



Periodontal Plastic Microsurgery: A Future Trend in Periodontics- A Review

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Dr. B.M. Bhusari

Professor & Head of the Department, Department of Periodontics & Oral Implantology, Y.M.T. Dental College & Hospital, Kharghar, Navi Mumbai.

* Dr. Kunal A. Banavali

Postgraduate Student, Department of Periodontics & Oral Implantology, Y.M.T. Dental College & Hospital, Kharghar, Navi Mumbai. * correspondent author

Dr. Bhoomi Kotak

Dental Surgeon, Y.M.T. Dental College & Hospital, Kharghar, Navi Mumbai.

Dr. Rahul J. Nagda

Intern, Y.M.T. Dental College & Hospital, Kharghar, Navi Mumbai.

ABSTRACT *The purpose of this article is to introduce the history of microsurgery in the surgical disciplines. It reviews the benefits and potential applications of magnification and microsurgery in the specialty of periodontics. This article demonstrates the usefulness of microscope-enhanced periodontal surgery and addresses many issues involved in its application to the surgical discipline of magnification, in particular the use of surgical operating microscopes, has increased in periodontics.*

INTRODUCTION

Microsurgery is a methodology, through which surgical techniques are modified to accommodate the improved motor coordination made possible through magnification. Microsurgery in general is not an independent discipline, but is a technique that can be applied to different surgical disciplines. First reports on microsurgery go back to the 19th century when a microscope was developed for the use in ophthalmology.¹ Later first surgical operation with a microscope was performed in Sweden to correct otosclerotic deafness.² After a few early single reports surgical microscope was introduced in dentistry in 1990s.³

CONCEPTS IN MICROSURGERY

1. Magnification.
2. Illumination.
3. Instruments.

These are called the Microsurgical Triad,⁴ the improvement of visual acuity which is a prerequisite for improved accuracy in surgical interventions. Without any of these microsurgery is not possible.

I. MAGNIFICATION

An optimal vision is a stringent necessity in periodontal practice. More than 90 % of the sensations of the body is perceived by visual impressions. Important element to assess in human eyesight is visual acuity, defined by the ability to perceive 2 objects separately. It is influenced by anatomic, physiologic factors & lighting.

Visualization of fine details is enhanced by increasing the image size by 2 ways –

1. Getting closer to the object – influence on visual capacity &
2. The ability of the lens of the eye to accommodate.

In periodontal practice, the tissues to manipulate are usually very fine resulting in a situation in which the natural visual capacity reaches its limits. Therefore the clinical procedure may only be performed successfully with the use of magnification improving precision and hence, the quality of work.

1. Magnifying loupes:

Two monocular telescopes with side by side lenses con-

verged to focus on the operative field. Magnified image has stereoscopic properties. A convergent lens optical system also called a *KEPLERIAN* optical system.

Disadvantages: Clinician's eyes must converge to view the operative field. May result in Eye strain, Fatigue, Pathological vision changes Each type of loupes varies widely in optical sophistication and individual design.

A. Simple Loupes:

STRUCTURE:-

Consist of a pair of single meniscus lenses. They are primitive magnifiers with limited capabilities. Each lens is limited to just two refracting surfaces. Produce the diapter magnification that simply adjusts the working distance to a set length as diapters increases, working distance decreases.

Limitations:-

1. Only increasing their lens diameter or thickness can increase their magnification.
2. The size and weight constrains makes simple loupes impractical for magnification beyond 1.5x.
3. Highly affected by spherical & chromatic aberration.
4. Distort the shape & color of object being viewed.
5. With a set working distance, there is no opportunity for movement - difficulty in maintaining focus. Therefore may cause neck & back strain.

B. Compound loupes:

Structure: - Multielement lenses with intervening air space to gain additional refracting surfaces,



Fig: 1 Compound microscope

Advantages:-

1. Allow increase magnification with more favorable working distance & depth of field.
2. Can be adjusted to some clinical needs without excessive increase in size or weight.
3. Can be achromatic - consist of two glass lenses, joined together with clear resin.
4. Specific density of each lens counteracts the chromatic aberration.
5. Produces color correct image.
6. Offer improved ergonomic posture.
7. Significant advancement in optical performance ⁵

Disadvantages:

They become optically inefficient at magnification above 3X diameter.

C. Prism telescopic loupes**Structure: -**

They are the most optically advanced type of low power telescopes. Contain Schmidt or rooftop prisms to lengthen the light path through a series of switchback mirror reflection within the lens elements. This arrangement folds light so that the barrel of the telescopic loupes can be shortened - so that can be mounted on either eyeglass frames or headbands.

Advantages:-

1. Produces better magnification.
2. Wider depth of field.
3. Longer working distance.
4. Larger field of view.
5. Even though the distance the light travels increase, there is no decrease in brightness or image contrast even at 4x/5x. Because the light does not travel through air but instead through the glass or prism.

Magnification range of surgical loupes:

- Limited range of magnification from 1.5x to 6x.
- Less than 3x: - inadequate for visual acuity necessary.
- More than 4x: - Are impractical because of their small field of view, shallow depth of focus & excessive weight.
- For some periodontal procedures, prism telescopic loupes with magnification of 4x provide an adequate combination of magnification, field of view & depth of focus.

