

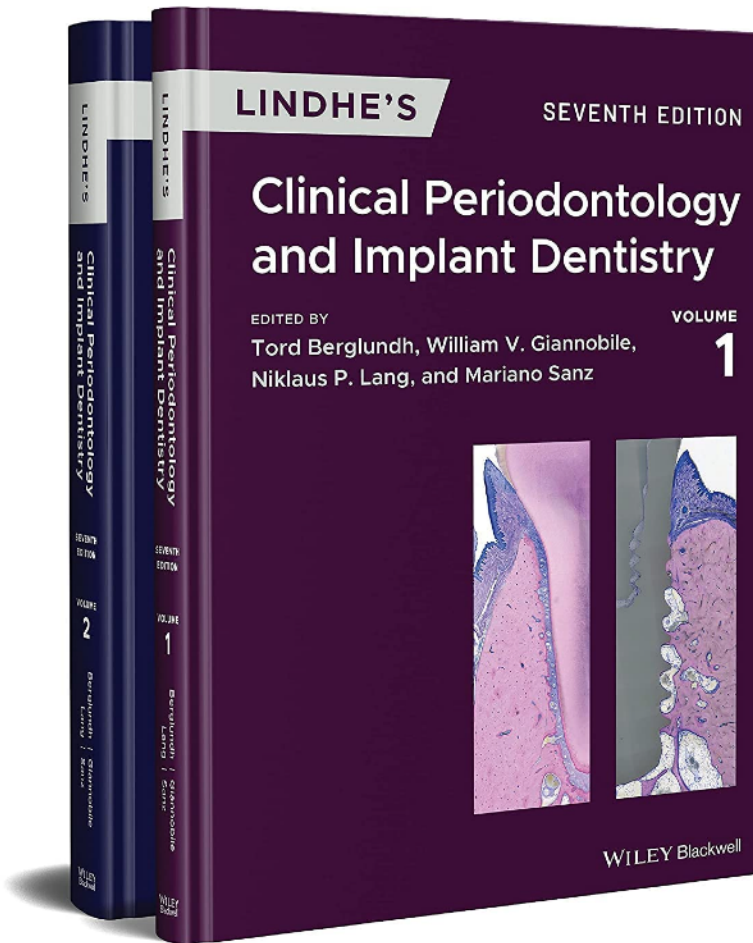


Mechanical Supragingival Biofilm Control

Dr Emma Perry | *BDS*Sc, *AssocDeg DH*, *GradCert HPEd*

Content courtesy of Dr Anna Hughes | *BDS*, *MSC*, *FDS RCPS*, *MRACDS (Perio)*

Textbook



Chapter 28

Mechanical Supragingival Plaque Control

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Learning Outcomes

- Define Mechanical Supragingival Biofilm Control (MSBC).
- Explain the rationale for MSBC.
- Describe the role of MSBC in periodontal treatment.
- Develop an evidence-based, individualised MSBC regime for a patient.
- Instruct a patient in MSBC.

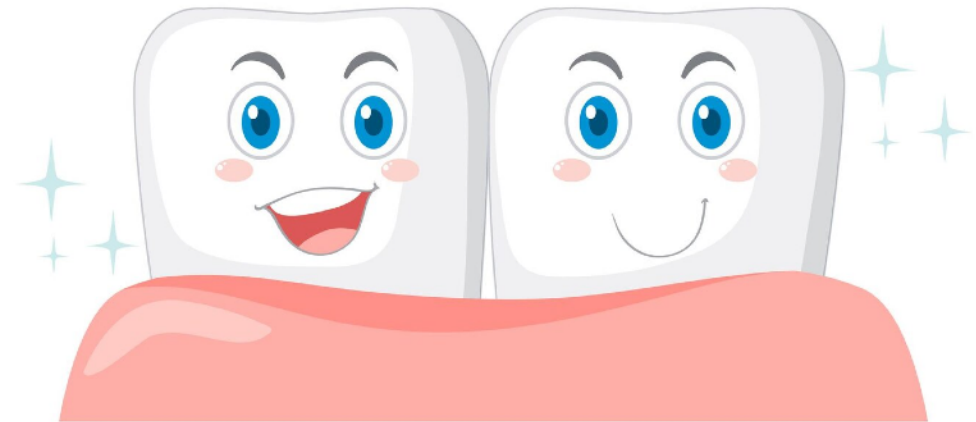
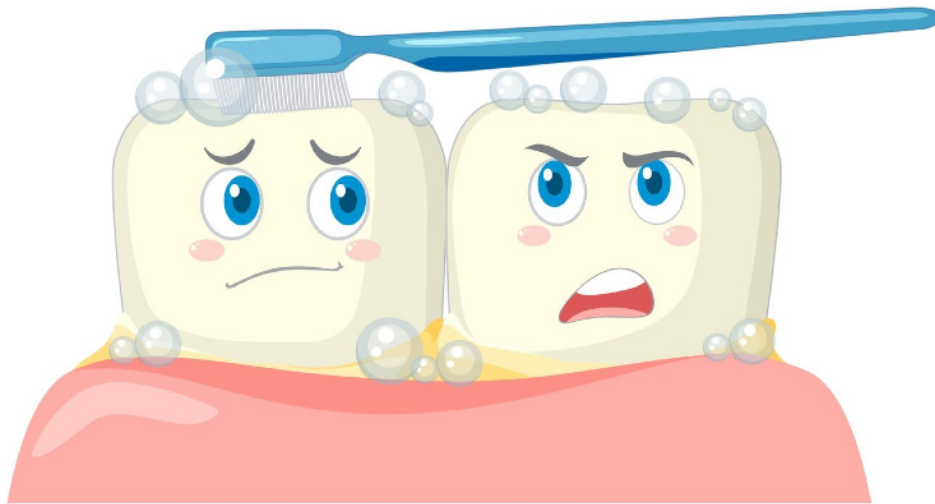
Lecture outline

- **Define Mechanical Supragingival Biofilm Control (MSBC).**
- **Explain the rationale for MSBC.**
 - Patient
 - Dentist
 - Gum disease
 - Caries
- **Describe the role of MSBC in periodontal treatment.**
 - Professional
 - Patient-performed
- **Develop an evidence-based, individualised MSBC regime for a patient.**
 - Brush
 - Technique
 - Interdental
 - Other devices
 - Dentifrices
- **Instruct a patient in MSBC.**



Definition

The removal of microbial plaque and food debris from dental hard surfaces through abrasion using physical means such as brushes, floss and other devices.

