Optimised methods for plaque control

Laurence J. Walsh
BDSc PhD DDS FFRPRC QGEd FICD FADI FIADE

Drivers of the caries process

- Good plaque (formed in a low cariogenic environment)
  - Limited fermentation capabilities
  - Produces primarily acetate, (with lesser quantities of propionate and butyrate)
  - These weaker acids can effectively buffer plaque pH changes.

- Bad plaque (formed in a highly cariogenic environment)
  - Produces large quantities of lactate, formate and pyruvate
  - These stronger organic acids can readily demineralize enamel

Plaque assessment and OHI

Decalcification alert!
One colour disclosing:

Erythrosine

[²] 2 tone disclosing
(red = new/thin, blue = old/mature)

[²] Plaque fermentation

Stephan pH curve
As the result of de-coloration of Red 105 dye, under acidic pH the colour of the mixture of Red 105 and Blue 1 changes from purple into light blue/aqua green.
Opportunities at the Patient level

- Identity areas of plaque acid production for education and monitoring purposes

CHX for chemical plaque control?

Selective decontamination with CHX

- Tsang et al. Pediatric Dentistry 2003
- Placebo-controlled RCT of CHX suppression of MS over 15 months
- N=50 subjects per group
- No side effects seen in the active group
- 41% in the CHX group showed S. mutans salivary counts of zero CFU/mL
- Persisting benefit for 3 months after cessation

CHX for chemical plaque control?

- CHX with anti-discolouration chemistry (ADS)

Effects of chlorhexidine gel on mutans streptococci (MS) and lactobacilli (LB) counts and caries development at 24 months of age.

Addition of once daily application of 0.12% chlorhexidine gel

Effects after 24 months
(at 2 years of age) vs. Tooth-brushing only (304 ppm fluoride) and vs. community control (no intervention)
Rethinking mechanical oral hygiene

- Brushing and flossing are the standard methodology for removing plaque,
- But bacteria/plaque/biofilm are often left behind due to:
  - Inadequate technique
  - Inaccessibility of hard-to-reach areas
  - Loss of patient motivation over time
  - Loss of patient compliance over time


The triple threat

- Don’t know – gap in knowledge
- Can’t do – gap in manual skills or dexterity
- Won’t do – gap in motivation and priorities

Information, instruction, training and coaching, disclosing

New designs, powered brushes, and adjuncts such as chemical plaque control

Motivational interviewing and encouragement

Dealing with the Triple Challenges of Plaque Control: Don’t Know, Can’t Do, Won’t Do

Dentifrice selection
Triclosan Toothpastes: 2005 Systematic review

- Meta-analysis: 9 studies of Colgate Total®
  - 0.3% Triclosan/2% Copolymer/0.243% NaF
- Difference versus conventional fluoride toothpaste
  - Quigley and Hein plaque scores reduction 48% (24-73%)
  - Löe and Silness gingival index reduction 24% (13-35%)
- 6 studies of other triclosan toothpastes
  - Triclosan zinc/citrate
    - Plaque 7% reduction (5-10%)
    - Bleeding 10.81% reduction 8.93-12.69%
- 2004 Systematic Review
  - 16 studies of adults with plaque and gingivitis; unsupervised use for at least 6 months of Total® vs a fluoride control toothpaste.
  - Less plaque by 48% (32-64%) for the Quigley-Hein index
  - Less gingivitis by 26% (18-34%) for the GI

Colgate Total® Toothpaste: 2013 Systematic review

- Compared with a conventional fluoride dentifrice,
  - Better plaque control and gingival health in patients affected by gingivitis
  - The most effective Triclosan-based toothpaste formulation for controlling plaque and gingival inflammation in patients with gingivitis or mild/moderate periodontitis over a 6-month period
  - Reduced clinical attachment loss in young adolescents, with the magnitude of the difference being greater for patients with deep periodontal pockets at baseline
  - More efficacious in preventing the progression/recurrence of periodontal destruction when compared to a conventional fluoride toothpaste
  - Triclosan-based toothpaste is more efficacious in preventing the progression of periodontal disease.


- Introduction: Triclosan is a broad-spectrum antibacterial agent, marketed for use in end products. It is effective against both gram-positive and gram-negative bacteria. PDAWMA is the joint proprietary designation for polyvinyl-maleic acid and copolymer. It has been demonstrated that there is a greater uptake of triclosan to oral and buccal epithelial cells from the use of either the compound versus placebo. Clinical studies show that Triclosan is an effective anti-plaque agent. The Supragingival Plaque Score (SGPS) is determined by examining the oral cavity with a dental mirror and identifying triclosan at the position of severe gingivitis. Additionally, the Supragingival Plaque Score is used to determine the effectiveness of triclosan/copolymer dentifrices in reducing plaque.

