (8.65). Correlating these results to the available literature is difficult because this is, to our knowledge, the first study that assessed the different volumes of mouthwash with respect to patients' perceptions of comfort.

VAS

All participants filled in a questionnaire immediately after rinsing with each volume to allow the evaluation of their opinions towards the different volumes of mouthwash using a VAS. The participants placed a vertical mark on a 10-cmlong uncalibrated line. The VAS score line had two extremes at either end of the line. The investigator then measured the distance along the line from the left extreme to the marking made by the participant. The VAS is widely used to measure clinical symptoms and can provide a valid and reliable solution to challenging measurement problems (18). A recent study regarding the reliability and validity of mouth feel questionnaires with salivary flow rates indicated that the Bluestone Mouthfeel Questionnaire, a VAS score with questions that resemble those used in the present study was valid for examining participants' subjective comments on how their mouths felt (19). VAS scores are highly subjective and are of less value in comparisons across groups Table 2. Mean VAS scores (with standard deviation) for all volumes providing each of the duplicate assessments separately and the overall mean of both assessments together with the overall statistical analysis (ANOVA). These data reflect the participants' perceptions with respect to the following question: 'What is your opinion on the volume you rinsed with?' Extremes from 0 (far too little) to 10 (far too much). In addition, the table provides the correlation between the duplicate assessments

n = 62	Mean (SD) Assessment 1	Mean (SD) Assessment 2	Mean (SD) Overall	99% confidence interval of the difference between assessment 1 & 2		Assessments 1 & 2	
						Correlation	P value*
				Lower	Upper	coefficient	coefficient
5 ml	1.89 (1.73)	1.90 (1.68)	1.89 (1.42)	-0.64	0.63	0.4	0.002
10 ml	3.80 (1.79)	3.63 (1.64)	3.71 (1.56)	-0.32	0.66	0.6	<0.001
15 ml	5.53 (1.42)	5.27 (1.00)	5.40 (1.02)	-0.20	0.71	0.4	0.001
20 ml	6.76 (1.72)	6.32 (1.54)	6.54 (1.38)	-0.15	1.03	0.4	<0.001
30 ml	8.62 (1.63)	8.67 (1.24)	8.65 (1.27)	-0.53	0.43	0.5	<0.001
ANOVA <i>P</i> -value	<0.001	<0.001	<0.001				

*Pearson correlation.

Table 3. Post-	testing by comparing the overall mean VAS
scores for the	various mouthwash volumes to analyse the origin
of the signification	ant difference as observed with the overall test
(ANOVA: See Ta	ble 2)

n = 62		99% Confidence interval of the difference between volumes		
	P-value*	Lower	Upper	
5–10 ml	< 0.001	-2.24	-1.40	
10–15 ml	< 0.001	-2.12	-1.25	
15–20 ml	< 0.001	-1.54	-0.75	
20–30 ml	< 0.001	-2.54	-1.67	

*P-value from paired t-test.

Table 4. Additional questions of the questionnaire analysing secondary outcomes with respect to the mouthwash used, which were evaluated using VAS scores with a range from 0 to 10 (n = 62)

		With extrem		
Paraphrase	Complete question	From (0)	To (10)	Mean score (SD)
Rinsing time	What is your opinion about the rinsing time (30 s)?	Far too short	Far too İong	5.27 (1.01)*
Taste sensation	What is your opinion about the taste of the mouthwash?	Very unpleasant	Very pleasant	6.11 (1.93) [†]
Pungent feeling	Did you experience a pungent feeling in the mouth?	Not at all	Very much	5.00 (1.36) [†]
Foaming effect	This mouthwash foamed	Not at all	Very much	4.21 (2.01) [†]

*A score of 5 is considered to be the most comfortable score. *A score of 5 is considered to be an average score.