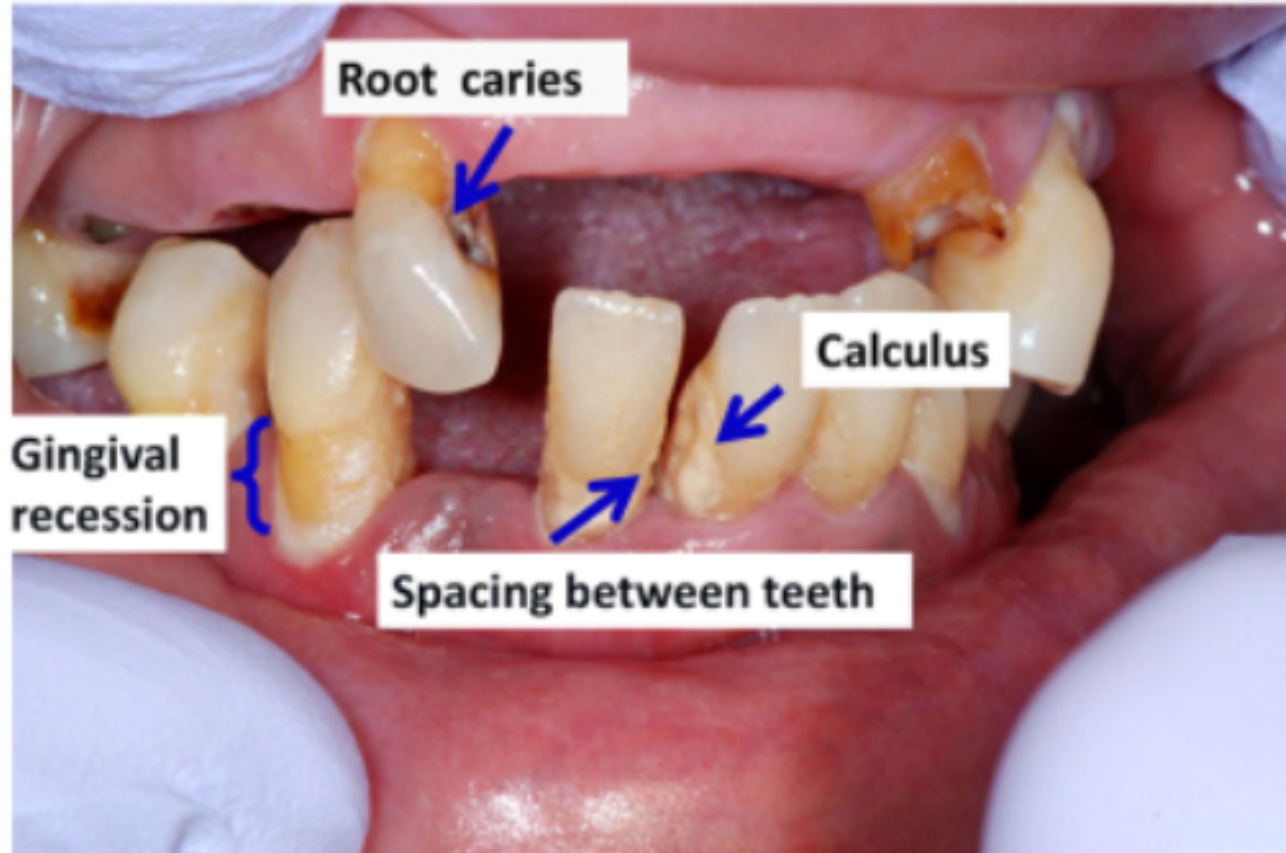


Rationale: A patient's perspective

- To achieve oral wellbeing
- To feel clean and fresh
- To have a nice smile
- To reduce bad breath

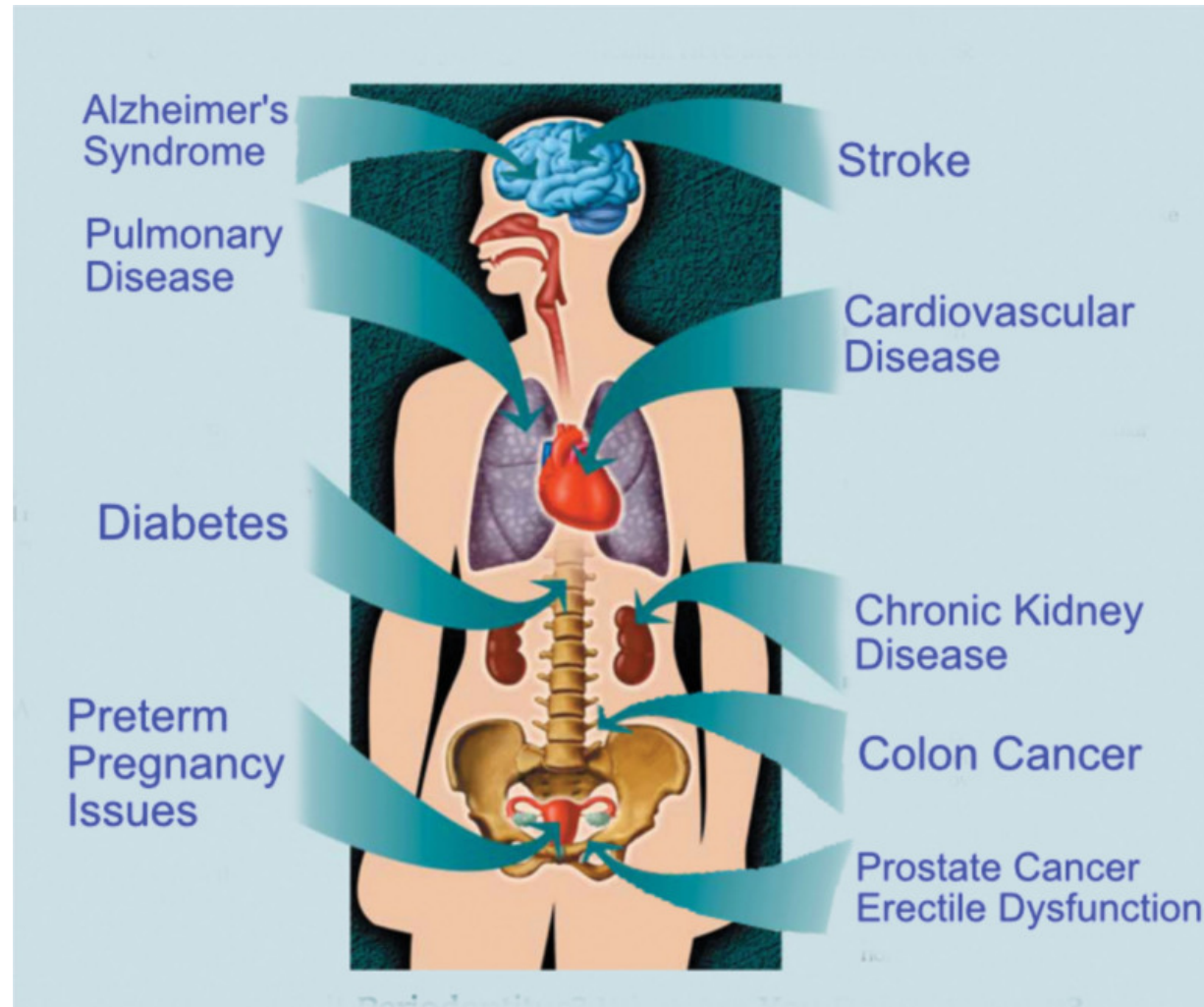


Rationale: A dentist's perspective



- Gum disease
gingivitis and periodontitis
- Caries
- Systemic effects

Rationale: Systemic effects



Rationale: A dentist's perspective

- Natural self-cleansing mechanisms have limited effect on plaque build-up.
- Biofilm adherence to teeth is tenacious and cannot be removed by rinsing alone or chemical dissolution.



