

The Role of Self-Administered Plaque Control in the Management of Periodontal Diseases: 2. Motivation, Techniques and Assessment

PHILIP OWER

Abstract: The delivery of oral hygiene advice is a crucial component of the management of patients susceptible to periodontal disease. However, the complexity of the issues surrounding such advice is frequently underestimated. It is not simply a question of manual dexterity; many factors influence compliance and motivation, including lifestyle, beliefs, attitude and understanding, and such factors need to be taken into account in order to effect permanent change in a patient's habits. This article reviews these issues and examines oral hygiene techniques and methods of assessment.

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Clinical Relevance: The level of self-performed plaque removal has a significant effect on the outcome of all forms of periodontal therapy.

The first article in this series established the evidence base for the essential role that optimal self-performed plaque control plays in the prevention and treatment of all forms of periodontal disease. The purpose of this article is to offer practical advice in instructing patients on oral hygiene. Chemical plaque control will not be considered: chemotherapeutic measures can help in the prevention of plaque formation on clean tooth surfaces but plaque deposits can be effectively removed only by mechanical means. It is issues concerning mechanical plaque control that form the basis of this article.

Philip Ower, MSc, BDS, MGDS RCS(Eng.), MGDS RCS(Edin.), Specialist in Periodontics, The Periodontal Practice, 21 Devonshire Place, London, and The Briars Dental Centre, Newbury.

FACTORS AFFECTING COMPLIANCE

A number of factors have been identified as influencing compliance with oral hygiene advice:

- Compliance with healthcare advice tends to be poor in patients who have non-life-threatening chronic conditions.¹
- Patients who have good levels of oral hygiene tend to comply better with advice than those whose initial plaque levels are high.²
- Patients who believe that they have some control over their personal health and can influence treatment outcome are likely to be the most compliant.³
- Females tend to have better oral hygiene habits than males.⁴
- Socioeconomic status is also strongly related to oral hygiene

and other health-related behaviour.⁵

Other factors associated with non-compliance include an unwillingness to perform self-care,⁶ poor understanding of the problem⁷ and stressful life events.⁸ Significant associations have also been found between oral health behaviour and other 'healthy lifestyle' habits such as not smoking, exercising and healthy diet.⁹

The management of personal oral hygiene should therefore not be assessed in isolation but evaluated in the context of a patient's overall lifestyle, circumstances, beliefs, knowledge and attitudes. Improving the level of plaque control invariably involves behavioural change, which may impinge on existing behaviour and lifestyle. If modifications or improvements in oral health behaviour are to be made and, more importantly, maintained, a holistic approach needs to be taken in the delivery of advice.

Instructions on oral hygiene can either be delivered all at once or by a 'drip feed' method. Investigators disagree about the most effective means of delivery, and research indicates that the mode of delivery, and the number and length of instruction sessions, has no influence over the resulting levels of plaque control.¹⁰ It is widely accepted, however, that once improvements have been established, compliance must be carefully monitored because patients tend to relapse into old habits.

