



## AN OVERVIEW ON PERIODONTAL MICROSURGERY

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### ABSTRACT

Periodontal microsurgery shares the attributes with medical microsurgery that will positively influence its professional acceptance. These include improved cosmetic results, increased predictability, less pain and higher patient acceptance. Future Periodontics will see increasing use of magnification in all areas of practice.

#### Key words:

Microsurgery, Magnification,  
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## INTRODUCTION

Microsurgery has been indispensable asset in medicine for many years. Dentistry has borrowed microscopic surgery from medicine, which dates back to 1922. It was introduced to the speciality of periodontics in 1992.

Microsurgery was broadly defined by **Daniel. R. K. in 1979** as surgery performed under magnification provided by microscope<sup>1</sup>. **Serafin 1980** described microsurgery as methodology a modification & refinement of existing surgical techniques using magnification to improve visualization that had implications & applications to all specialties.<sup>2</sup> **Dennis.A.Shanelec & L.S.Tibbets** defined Microsurgery as a refinement in surgical technique by which visual acuity is increased using a microscope at magnification exceeding 10x. Microsurgery is a practice that embraces three distinct values.<sup>1</sup> Improvement of motor skills, thereby enhancing surgical ability.<sup>2</sup> An emphasis on passive wound closure with exact primary apposition of the wound edge<sup>3</sup>. The application of microsurgical instrumentation and suturing to reduce tissue trauma

#### Types of Magnification Systems

Basically, there are two types of optical magnification systems available to dentists which include

1. Loupes

2. Surgical Operating Microscope

#### Loupes

##### Optical principles of loupes

This is most common magnification system used in the dentistry. Loupes are fundamentally two monocular microscopes, with side-by-side lenses, angled to focus on an object. The magnified image that is formed, has stereoscopic properties that are created by the use of convergent lens systems. Although loupes are widely used, their major disadvantage is that the eyes must converge to view an image, which can result in eye strain, fatigue and even vision changes with the prolonged use of poorly fitted loupes. For most periodontal procedures, loupes of 4.0 x to 5.0 x provide an effective combination of magnification, field size, and depth of focus.<sup>3</sup>

Three types of loupes are commonly used.

1. Simple loupes.
2. Compound loupes.
3. Prism loupes.

#### 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, with one occurring as light enters the lens and the other when it leaves.

### Limitations

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

### Compound loupes

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

### 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

### Disadvantages

They become optically inefficient at magnification above 3Xdiameter.

### 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, thereis no decrease in brightness or image contrast even at4x/5x. Because the light does not travel through air butinstead through the glass or prism.

### Surgical Microscope<sup>4,5</sup>

The operating microscope offers flexibility and comfort superior to magnifying loupes. It is much more expensive and is initially more difficult to use. For use in dentistry, operating microscopes are designed on Galilean principles. They use the application of the magnifying loupes in combination with a magnification changer and a binocular viewing system, so that it employs parallel binoculars for protection against eye strain

and fatigue. They also incorporate fully coated optics and achromatic lenses, with high resolution and good contrast stereoscopic vision. There must be an adequate working distance for instruments between the object being viewed and the microscope. To be able to use the microscope throughout the various areas of the mouth, it must also have extensive horizontal and vertical maneuverability with its attachment to the wall, ceiling, or floor mount. Surgical microscopes use co-axial fibre-optic illumination. This type of light produces an adjustable, bright, uniformly illuminated, shadow-free, circular spot of light that is parallel to the optical viewing axis.

### A basic surgical microscope for dentistry should have the following configuration

- Eyepieces with 12.5X reticule.
- Objective lens 200 - 250 mm
- Binocular inclinable at 180 degree
- Magnification with five step manual changer or power zoom
- magnification changer
- Fibreoptic illumination system
- Audiovisual accessories (e.g. video camera)
- Documentation

### Advantages of Operating Microscope

- Greater operator eye comfort because of the parallel viewing
- optics of the Galilean system as well as the range of variable
- magnification.
- Excellent coaxial fiberoptic illumination
- Countless accessories such as still and video cameras for case
- documentation.