2. Surgical microscope:

- Operating microscope provides higher magnification & superior optical performance compared with dental loupes.
- It is a complicated system of lenses that allows stereoscopic vision at a magnification of approx. 4-40x with an excellent illumination of the working area.
- In contrast to loupes, the light beams fall parallel on to the retinas of the observer.

Components:

- Optical components, lighting unit, mounting system.
- Optical unit – Magnification changer/Galilean changer, objective lenses, binocular tubes, eye pieces, lighting unit.⁶



Fig: 2 Surgical Microscope

- Have binocular eyepieces joined by offsetting prisms with parallel optical axis.
- Allow viewing of operating field without eye convergence.
- Permit relaxed viewing of operating field.
- No eye strain or fatigue.
- Incorporate fully coated optics with achromatic lenses.
- Provide highest optical resolution with the most efficient illuminations.

Advantages:-

1. Provide better magnification.
2. Better optical performance (depth of focus & field of view are enhanced than loupes).
3. Durable.
4. Versatile.
5. Allow dentist to easily change working magnification (Rotating variable - Magnification element).
6. Have a rotating variable magnification.
7. The surgeon can view, perfectly the deepest reaches of the oral cavity, including into subgingival pockets & angular bony defect.
8. Definitive visualization of root surface deposits & irregularities is possible.
9. Adequate working distance between the surgical field and objective microscope lens present – assistant aided control of surgical access is permeable (Useful range in dentistry is 250-350mm).

II. ILLUMINATION

- Most of the manufacturers offer collateral lighting system or suitable fixing options which is helpful for higher magnification.
- Periodontists are accustomed to lateral illumination from side mounted dental lights.
- Loupes often require a head lamp to compensate for the decreased illumination.
- Loupes with larger field of view have better illumination & brighter images.
- Fiber optic coaxial illumination (lighting focuses the light parallel to the microscope's optical axis) is a major advantage of operating microscope – no shadows are produced so can view perfectly the deepest areas including subgingival pockets & angular bony defects.
- In telescopic loupes, 50% reduction in brightness is due to surface reflection (anti-reflective coatings are developed).

III – INSTRUMENTS

Periodontist have always attempted to treat the surgical site atraumatically & to achieve primary wound closure. Periodontal microsurgery is the natural transition from conventional surgical principles to a surgical ethic in which the microscope is employed to permit more accurate & atraumatic handling tissues to enhance wound healing

Microsurgery entails the use of specially constructed microsurgical instruments designed specially to minimize trauma. An important characteristic of microsurgical instruments is their ability to create clean incision that prepare wounds for healing by primary intention.

Microsurgical incision is established at a 90 degree angle to the surface using ophthalmic microsurgical scalpels. Basic set comprises of a needle holder, micro scissors, micro scalpel holder, anatomic surgical forceps & set of various elevators.

Microsurgical instruments are much smaller often by 10 folds. Handles have a round cross sectional diameter to enhance rotary movements using the precision grip. Made up of titanium to reduce weight (<15-20gms), prevent magnetization & provide reliable manipulation of needles, sutures & tissues.

Manufactured under magnification to high tolerances & resist deformation from repetitive use & sterilization cycles. They

should be approx. 18 cm long and color coated to avoid metallic glare under light.

Characteristics of needle:-

- Needle consists of a swage, body, tip & differs concerning material length, size, body diameter and the nature of connection between needle & thread.
- The body of the needle should be flattened.
- Tips are appropriate for atraumatic penetration.
- Shape of needle – straight/bent.

In order to minimize tissue trauma in periodontal microsurgery, the sharpest needles, reverse cutting, 3/8th circle with precision tips or spatula needle with microtips are preferred. ⁷

Needle length:-

- For papillary sutures – the posterior area - 13-15mm, front aspect – 10-12mm, for closing buccal releasing incisions – 5-8mm.
- Microscope permits easy identification of ragged wound edges for trimming & freshening.
- For primary wound closure, micro-sutures in the range of 6-0 to 9-0 are needed to approximate the wound edges.

Microsurgical wound apposition minimizes gapes or voids at the wound edges. It encourages rapid healing with less post-operative inflammation & with less pain.

Geometry of microsurgical suture:-

- Needle angle of entry and exit – slightly < 90°
- Bite size – 1.5 times the tissue thickness.

- Symmetry – equal size bites on both sides of the wound.
- Direction of needle passage – perpendicular to the wound.
- Monofilament suture material is preferable to polyfilament (high capillarity).⁸
- Polypropylene & its newest development polyhexafluoropropylene & polytetrafluoroethylene materials with excellent tissue properties.

Sterilization & Storage:

- To prevent damage micro instruments are stored in a sterile container or tray.
- Tips of the instruments must not touch with each other during sterilization or transportation.
- Cleansing in a thermo disinfectant without instrument fixation can irreparably balance the tip of these very expensive instruments.

SUMMARY

There is no clinical contraindication for the use of magnification in periodontal surgery. Only few areas in the oral cavity are difficult to access by microscope. These circumstances in surgical intervention, loupes may be preferable.

The microsurgery offers new possibilities for periodontal surgery can improve therapeutic result for a variety of procedures & gives benefits of improved cosmetics, rapid healing, and minimal discomfort & enhanced patient acceptance.

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