



Angeline Keh

Zehra Yonel

Step 1 for the Treatment of Periodontal Diseases

Abstract: The association between periodontitis and the dysbiotic biofilm necessitates that patients maintain excellent oral hygiene. Therefore, step 1 of the UK clinical practice guidelines for the treatment of periodontal diseases is aimed at behaviour change and motivation in successful removal of the supragingival dental biofilm and risk-factor control, which involves all the health behavioural change interventions that mitigate recognized risk factors for periodontitis onset and progression (smoking cessation, diabetes management). Step 1 should be tailored for the patient throughout the treatment journey and jointly with clinical findings and medical history.

CPD/Clinical Relevance: Step 1 lays the groundwork when progressing through ensuing steps of treatment and can affect response to any periodontal therapy.

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A key finding from the 2009 Adult Dental Health Survey was that only 17% of dentate adults in England, Wales and Northern Ireland had very healthy periodontal tissues and no periodontal disease (no bleeding on probing (BOP), no calculus and no periodontal pockets of >4 mm).¹ Marcenes *et al* highlighted that severe periodontitis is the sixth most prevalent condition, affecting 11.2% globally.² This broadly aligns with the World Health Organization (WHO), which suggested a global prevalence of periodontitis of 19%.³

Periodontitis is a chronic, multifactorial non-communicable disease characterized by inflammation of the oral tissues, and associated with dysbiotic dental plaque biofilms. According to the classification

of periodontal and peri-implant diseases and conditions defined in the 2017 World Workshop,⁴ there are broadly three categories of plaque-related periodontal conditions:

- Clinically healthy periodontium (bleeding on probing (BOP): <10%, absence of attachment and bone loss);
- Gingivitis (BOP: 10–30%, without attachment loss);
- Periodontitis (BOP: >30%, with clinical attachment loss measured by probing or radiographic bone loss).

Following the world workshop, the European Federation of Periodontology (EFP) guidelines were produced, and shortly thereafter the UK implementation of the EFP guidelines was published,

in which management of periodontal diseases within the UK healthcare context was outlined.

The gateway to optimal patient management involves initially using the Basic Periodontal Examination (BPE) as a screen for disease. If a subsequent diagnosis of periodontitis is confirmed, then a diagnostic statement is required. This diagnostic statement should include the following:

- Definitive diagnosis: periodontitis;
- Extent: localized or generalized;
- Stage: I–IV;
- Grade: A–C;
- Current status: stable/unstable;
- Risk factors: smoking habits, uncontrolled diabetes mellitus, familial history of periodontal disease, etc.⁵

Once a diagnosis has been made, patients should be treated according to a stepwise approach to periodontal therapy, with different interventions of care at each stage depending on the patient's disease presentation, history and compliance.⁶ A granular flow chart proposed by the EFP illustrating all four steps of care to each

Angeline Keh, BDS, MFDS RCS (Eng) Periodontology Specialist Trainee, Periodontology Unit, Centre for Host Microbiome Interactions, Faculty of Dentistry, Oral and Craniofacial Sciences, King's College London. **Zehra Yonel**, BDS, MFDS (RCS Edin) (RCS Eng), PGCert, FHEA, MPH (Hons), PhD, School of Dentistry, College of Medical and Dental Sciences (MDS), University of Birmingham. email: angeline.1.keh@kcl.ac.uk

