TITLE: Dental Cleaning and Polishing for Oral Health: A Review of the Clinical Effectiveness, Cost-effectiveness and Guidelines

DATE: 24 September 2013

CONTEXT AND POLICY ISSUES

Dental practitioners (dentist, dental hygienist or dental therapist) routinely provide scaling, with or without polishing (also commonly called “dental cleaning”), to patients attending their practices.1 Scaling is the removal of plaque, calculus (or tartar), debris and staining from the crown and root surfaces of the teeth.2 Polishing is the mechanical removal of any residual extrinsic stains and deposits, typically undertaken by using a rubber cup or bristle brush loaded with a prophylaxis paste.2 During the period of 2008 to 2009, scaling with or without polishing was the most common adult clinical dental treatment in England.3 In a survey of general dental practitioners on preventive recommendations in western New York State, 86% of respondents stated that they would recommend scaling and polishing every 6 months for 'low risk' patients of all ages (low risk was defined as a patient having “adequate brushing and flossing habits” and “no history of periodontal disease”).2 Despite its routine provision, there has been insufficient evidence to support the clinical effectiveness of routine scaling and polishing, or the frequency at which it should be provided.1,3 In a systematic review published in 2007, Beirne et al.2 evaluated the clinical effectiveness of routine scaling and polishing for periodontal health, in which it was concluded that clinical effectiveness of routine professional scaling and polishing and the optimal professional dental cleaning frequency was inconclusive. There has been debate over the clinical effectiveness and cost effectiveness associated with the routine scaling and polishing of teeth and the frequency with which it should be provided for patients.2,4 In the United States, the term 'oral prophylaxis' is sometimes used and has been defined as “the removal of plaque, calculus and stain from exposed and unexposed surfaces of the teeth by scaling and polishing as a preventive measure”.2

Plaque-induced periodontal disease includes gingivitis and periodontitis. Gingivitis is a reversible gingival inflammation without loss of connective tissue attachment. Gingivitis usually considered as a precursor to periodontitis in some individuals. Periodontitis is defined as the presence of gingival inflammation at sites where there has been a pathological loss of attachment. The effects on periodontal health of a routine scale and polish and of providing this intervention at different time intervals are unclear.2 Previous research evidence was of insufficient quality to reach any conclusions regarding the beneficial and adverse effects of routine scaling and polishing for periodontal health and regarding the effects of providing this intervention at different time intervals.1,2,4,5

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The objective of this review is to summarize the clinical effectiveness and cost-effectiveness of professional dental cleaning, and to summarize recommendations from evidence based professional guidelines to provide the research based evidence to assist Canadian jurisdictions in determining optimal frequency of the routine professional dental cleaning (scaling with or without polishing).

RESEARCH QUESTIONS

1. What is the clinical effectiveness of dental cleaning with or without polishing for preventing oral disease?

2. What is the evidence for the effectiveness of different frequencies of dental cleaning with or without polishing for preventing oral disease?

3. What is the cost-effectiveness of dental cleaning with or without polishing for preventing oral disease?

4. What are the evidence-based guidelines for dental cleaning with or without polishing for preventing oral disease?

KEY FINDINGS

Insufficient evidence was identified to determine the clinical effectiveness, optimal frequency and the cost-effectiveness of routine professional dental cleaning (scaling with or without polishing) in preventing oral disease. Better designed and longer term clinical trials are needed.

METHODS

Literature Search Strategy

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2013, Issue 7), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI (Health Devices Gold), Canadian and major international health technology agencies, as well as a focused Internet search. Methodological filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, economic studies and guidelines. Where possible, retrieval was limited to the human adult population. The search was also limited to English language documents published between January 1, 2008 and August 26, 2013.

Selection Criteria and Methods

One reviewer screened the titles and abstracts of the retrieved publications and evaluated the full-text publications for the final article selection, according to selection criteria presented in Table 1.

Table 1: Selection Criteria

<table>
<thead>
<tr>
<th>Population</th>
<th>Adults (18+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>Dental cleaning with or without polishing provided by a dental professional</td>
</tr>
<tr>
<td>Comparator</td>
<td>No dental cleaning with or without polishing, regular personal dental care (brushing and flossing)</td>
</tr>
</tbody>
</table>
Dental cleaning with or without polishing at different frequencies

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Prevention of oral diseases (e.g. caries, gingivitis, periodontal disease), need for additional intervention, cost-effectiveness, guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Designs</td>
<td>Health technology assessment / Systematic review/Meta-analysis Randomized controlled trials Non-randomized controlled trials Guidelines</td>
</tr>
</tbody>
</table>

Exclusion Criteria

Studies were excluded if they did not meet the selection criteria in Table 1.

Critical Appraisal of Individual Studies

The methodological quality of the included RCTs were assessed with Scottish Intercollegiate Guidelines Network, Methodology Checklist 2 (SIGN 50 Checklist 2). A numeric score was not calculated for each study. Instead, the strengths and weakness of each study were summarized and described.

