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Periodontal Microsurgery: A New Approach to Periodontal Surgery

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Abstract: ***Surgeons have always endeavored to treat surgical sites atraumatically. The extent to which this goal coud be accomplished, however was often defined by the limits of normal visual acuity. Optical magnification has therefore broadened the horizons of dentistry in general and periodontcs in particular. The purpose of this article is to throw light on the different magnification systems, parts of surgical microscope, potential application and benefits of microsurgery in periodontics.***

Keywords: Surgical microscope, magnification system

1. Introduction

Contemporary periodontal therapy extends well beyond merely treating the bacterial component of periodontal disease. Increased patient awareness has generated the demand for an ideal therapy encompassing the elimination of disease and the restoration of esthetics and function that is administered with minimal trauma and discomfort. Therefore over the last decade, due to the introduction of periodontal microsurgery, periodontics has seen increasing refinement of procedures such as guided tissue regeneration, root coverage, gingival augmentation, hard tissue augmentation, osseous resection, cosmetic crown lengthening and dental implants, that require clinical expertise and challenges the technical skills of periodontists.

Microsurgery has been broadly defined by Daniel RK. (1979)[1] as surgery performed under the magnification provided by operating microscope. Microsurgery was described by Serafin (1980)[2]as a methodology which assures modification and refinement of existing surgical techniques using magnification to improve visualization, with applications to all specialties. A microsurgery triad constitute magnification, illumination and instruments. It is a practice that embraces three distinct values. First is enhancement of motor skills to improve surgical ability. Second is the decreased tissue trauma at the surgical site, which is apparent in the use of small instruments and a reduced surgical field. Third is the application of microsurgical principles to achieve passive and primary wound closure. The aim is the elimination of gaps and dead spaces at the wound edge to allow new tissue formation needed to fill surgical voids. Periodontal microsurgery is defined as ' refinements in existing basic surgical techniques that are made possible by the use of surgical microscope and subsequent improved visual acuity' *(*Shanelec *1992)*[3].

The introduction of loupes and surgical operating microscopes along with the micro-instruments has taken periodontal surgery to a new level of sophistication and have made the microsurgical approach a reality. Therefore this review highlights on application of Periodontal microsurgery in Management of Flap, Root coverage procedures, Periodontal regeneration and recently added implant surgical procedures.

2. Magnification Systems

There is a wide range of simple and complex magnifying systems that are available, including three types of magnification loupes and the operating microscope.

Magnifying Loupes

Loupes are essentially two monocular microscopes with lenses mounted side by side and angled inward (convergent optics) to focus on an object. Although loupes are widely used, their major disadvantage that the eyes must converge to view an image, which can result in eye strain, fatigue and even vision changes with the prolong use. Three types of magnifying 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.cost effective is the main advantage of simple loupes.

Disadvantages:

- It is primitive with limited capabilities.
- Highly subjected to spherical and chromatic aberration, which distorts the image of the object.
- Magnification is increased only by augmenting the lens diameter or thickness.
- Because of their size and weight limitations, it has no practical dental application beyond a magnification range of 1.5 diameter.
- When positioned closed to the eye,it sacrifice depth of field for working distance.
- When positioned close to the object viewed, it sacrifice working distance for depth of field

Compound loupes:

a) It consists of converging multiple lenses with intervining air spaces to gain additional refracting power, magnification, working distance and depth of field.
b) It is achromatic and substantially improved optical design. An achromatic lens consists of two glass pieces, usually banded together with clear resin. The specific density of each piece counteracts the aberration of the adjacent piece.
   - It is usually mounted on eyeglasses.
   - It can be adjusted to clinical needs without excessive increase in size or weight.
   - However ,it become optical insufficient at magnifications above 3x.

Prism loupes

- They are the most optically advanced type of loupe magnification.
- They are superior to other loupes in terms of better magnification, wider depths of field, larger working distances and larger fields of view.
- The barrels of prism loupes are short enough to be mounted on eyeglasses or headband.
- But at magnifications of 3.0 diameters or greater, headband mounted loupes are more comfortable and stable than mountings on glasses due to increased weight

Surgical Operating Microscope

Operating microscopes are designed on Galilean principles. It consist of a complicated system of lenses that allows stereoscopic vision at a magnification of approximately 4–40×.

Parts of Surgical Microscope

- **Eyepiece**[4]

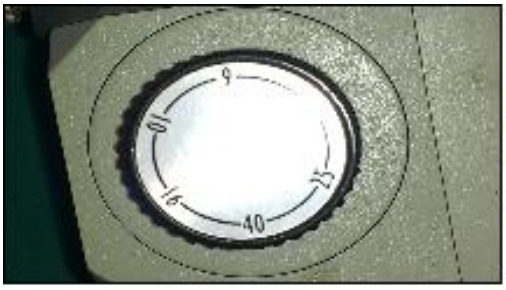
It magnify the image produced in binocular tube and avaialble in powers of 6.3x,10x,5.5x,12.5x,16x,20x

- **Binoculars**

It project an intermediate image into the focal plane of the eyepiece. Most commonly used for periodontal surgery, is inclinable-adjustable upto 18 degrees.

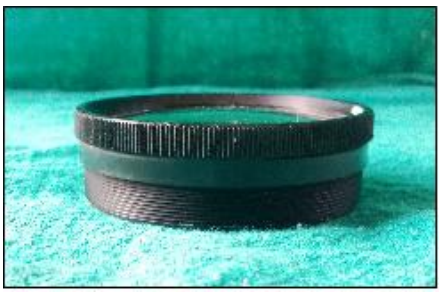
- **Magnification Changer** [5]

It is located in the head of microscope. Either it is a manual zoom chargers or power zoom charger. Operator can change the magnification according to the requirement in the procedure.



