

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Dental Loupes and Headlamps for Dental Care: Clinical Effectiveness, Cost- Effectiveness, and Guidelines

Service Line: Rapid Response Service
Version: 1.0
Publication Date: October 9, 2019
Report Length: 8 Pages

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Cite As: Dental loupes and headlamps for dental care: clinical effectiveness, cost-effectiveness, and guidelines. Ottawa: CADTH; 2019 Oct. (CADTH rapid response report: summary of abstracts).

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Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

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Research Questions

1. What is the comparative clinical effectiveness of dental care performed with dental loupes versus dental care with unaided vision?
2. What is the comparative clinical effectiveness of dental care performed with headlamps versus dental care with dental operatory lights?
3. What is the comparative cost-effectiveness of dental care performed with dental loupes versus dental care with unaided vision?
4. What are the evidence-based guidelines for use of dental loupes for dental procedures?
5. What are the evidence-based guidelines for the use of headlamps for dental procedures?

Key Findings

Two systematic reviews, two randomized controlled trials, and three non-randomized studies were identified regarding the clinical effectiveness of dental care performed with dental loupes versus dental care with unaided vision.

Methods

A limited literature search was conducted by an information specialist on key resources including PubMed, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine’s MeSH (Medical Subject Headings), and keywords. The main search concepts were dental loupes or magnification devices AND dentistry. No search filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2009 and September 26, 2019. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients receiving dental care
Intervention	Q1,3,4: Dental care with dental loupes (with or without built-in headlamps) Q2,5: Dental care with headlamps (on their own)

Comparator	Q1,3: Dental care with unaided vision (e.g., no eye wear, safety goggles, or regular eye wear without magnification) Q2: Dental operatory lights (i.e., the overhead light hanging from the ceiling that can be moved or articulated) or room lights Q4,5: Not applicable
Outcomes	Q1,2: Clinical effectiveness (e.g., caries detection, change in size of cavity following removal of restoration, identification of dentinal cracks, detection of proximal caries, crown and veneer preparation, root planning, detection of oral pathologies, detection and treatment of canals in root canal therapy, detection of dental remnants [e.g., root tips] during oral surgery) and safety (e.g., risk of injury to the patient) Q3: Cost-effectiveness (e.g., cost per benefit gained, cost per quality-adjusted life-year) Q4,5: Guidelines on appropriate use
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized control trials, non-randomized studies, economic evaluations, evidence-based guidelines.

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

Two systematic reviews,^{1,2} two randomized controlled trials,^{3,4} and three non-randomized studies⁵⁻⁷ were identified regarding the clinical effectiveness of dental care performed with dental loupes versus dental care with unaided vision. No relevant health technology assessments, economic evaluations or evidence-based guidelines were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

Two systematic reviews,^{1,2} two randomized controlled trials,^{3,4} and three non-randomized studies⁵⁻⁷ were identified regarding the clinical effectiveness of dental care performed with dental loupes.

The authors of the first systematic review¹ aimed to evaluate and compare the effects of endodontic treatment performed with the aid of magnification devices versus without magnification devices. They also aimed to compare the different magnification devices used in endodontic treatment with one another.¹ The authors of this systematic review found no trials that met the inclusion criteria and concluded that no articles could be identified in the current literature for this review.¹ The authors of the second systematic review² investigated if the use of magnification devices in endodontics were associated with improved clinical outcomes. The authors of this systematic review identified three prospective studies on endodontic surgery and found no significant difference in outcomes among patients treated using magnifying loupes, surgical microscope or endoscope.² They concluded that the type of magnification device can only minimally affect the treatment outcome.² Outcome measurements were not specified in the abstract.²

The authors of the first randomized controlled trial³ evaluated the effectiveness of scaling and root planning (SRP) performed without magnification (unaided), with magnifying loupes, and with a dental operating microscope. Their results suggested a significant

difference among the three treatment groups, with the dental operating microscope being the most effective technique for SRP and unaided technique being the least effective for SRP.³ The authors concluded that magnification tools significantly improve the efficacy of SRP.³ The authors of the second randomized controlled trial⁴ aimed to evaluate the influence of wearing dental loupes on enamel damage during debonding procedures. The authors compared adhesive removal with and without the use of dental loupes and used enamel damage index (EDI), line angle grooves (LAG) and composite residues (CR) to measure outcomes.⁴ They found a significant advantage for debonding with dental loupes with regards to EDI, LAG and CR.⁴ The authors concluded that dental loupes affect the quality of debonding procedure, resulting in less enamel damage and composite residue, and fewer LAG compared to no dental loupes.⁴

The authors of the first non-randomized study⁵ assessed the effectiveness and reliability of magnification in the detection of smooth surface white spot lesions using naked eye and magnifying loupes. Their results suggested that there were significant differences between naked eye and magnifying loupes for the detection of smooth surface white spot lesions with and without air drying.⁵ The authors concluded that magnifying loupes are effective for the detection of smooth surface white spot lesions.⁵ The authors of the second non-randomized study⁶ investigated clinical and patient-centered outcomes of supragingival scaling performed with or without magnification loupes and illumination. They found that the duration of the treatment was significantly higher in the magnification loupes and illumination group compared to controls.⁶ The authors concluded that magnification loupes (with or without illumination) did not improve clinical and patient-centered outcome of supragingival scaling procedures.⁶ The authors of the last non-randomized study⁷ compared the time in performing non-surgical endodontic therapy with or without the use of magnifying loupes. The authors found that treatment time was associated with the use of magnifying loupes and concluded that magnifying loupes could significantly reduce the endodontic treatment time.⁷