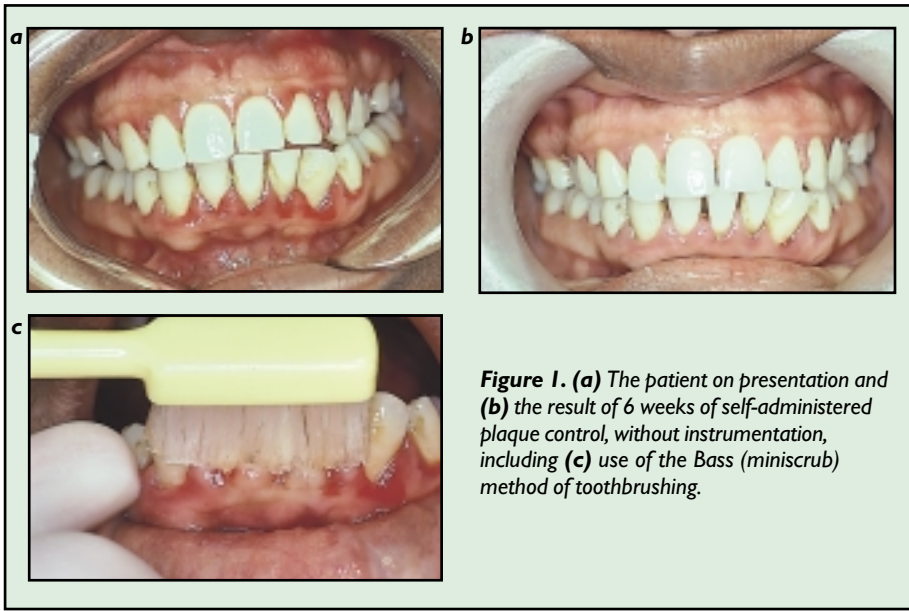


Figure 1. (a) The patient on presentation and (b) the result of 6 weeks of self-administered plaque control, without instrumentation, including (c) use of the Bass (miniscrub) method of toothbrushing.

MOTIVATING PATIENTS TO CLEAN BETTER

For periodontally susceptible patients, a high standard of plaque control must be a lifelong commitment and relies entirely on the active participation of the patient, with the clinician simply acting as mentor and adviser. The initial objective in the management of such patients is resolution of marginal inflammation by the patient him- or herself. In order to gain patients' cooperation, and to motivate them to follow the advice given, it is essential that they understand the nature and aetiology of the disease process and the morphological changes that occur as a result. Explaining this in detail, in terms that the patient can understand, is almost as important as teaching the plaque control techniques themselves since, for example, there is little point in instructing patients to clean pockets if they do not understand what, and where, pockets are.

It can be difficult to instil new habits, particularly when dealing with adults who have employed the same cleaning habits for many years. The success of advice will be affected by patients' perceptions of their degree of control over what happens to them.¹¹ This is known as the 'locus of control':

- patients who believe that what happens depends entirely on their own behaviour are described as having high *internal locus of control*;
- at the other extreme, patients who believe that health depends on luck, fate or professional intervention are described as having high *external locus of control*.

It is fundamentally important to ensure that the locus of control is shifted towards the internal at the earliest possible stage in management. In many cases this is most effectively done by concentrating on the patient's own efforts and the effects thereof, withholding professional intervention or instrumentation. Patients can often then see for themselves that improvements, usually in the form of resolution of marginal inflammation (reduction in gingival redness, bleeding, swelling or tenderness), occur as a result of their own improved practices rather than professional treatment (Figure 1). This requires patience and persistence on the part of the clinician but may reach the goal of establishing periodontal health and stability more quickly. One may also speculate that the maintenance of periodontal health in the long term is more likely in patients managed in this

way, although there is no data to support this view and further research is needed. Such an approach may not be appropriate in all cases, however, for example in the case of a heavy smoker in whom overt signs of inflammation may be less obvious.

Establishment of new habits (such as flossing in a patient who has never tried) is more successful if linked to established habits (such as toothbrushing, which most patients are used to), but the former should always be done before the latter. This approach, known as the 'linking method', was implemented in a 15-year longitudinal study on adult patients.¹² The study group, which also received professional maintenance, experienced no further loss of attachment over the study period and tooth loss was 10% lower than that for the average (Swedish) population. This study also showed that new self-care habits can be established in adults, irrespective of age (up to 85 years old in this study).

A variation on the 'linking' principle is to suggest the introduction of new habits in conjunction with other more pleasurable habits such as taking a bath or listening to the radio. It should be remembered that oral hygiene practices are essentially tedious to perform and combining them with other habits in this way may help to relieve the tedium and ensure greater compliance.

