TITLE: Dental Loupes for Dental Procedures: A Review of the Clinical and Cost-Effectiveness

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CONTEXT AND POLICY ISSUES:

The use of magnification in dentistry is expanding rapidly. Magnification is aimed to enhance visualization of dental details thus improving diagnosis and treatment, as well as to improve the ergonomics of dental practitioners. Advanced magnification technologies such as surgical microscopes and telescopes are currently available for a variety of applications.

Surgical telescopes (referred to as loupes) are becoming the standard of care for most routine dental procedures, with a new survey indicating over 60% of practicing dental hygienists are using loupes. Dental loupes can provide magnification from two to six times that of the unaided eye. Two basic styles of loupes are offered: front-lens mounted or “flip flop” (FLM) and through-the-lens (TTL). FLM and TTL loupes are typically provided in one of two magnification systems, Galilean (magnification up to 3.25x) or Prismatic (magnification greater than 3x).

Updated evidence on their clinical and cost-effectiveness as well as guidelines for use of dental loupes are needed to determine whether dental loupes are appropriate for use for all procedures and for all dental personnel.

RESEARCH QUESTIONS:

1. What is the evidence for the comparative clinical effectiveness of dental loupes for dental procedures?
2. What is the cost-effectiveness of dental loupes?
3. What are the guidelines for use of dental loupes for dental procedures?
METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, The Cochrane Library (Issue 3, 2008), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international health technology agencies, and a focused Internet search. Results include articles published between 1998 and September 2008 and are limited to English publications only. No filters were applied to limit the retrieval by study type.

SUMMARY OF FINDINGS:

Clinical effectiveness of dental loupes

Our literature search identified six studies\(^{14-19}\) and no health technology assessments, systematic reviews, or meta analysis on clinical effectiveness of dental loupes. Five studies are \textit{in vitro} studies\(^{14-16,18,19}\) and one is a survey.\(^{17}\) All the six studies compared dental loupes with unaided vision. Five out of six reported beneficial effect of magnification by dental loupes. No study indicated industry sponsorship. The main findings of the studies are summarized in Table 1.

Table 1: Summary of findings from studies on the clinical effectiveness of dental loupes

<table>
<thead>
<tr>
<th>Studies</th>
<th>Type of loop/magnification</th>
<th>Outcome</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forgie \textit{et al.} (^{14})</td>
<td>FLM, 3.25x, Galilean</td>
<td>Caries detection</td>
<td>Magnification increases sensitivity and specificity (p&lt;0.05)</td>
</tr>
<tr>
<td>Forgie \textit{et al.} (^{15})</td>
<td>2.6x (type of loupe not reported)</td>
<td>Change in size of cavity following removal of restoration*</td>
<td>Magnification makes cavity size change smaller (p&gt;0.05)</td>
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<tr>
<td>Slaton \textit{et al.} (^{16})</td>
<td>3.3x (type of loupe not reported)</td>
<td>Identification of dentinal cracks</td>
<td>Magnification increases sensitivity and specificity (p&gt;0.05)</td>
</tr>
<tr>
<td>Buhrley \textit{et al.} (^{17})</td>
<td>Varied</td>
<td>Location of the MB2 canal</td>
<td>Magnification increases the frequency of detection (p&lt;0.05)</td>
</tr>
<tr>
<td>Haak \textit{et al.} (^{18})</td>
<td>FLM, 4.5x, Prismatic</td>
<td>Detection of proximal caries</td>
<td>Magnification increases detection (p&lt;0.05) if users are experienced in loupe utilization</td>
</tr>
<tr>
<td>Hayashi \textit{et al.} (^{19})</td>
<td>2x (type of loupe not reported)</td>
<td>Detection of marginal discrepancies</td>
<td>No difference found between magnification and unaided vision</td>
</tr>
</tbody>
</table>

\(^{FLM = \text{front lens mounted}; MB2 canal: second mesiobuccal canal}}^{* \text{The smaller the size change, the better the accuracy of the removal technique}}

In addition to the studies on clinical effectiveness of dental loupe use, there are two studies looking at the effect of dental loupe use on the operator’s posture.\(^{20,21}\) Both studies, using TTL, 2.6x\(^{20}\) and FLM, 2.5x,\(^{21}\) reported significant improvement in dental hygiene posture when dental hygiene students are using loupes as compared to without loupe use.
Cost-effectiveness of dental loupes

No study on cost-effectiveness of dental loupes was found. The price range for dental loupes is US$550 to US$1500.\(^{22}\) Over a 20-year career in dental practice, a $1000 investment for a dental loupe comes out to $50 a year.\(^{22}\)

Guidelines for use of dental loupes

Our literature search did not identify any guidelines for dental loupe use.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING:

Overall, five of the six studies found that dental loupes could enhance dental care. Magnification has the potential to increase the quality of dental care and supports the musculoskeletal health of dental practitioners. No guidelines on the use of dental loupes, including the indications for use, specifications for the dental loupes, or which personnel should be using the loupes were identified. No cost-effectiveness studies on dental loupes were identified. Even though the benefits of magnification are recognized, the costs, cross-infection if the loupes are touched to the treated areas, and peculiarity to patients, particularly children, need to be considered.\(^{23}\)

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