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

1. Del Fabbro M, Taschieri S, Lodi G, Banfi G, Weinstein RL. Magnification devices for endodontic therapy. *Cochrane Database Syst Rev*. 2015 Dec 9(12):Cd005969. [PubMed: PM26650099](#)
2. Del Fabbro M, Taschieri S. Endodontic therapy using magnification devices: a systematic review. *J Dent*. 2010 Apr;38(4):269-275. [PubMed: PM20117164](#)

Randomized Controlled Trials

3. Mohan R, Agrawal S, Gundappa M. Atomic force microscopy and scanning electron microscopy evaluation of efficacy of scaling and root planing using magnification: a randomized controlled clinical study. *Contemp Clin Dent*. 2013 Jul;4(3):286-294. [PubMed: PM24124292](#)

4. Baumann DF, Brauchli L, van Waes H. The influence of dental loupes on the quality of adhesive removal in orthodontic debonding. *J Orofac Orthop*. 2011 Mar;72(2):125-132. [PubMed: PM21503852](#)

Non-Randomized Studies

5. Gupta N, Sandhu M, Sachdev V, Jhingan P. Comparison of visual examination and magnification with DIAGNOdent for detection of smooth surface initial carious lesion- Dry and wet conditions. *Int J Clin Pediatr Dent*. 2019 Jan-Feb;12(1):37-41. [PubMed: PM31496570](#)
6. Corbella S, Taschieri S, Cavalli N, Francetti L. Comparative evaluation of the use of magnification loupes in supragingival scaling procedures. *J Investig Clin Dent*. 2018 May;9(2):e12315. [PubMed: PM29322638](#)
7. Wong AW, Zhu X, Zhang S, Li SK, Zhang C, Chu CH. Treatment time for non-surgical endodontic therapy with or without a magnifying loupe. *BMC Oral Health*. 2015 Mar 20;15:40. [PubMed: PM25887978](#)

Economic Evaluations

No literature identified.

Guidelines and Recommendations

No literature identified.

Appendix — Further Information

Previous CADTH Reports

8. Ho C, Argáez C. Dental loupes for dental procedures: a review of the clinical and cost effectiveness. Ottawa (ON): CADTH; 2008 Oct:
<https://www.cadth.ca/media/pdf/htis/Dental%20Loupes%20for%20Dental%20Procedures%20A%20Review%20of%20the%20Clinical%20and%20Cost-Effectiveness.pdf>
 Accessed 2019 Oct 08.

Non-Randomized Studies

Simulated Setting

9. Perrin P, Neuhaus KW, Eichenberger M, Lussi A. Influence of different loupe systems and their light source on the vision in endodontics. *Swiss Dent J.* 2019 Aug 28;129(11).
[PubMed: PM31460731](#)
10. Eichenberger M, Biner N, Amato M, Lussi A, Perrin P. Effect of magnification on the precision of tooth preparation in dentistry. *Oper Dent.* 2018 Sep/Oct;43(5):501-507.
[PubMed: PM29513642](#)
11. Perrin P, Neuhaus KW, Lussi A. The impact of loupes and microscopes on vision in endodontics. *Int Endod J.* 2014 May;47(5):425-429.
[PubMed: PM24033447](#)

Review Articles

12. Low JF, Dom TNM, Baharin SA. Magnification in endodontics: a review of its application and acceptance among dental practitioners. *Eur J Dent.* 2018 Oct-Dec;12(4):610-616.
[PubMed: PM30369811](#)
13. Wajngarten D, Garcia PPN. Expanding the operating field in endodontics: from magnification loupes to microscope. *Dent Oral Biol Craniofacial Res.* 2018 Mar;1(1):1-4;
<https://www.scienceopen.com/document?doi=10.1016/j.docr.2018.03.001> Accessed 2019 Oct 08.
14. Mamoun J. Preparing and restoring composite resin restorations. the advantage of high magnification loupes or the dental surgical operating microscope. *N Y State Dent J.* 2015 Jun-Jul;81(4):18-23.
[PubMed: PM26373029](#)
15. Mamoun J. Use of high-magnification loupes or surgical operating microscope when performing dental extractions. *N Y State Dent J.* 2013 Apr;79(3):28-33.
[PubMed: PM23767397](#)
16. Mamoun J. Use of high-magnification loupes or surgical operating microscope when performing prophylaxes, scaling or root planing procedures. *N Y State Dent J.* 2013 Aug-Sep;79(5):48-52.
[PubMed: PM24245463](#)

17. James T, Gilmour AS. Magnifying loupes in modern dental practice: an update. *Dent Update*. 2010 Nov;37(9):633-636.
[PubMed: PM21179934](#)
18. Taschieri S, Del Fabbro M, Weinstein T, Rosen E, Tsesis I. Magnification in modern endodontic practice. *Refuat Hapeh Vehashinayim (1993)*. 2010 Jul;27(3):18-22, 61.
[PubMed: PM21485416](#)
19. Mamoun JS. A rationale for the use of high-powered magnification or microscopes in general dentistry. *Gen Dent*. 2009 Jan-Feb;57(1):18-26; quiz 27-18, 95-16.
[PubMed: PM19146139](#)