SUMMARY OF EVIDENCE

Quantity of Research Available

The literature search yielded 364 citations. Upon screening titles and abstracts, twelve potentially relevant articles were retrieved for full-text review. Five additional potential relevant reports were retrieved from other sources. Of the 17 potentially relevant articles, one RCT was included in this review. The RCT estimated the effectiveness of different frequencies (6 months vs. 12 months or 24 months) of dental scaling and polishing for preventing dental plague, calculus and gingival bleeding (for the research question two). No evidence was identified for research questions 1, 3 and 4.

The study selection process is outlined in a PRISMA flowchart (Appendix 1).

Summary of Study Characteristics

A summary of the study characteristics can be found in Table 2.

1. **What is the clinical effectiveness of dental cleaning with or without polishing for preventing oral disease?**

No study was identified to evaluate the clinical effectiveness of dental cleaning with or without polishing for preventing oral disease.

2. **What is the evidence for the effectiveness of different frequencies of dental cleaning with or without polishing for preventing oral disease?**

The RCT by Jones et al. (2011) was conducted in the UK. The study was a pragmatic, parallel randomized controlled trial with 24-month follow-up. All participants received a baseline scale and polish after baseline assessment. Following the baseline treatment, healthy adults (basic periodontal examination [BPE] codes <3) were randomly assigned to 3 groups (6-month, 12-month, or 24-month...
interval between dental visits). Throughout the 24-month follow-up period, all participants were recalled every 6-month for routine examination with their family dentist which included monitoring of their periodontal condition using BPE. The primary outcome was gingival bleeding. Follow-up outcomes were assessed by examiners blinded to the allocation. In total 369 participants were randomized to the 6-month (n=125), 12-month (n=122) and 24-month group (N=122). Statistical analysis was performed in both complete data set analyses and multiple imputation analyses for participants with incomplete data sets (see Table 2).

Table 2: Characteristics of Included Studies

<table>
<thead>
<tr>
<th>First Author, Publication Year, Country</th>
<th>Study Design/Length of Follow-up</th>
<th>Patient Characteristics, Sample Size (n)</th>
<th>Intervention</th>
<th>Comparator(s)</th>
<th>Clinical Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones 2011, UK</td>
<td>RCT 24-month</td>
<td>Healthy adults (with BPE codes &lt;3)* Total N=369 (6 - month: N=125; 12 - month: N=122; 24 - month: N=122)</td>
<td>&quot;Scale and polish&quot; at 6 - month interval</td>
<td>Different visit interval: 12 - month 24 - month</td>
<td>Gingival bleeding Plaque Calculus</td>
</tr>
</tbody>
</table>

BPE = Basic periodontal examination; RCT = randomized control trial.
- BPE code 3 is defined as “a sextant in which the colored band of the probe (3.5 mm to 5.5 mm) remains partially visible when it is inserted into the deepest pocket”.7

3. **What is the cost-effectiveness of dental cleaning with or without polishing for preventing oral disease?**

No study was identified to evaluate the cost-effectiveness of dental cleaning with or without polishing for preventing oral disease.

4. **What are the evidence-based guidelines for dental cleaning with or without polishing for preventing oral disease?**

No guidelines for dental cleaning with or without polishing for preventing oral disease were identified.

**Summary of Critical Appraisal**

The strengths and limitations of included study are summarized in Table 3.

The objective of this trial was clearly described. Baseline characteristics were well reported. Outcome measurement was reliable. However, the overall methodological quality of the RCT by Jones et al. was considered poor because the randomization method was not well described, and allocation concealment was not adequately reported. Study withdrawals were reported, but reasons for withdrawal were not provided and no intention to treat analysis was performed (See Table 3).
Table 3: Summary of Study Strengths and Limitations

<table>
<thead>
<tr>
<th>First Author, Publication Year</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones 2011, UK</td>
<td>• Research question was clearly defined</td>
<td>• Randomization method was not clearly described</td>
</tr>
<tr>
<td></td>
<td>• Blinding process was clearly described</td>
<td>• Allocation concealment was not adequate</td>
</tr>
<tr>
<td></td>
<td>• Key patient characteristics at baseline are comparable in the treatment</td>
<td>• No ITT analysis was performed.</td>
</tr>
<tr>
<td></td>
<td>and control groups</td>
<td>• Participants were not blinded to the intervention received</td>
</tr>
<tr>
<td></td>
<td>• Only difference between groups is the treatment frequency under</td>
<td></td>
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<tr>
<td></td>
<td>investigation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outcome was standard, valid and reliable</td>
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<tr>
<td></td>
<td>• Drop-out were comparable between groups and less than 20% in each group</td>
<td></td>
</tr>
</tbody>
</table>

ITT= intention to treat.

Summary of Findings

1. **What is the clinical effectiveness of dental cleaning with or without polishing for preventing oral disease?**

No evidence was identified.