- Conclusion: The results indicate that the use of a triclosan/copolymer/fluoride dentifrice (Colgate® Total®) was superior to placebo in reducing plaque and gingivitis. The study was designed to determine whether the use of triclosan/copolymer dentifrices was effective in reducing plaque and gingivitis.

DON’T KNOW: Choosing a manual brush

- Brush
  - Soft bristles
  - Small head - to reach posterior regions
  - Comfortable handle
  - For many patients, a powered toothbrush is a good alternative. It can do a better job of cleaning teeth, particularly for those who have difficulty brushing or who have limited manual dexterity
  - Replace brush when it begins to show wear, or every three months, whichever comes first.
Brushing technique advice

- Cervical area
- Proximal embrasures
- Low trauma to soft tissues
- Low force (jiggling action)
- Scrubbing only for occlusal surfaces!

Sequence

- Use short, gentle strokes, paying extra attention to the cervical and interdental regions
- Clean the labial/buccal surfaces of the upper teeth, then the lower teeth
- Clean the palatal/lingual surfaces of the upper teeth, then the lower teeth
- Clean the occlusal surfaces
- Brush the tongue. Proper brushing takes at least 2 minutes.

Optimal brushing method

- MODIFIED BASS METHOD
  - Clean entire facial/buccal and lingual surfaces.
  - Bristles inserted into sulcus. Gentle back-and-forth strokes of vibratory motion without removing bristle ends from sulcus.
  - Most effective in cleaning cervical 1/3 & beneath gingival margins
  - Suitable for all patients
Common Mistakes

- Wrong brush size – head too large
- Hard bristles or excessive force – gingival abrasions and greater risk of tooth wear
- Wrong technique, e.g. scrubbing buccal surfaces
- Not brushing often enough – twice daily to alter biofilm and deliver active therapeutic agents
- Missing areas – no sequence, not brushing long enough, no interdental cleaning devices used

Poor brushing techniques

- Not letting the brush dry - a toothbrush that is perpetually moist, it will cultivate more bacteria
- Bristles too soft – worn brush, past usable date. Get a new brush every three or four months, or sooner if the bristles look frayed. Once the bristles lose their normal flexibility and start to break apart, change the brush.

Poor equipment

- Bristles too hard or too soft

How effective is a single brushing?

- Systematic review of 59 studies with 212 brushing exercises with manual brushes.
- The efficacy in plaque removal following a brushing exercise is a reduction from baseline plaque scores of 42% on average, with a variation of 30-53% dependent on the plaque index used.
- Different bristle tuft configurations (flat trim, multilevel, angled) affect plaque removal ability (24-61%). The angled bristle design numerically showed the highest mean plaque reduction.
- Effect of brushing duration: after 1 min, a mean reduction of 27% and after 2 min, 41%.

Powered brushes: emerging evidence over the past decade

- **2003**: Some powered toothbrushes with a rotation-oscillation action achieve a significant reduction in plaque and gingivitis compared with manual toothbrushes.

- **2004**: Rotation oscillation powered brushes significantly reduce plaque and gingivitis in both the short and long-term.

What does the evidence say?

- The June 2014 Cochrane systematic review confirmed the effectiveness of powered brushes, specifically those using oscillating-rotating brushes, over manual brushes.
- The review included 56 studies published from 1964 to 2011 and evaluated **seven different types of power brush technologies**, based on the pattern of brush head movement.
- Over half of the studies in the 2014 Cochrane systematic review were of Oral-B powered brushes using oscillating-rotating technology.

• The Oral-B power brush technology
  – was the superior technology, since none of the six other power brush technologies consistently gave significant effects on both plaque and gingivitis in the short or long term.
  – has been consistently proven to reduce more plaque and gingivitis versus manual brushing in both the short and long term
  – is superior in direct comparisons in cohorts of orthodontic patients, where the Oral-B powered brushes with the dedicated orthodontic brush head have outperformed other powered brushes.

Will powered brushes damage teeth?
• Comprehensive review of all clinical and laboratory investigations solely comparing the safety of powered to manual toothbrushes
• 35 studies
• No difference in gingival recession.
• Large body of published research in the preceding 2 decades has consistently shown powered brushes to be safe compared to manual toothbrushes, and do not pose a clinically relevant concern to hard or soft tissues.
  