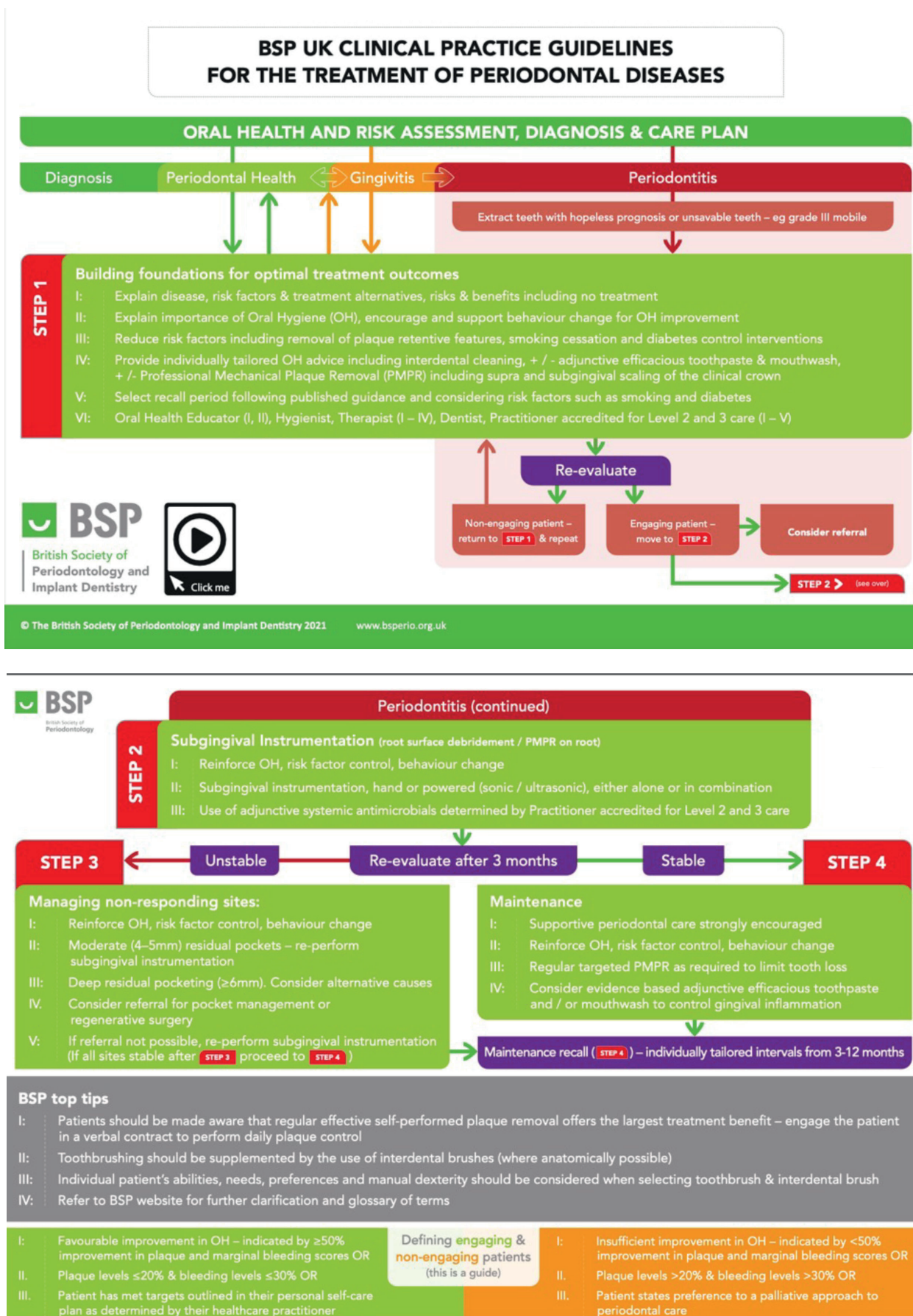


Figure 1. BSP UK Clinical guidelines for the treatment of periodontal disease.

stage (severity and extent) of periodontitis (stages I–III) and adopted by the British Society of Periodontology (BSP) is shown in Figure 1.

The first steps

The first step in therapy targets behaviour change by motivating the patient to undertake successful removal of supragingival dental biofilm and to control risk factors.⁶ It aims to build the foundations for optimal treatment outcomes with six steps:

- Explain the disease, risk factors and treatment alternatives, risks and benefits including no treatment;
- Explain importance of oral hygiene (OH), encourage and support behaviour change for OH improvement;
- Reduce risk factors including removal of plaque retentive features, smoking cessation and diabetes control interventions;
- Provide individually tailored OH advice including interdental cleaning, +/- adjunctive efficacious toothpaste and mouthwash, +/- professional mechanical plaque removal (PMPR) including supra- and subgingival scaling of the clinical crown;
- Select recall period following published guidance and considering risk factors, such as smoking and diabetes, depending on level of diabetes management;
- Oral educator (I, II), hygienist, therapist (I–IV), practitioner accredited for level 2 and 3 care (I–V).