Fig. 2. Overall mean individual VAS scores of the duplicate assessments per person for all volumes regarding the question: 'What is your opinion on the volume you rinsed with?' with extremes at 0 (far too little) and 10 (far too much). The line in the middle represents a score of 5, which was considered to be the optimal score.

of individuals at a single time point (20). For this reason, we opted to use the mean of the two assessments as our estimate of patient comfort. Two separate assessments were performed 1 week apart. The mean scores of assessments 1 and 2 showed a moderate reproducibility with a correlation coefficient of 0.4–0.6. It can be argued that the use of a continuous scale may have afforded a higher degree of precision, although it seems unlikely that the underlying attribute can be measured to that level of precision. In addition, VAS measure a single construct where the reliability of the measure is low (21). This might be a reason for the moderate level of reproducibility in this study, which impairs the validity of the estimate.

Mouth feel of the product

For the secondary outcomes, additional questions concerning taste sensation, pungent feeling and foaming effect of the mouthwash product were asked of the patients to investigate their appreciation for the mouthwash used in the study (Elmex Sensitive). The reason for selecting this mouthwash was essentially the neutral taste perceived by the study coordinator. In the study population, the taste sensation received a mean score of 6.1, where 10 represented 'very comfortable'. The results of the questions regarding pungent feeling and foaming effect were 5.0 and 4.2, respectively. As such, it can be assumed that these factors had no apparently negative or positive impact on the results of the questions regarding the different rinsing volumes. With other brands and constituents of mouthwashes, this may have been different. Mouthwashes vary in their composition, including the addition of flavour, colour and preservative additives such as sodium benzoate (22). For example, despite the popularity of Listerine (Johnson & Johnson, Skillman, NJ, USA) mouthwash (as a result of its 'clean' sensation in the mouth), its users may find the taste unpleasant with a burning sensation on the mucosa (23). Alcohol that is contained in mouthwashes may cause a burning sensation that is directly related to its concentration and to the length of rinsing. Chlorhexidine mouthwashes are considered to have an unpleasant taste (23) and aftertaste (24). The presence of pain or an unpleasant taste during mouthrinsing can be discouraging and may have a negative impact on patient compliance (25).

Manufacturers' consideration

This study is one of a series of articles that scientifically addresses the user guidelines for mouthwashes. Many patients do not comply with instructions on how to use antimicrobial mouthwashes (26). Patients often perceive oral healthcare instructions to be difficult to follow and time-consuming (27). For this reason and to promote compliance, mouthwash manufacturers should prepare easy-to-use rinsing advice for patients as well as recommending limited rinsing times. Rinsing for 30 s with the present 15-ml mouthwash is sufficient for the mouthwash contact all surfaces of the dentition (14, 15). With a preferable mouthwash volume of 15 ml, the dosages of the bottle caps and the content of the bottle should be in line with this observation. Currently, the content of most bottles is 400 or 500 ml, although it may be most sensible to aim for a total volume of 450 ml. In doing so, patients can rinse 30 times with one bottle, which is sufficient for 2 weeks of twice-daily use.

Limitations

This study has limitations:

• Only one brand of mouthrinse was used, and it is possible that the taste sensation, pungent feeling and foaming effect may have had an impact on the perception of comfort per volume. It is possible that a different volume could be associated with the most comfortable perceptions had other brands of mouthrinses been used. For instance, other mouthwashes containing ethanol or other solvents can provide variable taste experience. The mouthwash in this study was selected because it was relatively neutral with respect to the above variables.

• Previous rinsing experiences with other mouthrinses may have influenced the outcome of this study. It is, however, impossible to preselect participants without any rinsing experience because everyone rinses at least every time following toothbrushing.

• The use of the perception of the patient as the primary outcome variable does not take into account the proper dosage of the active agent. In this study, no attention is paid to the effect of the mouthrinse used. When formulating a mouthrinse, manufacturers can take into account the present observation, but should also evaluate the efficacy of dosages.

• The rinsing time was 30 s, which, as mentioned previously, has been scientifically found to be sufficient to allow contact with entire dentition. A shorter or longer rinsing time could also have impact the results.

• Individual salivary flow can influence the perception of the volumes; salivary flow during rinsing can increase volume (28). Additionally, the salivary flow may be different during rinsing with the first volume compared with the fifth volume. This study attempted to compensate for this discrepancy by having subjects rinse with the different volumes in varying (random) orders.