### Limitations of operating microscope

- Restricted area of vision and loss of depth
- Loss of visual reference points
- Special training required
- Expensive

### Benefits of Microscopes in Periodontics<sup>4</sup>

- Accurate wound closure
- Little damage to the tissues
- Ergonomic
- Eliminates patient pain and morbidity
- Perceived more favorably

### Microsurgical instruments<sup>5</sup>

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 a traumatic 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.

#### **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 postoperative inflammation & with less pain.

#### **Geometry of microsurgical suture**

- Needle angle of entry and exit – slightly  $< 90^\circ$ .
- 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).
- 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.

#### **Clinical applications of Microsurgery**

##### **In root preparation**

Research demonstrates that root preparation is enhanced when it is performed under illumination. Currently, no studies indicate whether magnification can enhance the effectiveness of periodontal calculus removal. Because stereomicroscopy is used to evaluate residual calculus on extracted teeth, it seems logical that a surgical operating microscope can enhance the operator's ability to see and remove calculus.<sup>6</sup>

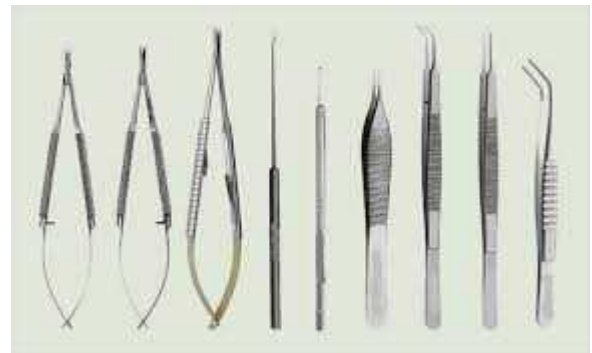
##### **In mucogingival surgery**

All mucogingival surgical procedures are technique and operator sensitive and therefore tend to have varying therapeutic results. One way to achieve more consistent

mucogingival surgical treatment results is to use microsurgical techniques and training, which itself has a long learning curve to obtain desired treatment end points. Microsurgical principles and methodology application has made all gingival transplant procedures extremely reliable.<sup>7</sup>



**Fig 1** Loupes



**Fig.2** Microsurgical instruments



**Fig.3** Surgical Microscope

#### **Minimally invasive surgery**

Harrel in 1999 introduced MIS.<sup>8</sup> The salient difference between the minimally invasive approach and more traditional approaches for regeneration is in the use of much smaller incisions to gain surgical access and debride the periodontal defect prior to placing the bone graft and membrane.

#### **Management of periodontal flaps**

By using microsurgical techniques, flap margins and closure can best be controlled by dissection of a uniform thickness periodontal flap that has a scalloped but join margin. This facilitates precise adaptation of the tissue to the teeth or the opposing flap in an edentulous area.<sup>9</sup>

#### **In Implant therapy**

All phases of implant treatment may be performed using a microscope. Magnification achieved by the surgical microscope is instrumental in implant site development and placement.<sup>10</sup> We can also use microsurgery in the sinus lift procedure. The surgical microscope can aid in visualization of the sinus membrane.

### **Surgical tooth extraction**

Exodontia has been a traumatic procedure for centuries. Under a microscope, minimal invasive principles can be applied to tooth extraction<sup>11</sup>

### **CONCLUSION**

In Periodontics today, microsurgery is in the same position it occupied in medicine in the recent past. Periodontal microsurgery shares the attributes with medical microsurgery that will positively influence its professional acceptance. The operating microscope allows the surgeon to practice enhanced, precise, delicate surgical procedures that have important healing processes and outcomes for patients. Periodontal microsurgery provides a natural evolution in the progression of periodontics.

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