ACCESSIBILITY OF PLAQUE

In order to maintain periodontal health, patients must disrupt plaque wherever it accumulates. In periodontally healthy individuals, plaque always accumulates in totally accessible areas and can be removed simply, using toothbrush and floss. Access may, however, be impeded by altered gingival morphology, for example areas of recession or hyperplasia, tooth crowding or malposition or faulty restorations. Other obstacles include a large tongue, limited opening, narrow arches, prominent fraena and a pronounced gag reflex. These factors complicate efficient plaque removal, but do not in themselves preclude the maintenance of

plaque-free gingival margins, providing the patient has been shown the appropriate techniques to overcome these hurdles. As periodontal breakdown (and pocket formation) occurs, plaque deposits become gradually less accessible as the pockets deepen. However, removal of the more accessible plaque elicits a gingival response resulting in gingival shrinkage, which in turn renders less accessible plaque more accessible.¹³ The distinction between various levels of plaque accessibility is important in helping to evaluate the likely response of the patient to treatment; patients who cannot master basic plaque control at sites that are totally accessible are unlikely to make any inroads at sites that are less accessible and disease will persist, whatever treatment is carried out.

FREQUENCY AND TIMING OF CLEANING

Modern life places ever-increasing demands on people's time and the introduction of new and complex oral hygiene measures only adds to the strain. However, periodontally susceptible patients need to find time to devote to such measures on a daily basis. Gingival inflammation can be prevented provided plaque is disrupted every 48 hours, but if left for 72 hours gingivitis will develop.¹⁴ It is therefore accepted that plaque removal should be undertaken on a daily basis – that is at least once every 24 hours – which is a more socially acceptable interval than 48 hours for most individuals. How much time they need to spend on each cleaning session depends on:

- the patient's degree of susceptibility;
- the extent of periodontal breakdown;
- the patient's dexterity and motor skills;
- the presence of obstacles to plaque control.

These factors should be carefully assessed at the outset and a practical

oral hygiene strategy devised that will enable each individual to clean to a level that will prevent further breakdown. This level will vary from patient to patient; not all will need to remove or disrupt all plaque on a daily basis. Some patients will be able to tolerate levels of residual plaque that in others, with a greater degree of susceptibility to the effects of plaque accumulation, would inevitably result in continued loss of periodontal attachment. Thus the more susceptible the patient, the more effectively he/she needs to clean. For practical purposes, it is probably better, in the early stages of periodontal management, to encourage all patients to clean to an optimal level until their level of susceptibility has been more clearly established. Gradually a *personal plaque control regimen* can be developed for each individual.

The more susceptible patient will need to employ a number of techniques and the time commitment can be considerable, often demanding up to 15 minutes of the patient's time on a daily basis. Unfortunately, the poorly performing patient will always perform badly, however long he/she spends on cleaning. One common misunderstanding held by many patients is that their cleaning needs to be carried out at certain fixed times of the day, usually first thing in the morning or last thing at night. Patients should be encouraged to clean when they have time; this can significantly improve their level of performance.

TECHNIQUES IN ORAL HYGIENE

Toothbrushing

Toothbrushing is the most widely used mechanical means of plaque control in the world and is suitable for all buccal, lingual and occlusal surfaces. No toothbrush negotiates interdental surfaces, for which specific devices need to be employed. World and European workshops on periodontology have consistently concluded that no one toothbrush



Figure 2. Powered toothbrush, rotary head design.

design is superior to any other and that the method used is less important than the performance of the person using the brush.¹⁵ Numerous toothbrushing methods have been described in the literature, classified by the pattern of motion of the brush head. Methods include a roll movement ('Modified Stillman'), vibratory ('Stillman' or 'Bass'), circular ('Fones') and both a vertical and horizontal scrubbing action.¹⁶ Using the most frequently recommended method of brushing, the Bass (or miniscrub) method, plaque can be removed at least 1 mm subgingivally (Figure 1c).¹⁷