2. **What is the evidence for the effectiveness of different frequencies of dental cleaning or cleaning and polishing for preventing oral disease?**

In the RCT by Jones et al., it was reported that prevalence of gingival bleeding was similar at 6-month (78.5%), at 12-month (78%) and at 24-month (82%) follow-up (P = 0.746 for both at 12-month and at 24-month compared with at 6-month). There were no statistically significant differences between groups with respect to prevalence of plaque and calculus at follow-up. The authors indicated that this trial could not identify any differences in outcomes for scaling and polishing provided at 6, 12 and 24 month frequencies for healthy patients (with no significant periodontal disease). However, the authors also pointed out that their results are not conclusive and suggested that evidence from a better designed, larger and longer follow-up trial is needed for determining the optimal frequency of routine dental cleaning.

Table 4: Main Study Findings and Authors’ Conclusions

<table>
<thead>
<tr>
<th>First Author, Publication Year</th>
<th>Main Study Findings</th>
<th>Author’s Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones 2011, UK</td>
<td>Gingival bleeding</td>
<td>On page 1: “This trial could not identify any differences in outcomes for single-visit</td>
</tr>
<tr>
<td></td>
<td>-Prevalence</td>
<td>scale and polish provided at 6, 12 and 24 month frequencies for healthy patients (with</td>
</tr>
<tr>
<td></td>
<td>6-month: 78.5%</td>
<td>no significant periodontal disease). However, this is the first trial of scale and</td>
</tr>
<tr>
<td></td>
<td>12-month: 78%</td>
<td>polish which has been conducted in a general practice setting and the results are not</td>
</tr>
<tr>
<td></td>
<td>24-month: 82%</td>
<td>conclusive. Larger trials with more comprehensive measurement and long-term follow up</td>
</tr>
<tr>
<td></td>
<td>(χ² test, p = 0.183 for both 12-month and 24-month vs. 6-month)</td>
<td>need to be undertaken to provide firm evidence base for this intervention. This trial</td>
</tr>
<tr>
<td></td>
<td>-Odds ratio (95%</td>
<td>informs the design of future</td>
</tr>
<tr>
<td></td>
<td>Confidence Interval)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a Complete data set:</td>
<td></td>
</tr>
</tbody>
</table>
### First Author, Publication Year | Main Study Findings | Author’s Conclusions
--- | --- | ---
unknown | 12-month vs. 6-month: 0.92 (0.47, 1.79)  
24-month vs. 6-month: 1.17 (0.59, 2.35)  
Multiple imputation data set:  
12-month vs. 6-month: 0.92 (0.45, 1.89)  
24-month vs. 6-month: 1.19 (0.58, 2.47)  
**Plaque**  
- Prevalence:  
  6-month: 73.8%  
  12-month: 76.0%  
  24-month: 84.0%  
  ($X^2$ test, $p = 0.183$ for both 12-month and 24-month vs. 6-month)  
- Odds ratio (95% Confidence Interval) **b**:  
  Complete data set:  
  12-month vs. 6-month: 1.08 (0.57, 2.07)  
  24-month vs. 6-month: 1.90 (0.93, 3.81)  
  Multiple imputation data set:  
  12-month vs. 6-month: 1.04 (0.57, 1.98)  
  24-month vs. 6-month: 1.90 (0.93, 3.86)  
**Calculus**:  
No statistically significant differences between groups.  
**Withdrawal at 24 months: n (%)**  
6-month group: 18 (14%)  
12-month: 22 (18%)  
24-month: 23 (19%)  
| | practice-based trials on this subject.**a** |
prevalence of the gingival bleeding, plaque and calculus at the end of the trial with those at baseline in this trial, so, it is unknown whether the professional dental cleaning improved oral health and prevented periodontal disease regardless of the frequency.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING

No evidence was identified to evaluate the clinical effectiveness, cost-effectiveness of dental cleaning with or without polishing for preventing oral disease. No guidelines and recommendations on dental cleaning and polishing (such as optimal frequency) for preventing oral disease was found. Findings from a single trial showed no differences in preventing gingival bleeding, plaque and calculus for scale and polish provided at 6, 12 and 24 month frequencies for healthy patients. However, the evidence needs to be interpreted with caution because it is from a single trial with relatively poor methodological quality. Larger scale and better designed trials with more comprehensive measurement and long-term follow up is needed to determine the clinical effectiveness, the optimal frequency and the cost-effectiveness of dental cleaning.

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REFERENCES


APPENDIX 1: Selection of Included Studies

364 citations identified from electronic literature search and screened

352 citations excluded

12 potentially relevant articles retrieved for scrutiny (full text, if available)

5 potentially relevant reports retrieved from other sources (grey literature, etc.)

17 potentially relevant reports

16 reports excluded:
- irrelevant population (4)
- irrelevant intervention (7)
- irrelevant comparator (2)
- irrelevant outcomes (2)
- irrelevant study design (1)

1 report included in review