Explain disease, risk factors and treatment alternatives, risks and benefits including no treatment

Three out of four adults with periodontitis are unaware that they have the condition.⁷ Rather than referring to periodontitis as a silent disease, the oral healthcare team has a duty to educate the public, raise awareness and prevent periodontitis through early identification and modification of risk factors. The initial appointment needs to be dedicated to managing patient expectations, especially because altered aesthetics including longer looking teeth and more prominent interproximal spaces (black triangles) following periodontal therapy is common. This includes the patient's role in ensuring

optimal outcomes, as well as the natural progression of the disease, which if left untreated, can lead to tooth loss.

Consequences of no treatment

Prior to initiating the first step, a discussion with the patient is needed to explain the diagnosis, risk factors, risk–benefit profile of treatment and alternative treatment options, including that of no treatment. Failure to diagnose and treat periodontitis has both health and economic implications, resulting in significant individual and societal costs. Apart from aesthetic and functional issues, advanced periodontitis, coupled with caries, accounts for more years lost to disability than any other human disease. Of economic importance, periodontitis has been found to cost £4.7 billion annually in the UK.⁸ Much of this comes from direct treatment costs, increased dental visits, replacement of tooth loss from periodontitis, lost productivity and the impact on general health. Periodontitis has also been linked to various systemic diseases, such as diabetes mellitus,⁹ cardiovascular diseases¹⁰ and adverse pregnancy outcomes.¹¹

Explain the importance of oral hygiene and encourage and support behaviour change for OH improvement

Although the evidence base and periodontal classification has evolved, the role of the oral healthcare team remains unchanged – provision of preventive advice and biofilm control.¹² Several members of the dental team can carry out step 1 of care, including qualified dental nurses, hygienists, therapists and dentists. Plaque is an initiating factor and therefore plays a major role in the aetiology of periodontitis.¹³ The supragingival biofilm can be eliminated both mechanically (manual or electric toothbrushing and interdental cleaning) and chemically (antiseptic agents delivered in dentifrices/mouth rinses).

Interdental brushes (IDBs) rather than floss should be recommended for interproximal plaque removal where appropriate. Flossing is only indicated where IDBs cannot pass interproximally without trauma. Other interproximal cleaning devices, for example, oral irrigators and wood sticks, might be used as adjuncts, but show inconsistent/weak evidence for an adjunctive effect, which

is probably from a lack of evidence from appropriate clinical investigations¹⁴

The 2-minute standardized brushing time rule cannot apply to the periodontitis patient given the accumulated time also needed for interproximal cleaning. The pellicle re-accumulates minutes after brushing. While mechanical plaque removal remains the bedrock of successful periodontal disease management, in high-risk patients, the critical threshold for plaque accumulation to trigger disease progression is low.¹⁴ It is important that this is communicated with patients early on.

Reduce risk factors including removal of plaque retentive features, smoking cessation and diabetes control interventions

A risk factor is a feature that has been associated with a higher likelihood of subsequently developing the disease, but does not necessarily cause the disease. Risk factors may be modifiable, usually environmental or behavioural, or non-modifiable, which are intrinsic to the patient and include genetics.¹⁵ This section focuses on two main modifiable risk factors: smoking; and diabetes that is not well managed. These are the main focus because they are included in the grading of periodontitis. Their associated interventions, as outlined by the BSP, have been included. Risk-factor identification has become significant because of the potential that some factors could be modified to prevent or alter the course of periodontal disease, especially in susceptible individuals.