Powered Toothbrushes

Powered brushes have enjoyed a resurgence of interest over the last decade. This is largely due to improved designs, the most popular design being the rotary, oscillating head type (Figure 2). Such designs offer the advantage of accurate single-tooth cleaning and ease of access to all parts of the mouth. Studies indicate that powered brushes are highly efficient and may provide additional benefit over manual brushes.¹⁸ The optimal brushing time has been shown to be 2 minutes;¹⁹ powered brushes remove more plaque than manual brushes in the same time and most are equipped with a 2 minute timer which, given that most patients using manual methods brush for less than 1 minute,²⁰ is a further advantage.¹⁹ However, patients need to be shown how to use powered toothbrushes correctly, using the brush in a fixed position and directed into the gingival sulcus (Figure 2), since there is a tendency for patients to use them like

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Figure 3. Cleaning furcations.



Figure 4. Control of subgingival plaque in a periodontal pocket.

manual brushes and thereby reduce their effectiveness.

Interdental Cleaning

Gingivitis and, by inference, periodontitis mainly starts interdentally.²¹ Toothbrushing alone is not effective on proximal surfaces,^{15,22-24} even if used in conjunction with chlorhexidine mouthwash:²⁵ plaque control in these areas has to be achieved mechanically. Most patients understand that interdental cleaning is essential once it has been explained that disease usually starts and continues in these areas of stagnation. Nevertheless, interdental cleaning is not an established habit in most countries. In addition, many patients who start off with the best intentions do less interdental cleaning with time as it is so time-consuming and tedious.²⁶

No one method of interdental cleaning suits all individuals.²⁴ Methods include the use of floss, wire brushes and wooden or plastic sticks. The methods chosen should be dictated by individual dexterity, preference and anatomy.¹⁵ Any individual will need to employ a number of different tools in order to negotiate various anatomical features, such as involved furcations (Figure 3) or

periodontal pockets (Figure 4).

In general terms, the use of floss is to be recommended for most patients, and is essential in periodontally susceptible individuals. Many patients claim to have tried floss without success but these patients are invariably self-taught and if shown the appropriate methods (Figure 5) learn to use floss without difficulty.

Single tufted brushes are exceptionally useful for patients with periodontal pockets. Patients can be instructed to splay the bristles on the interdental surface and pass the bristles into the pocket to achieve significant subgingival plaque disruption. Any bleeding that occurs can be used by the patient to detect subgingival inflammation. Such subgingival cleaning, if carried out regularly and effectively, can have profound clinical effects owing to the superficial nature of root surface contaminants (see Part 1 of this series). There is no doubt that such techniques demand a high level of dexterity on the part of the patient. Recently, microbrushes (used for the application of gels and resins in restorative procedures) have been found highly effective in disrupting subgingival plaque.²⁷

Careful one-to-one instruction is

needed for all of these interdental cleaning techniques, many of which most patients will not have attempted in the past. With perseverance on the part of the operator and co-operation on the part of the patient, most patients can master most techniques. However, the main problem with all forms of interdental cleaning is long-term motivation and compliance rather than establishing the necessary levels of dexterity.

ASSESSMENT OF PLAQUE CONTROL

Patients can assess their own levels of cleaning by using disclosing tablets or solutions, or by monitoring visible gingival inflammation. They should be made aware that bleeding and tenderness of the tissues during oral hygiene sessions are a result of plaque-induced inflammation and that a reduction in these signs indicates improving gingival and periodontal health. A common misconception is that such signs indicate over-zealous cleaning and it is not uncommon for patients to reduce their cleaning efforts in response. It is also possible for gingival bleeding and tenderness to