Rationale: Gum disease

- Regular personal plaque removal measures must be undertaken to achieve and maintain periodontal health.

- Biofilm removal and control is fundamental to prevention and control of periodontal diseases

Chapple et al 2015



- Supragingival plaque control can modify the quantity and composition of sub gingival plaque, but by itself cannot treat moderate and severe periodontitis

Lindhe et al 1989



Rationale: Caries

- The evidence for toothbrushing itself to reduce caries is weak and inconsistent
[Addy 1986](#)



More important than brushing
(when considering caries),
the toothbrush is an effective
vehicle for fluoride toothpaste.



- National surveys in Finland [Mattila et al 2010](#) and Germany [Jordan et al 2014](#) have found a strong association between caries and attachment loss in adults, but no attempts were made to explore to what extent this association was explained by common risk factors [Jepsen et al 2017](#). Therefore we cannot conclude poor plaque control caused their carious lesions.

MSBC in Periodontal Treatment

- Professional
 - Part of preventive or active treatment
 - Prophylaxis
 - Traditional cup/brush and paste
 - Air/powder/water jets
- Patient-performed
 - OHI

MSBC in Periodontal Treatment



Phases of Periodontal Treatment

[Corbet & Smales 2012](#)

- Emergency care
- Risk management
- Fundamental
- Corrective
- Supportive

“...sustainable improvements in plaque control form the cornerstone of **all** phases of periodontal therapy...”



