ADVANCES IN MAGNIFICATION

Abstract

The oral operating field poses a major challenge for dentists in maintaining musculoskeletal health. In recent years, much research has been conducted to improve visualization of the surgical field, and the use of magnification systems has been recommended to provide additional benefits. Magnification is generally considered one of the great revolutions in science, and dentistry in particular.

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I. INTRODUCTION

"The art of dentistry is based on precision. The microscope and other forms of magnification fill that need, especially for accomplishing endodontic procedures".

-J Esthet Restor Dent

Both Dental Operating Microscopes and Loupes are widely used by dentists. Magnification is divided into low magnification (2x to 8x), medium magnification (8x to 16x), and high magnification (16x to 25x). Microscopes offer adjustable magnification (magnification range 4x to 25x), whereas most magnifying glasses offer fixed magnification (magnification range 2.5x to 6x).

II. RECENT ADVANCES

1. **Endoscopes:** Primitive tube like instruments were used by early endoscopists like Hippocrates around 377 BC for endoscopy [1]. In 1960, a breakthrough in the quality of optics was made by Dr. Hopkins in the UK, marking a major breakthrough in the field of medicine. Hopkins developed his lens, a series of rods that improvised the field of view, focal length, and magnification of the endoscope to achieve clearer images [2]. The field of endoscopy continues to grow with the development of dental endoscopes. The use of rod lens endoscopy in endodontics was first described in the literature in 1979 [3]. The modular endoscopy system (Sialotechnology Ltd., Ashkelon, Israel) is based on modern microendoscopy technology and is therefore used in small ductal organs (salivary gland duct system, lacrimal duct system) [4].

2. **Orascope:** A recently introduced flexible fiber optic oralscope with a 15 mm length working section and a 0.8 mm diameter working tip is recommended for intracanal viewing. The use of a flexible or rigid rod lens endoscope within the oral cavity is called orascopy [5]. The use of an oral mirror to improve visibility during conventional and surgical endodontics is called oroscopic endodontics [6].An endoscope and an orascope are different in that:
   - Fiber optics are used to create orascopes.
   - Glass rods make up an endoscope.

3. **Endodontic Visualization System:** The recently introduced Endodontic Visualization System (EVS) (JEDMED Instrument Company, St. Louis, MO, USA) combines endoscopy and oral microscopy in one unit. The EVS system performs two documentation methods [7]. In EVS systems, an S-video camera head is used and documentation is typically done by recording the video to tape or can also be digitized to DVD [8].

4. **Dental Loupes:** The most commonly used type of magnification in apical surgery is dental loupes. Because the lenses are aligned and tilted inward to focus on the object (convergent optics), the magnifying glass effectively becomes two monocular microscopes [9]. A magnifying telescope is also sometimes called a "magnifying glass."Binocular magnifying loupes come in three different categories:

- A single-lens, diopter-corrected loupe,
- A surgical telescope with a two-lens system in the Galilean configuration,
- A surgical telescope with a Keplarian system setup (a prism ceiling that bends light's path)[10].

5. **Operating Microscope:** Surgical operating microscopes were first introduced into otolaryngology around 1950, followed by use in neurosurgery in the 1960s and in endodontics in the early 1990s [11]. In most cases, microscopes can be set to magnifications of 40x or higher, but limitations in depth of field and field of view make it impractical to use them above this magnification. Canal fractures, POE, and isthmus can be easily visualized and treated [12].

III. CONCLUSION

With the introduction of dental operating microscopes and magnifiers, these have been adopted in many areas of dentistry to improve patient outcomes. Endodontics has advanced to improve visualization of the surgical field, even during basic procedures such as root canal therapy. For this purpose, the use of various magnifying devices such as operating microscopes, endoscopes, and magnifying loupes has added the added advantage of allowing better visualization for the operator. These also translate into benefits for patients in terms of improved clinical and radiological outcomes.

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