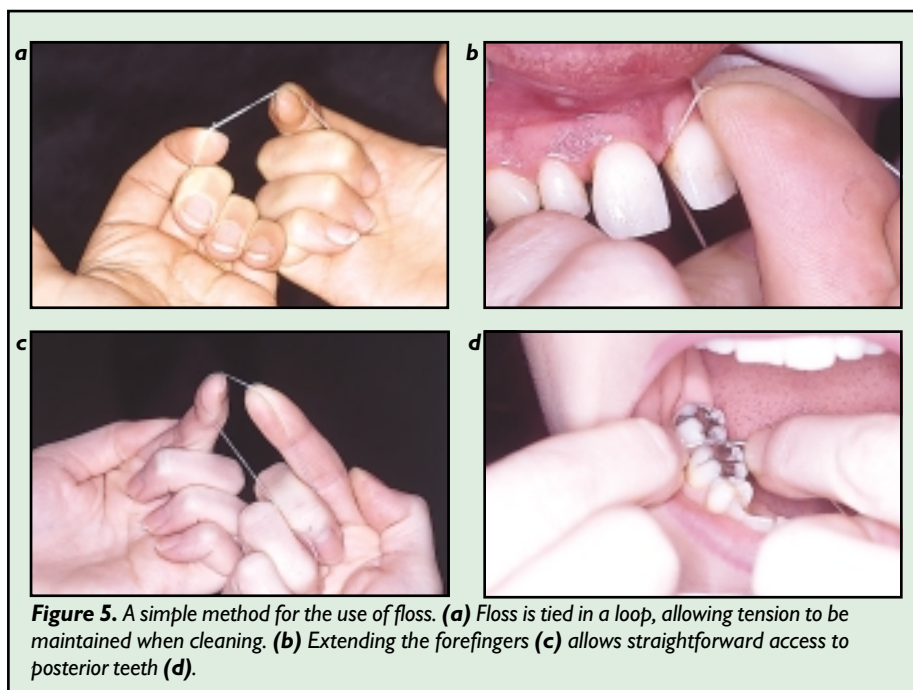


Figure 5. A simple method for the use of floss. (a) Floss is tied in a loop, allowing tension to be maintained when cleaning. (b) Extending the forefingers (c) allows straightforward access to posterior teeth (d).

result from an inappropriate or heavy-handed technique so the operator must be alert to this possibility and advise the patient accordingly.

The operator can assess a patient's plaque control efforts either directly, by recording the presence or absence of plaque or by disclosing, or indirectly by assessing marginal inflammation, usually by means of a bleeding index.

Plaque Assessment

Plaque assessment is time-consuming, and is an unreliable indicator of a patient's usual standard of oral hygiene. The amount of plaque recorded by such means merely indicates where the patient has been unsuccessful in cleaning, *despite extra effort on the day of the dental appointment*.²⁸ Most patients, although by no means all, will put greater effort into their cleaning on the day of a dental appointment than at other times.

Marginal Inflammation

Assessment of marginal inflammation is a more reliable indicator of the efficiency of routine oral hygiene because inflammatory lesions take 2–3 weeks to develop,²⁹ and only in the presence of persistent plaque accumulation. In most patients (the exception being some heavy smokers), marginal inflammation can be readily assessed visually or by recording the presence or absence of bleeding on blunt probing (dichotomous scoring) into the gingival sulcus. This can be done quickly throughout the mouth and recorded as a percentage score, which can also be used as an easily understood motivational aid.

It is important, however, when using such an index, to distinguish between marginal bleeding (resulting from the accumulation of accessible plaque) and bleeding on probing (resulting from the presence of possibly inaccessible plaque) which may emanate from either inflamed marginal tissues or inflammation at the pocket base. Marginal bleeding can be a true indicator of plaque control efforts, whereas bleeding on probing is more

variable and simply indicates the presence of inflammation that, in the presence of pocketing, it may be unreasonable to expect the patient to control. Measurement of bleeding on probing can, however, be a useful tool during periodontal therapy to indicate sites that require further professional attention once marginal inflammation has been effectively controlled by the patient.

CONCLUSION

One of the biggest challenges in periodontal therapy is to produce permanent improvements in patients' daily oral hygiene practices. To do so effectively requires:

- assessment of the patient's knowledge, beliefs, attitudes, psychomotor skills and past behaviours;³⁰
- establishment of mutual understanding and co-operation between operator and patient;
- selection of appropriate methods of plaque control; and
- application of those methods by the patient, under the guidance of the clinician.

