

MAGNIFICATION IN ENDODONTICS

Dental Loupes Vs Microscope

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ABSTRACT

Better ideas, observation and understanding are possible when one routinely uses magnification during all operations. Dental loupes and microscopes are such devices that are borrowed from allied surgical fields, utilized in the field of endodontics and improved by research. The aim of this review is to discuss the role of magnifying aids like dental loupes and microscopes with its added advantages in endodontics.

Key Words: Magnification, Dental Loupes, Microscope, Microsurgery, Illumination.

J Odontol Res 2015;3(1)31-34.

INTRODUCTION

Excellence in endodontics proceeds with newer innovative devices, borrowing operative devices from allied surgical fields and with thorough understanding of the basic biological science.

It is a well known fact that better surgeries are possible with HIM-Haemostasis, Illumination and Magnification. While haemostasis is in the domain of surgical skill, the other two factors are with field of endodontics and improved by research.

Co-axial Illumination and stereoscopic grades magnification with accessories for assisting and teaching has definitely given a new leap of intent in the field of dentistry and endodontics in particular.

HISTORY¹

- 1975 Baumans article stressing the benefits of the use of an operating microscope to dentist and its possible uses in endodontics was published.
- 1981 A preliminary report by Apotheker was published which highlighted the various applications of a special dental microscope (Dentiscope) including endodontics and teaching.
- 1983 Humes and Greaves reported various uses of the operating microscope in general dentistry.
- 1984 Reuben and Apotheker tested the dental microscope (Dentiscope) in an apical surgery and recommended its further application in endodontics.
- 1986 Pecora and Adreana also used microscope during the performance of 50 apicoectomies and reported reduced incidence of post operative symptoms.
- 1989 Selden and Bethlehem reported the successful non-surgical treatment of calcified canal using microscopes.
- 1992 Carr advocated the use of microscopes for different routine endodontic procedures.
- 1995 Weller et al. stressed the use of surgical operating microscopes in recognizing and treatment of the canal isthmus during apical surgeries to increase the success rate.

MICROSCOPE Vs LOUPES

Advantages of Microscope over Loupes

1. Microscopes gives a detailed stereoscopic view of a small operating field which the loupes cannot.
2. Magnification from 3x - 40x can be obtained with microscopes².
3. It gives higher magnification, elimination and superior optical properties.
4. Images are stable unlike that with higher magnification loupes or spectacles.
5. Clinician can easily change the working magnification.
6. There is no weight on the nose and head.
7. Using beam splitters, the assistant surgeon can also view the magnified surgical field directly.
8. Still photography, video documentation and live screening of the surgical procedure is possible unlike loupes.
9. They use Galilean optical principle i.e, binocular eye piece jointed by 2 prisms with parallel optical accesses - permits stereoscopic viewing of the surgical field without eye convergence³.
10. Less eye strain and fatigue to the operator.
11. Illumination near optical axis is called ca-axial lighting. Microscope equipped with co-axial lighting provides a homogenous illuminated field that is concentric with field of view. Thus the light is focused between the eye piece in such a fashion that clinician can look in to the surgical site without seeing any shadow⁴.
12. They are also incorporated fully coated optics with achromatic lens provided³.
13. They allow lens invasive surgical procedures and minimal retraction leading to less post-operative pain⁵.

Limitations of Microscope

- Bulky, occupies lot of space in the operatory and very difficult to carry².
- Training regarding its parts and usage is a must

before surgery is attended on the patient and learning curve is considerably more⁶.

- Surgeon's position is restricted⁴.
- With higher magnification, field of view and depth of focus is reduced^{7,5}.
- Time is required before one gets adjusted in using the microscope⁸.
- Very expensive³.
- Requires proper and regular maintenance⁸.

But the above cited disadvantages can be overcome by proper learning and quality instruments with more workshops, these disadvantages become null and void.

Advantages of Loupes over Microscopes

1. Small in size, does not occupy such space and easy to use and store
2. No formal training is required
3. Surgeon's position is not restricted.
4. Occasionally more practical than a microscope, particularly in preliminary procedures, when very high magnification and illumination is not required.
5. Very minimal maintenance is required.
6. Not expensive as a microscope.
7. Prism telescopic loupes produces better magnification by wider depth of field, longer working distances and larger field of view. These loupes gives magnification from 2.5x to 8x. They can incorporate coaxial, fibre optic, lighting in the lens element to improve illumination.³

Disadvantages of Loupes

1. Stereoscopic view is not possible in loupes, hence no depth perceptions.
2. With loupes, magnification only up to 5x is practical. For higher magnification microscopes are better¹.
3. Image is not stable due to head movement.
4. Illumination is not as high as in microscope.
5. Only limited magnification change is possible.
6. Loupes with higher magnification are uncom-

fortable on nose or head due to their large size and increased weight¹.

7. Clinician's eyes must coverage the view to the operating field. This result in eye strain, fatigue and even vision changes in prolonged use of poorly fitted loupes.
8. Accessories like auxiliary observation tubes, 35mm camera, T V camera or movie camera cannot be attached to capture the magnified field¹⁰.

DISCUSSION

Pathways to pulp other than apical and accessory foramen lead to pathological changes in the healthy pulp and periodontium with a cascade of events. Identifying the portal of entry to and exit from pulp space and hermetic seal after debridement forms the basic in endodontics. Clinical clues, radiographic co-relations, visual, tactile, tracing, staining, therapeutic, microbiological and normal vision inspection are generally available for routine endodontics in the past. With magnified visual perception, newer understandings are emerging in endodontics leading to excellence in treatment.¹

A better illumination and higher magnification is needed for endodontic excellence. The answer to this need for magnification initially was solved with the introduction of magnifying loupes. Although the magnification associated with loupes is helpful, it is indeed limited when compared to the typical microscope which offers magnification in the order of 3x - 30x.

Endodontics has changed fundamentally in the last few years following the introduction of the surgical operating microscope. Cases that once seemed impossible became easy and exciting to operate like

- a) Location of MB' canal of maxillary molar, missed or extra canal and orifices of the root canal in calcified pulp chamber.^{5,12}
- b) Retrieval of separated instrument of silver points from middle and apical third.⁵
- c) Apicoectomies, from osteotomy to apex resection to retro filling and suturing through surgical approach.^{5, 13} With the use of surgical operating microscopes, cases can now be performed with a higher degree of clinical confidence, predictability and success.⁵

CONCLUSION

By nature of the specialty an endodontist would also agree that diagnosis in the most different aspect of endodontics. Any equipment or methodology that assist in diagnosis and treatment procedure is appreciated and magnifying aids especially microscopes certainly meets these criteria. The bottom line of success depends upon our commitment to achieve perfection and excellence. If we make an honest, sincere effort, we will find ourselves rejuvenated and endodontics more enjoyable.

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