Steps of Periodontal Treatment

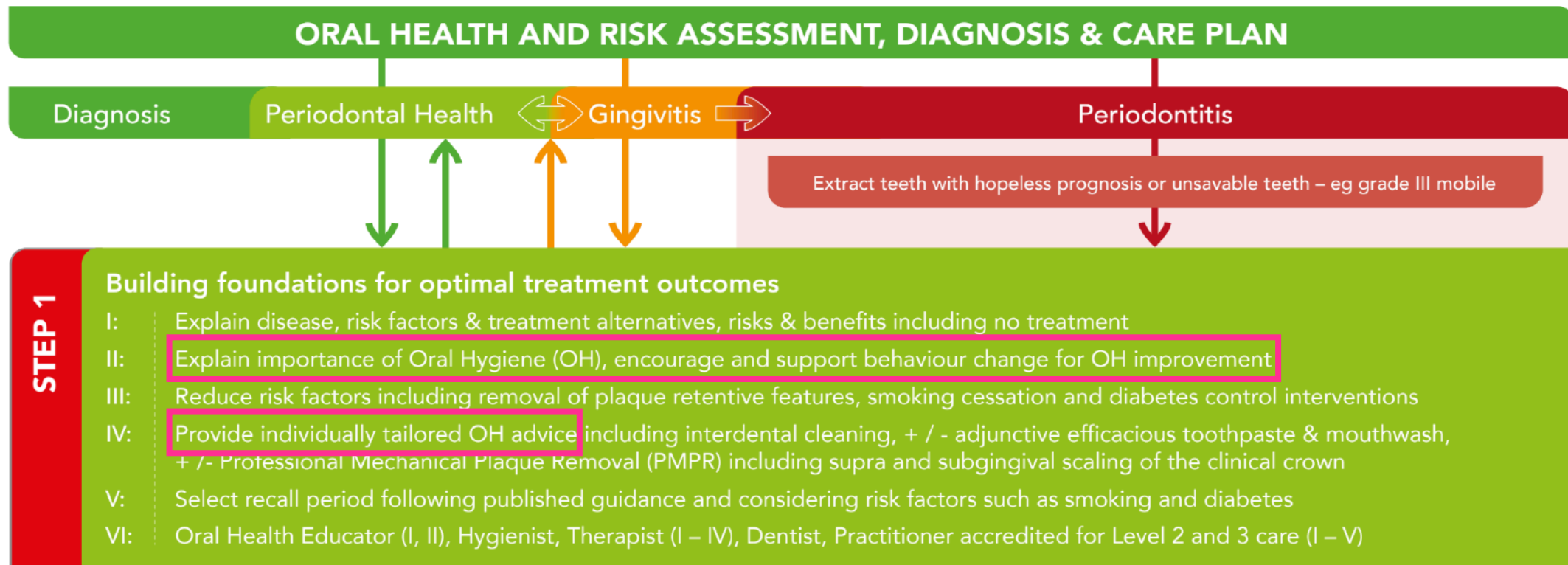


Steps of Periodontal Treatment

Supported by



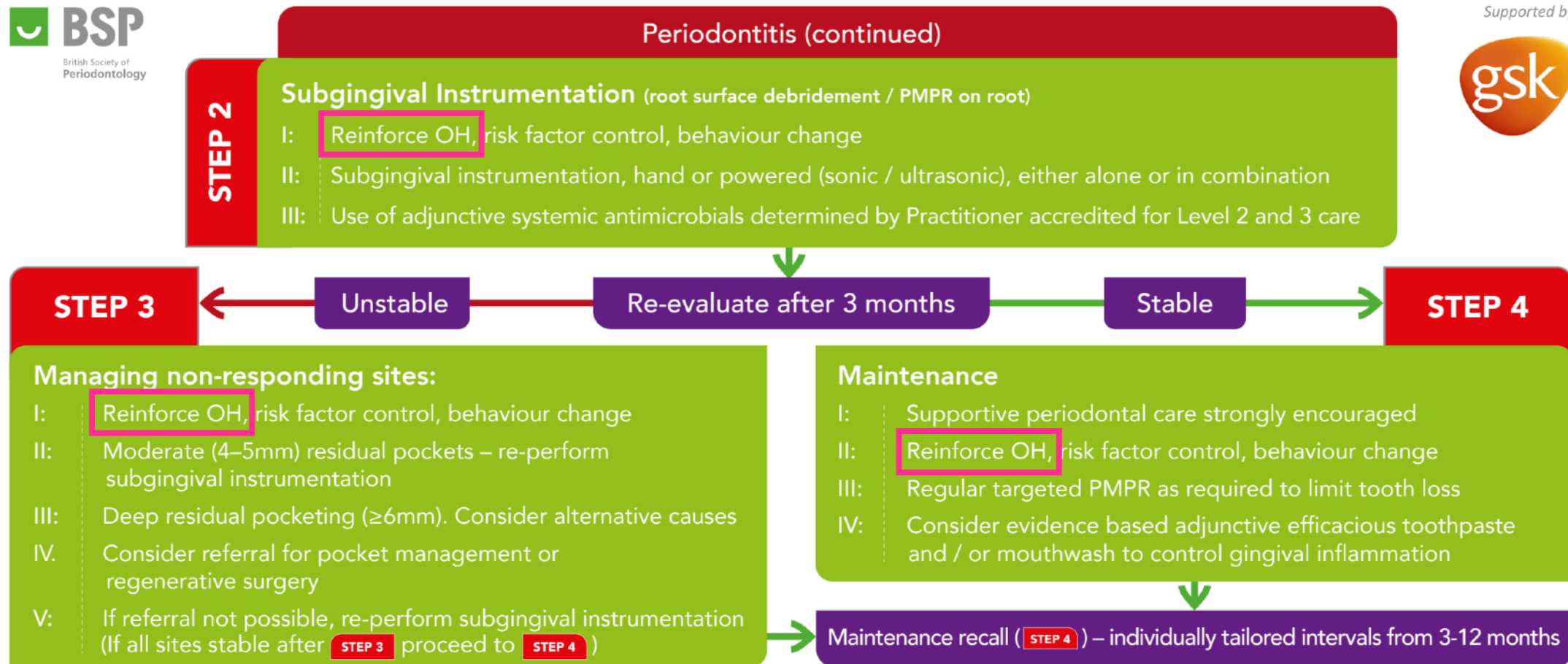
BSP UK CLINICAL PRACTICE GUIDELINES FOR THE TREATMENT OF PERIODONTAL DISEASES



Steps of Periodontal Treatment



Supported by



Steps of Periodontal Treatment

BSP top tips

- I: Patients should be made aware that regular effective self-performed plaque removal offers the largest treatment benefit – engage the patient in a verbal contract to perform daily plaque control
- II: Toothbrushing should be supplemented by the use of interdental brushes (where anatomically possible)
- III: Individual patient's abilities, needs, preferences and manual dexterity should be considered when selecting toothbrush & interdental brush
- IV: Refer to BSP website for further clarification and glossary of terms

- I: Favourable improvement in OH – indicated by $\geq 50\%$ improvement in plaque and marginal bleeding scores OR
- II. Plaque levels $\leq 20\%$ & bleeding levels $\leq 30\%$ OR
- III. Patient has met targets outlined in their personal self-care plan as determined by their healthcare practitioner

Defining **engaging** &
non-engaging patients
(this is a guide)

- I: Insufficient improvement in OH – indicated by $< 50\%$ improvement in plaque and marginal bleeding scores OR
- II. Plaque levels $> 20\%$ & bleeding levels $> 30\%$ OR
- III. Patient states preference to a palliative approach to periodontal care

Efficient Periodontal Treatment

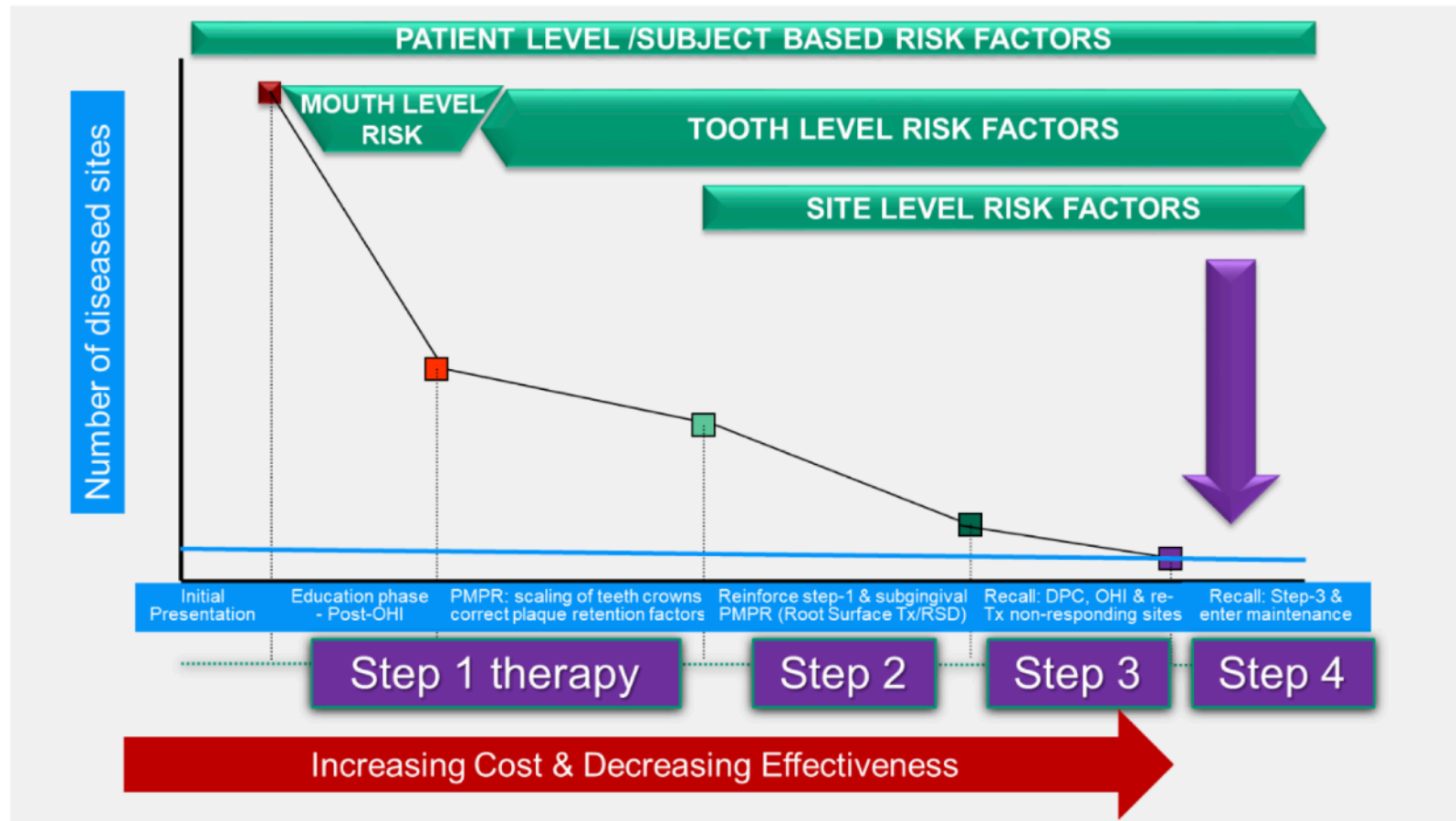


Figure 1 – Risk-driven prevention delivers the greatest periodontal health improvement in Step-1 of care, with decreasing return on investment (time & money) towards Step-2 and 3.

