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# A REVIEW ON THE USE OF DENTAL LOUPES AND OPERATING MICROSCOPE IN ENDODONTICS

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## Abstract:

Having a clear accessibility and vision in Endodontic therapy was a challenging issue in the history until the development of various magnification tools. These tools have improved the prognosis of root canal treatment and made it possible to treat some difficult cases that were impossible to treat without magnification. This article highlights the use of dental loupes and operating microscope and their merits and demerits. Also, the stages of magnification are needed for various dental procedures.

**Source:** "EBSCO", "Medline" and "PubMed" databases

**Keywords:** Endodontic, operating microscope, magnification, and dental loupes

## Introduction

Endodontic therapy possessed a correct tool for achieving a great success position (1). Surgical and non- surgical endodontics in the previous 15 year, explores a new material, new technologies,

new instruments. These establishment have enhanced the accuracy of performance by endodontics. By the involvement of empowered clinician's methods are related is incredible or the methods are performed by highly lucky and talented clinicians (2). Dentistry is an art and this is based on accuracy. Human unaided eye has the capacity for observing every minute details, but this not applicable because the while the picture is enlarged or sharpen. The need of the study is filled by the magnification tool. The involvement of magnification tools like microscope, endoscopes, loupes and orascope that allows the endodontist to modify a enhanced treatment sectors beyond the supported of unaided eye (10).

**Dental Loups**

The most common magnification tool is Dental Loups that is used in apical operation. Mainly loupes are having 2 monocular microscopes, that have lenses and placed in a front of an object to focus and also in a side-by-side angle (6). Expanding loupes are innovated to express the issues of eyestrain, proximity, and decreased depth of field caused by sitting and contracting nearer to the object. Knowledge of the field is by the capability of lens system to emphasis an object that are far or close without taking the loupe site. As enlargement increases, decreasing of field's depth. The view of the field is smaller and the thinner the field depth. The loupe of enlargement is 2x, the field deepness is around 5 in [12.5 cm] and the loupe of enlargement 3.25x, is 2 in [6 cm]; and the enlargement of 4.5x is 1 in [2.5 cm]. (7).

**There are three types of binocular magnifying loupes [(8)]:**

(1) A flat-plane, diopter, single-lenes loupe.
(2) A surgical telescope with a Keplerian system configuration (prism roof design that folds the path of light).
(3) A surgical telescope with a Galileian system configuration (two lens system).

**Single Lens Loupe**

The single lens loupe contains very modest magnifying lens. Inexpensive system is the highlight of the significance of diopter system advantages, but this contains very low desirable because using of plastic lens are not optically right. Furthermore, being nearer to the seeing object depended the enhancement of image size and this leads to create stresses and compromise posture and deviations in musculoskeletal system (9).

**Galileian Lens Loupes:** Magnification or enlarging range to 2X – 4.5X by proving the Galileian system is light, very compact system and small (10).

**Prism Loupes:** The most enhanced type of optical present today was Prism loupes, of loupe enlarging. This involves the refractive prisms and this is exactly telescopes with complex light ways, that provide enlargements to 6x. This also gives high view point in fields with larger field depth and longer fielding distance than various categories of loupes (9).

**Advantages of dental loupes:**

The two system produce correct spherical and chromatic aberrations and superior magnification with easy to carry and small size, have great field depth, and have capacity of enhanced focal length (30 – 45 cm), this helps to decreasing eyestrain and neck fatigue and head. The loupes suggest important improvement over eye lenes by simple magnification.

**Disadvantages of dental loupes:**

Loupe's disadvantage is a theoretical highest magnification over 4.5x. Availability of highest magnification in loupes, but the loupes are unwieldy and heavy, with a field limit for viewing. Those loupes need a controlled physical position and this produce a significant back strain, neck and head (7) by wearing a long time. Gadgets like 35mm camera, beam-splitter and video camera cannot be connected to loupe for capturing the magnified field (10).