• The volume of the oral cavity of the participants was not measured. The optimal rinsing volume may depend on the sizes of the individual mouths.

Directions for further research

This study was confined to a neutral mouthwash.

- Different brands with various ingredients may provide other outcomes.
- Differences in gender, culture or ethnic groups may also have an impact on the outcome of the study.

Future studies may include larger sample sizes to perform subanalysis based on these variables.

Clinical relevance

Scientific rationale for the study

Various manufacturers' recommend different mouthwash volumes for rinsing, which range from 10 to 20 ml as included their user instructions. No studies are currently available assessing patients' perceptions of comfort regarding the volumes of mouthwash.

Principal findings

Based on the results of this experiment and within this study population, it can be concluded that the most pleasant volume of mouthwash for mouthwashes is 15 ml. This volume had a mean VAS score of 5.40, which was closest to the optimal score of 5. The differences between the mean VAS scores of rinsing with 15 ml and other volumes were significant.

Practical implications

The dosage of the bottle cap and the content of the bottle should be in line with the preferable mouthwash volume of 15 ml. Currently, the content of most bottles is 400 or 500 ml, although it may be most sensible to aim for a total volume of 450 ml. In doing so, patients can rinse 30 times with one bottle, which is appropriate for 2 weeks used twice daily.

Conclusion

On the basis of the results of this experiment and within this study population, it can be concluded that 15 ml is perceived as the most comfortable volume of a fluoride mouthwash.

Acknowledgements

The authors gratefully acknowledge GABA, Weesp, The Netherlands, and especially Carla Vos for providing the study products.

Conflict of interest and source of funding

The authors declare that they have no conflicts of interest. This study was self-funded by the Department of Periodontology, Academic Center for Dentistry Amsterdam (ACTA). GABA provided products but had no influence on the design or conduct of this experiment.

References

- Slot DE, Rosema NAM, Van der Weijden GA. Effectiveness of manual toothbrushes during a single brush exercise: a systematic review. *Int J Dent Hyg* 2012; doi: 10.1111/j.1601-5037.2012.00557.x. [Epub ahead of print].
- 2 Barnett ML. The role of therapeutic antimicrobial mouthrinses in clinical practice. Control of supragingival plaque and gingivitis. J Am Dent Assoc 2003; 134: 699-701.
- 3 Gunsolley JC. Clinical efficacy of antimicrobial mouthrinses. J Dent 2010; 38: 6-10.
- 4 Haps S, Slot DE, Berchier CE, Van der Weijden GA. The effect of cetylpyridinium chloride-containing mouth rinses as adjuncts to toothbrushing on plaque and parameters of gingival inflammation: a systematic review. *Int J Dent Hyg* 2008; **6**: 290–303.
- 5 Berchier CE, Slot DE, Van der Weijden GA. The efficacy of 0.12% chlorhexidine mouthrinse compared with 0.2% on plaque accumulation and periodontal parameters: a systematic review. *J Clin Periodontol* 2010; **37**: 829–839.
- 6 Van Strydonck DAC, Slot DE, Van der Velden U, Van der Weijden GA. The effect of a chlorhexidine mouthrinse on plaque, gingival inflammation and staining in gingivitis patients: a systematic review. *J Clin Periodontol* 2012; **52**: 230. accepted.
- 7 Afennich F, Slot D, Hossainian N, Van der Weijden G. The effect of hexetidine mouthwash on the prevention of plaque and gingival inflammation: a systematic review. *Int J Dent Hyg* 2011; 9: 182–190.