Toothbrush

- Miswak
- Arak-salvadora persica tree
- Widely used in Asia, Middle East, Africa.
- Can be as effective as a manual toothbrush if used 3-5 x daily.

[Adam et al 2021](#)



Toothbrush

- Most common method of mechanical plaque control.
- Handles usually made of plastic +/- rubber.
- Bristles usually made of nylon or polyester +/- rubber.
 - Head design
 - Bristles
 - Handle design
 - Electric or manual



Toothbrush: Head design

Table I: Manual Toothbrushes Utilized In Study and Features

MTB Heads	Manufacturer	Type
	Biotene Supersoft (BIO) (GlaxoSmithKline, USA)	Adult
	Butler Gum Tec (GBTE)	
	Butler Gum Sumi	
	Butler Gum (B)	
	Butler Gum Crayc	
	Butler Gum Kids	
	Colgate Wave (C) (Colgate-Palmolive Company, New York)	
	Crest Dual Action (CRDA)	
	Crest Complete	
	Oral-B Advantage (OBAA)	
	Oral-B Advantage (OBAG)	
	Oral-B Advantage (OBAP)	

Table I: Manual Toothbrushes Utilized In Study and Features (continued)

MTB Heads	Manufacturer	Type
	Oral-B Advantage (OBAD)	Adult
	Oral-B Advantage (OBI)	
	Oral-B Cross	
	Oral-B Indicator	
	Oral-B Indicator	
	Oral-B Pro-H	
	Oral-B Original	
	Oral-B Stage 1	
	Oral-B Stage 2	
	Oral-B Stage 3	
	Oral-B Stage 4	

Table II: Power Toothbrushes utilized in study and features

PTB Head	Manufacturer	Type	Features
	Arm & Hammer Spinbrush Sonic (AHSO)	Battery	Soft bristles
	Arm & Hammer Spinbrush (AHSP)		
	Colgate Motion (COM) (Colgate-Palmolive Company, New York, NY)		
	Oral-B Stages Power A 3+ (OB3B)*		
	Oral-B Power Polish (OBPD)		
	Oral-B (OBP)		
	Oral-B Power Tip (OBPT)		
	Oral-B Pulsar (OBPL)		
	Oral-B Sonic (OBSC)		
	Oral-B CrossAction D Clean (OBDC)		
	Oral-B Dual Action (OBD)		

*Children PTBs

Table II: Power Toothbrushes utilized in study and features (continued)

PTB Head	Manufacturer	Type	Features
	Oral-B Pulsonic (PULSE)	Rechargeable	Prosoft bristles; pivots and pulses
	Oral-B Kids 3+ (OBKP)*	Battery	Extras Soft bristles; raised row of bristles, blue indicator bristles, round head; oscillating rotation motion
	Sonicare Elite Compact (SECP)	Rechargeable	Soft Bristles ; Slim, angled neck and contour-fit bristles; rippled bristles; compact head
	Sonicare Elite Standard (SESP)	Rechargeable	Soft Bristles; Slim, angled neck and contour-fit bristles; rippled bristles
	Sonicare Flexcare Compact (SFCP)	Rechargeable	Soft rippled bristles; indicator bristles; compact head
	Sonicare Flexcare Standard (SSFB)	Rechargeable	Soft rippled bristles; indicator bristles
	Sonicare Kid Age 4+ (SKID1)*	Rechargeable	Extrasoft bristles; compact head; rippled
	Sonicare Kid Age 7+ (SKID2)*	Rechargeable	Extrasoft bristles; rippled
	Waterpik Large (WATP1) (Fort Collins, CO)	Rechargeable	Extrasoft bristles; standard head
	Waterpik Small (WATP2)	Rechargeable	Extrasoft bristles; compact head

*Children PTBs

Toothbrush: Professional range



<https://www.colgateprofessional.com.au/products/toothbrush>

Toothbrush: Bristles

Soft- 0.2mm diameter – less traumatic

Medium-0.3mm diameter – better cleaning

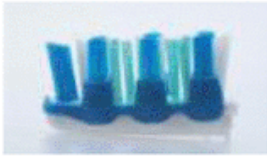
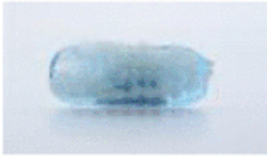
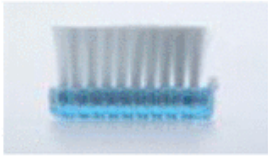
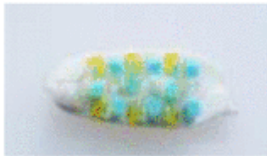
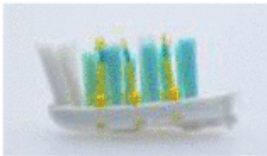
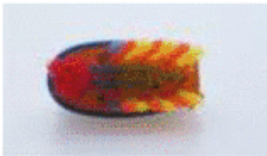
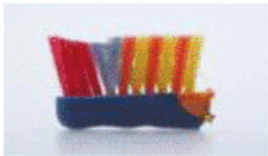
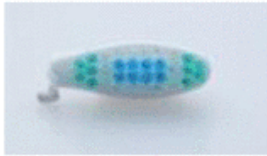
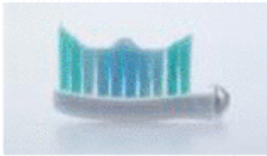
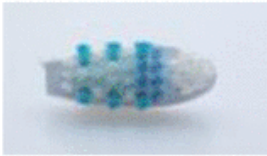
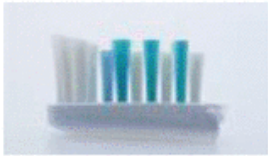
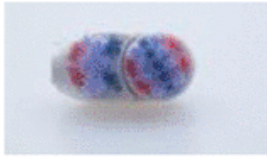
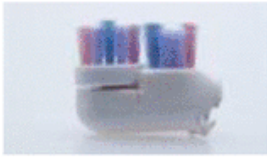
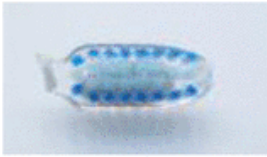
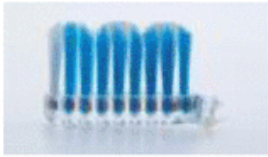
Hard-0.4mm diameter- more damaging