Smoking is probably the most well-known modifiable risk factor for periodontal disease. Tobacco smoking cessation interventions should be provided for all dental patients. Meta-analyses have suggested that smoking increases the risk of periodontitis by 85%.¹⁶ Furthermore, this likelihood increases depending on the number of 'pack years', indicating dose dependency.¹⁷

Evidence from cross-sectional and case-control studies has shown that smokers have a diminished response to periodontal therapy and show approximately half as much improvement in probing depths and clinical attachment levels following non-surgical and various surgical modalities of therapy compared with non-smokers.¹⁸ Implant failures in smokers are twice those of non-smokers, with the higher failure

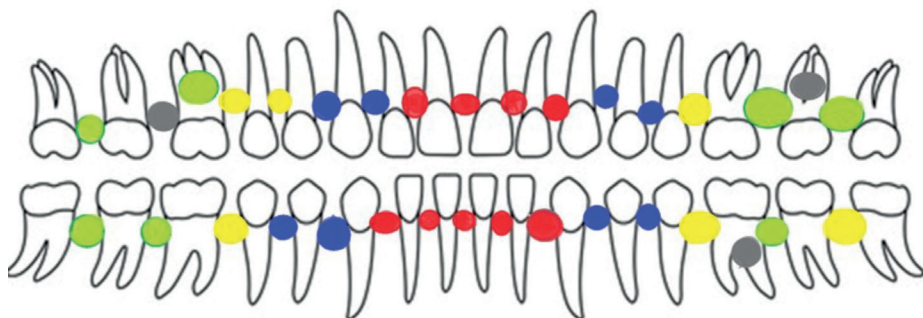


Figure 2. An example of a personalized coloured dental chart representing the colours of interdental brushes at different tooth sites for patients to refer to.

rate in the maxillary arch accounting for the majority of the difference.¹⁹ Research points to the fact that smoking alters the relative abundance of microbial taxa in smokers, supporting higher proportions of *Actinobacillus actinomycetemcomitans* (Aa), *Porphyromonas gingivalis* (Pg) and *Tannerella forsythia* (Tf), all of which are associated with gingival inflammation.²⁰ Smoking also impairs the innate and immune host response, resulting in a change in gingival crevicular fluids, peripheral blood mononuclear cell levels of various cytokines (IL-6, IL-1 pro-inflammatory cytokines), tipping the balance of tissue breakdown. It also decreases salivary IgA (secretory immunoglobulin A) and serum IgG, which is associated with increased susceptibility to oral infections, including periodontal disease. There are also local effects of nicotine, such as vasoconstriction, that reduce gingival blood flow thus impairing the soft- and hard-tissue wound healing needed after periodontal therapy.²¹

Smoking cessation interventions can be as simple as brief counselling to the 5As (ask, advise, assess, assist and arrange), motivational interviewing or to the more advanced cognitive behavioural therapy (CBT). It may involve referring

patients for advanced counselling and pharmacotherapy. Other documents to be referred to alongside this recommendation are the Delivering Better Oral Health toolkit,¹² the NICE guidelines²² and the SDCEP guidelines on periodontal disease in primary care.²³

Poorly managed diabetes mellitus (DM) is another established modifiable risk factor in the aetiopathogenesis of periodontal disease.^{14,28} The severity depends on the quality of diabetic management, patient age and duration of diabetes. Management of DM is not necessarily easy. Patients may be more prone to periodontal abscesses and show a reduced response to periodontal treatment. This has been associated with reduced collagen production, increased collagenase activity and defective remodelling and repair by poorly cross-linked glycosylated collagen.²⁴ Additionally, elevated TNF- α (a cytokine involved in inflammation) levels can suppress insulin activity and present in patients living with type II DM and who are obese and further increased in periodontitis.^{25,26} Diabetic interventions in patients with periodontitis are therefore recommended. The interventions proposed consist of patient education as well as brief

dietary counselling and in situations of hyperglycaemia, referral of the patient to their physician for management of their glycaemic level, to ensure maximum time in range. Interventions such as dietary counselling, lifestyle modifications for weight loss and exercise have been run by the Diabetes UK, Public Health England initiative 'The Healthier You' NHS Diabetes Prevention Programme (DPP)²⁷ have proven to be cost-effective and clinically effective.