- 8 Hossainian N, Slot D, Afennich F, Van der Weijden G. The effects of hydrogen peroxide mouthwashes on the prevention of plaque and gingival inflammation: a systematic review. *Int J Dent Hyg* 2011; 9: 171–181.
- 9 Addy M, Moran J, Newcombe RG. Meta-analyses of studies of 0.2% delmopinol mouth rinse as an adjunct to gingival health and plaque control measures. *J Clin Periodontol* 2007; **34**: 58–65.
- 10 Paraskevas S, Versteeg PA, Timmerman MF, Van der Velden U, Van der Weijden GA. The effect of a dentifrice and mouth rinse combination containing amine fluoride/stannous fluoride on plaque and gingivitis: a 6-month field study. J Clin Periodontol 2005; 32: 757-764.
- 11 Benson PE, Shah AA, Millett DT, Dyer F, Parkin N, Vine RS. Fluorides, orthodontics and demineralization: a systematic review. J Orthod 2005; 32: 102-114.
- 12 Stoeken JE, Paraskevas S, Van der Weijden GA. The long-term effect of a mouthrinse containing essential oils on dental plaque and gingivitis: a systematic review. *J Periodontol* 2007; **78**: 1218–1228.
- 13 Van Leeuwen MP, Slot DE, Van der Weijden GA. Essential oils compared to chlorhexidine with respect to plaque and parameters of gingival inflammation: a systematic review. J Periodontol 2011; 82: 174–194.
- 14 Paraskevas S, Danser MM, Timmerman MF, Van der Velden U, Van der Weijden GA. Optimal rising time for intra-oral distribution (spread) of mouthwashes. *J Clin Periodontol* 2005; **32**: 665–669.
- 15 Van der Weijden GA, Timmerman MF, Novotny AGA, Rosema NAM, Verkerk AAJ. Three different rinsing times and inhibition of plaque accumulation with chlorhexidine. *J Clin Periodontol* 2005; 32: 89-92.
- 16 Saha I, Paul B. *Biostatistics MCQ and Essentials*. West Bengal, India: Academic Publishers; 2010.
- 17 Dupont WD, Plummer WD. PS power and sample size program available for free on the Internet. *Controlled Clin Trials* 1997; **18**: 274.
- 18 Mottola CA. Measurement strategies: the visual analogue scale. Decubitis 1993; 6: 56-58.
- 19 Ship JA, Corby PM, Fisch GS et al. Reliability and validity of mouthfeel questionnaire with salivary flow rates. Available at: http://iadr.confex.com/iadr/2009miami/webprogram/Paper118527. html (accessed 15, February 2012).
- Wewers ME, Lowe NK. A critical review of visual analogue scales in the measurement of clinical phenomena. *Res Nurs Health* 1990; 13: 227-236.
- 21 Streiner DL, Norman GR. Health Measurement Scales: A Practical Guide to Their Development and Use. Oxford: Oxford University Press; 2003.
- 22 Versteeg PA, Rosema NAM, Hoenderdos NL, Slot DE, Van der Weijden GA. The plaque inhibitory effect of a CPC mouthrinse in a 3-day plaque accumulation model – a cross-over study. Int J Dent Hyg 2010; 8: 269–275.
- 23 Adams D, Addy M. Mouthrinses. Adv Dent Res 1994; 8: 291-301.
- 24 Van Strydonck DA, Timmerman MF, Van der Velden U, Van der Weijden GA. Plaque inhibition of two commercially available chlorhexidine mouthrinses. J Clin Periodontol 2005; 32: 305–309.
- 25 Lemos CA Jr, Villoria GE. Reviewed evidence about the safety of the daily use of alcohol-based mouthrinses. *Braz Oral Res* 2008; 22: 24–31.
- 26 Silverman S Jr, Wilder R. Antimicrobial mouthrinse as part of a comprehensive oral care regimen. Safety and compliance factors. J Am Dent Assoc 2006; 137: 22S-26S.
- 27 Wilson TG Jr. How patient compliance to suggested oral hygiene and maintenance affect periodontal therapy. *Dent Clin North Am* 1998; **42**: 389–403.
- 28 Mansson-Rahemtulla B, Pruijtt KM, Tenovuo J, Le TM. A mouthrinse which optimizes *in vivo* generation of hypothiocyanite. *J Dent Res* 1983; 62: 1062–1066.

Copyright of International Journal of Dental Hygiene is the property of Wiley-Blackwell and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.