Why the tongue? Is brushing enough?
• Systematic review of the effects of mechanical tongue cleaning compared with no mechanical tongue cleaning on breath odour and tongue coating in patients in good general health (no systemic disorders) and ≥17 years.
• All 7 experiments in 5 studies showed a positive effect of mechanical tongue cleaning in addition to toothbrushing on various parameters of oral malodour.
• Mechanical approaches, such as tongue brushing or tongue scraping to clean the dorsum of the tongue, successfully reduce breath odour and tongue coatings.
  

Interdental cleaning
• Dental floss is efficient in removing plaque BUT dependent on motivation and dexterity of patient
• Motivation for and effectiveness of flossing are lost over time (Stewart, 1989)
• Very technique sensitive: Most patients have poor interdental cleaning skills
• Alternatives
  – Interdental brushes
  – Philips Air floss
  – Phenolics to lower interdental plaque (Colgate Total paste, Listerine rinse) (More on this in Lecture 3)
Common problems with flossing

- Floss too short – “strangulation”
- Span between fingers too long – “plinking” rather than sluicing

Flossing after brushing?

- Systematic review of adjunctive effect of flossing after brushing on plaque and gingivitis.
- 11 studies
- A greater part of the studies did not show a benefit for floss on plaque and clinical parameters of gingivitis.
- In light of the results of this comprehensive literature search and critical analysis, it is concluded that a routine instruction to use floss is not supported by scientific evidence.
- The dental professional should determine, on an individual patient basis, whether high-quality flossing is an achievable goal.

Interdental brushes?

- Systematic review of 9 studies
- As an adjunct to brushing, the IDB removes more dental plaque than brushing alone.
- Studies showed lower plaque scores, bleeding scores and probing pocket depths.
- The majority of the studies presented a positive significant difference in the plaque index when using the IDB compared with floss.

What about woodsticks?

- Systematic review of 7 studies comparing hand-held triangular woodsticks, as compared with no adjunct or other interdental cleaning device in addition to daily toothbrushing
- Improvement in gingival health with lower bleeding tendency was seen in all 7 studies, and represents a significant incremental benefit.
- No significant effect on reducing visible interdental plaque, in gingivitis patients.

Need to irrigate after brushing?

- Systematic review of 8 studies
- As an adjunct to brushing, the oral irrigator does not have a beneficial effect in reducing visible plaque.
- However, there is a positive trend in favour of oral irrigation improving gingival health over regular oral hygiene or toothbrushing only.


Time for a change?

- Despite many developments in manual toothbrush design, plaque removal at the back of the mouth and at approximal surfaces remains inadequate, yet it is at these sites in particular that plaque accumulates and leads to the development of gingival disease.
- Improved oral hygiene can be achieved by better brushing technique and by increasing brushing time, but a change in behaviour patterns is almost impossible to achieve for the majority of individuals.


How effective is 1 appt of OHI?

- 2005 systematic review of 33 studies measuring the effectiveness of self-performed mechanical plaque removal in adults with gingivitis over 6 months.
- In adults with gingivitis, the quality of self-performed mechanical plaque removal is not sufficiently effective and should be improved.
- Based on studies > or = 6 months of duration, it appears that a single oral hygiene instruction, describing the use of a mechanical toothbrush, in addition to a single professional 'oral prophylaxis' provided at baseline, had a significant, albeit small, positive effect on the reduction of gingivitis.


Threats are not effective

- 2013 systematic review
  - Behavioural interventions addressing toothbrushing at primary school – but none were reported as being based on or derived from behavioural theory.
  - 4 studies involving a total of 2302 children
  - 3 studies measured plaque and found a statistically significant reduction in plaque in the intervention groups.
  - 1 study measured caries
    - Caries prevented fraction of 0.65 (95% CI 0.12-1.18). Currently, there is insufficient evidence for the efficacy of primary school-based behavioural interventions for reducing caries.


Motivational interviewing

- An effective patient/client-centred method for enhancing intrinsic motivation to change by exploring and resolving ambivalence.
- Direct persuasion is not seen as useful for resolving ambivalence.
- Motivation is elicited from the client rather than imposed from without.
- The patient is supported in identifying and resolving their own ambivalence about change.
- Patient values and autonomy are respected.
- “Change talk” is recognized, elicited and responded to.
- Resistance is treated constructively.

Motivational interviewing

- Traditional approaches to individual oral health education are largely ineffective, and new approaches are required to address personal motivations for preventative behaviour.
- Of motivational interviewing (MI), counselling, and models based interventions, MI interventions were found to be the most effective method for altering health behaviours in a clinical setting.
- There is a need to develop an effective model for chairside oral health promotion that incorporates this evidence and allows oral health professionals to focus more on the underlying social determinants of oral disease during the clinical encounter.