Filament ends important- cut vs end-rounded vs tapered

Number of filaments per tuft

Length and shape of filaments

Toothbrush: Bristles

PTBs		MTBs	
			
Arm & Hammer Sonic (PTB) Bilevel, separated tufts/ rectangle		Biotene (MTB) Flat	
			
Oral-B Pulsar (PTB) Multilevel		Oral-B Stages mixed dentition (MTB) Angled	
			
Sonicare Elite Standard (PTB) Rippled		Oral-B Advantage Plus (MTB) Multilevel	
			
Oral-B Power Stages 3+ (PTB) Bilevel, round angled		Butler Gum (MTB) Rippled	

Toothbrush: Professional range



<https://www.colgateprofessional.com.au/products/toothbrush>

Toothbrush: Consumer range



<https://www.colgate.com.au/products/toothbrush#>

Toothbrush: Ergonomics

“designed to fit their lifestyle through comfort of use”

- Handle design
- Grip design
- Angulation of head
- Design of head
 - Size
 - Shape
 - Tuft length and angle

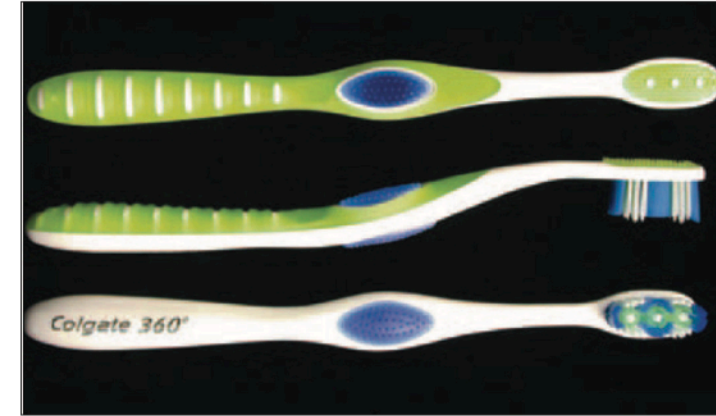


Figure 1. The Colgate 360° manual toothbrush launched in 2004.¹² Figure reprinted with permission.

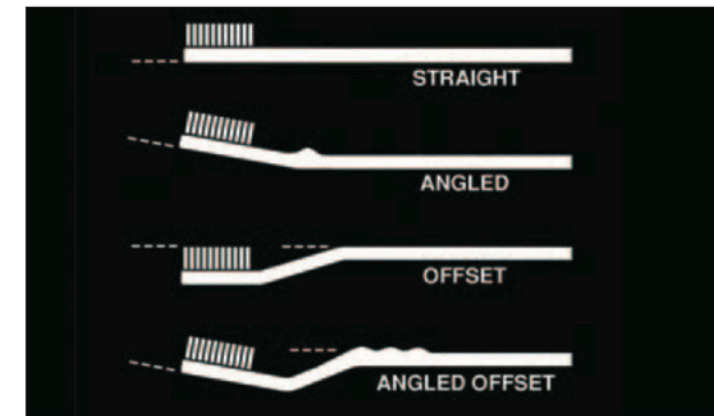


Figure 2. Four types of toothbrush handle designs.¹² Figure reprinted with permission.

Toothbrush: Evidence

- Manual toothbrushing reduced plaque levels by 42%, while powered toothbrushing reduced plaque levels by around 46% [Van der Weijden & Slot 2015](#)

More than 50% of plaque left

- Angled bristle tuft design scored higher in manual brushes [Slot et al 2012](#)
- Oscillating-rotating brushes appear to reduce plaque and gingivitis more than side to side electric brushes in the short term and also to be safer to the hard and soft tissues compared to manual brushes [Van der Weijden & Slot 2015](#)
- Dexterity , brushing time and technique, type of brush used, frequency important.
- Crowding/ spacing/gingival phenotype and the gingival changes after periodontal treatment influence choice of aids

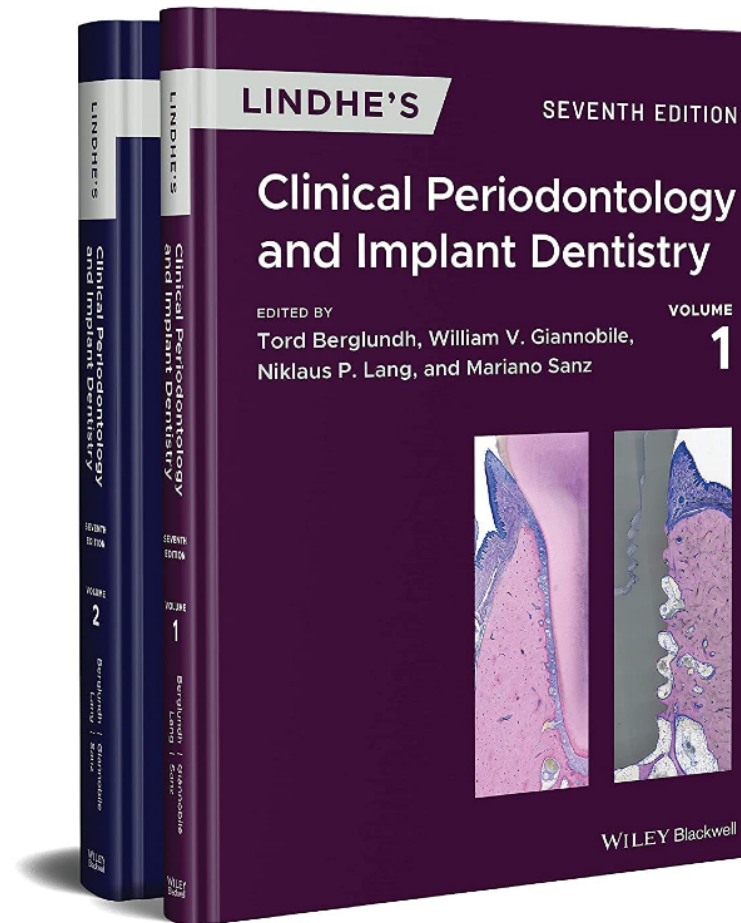
Toothbrush: Technique

- Sulcular
 - Bass/Modified Bass
 - Can reach up to 1mm subgingival [Waerhaug 1981](#)
 - Most recommended



Toothbrush: Technique

- Vibratory
 - Stillman
 - Charters
- Circular
 - Fones
- Vertical
 - Leonard
- Horizontal



Chapter 28
Pages 665-673

Toothbrush: Abrasion

TOO MUCH?



(c)



(d)



Fig. 28-9 (a) Soft tissue damage as a result of extensive toothbrushing. Note the gingival recession on the buccal gingival surface of tooth 13. (b) Note the multiple ulcerations of the buccal gingival margin in the right maxilla. (c, d) Hard tissue damage (arrows) has resulted after extensive use of interdental brushes.