The significance of good diabetes management should not be underestimated, as the bi-directional relationship between DM and periodontitis is now well established.²⁸ Periodontal treatment reduced TNF- α levels and enabled better glycaemic control by restoring insulin sensitivity as seen by a reduction in HbA1c levels.²⁹ This puts dental clinicians in a prime position to not only provide routine dental care, but also identify undiagnosed cases of DM or non-diabetic hyperglycaemia (NDH), and facilitate management.³⁰ The general population attends their dentists on an average 6–12 month basis. Conversely, they visit their general practitioner when symptomatic.³¹

The robust evidence linking periodontal disease and diabetes mellitus and other systemic conditions, such as cardiovascular disease³² and rheumatoid arthritis,³³ has meant that the role of the dental team goes beyond a traditional 'scale and polish'. The potential role of dental teams in risk assessment of undiagnosed diabetes supports initiatives such as 'Making Every Contact Count' (MECC), which are aimed at reducing the barriers between healthcare services. Importantly, it may also enable a pathway to improved systemic health for these individuals, by allowing earlier detection and instigation of prevention and management strategies.³⁴

	Engaging patient	Non-engaging patient
Response to the oral hygiene (OH) instructions given	Favourable	Unfavourable
Improvement in OH in plaque and bleeding on probing scores	>50%	<50%
Indicative bleeding levels	<30% (10% in a level 2/3 setting)	>30% (10% in a level 2/3 setting)
Indicative plaque levels	<20%	>20%
Stated preference	Achieving periodontal health	Palliative approach to periodontal care

Table 1. Clinical evidence of the engaging versus non-engaging patient.

