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# PERIODONTAL MICROSURGERY: A REVIEW

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**ABSTRACT** Microsurgery is a minimally invasive technique that is performed with the surgical microscope, microsurgical armamentarium and suture materials. Periodontal microsurgery is the refinement of basic surgical techniques made possible by the improved visual acuity gained with the use of surgical microscope. The effect of periodontal microsurgery may include more predictable therapeutic results, less invasive procedure with reduced patient discomfort, more rapid healing, improved cosmetic results and greater patient compliance. In periodontics, microsurgery can be very useful in diagnostic procedures, crown lengthening, regenerative periodontal surgery, rootcoverage procedures, papilla reconstruction, smile designing and implantology.

**KEYWORDS :** microsurgery, minimally invasive surgery ,periodontics, surgical microscope

## INTRODUCTION

Microsurgery is an advanced surgical technique, which is defined as surgery performed under magnification of 10× or more which is performed under a surgical microscope [1-3]. The application of magnification to periodontics promises to change clinical concepts of periodontal surgical care. In 1979, Daniel defined microsurgery in broad terms as surgery performed under magnification by the microscope.[4] In 1980, microsurgery was described by Serafin as a methodology- a modification and refinement of existing surgical techniques using magnification to improve visualisation, with applications to all specialties.[5]

### History

- In 1694, Anton van Leeuwenhook constructed the first compound lens microscope.
- Magnification for microsurgical procedure was introduced to medicine during the late nineteenth century. [6]
- Saemisch, a German ophthalmologist, in 1876, introduced simple binocular loupes to ophthalmic surgery
- In 1921, Carl Nylen, who is the father of microsurgery, first used a binocular microscope for ear surgery[7]
- During 1950s, Barraquer began using the microscope for corneal surgery.[8]
- Apotheker and Jako first introduced the microscope to dentistry in 1978.[9]
- During 1992, Carr published an article outlining the use of the surgical microscope during endodontic procedures.[10]
- In 1993, Shanelec and Tibbetts presented a continuing education course on periodontal microsurgery at the annual meeting of the American Academy of Periodontology.

Microsurgery has three elements. Magnification, illumination, and instruments are called the 'microsurgical triad', the improvement of which is a prerequisite for improved accuracy in microsurgical interventions.

### Magnification Systems

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

A. Loupes
B. Surgical Operating Microscope

### Loupes

The most common magnification system used in dentistry is magnification loupes. Loupes are fundamentally two monocular microscopes, with side-by-side lenses, angled to focus on an object.It is based on Keplerian optical system . 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. Three types of Keplerian loupes are commonly used:

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

**Simple loupes -** Simple loupes consist of a pair of single, positive, side-by-side meniscus lenses. Each lens has two refracting surfaces, with one occurring as light enters the lens and the other when it leaves. Its main advantage is that it is cost effective. The magnification can be increased by increasing lens diameter and its thickness. Size and heavy weight make simple loupes impractical for magnification beyond 1.5×. They are greatly affected by spherical and chromatic aberration, thus distorts the image shape and color of objects being viewed [11,12].

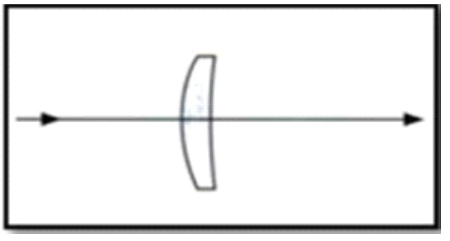

**Fig 1: Simple Loupe**

### Compound Loupes

They use multi-element lenses with intervening air spaces to gain additional refracting surfaces [13]. Magnification of compound loupes can be increased by increasing the distance between lenses, thereby avoiding excessive size and weight. Compound lenses can be achromatic and produces a color-correct image. However, compound loupes become optically inefficient at magnifications above 3×

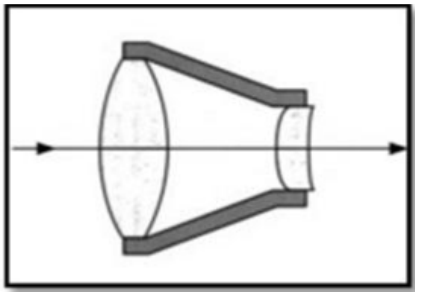

**Fig 2: Compound loupe**

**Prism Telescopic Loupes**

The most advanced loupe is the prism telescopic loupe. They use Schmidt or "rooftop" prisms and lengthen the light path through a series of switchback mirrors between the lenses [14-15]. They produce better magnification, wider depths of field, longer working distances, and larger fields of view than other types of loupes. The magnification is increased upto 4×. Inclusion of coaxial fibroptic lighting has improved properties of illumination.