Electric Toothbrushes



- Oscillating – rotating
 - Braun Oral B
 - 3D movements
 - High frequency vibrations
 - Pressure monitoring
- Oscillating-rotating brushes appear to reduce plaque and gingivitis more than side to side electric brushes in the short term and also to be safer to the hard and soft tissues compared to manual brushes

[Van der Weijden & Slot 2015](#)

Electric Toothbrushes



- Sonic
 - High frequency filament movement creating a turbulent flow
 - Phillips Sonicare, HiSmile
 - Not as effective as oscillating-rotating [van der Sluijs et al 2020](#)



Toothbrush: When to replace?

- 3-monthly
- Or when it looks like this:



Wear scores	Description
0 – No wear	No visible signs of wear, inner and outer tufts are intact
1 – Light wear	Outer tufts begin to splay, inner tufts are still intact
2 – Medium wear	Outer tufts are splayed beyond the base of the toothbrush, inner tufts begin to splay
3 – Heavy wear	Outer and inner tufts are splayed
4 – Extreme wear	Outer and inner tufts are splayed whereby no distinction can be made



Score 0



Score 1



Score 2



Score 3



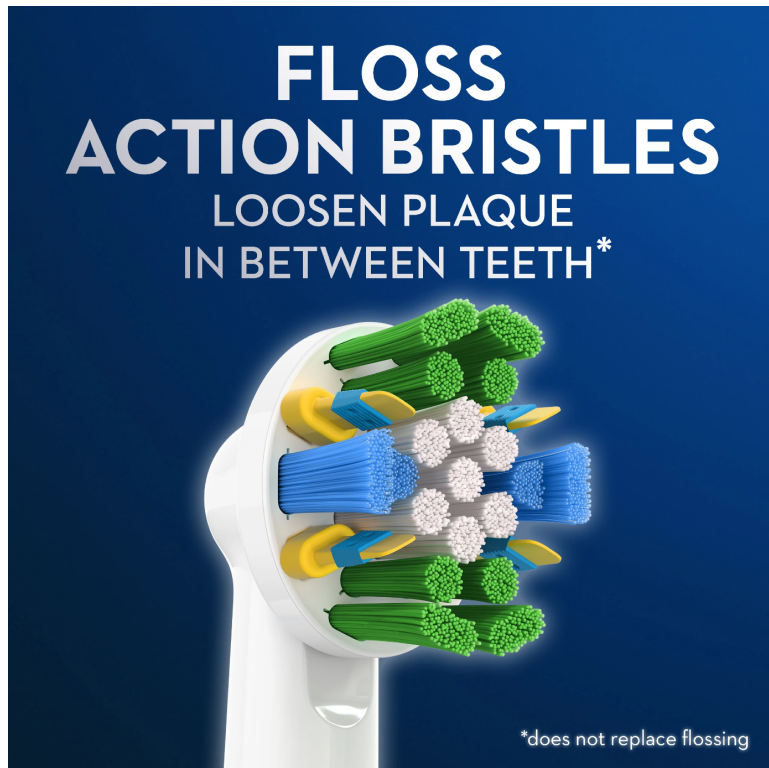
Score 4



Toothbrush: General conclusions

- No 1 superior technique [Hansen & Gjermo 1971](#)
- Average time spent on toothbrushing between 30-60s, only 10% of that on lingual surfaces
- [Bosman and Powell 1977](#) and [Lang et al 1973](#) showed once daily or every other day thorough cleaning can reverse gingivitis in dental students
- Quality of cleaning more important than frequency [Bjertness 1991](#)
- Brush twice daily, for at least 2 minutes with a fluoride toothpaste is the current recommendation
- Professional instruction is important
- No toothbrush can clean interproximally

Interdental cleaning



- Toothbrushes **do not** reach interproximally.
- Residual plaque remains on the interproximal surfaces of premolars and molars after toothbrushing.
- Gingivitis, periodontitis and dental caries occur more frequently in the interdental region than on oral and facial surfaces.
- Choice of method should be personalised to each patient and each interdental space, and needs to be reviewed and possibly modified.

*does not replace flossing

Interdental cleaning

Table 28-1 Interdental cleaning methods recommended for particular situations in the mouth.

Situation	Interdental cleaning method
Intact interdental papillae; narrow interdental space	Dental floss or small woodstick/rubber/elastomeric interdental cleaning stick
Moderate papillary recession; slightly open interdental space	Dental floss, woodstick/rubber/elastomeric interdental cleaning stick or small interdental brush
Complete loss of papillae; wide open interdental space	Interdental brush
Wide embrasure space; diastema, extraction diastema, furcation or posterior surface of most distal molar, root concavities or grooves	Single-tufted/end-tufted brush or gauze strip

Interdental cleaning: Floss

“It’s low risk, low cost,” he said.
“We know there’s a possibility that it works, so we feel comfortable telling people to go ahead and do it.”

National Institutes of Health dentist Tim Iafolla
Associated Press, 2021

<https://apnews.com/article/f7e66079d9ba4b4985d7af350619a9e3>



Interdental cleaning: Floss

- Most frequently recommended method
- Ideal for crowded spaces and when the papillae fill the embrasure spaces.
- When properly used can remove up to 80% of proximal plaque and can reach 2-3.5mm subgingivally. [Carnio 2009](#)
- Waxed (tight contacts)
- Unwaxed (normal contacts, thinnest and separates during use to cover a wider surface area)



Interdental cleaning: Floss

MANFLOSS™
SERIOUSLY GOOD FLOSS

Made Black

To show white plaque being removed



Is White

For the Squeaky Clean amongst us
who prefer not to know...



Interdental cleaning: Floss

- Avoid using floss around exposed rough surfaces of dental implants
[Montevecchi et al 2016](#) , [Van Velzen et al 2016](#)
- Difficult to master, special holders available
- Time consuming
- Several systematic reviews and a meta-review have shown no benefit from flossing
[Sälzer et al 2015](#)
- Flossing was only shown to be effective in reducing interproximal caries (by 40%) when applied professionally although this benefit was not seen in self performed flossing and when fluoridated toothpaste was used.
[Hujoel et al 2006](#)
- **Again, despite the weak evidence of benefit, self or parental-performed flossing should be a routine part of oral biofilm control if no other interdental cleaning devices can be used.**

Flossing technique



Interdental cleaning: Brushes

- Highly effective plaque removal especially where root concavities, grooves and for Gr III furcation defects
- Most effective interdental cleaning method [Sälzer et al 2015](#)
- Easy to use
- More effective than floss in plaque removal and pocket reduction
- Can clean 2-2.5mm subgingivally
- Caution - overuse/incorrect use can cause soft and hard tissue damage
- Wire can cause damage to implant surfaces



Interdental cleaning: Sticks



- Wooden sticks - one of humanities oldest interdental cleaners
- Toothpicks - circular, for food debris
- Wooden sticks - triangular, soft wood, easy to use, useful if there is enough space interproximally, can clean subgingival plaque but can traumatise papillae if incorrectly used

Interdental cleaning: Wood sticks



Interdental cleaning: Rubber sticks

- Elastomeric cleaning sticks
- Massages gum, dislodges food
- Few studies to date, mostly showing no reduction in plaque and gingivitis score
- Safe and popular with patients



Figure 3. Clinical application of CPP-ACP paste using an appropriately sized interdental applicator (courtesy of Louis Mackenzie)

Tongue cleaning



The dorsum of the tongue harbours a great number of microorganisms which can disseminate to other parts of the mouth.