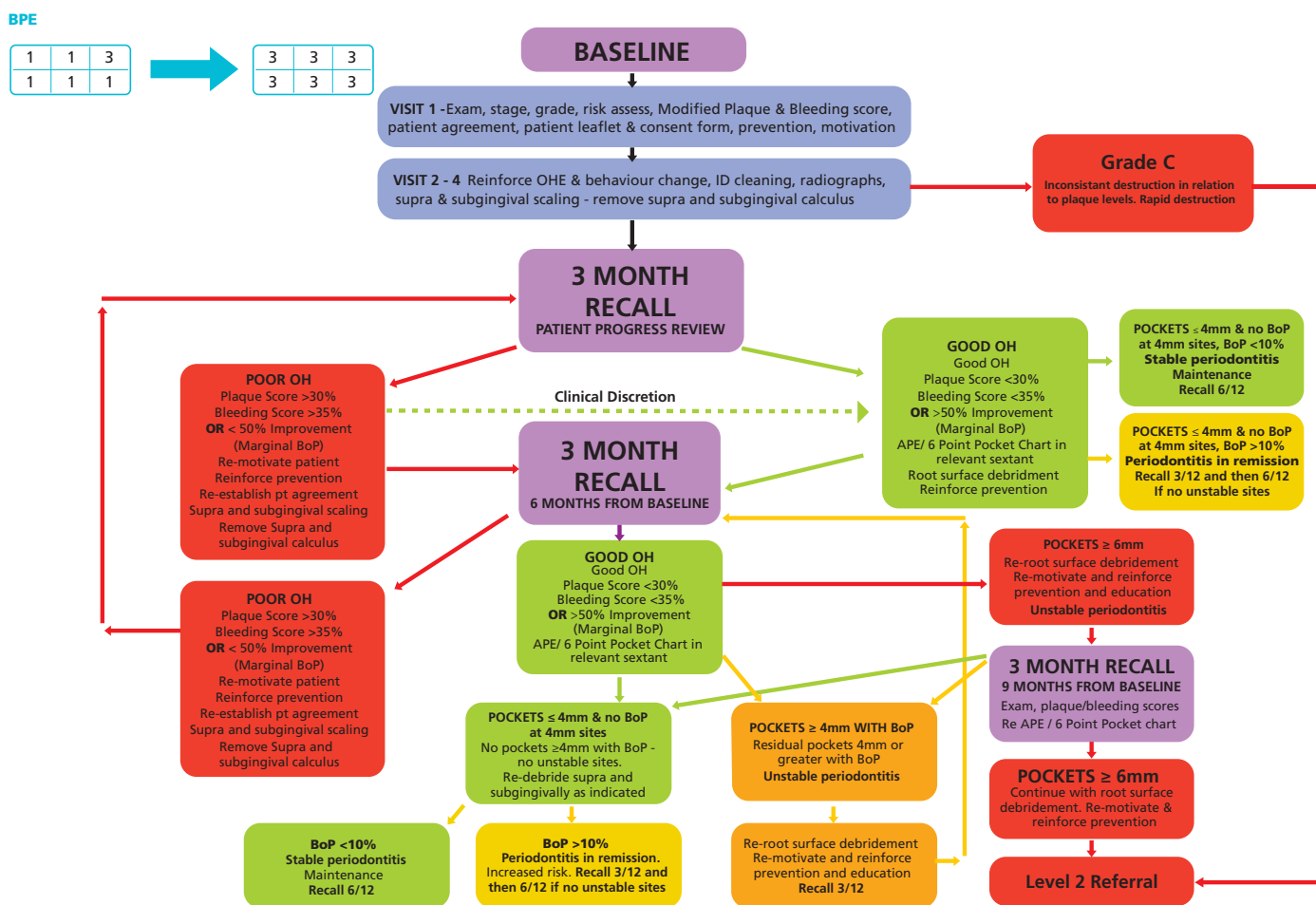


Figure 3. Periodontal disease pathway for patients with active periodontitis.⁴¹

The presence of plaque retentive factors, either due to tooth anatomy or iatrogenic factors, are often associated with gingival inflammation and/or periodontal attachment loss. It is therefore recommended that they are addressed in the first step of periodontal therapy. This can include correction of over-contoured restorations, removal of overhangs and ensuring adequate marginal fit of indirect restorations, which should not be subgingival to avoid impingement of the supracrestal tissue attachment (STA). Previously termed the biological width, the STA is the 0.97 mm of junctional epithelium and the 1.07-mm connective tissue attachment coronal to the alveolar crest.³⁵ If the STA is encroached upon, it triggers a host response, with tissue remodelling to recreate the requisite 2.04 mm distance between the restoration margin and alveolar bone crest, hence resulting in

the loss of periodontal attachment. This is more commonly observed in those with thin gingival phenotypes, whereas in patients with thick gingival phenotypes, this presents as inflammation.

Provide individually tailored OH advice including interdental cleaning, +/- adjunctive efficacious toothpaste and mouthwash, +/- professional mechanical plaque removal including supra- and subgingival scaling of the clinical crown

Van der Weijden and Slot's meta review reported that 42–46% of plaque is removed when toothbrushing with a manual or electric toothbrush.³⁶ Surprisingly, even with oral hygiene reinforcement, the further

reduction in plaque scores was found to be small ($P = 0.06$), and bleeding tendency less than 6%.³⁷ The implication here is that oral hygiene instruction needs to be tailored for patients to initiate habitual change. This can include how to use interdental brushes in furcation areas, lingually/palatally, the use of single-tufted brushes, vertical brushing and even an individualized coloured dental chart representing the colours of brushes at different tooth sites (Figure 2).

Additionally, the use of jargon-free terminology, so that the 'lay person' can understand the disease, cannot be overlooked. In this digital era, having patients take photographs of their disclosed teeth might spur behaviour change. This graphic visualization of the saturated plaque stains, coupled with an appropriate explanation of its seriousness, serves as a motivational tool to reduce plaque scores.³⁸ It also formulates part of the dental notes. Tactile feedback is essential, and having the

patient repeat how to use the interdental brush in the clinic helps to reinforce its use. Effective, consistent, mechanical removal of their biofilm is the key message.³⁹

For the treatment of gingivitis, and where improvements in plaque control are required, adjunctive use of antiseptics may be considered. Chlorhexidine is frequently cited, but only as an adjunct to mechanical debridement in select cases. Available as 0.2% and 0.06% formulations in the UK, the chlorhexidine mouthwash should only be used for 1–2 weeks, with the 0.2% recommended for more specific clinical uses, such as post periodontal surgery.