**Operating Microscope:**

The dental OM was introduced in 1981 by Apotheker (1). In the first use of OM, that produce bad experience configured and ergonomically tough to handle. This has the capacity of 8x magnification. Although OM was also used in various decades of medical field: neurosurgery, otorhinolaryngology, vascular surgery, ophthalmology and reconstructive surgery. The introduction of OM creates dentistry in the past 15 years, mainly in endodontics, that shows the transformation of endodontics practices over worldwide. Still currently, endodontic therapy was explored by tactile sensitivity usage and radiography. Radiography is a unique significant way to see the depth of the root canal (18). Before the introduction of OM, various issues are was happened such as, a perforation, a broken instrument, a ledge and a blockage, and the problem by the clinical management was depended on happenstance and unpredictable. The significant use of OM needs efficient training. Various endodontic actions are achieved by 10x to 15x, magnification, and few need a high 30x magnification. Working securely on these magnification needs accommodation to enhanced skills and this was not trained still today in school of dental. Over the various things, operating in highly empowered magnifications gives the clinician to empire. Even on the small hand movements are physiologic and disruptive hand shake become issue (11). Moreover, in present OM was considered as a empower helped in endodontics and this is not accepted by every endodontist in universities. This shows the various endodontists as an only sub tool and this is not a right way of training endodontist is working. Similarly, in trust economically this is constantly cited as a main impediment, although this is not about the money this is about failure to implement and understand the ergonomic and positional skills that is necessity to use OM significantly (18).

**Summary of advantages and disadvantages of operating microscopes** [(10)].

**Advantages:**

The operating microscope gives superior optical properties, illumination and magnification. Clinicians are efficiently changing the employing magnification.

By the use of beam-splitters, that is injected to microscope's optical pathway, also helping surgeon see the field of magnified surgical.

Galilean optics are employed by dental operational microscopes. Galilean optics have the optional way are focused and parallel at eternity. This decreases the require of converging the eyes to focus and this also decrease fatigue and eye strain.

**Disadvantages of Microscopes:**

The tool needs more space and tough to carry.

Working related to the usage and part is compulsory before attending the surgery on patient and the position of the surgeon is also restricted.

By using of highest magnification, the depth focusses and view point of field is decreased.

The instrument is more expensive and need regular and proper maintenance.

**Common question that dental practitioners always asked is "What level of magnification is needed?"**

The stage of magnification is depending on the various type of process that are followed and the person's size also need. The participator is taller having the larger magnification and this also possessed that head od the participator is beyond from the site of operation and the picture is small. For an average height person, a famous magnification stage is over 2.5x and generally this is applicable for dental operations e.g. crown preparation, and caries removal. The availability of highest magnification is 3.5x and 6x for an endodontic training. The need of clinical microscope in the stages of magnification is higher of 20x and this is implemented to enhance the treatment and outcomes from the endodontics field. Moreover, knowing the usage and requirement of microscope and cost of the instruments and effort is important (19).

**How can the magnification tools assist in Endodontic procedures?**

1) **Examination, diagnosis, and treatment planning:**
   By the improved visualization, the ability of the clinician to identity the problems in the beginning stage of the illness or disease are possible (12,13).
2) **Diagnosis of cracked teeth:**
   Longitudinal fractures and microfractures are mostly complex to identity clinically and show the symptoms of occlusal damages that involves restorations or cracked teeth are identified more accurately with DOM (14).
3) **Better visualization of pulp chamber, canal orifices:**
   Magnification give access to endodontists for an enhanced identification of anatomical landmarks, by the soft tissue cavity – includes the sides of the cavity, dentinal map, initial perforations into the pulp, canal orifices and overhanging remnants of the pulp chamber roof and this shows the various among the main body of pulp over the chamber and pulp horns.
4) **During instrumentation:**
   During instrumentation the enhancement of capacity to show unique canals and asses the endodontists for operation files canal that begins with higher efficiency (15).
5) **Identification and removal of Denticles:**
   The unique procedure of calcification also met continuously, and wedge the canal entrance or hider the more instrumentation. Denticles show the negotiate readily and found by the support of DOM (16).

**6) Locating of hidden canal:**

Absence of magnification in therapy of endodontic particularly, the case of canals location and root anatomy is unexpected makes identifying all the complex canals leads to failures and incomplete RCT. The summary of the dental microscope and the related capacity to check the root canals on retrograde and orthograde essentially change the knowledge of dental morphology and the difficulties to decrease the chances of failures in endodontic (16,17).

**There are other procedures such as:**

External cervical aggressive reabsorption repairs, microsurgical apicoectomy**,** eliminating materials like solid obturation resources (carrier-based materials and silver points), removing of Obliterations, Perforation repair, Open apex cases Identification and calcifications (8).

**Conclusion:**

By using magnification tool on Endodontic like operating microscope and dental loupes, the process of endodontic enhance the clinician's capacity to achieve higher outcomes with fewer side effect in health by operation. The usage of OM and dental loupes, few of treatment moods are impossible before and become consistent.

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