Tongue microbes can contribute to bad breath

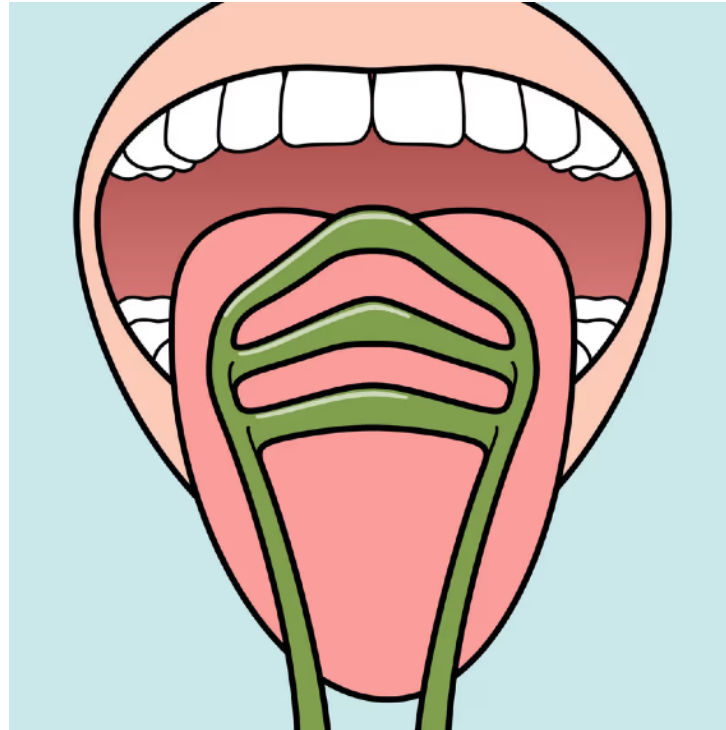


Hence tongue brushing has been advocated as part of daily home care



However , conflicting evidence on tongue brushing and new plaque formation-insufficient evidence to recommend frequency, duration or delivery [Kuo et al 2013](#)

Tongue cleaning



Water flossers

- Uses water jet
- Conflicting evidence to show adjunctive benefit
- Removes food, debris, loose plaque.
- Can be used to deliver antiseptic 3mm subgingivally
- Potential bacteraemia?
- Can be painful
- Useful around implants
- Messy



High tech

- Full arch sonic toothbrushes

★★★★★ 4.7/5.0 (16,860 Reviews)

World's **Only** **ADA-Accepted** U-Shape Toothbrush

Get up to 5.1X better clean in 30 seconds— up to 82% more plaque removal, up to 45% less gingivitis. Trusted by families, backed by experts

[SHOP 30% OFF →](#)



ADA
Accepted
American
Dental
Association ®

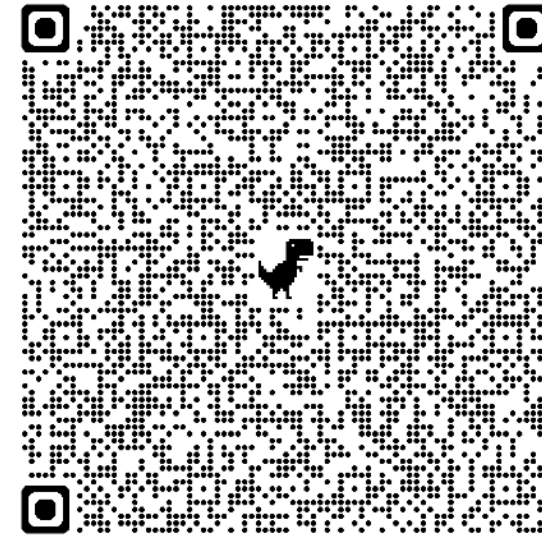
Low tech



Used in hospital settings when toothbrushing cannot be performed adequately

- Foam brushes/swabs
- Gauze
- Finger brushes

Dentifrices



- “[a powder, paste, or liquid for cleaning the teeth](#)”
- Plaque removal is dependent on mechanical contact of brush to teeth , rather than the abrasive nature of the toothpaste and more plaque can be removed without the use of toothpaste [Paraskevas et al 2007](#) [Jayakumar et al 2010](#)
- Compliance to toothbrushing is much lower without toothpaste [Dudding et al 1960](#)

Toothpaste: Ingredients

Active ingredients

- Anticaries
- Antimicrobial
 - [Triclosan](#)
- Desensitizing agents
- Anticalculus
- Abrasives
 - [Paraskevas 2006](#)

Inactive ingredients

- Flavouring
- Colouring
- Detergents/surfactants
- Humectants
- Thickening agents

Toothpaste: Ingredients



Potential allergens/irritants

- Detergent
 - Sodium Lauryl Sulphate (SLS)
- Preservatives
- Flavouring
- Essential oils
- Casein
- Gluten
- Xanthan gum
- H₂O₂
- CHX

OHI: Oral Hygiene Instruction



OHI: Plaque disclosing



- Be polite and non-judgemental
- Educate
- Demonstrate
- Constant motivation/feedback

Fig. 28-10 (a) Disclosing solution is often used to identify plaque. (b) Note the remaining plaque on the buccal tooth surfaces after staining. (c) After self-performed tooth cleaning, remaining plaque can be identified by the patient following rinsing with a disclosing solution.

OHI

- Customise
 - Patient's previous habits
 - Dexterity
 - Motivation
 - Clinical condition
 - Anatomical limitations
- Practise and refine your delivery



OHI: A customised regime

- Device
 - Brush
 - Interdental
- Duration
- Frequency
- Technique
- Dentifrice
- Adverse effects



The ideal technique is the one that allows for complete plaque removal

The best device and product are the ones that get used!

Product reviews

 ElectricTeeth

Buyer's guides ▾ Comparisons ▾ About us 🔍

Country Australia ▾

Find your next toothbrush

We specialise in rigorously hand-testing electric toothbrushes and water flossers.

We provide honest feedback so that you don't spend too much or choose the wrong product.

[Get started here](#)

✓ Genuine hands-on testing

✓ Expert contributions

✓ Unbiased monetisation

We remain impartial

About us



Dr Gemma Wheeler, BDS

In-house dentist

Questions?



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