In Step 1, PMPR is an essential component of periodontal therapy. Instrumentation will be covered in greater detail in step 2 of the UK clinical practice guidelines for the treatment of periodontal diseases, but it is important to highlight that even supragingival instrumentation may induce beneficial changes in the subgingival microbiota.⁴⁰

Select recall period following published guidance and considering risk factors such as smoking and diabetes

In the BSP implementation of the S3 guidelines,⁶ recall visits for supportive periodontal care were recommended at intervals of 3–12 months, with the frequency determined by the patient's risk profile and periodontal status after therapy.

The stepwise pathway allows for better-targeted periodontal therapy to ensure favourable outcomes and stability following treatment. Therefore, clinicians have to differentiate between an 'engaging' and 'non-engaging' patient (Table 1). However, these terms are not static descriptors. Depending on patient circumstances, a 'non-engager' can come on board, so should be given every opportunity to do so and vice versa, an 'engaging' patient can lose compliance. Patient engagement and motivation towards treatment should always be re-evaluated at each recall assessment. Additionally, some patients, despite their keenness, will not be able to achieve these levels of oral hygiene owing to factors such as mental or physical health problems, or manual dexterity. In these circumstances, formal periodontal therapy can be initiated in the best interests of the patient with the option for a level 2 referral.

To reflect the increased risk of disease in patients with well-established risk factors,

such as smoking and poorly managed diabetes, clinicians might wish to reduce the recall intervals. The recall period has to be determined by the treating clinician based on the patient's risk factors, medical and social history, all of which can change during the course of treatment. During the course of periodontal therapy, management moves from a high level ('mouth level') analysis of risk factors, such as poor plaque control, calculus levels, to 'tooth level' risk-factor management, such as tooth anatomy and furcation involvement, and finally to 'site level' risk-factor management, such as bleeding on probing and local root grooves/concavities. The level of knowledge and understanding of an individual patient's risk and disease increases as we move from mouth-level to tooth-level to site-level risk factors.

A more comprehensive guidance is the accredited 'Healthy gums do matter (HGDM) practitioner's' toolkit⁴¹ where a guidance for patients with active periodontitis has been suggested (Figure 3). The pathway is based on the BSP's implementation strategy, but is simplified and more practical for general practice.

Oral health educator, hygienist, therapist, dentist, practitioner accredited for level 2 and 3 care

The document 'Delivering phased-care for periodontitis patients under UDA banding: Road map to prevention and stabilisation'⁴² can be used when treatment planning for the periodontitis patient with other restorative needs. The advice given to patients is crucial for them to grasp the seriousness of disease progression and consequent inflammatory reaction, which extends far beyond the mouth. The stepwise approach to periodontal treatment front loads oral health education and prevention in step 1, but some patients might still require referral to secondary care or specialist periodontal care. The UK recognized referral criteria states this as 'Patients with a specific problem with the periodontal tissues, which is beyond the scope of general dental practice'. Some examples are advanced disease in a young patient, combined periodontal and orthodontic treatment and complex periodontal–restorative treatment planning.

Guidance on when and how to refer has been outlined in BSP's 'The Good Practitioners Guide to Periodontology' published in 2016.

- Level 1 care is the level of competence and minimum standard for general dental practitioners in primary care.
- Level 2 care refers to clinicians with enhanced skills and experience, but not necessarily on a specialist register.
- Level 3 care is by a clinician recognized as a specialist and is on the GDC specialist list or by a consultant.

The first step of therapy forms the basis of treatment in patients with periodontitis. Control of local and systemic modifiable risk factors that influence disease progression and response to non-surgical intervention are key. It is essential that progression to the next step (cause-related therapy) is not initiated until the patient can adequately maintain their plaque levels and subsequent gingival inflammation through an appropriate homecare regimen. Clinicians should revisit this step regardless of stage of treatment for patients to continue to motivate and support optimal oral hygiene.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

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