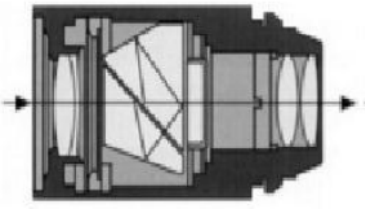

**Fig 3: Prism Telescopic Loupes**

**Loupe Magnification**

Wide ranges of magnifications are available in loupes, ranging from 1.5X to 10X. Loupes with less than 2X magnifications, are usually inadequate for the visual acuity necessary for microsurgery. For most periodontal procedures in which magnification is needed, loupes of 4X to 5X provide an effective combination of magnification, field size, and depth of focus.

**Choice of Loupes**

Before selecting a magnification system, different loupes and appropriate time for a proper adjustment have to be considered. Improperly adjusted loupes and the quality of the optics will influence the performance. For the use in periodontal surgery, an adjustable, sealed prism loupe with high quality coated lenses offering a magnification between 4X and 4.5X, either head band or front frame mounted, with a suitable working distance and a large field of view, seems to be instrument of choice.

**Surgical Operating Microscope**

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 .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

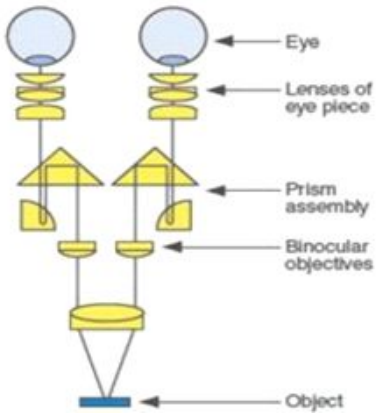


**Fig 4: Surgical Operating Microscope**

**Microsurgical Instruments**

In addition to the use of magnification and reliance on atraumatic technique, microsurgery ensures the use of specially constructed microsurgical instruments, specifically designed to minimize trauma. An important characteristic of microsurgical instruments is their ability to create clean incisions that prepare wounds for healing by primary intention. Proper instrumentation is fundamental for microsurgical intervention.. A basic set comprises of a needle holder, micro scissors, micro scalpel holder, anatomic and surgical forceps, and a set of various elevators. Several types of ophthalmic knives such as the crescent, lamellar, blade breaker, sclera and spoon knife can be used in the field of Periodontics. Ophthalmic knives offer the dual advantages of extreme sharpness and minimal size. This helps limit tissue trauma and promotes faster healing.[17]Because ophthalmic knives are chemically etched rather than ground, their sharper blades produce a more precise wound edge.

**Microsurgical Needles**

The needle diameter is ideally slightly larger than the suture size. Sutures used in microsurgery are swaged, making the needle and the suture continuous [18].

**Microsurgical Sutures**

The suture of choice in microsurgery is a monofilament suture material such as polypropylene or polydioxanone. These materials are bacteriostatic and non inflammatory, holds the knot extremely well, and are easily removed. Monofilament materials are preferred since polyfilament threads are characterized by a high capillarity and wicking effect. In periodontal microsurgery the suture size ranges from 6-0 (diameter of a human hair) to 9-0

**Advantages of Microsurgery**

There are many advantages of microsurgery. Surgical decision making is enhanced as the quality and quantity of visual data reaching the cerebral cortex is increased . It is ergonomic as well as reduced neuromuscular fatigue and occupational skeletal pathologies. The ability to create clean incisions prepares wounds for healing by primary intention. It also minimizes gaps or voids at the wound edges and encourages rapid healing with less postoperative inflammation and less pain [19].

**Microsurgical Indications In Periodontal Surgery**

- Horizontal augmentation
- Vertical augmentation
- Guided tissue regeneration (GTR)
- Guided bone regeneration (GBR) and other procedures where increasing the amount of bone needs special preparation forms of the soft tissue
- Accurate split thickness flaps
- Double papilla flaps
- Apical or coronal repositioned flaps
- Connective tissue grafts
- Pedicle or sliding flaps

**Minimal Invasive Surgery (MIS) For Regeneration**

MIS was introduced in 1999 by Harrel.[20].Hunter and Sackier in 1993 described the minimal invasive approach as "the ability to miniaturize our eyes and extend our hands to perform microscopic and macroscopic operations in places that could previously be reached only by large incisions."[21]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.

**Contraindications of Minimally Invasive Surgery**

- Generalized horizontal bone loss
- Multiple interconnected vertical defects.

**Microsurgery In Implant Therapy**

All phases of implant treatment may be performed using a microscope. One of the novel applications of microsurgery is in the sinus lift procedure. The surgical microscope can aid in visualization of the sinus membrane. Magnification achieved by the surgical microscope is instrumental in implant site development and placement.[22]

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