The entry 'OHI' on a patient's records hardly does justice to the complexity of the issues involved. The necessary levels of self-administered plaque control cannot be achieved in a few minutes of surgery time. Effecting behavioural change, ideally permanently, can be both painstaking and time-consuming and requires patience and mutual understanding on the part of both operator and patient. Behaviour can only be changed effectively on a one-to-one basis and no amount of educational material can substitute for direct patient/operator contact.

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BOOK REVIEW

Oral Health-Related Quality of Life.

Marita Rohr Inglehart and Robert Bagramian, eds. Quintessence Publishing Co. Inc., New Malden, 2002. ISBN 0-86715-421-7.

Measures of Oral Health Quality are being used increasingly in population surveys, the recent survey of Adult Dental Health published in 2000 being a prime example. Perceptions of oral well-being can play a prominent role in an individual's day-to-day life and usable indicators, measuring the effect of toothache or the confidence to smile, would prove valuable. This book resulted from a multi-disciplinary workshop on oral health-related quality of life funded by NIDCR. The contributors are academic staff working in North America and the character of the contributions reflect a climate of dental care working primarily in an

environment where remuneration is based upon insurance premiums. In disseminating the proceedings of the workshop, the book undertakes a comprehensive review of the distinguishing features of some of the indices in use and their role in various aspects of oral health. In the early chapters of the book the pertinence of quality of life as a guiding factor in oral health and the delivery of care are considered. This section ends with a review of QOL (quality of life) from the perspective of a health psychologist. Surprisingly, QOL does not appear to have received much attention from psychologists and the author suggests ways in which this might be remedied.

Chapters 7–14 consider the role of QOL in the study of a range of conditions and population groups. The former include caries and oral cancer; the latter, children with special needs and older adults. There are also chapters dedicated to QOL issues of gender and ethnicity. A warning to the

UK reader for these chapters in particular, despite the international attendance at the original workshop, the text is very much aimed at a North American audience. This is apparent throughout the book but the social chapters very much reflect the culture of North America. The final chapters concentrate on methodology, refocusing dental education and future directions of QOL.

The editors claim that this is the first book to be dedicated to QOL and this must be its main recommendation. The contents provide a fascinating insight into a topic which is almost certainly destined to enter the mainstream of primary dental care management. Although it is unlikely to be of great value in the day-to-day life of a GDP in the UK, postgraduate students would benefit from this book and it should be recommended for all dental libraries in this country.

Gillian Bradnock
University of Birmingham School of Dentistry

ABSTRACT

IS YOUR ENDODONTICS FAILING BECAUSE THE BLEACH HAS 'GONE OFF'?

The Shelf-life of Sodium Hypochlorite Irrigating Solutions. R.M. Clarkson, A.J. Moule, H.M. Podlich. *Australian Dental Journal* 2001; **46**: 269–276.

Although sodium hypochlorite is widely used as a root canal irrigant, various conditions may contribute to the loss of available chlorine content. These

workers investigated various storage effects and time intervals on different dilutions of domestic bleach, and the proprietary solution Milton.

The test situations were stored: i) in a closed plastic bottle which was opened daily and agitated; ii) in open plastic bottles; iii) in syringes exposed to sunlight; iv) in syringes kept in the dark; v) in open stainless steel bowls; vi) in closed stainless steel bowls; vii) heated at 50°C.

The study concluded that sodium hypochlorite should be stored undiluted

in closed opaque containers. Diluted solutions lost chlorine more quickly, as did those exposed to sunlight and those heated. Although undiluted solution of domestic bleach maintained 90% of the original strength after six months, diluted solutions deteriorated far more rapidly.

Practitioners are advised to review their purchasing and storage procedures accordingly, ensuring that appropriate opaque containers are kept out of sunlight, and are not opened frequently.

Peter Carrotte
Glasgow Dental School