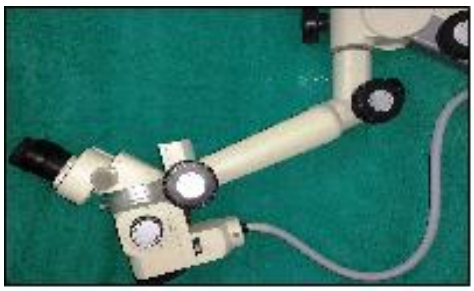
- **Objective Lens**

It is a focal length of objective lens determines the operating distance between the lens and surgical field. Variety of objective lenses with different focal lens are available.200 mm of objective lens focus at 8 inches is recommended for periodontal microsurgery



- **Light source**

Two light source system are commonly used; the xenon bulb and the quartz halogen bulb in the fiber optic lights.



- **Accessories**

a) Photographic and video adapaters
- 35mm digital camera
- Video cameras
- Digital Still camera
- Video printers

b) Assistant observation devices
- Articulating assistant binoculars
- LCD screens
- High resolution monitors
- Coupling and suspension system

Microsurgical Instruments [6]

An important characteristic of microsurgical instruments is their ability to create clean incisions and closure that prepare wounds for healing by primary intention. A basic set of periodontal microsurgery instrument kit comprises of

a) Knives and scalpel blades:

The knives which are commonly used in periodontal microsurgery are those which are used in ophthalmic surgery or plastic surgery. Different type of knifes are used. The crescent knife can be used for intrasulcular procedures. The spoon knife is often used to undermine into the lateral sulcular region in preparation for placement of connective tissue grafts using a sulcular, nonrelief technique. Scalpel blades include mini cresent microsurgical blade. Microsurgical incisions are established at a 90-degree angle to the surface using ophthalmic microsurgical scalpels. Microscissors: These are used for the dissection of tissues, blood vessels, and nerves. The most commonly used microscissors are 14 cm and 18 cm long. To manage the delicate part of the tissues, 9-cm microscissors are preferable. Straight scissors cut sutures and trim the adventitia of vessels or nerve endings. Curved scissors dissect vessels and nerves.

b) Microforceps: They are used to handle minute tissues without damaging them and to hold fine sutures while tying knots. Jeweler forceps are strong and can even be used to separate minute vessels and nerves.

c) Micro Needle Holder: It is used to grasp the needle, pull it through the tissues, and tie knots. The needle should be held between its middle and lower thirds at its distal tip. If the needle is held too close to the top, the anastomosis between the two ends of the vessel cannot be completed with a single stitch. If it is held too close to the bottom, maintaining steady control is difficult, and the direction of the tip can be changed easily. A titanium needle holder is the best choice.

d) Needles: In order to minimize tissue trauma in microsurgery, the sharpest needles, reverse cutting needles with precision tips or spatula needle with micro tips are preferred. For periodontal microsurgery, the 3/8" circular needle generally ensures optimum results.15

e) Suture Material: Although 4-0 or 5-0 sutures are typically used in Periodontics, in periodontal microsurgery 6-0 and 7- 0 sutures are used. The geometry of microsurgical suturing consists of the following points:

1) Needle angle of entry and exit of slightly less than 90 degrees
2) Suture bite size of approximately 1.5 times the tissue thickness
3) Equal bite sizes (symmetry) on both sides of the wound
4) Needle passage perpendicular to the wound

Knot tying using the microscope is done using instrument ties, with a microsurgical needle holder in the dominant hand and a microsurgical tissue pick-up in the nondominant hand.[7]

3. Application of Microsurgery in Periodontics

The reason microsurgery has gained acceptance among some periodontists is reduced morbidity, cleaner incisions, closer wound apposition, reduced hemorrhage, and reduced trauma at the surgical site. The difference is self-evident and can be startling when compared with conventional surgery. Periodontal surgery viewed under the microscope reveals the coarseness of most surgical manipulation. (Shanelec D, Tibbetts L et al 1996)[8] What appears as gentle handling of tissues is discovered to be a gross crushing and tearing. The microscope is a tool that permits less traumatic and less invasive surgery. Using of 7-0 to 9-0 microsutures allows more precise wound closure. This encourages repair through primary healing, which is rapid and requires less formation of granulation or scar tissue. Wound healing studies show anastomosis of microsurgical wounds within 48 hours.(Shanelec DA, Tibbetts LS 1992)[3] Secondary wound healing is slower because new tissue formation is required to fill voids at the edge of the partially closed wound. Because surgical trauma is minimized during microsurgery, less cell damage and necrosis occurs. This means less inflammation and reduced pain.

Periodontal microsurgery does not compete with conventional periodontal surgery. It is an evolution of surgical techniques to reduced trauma. Its methodology improves existing surgical practice and introduces the possibility for better patient care to periodontics.

4. Application for Non Surgical Periodontal Therapy

1) Improved root visualization

The importance of root debridement is recognized universally as an essential component of periodontal therapy. The critical determinant of the success of periodontal therapy is the thoroughness of debridement of the root surface rather than the choice of grafting modality. Studies designed by Buchanan et al (1987)[9] and Caffesse et al (1986)[10] evaluated the effectiveness of calculus removal after scaling and root planing, with and without surgical intervention have noted that all calculus is seldom removed from the root surfaces.

2) Management of periodontal flap

By using microsurgical techniques, flap margins and closure can best be controlled by dissection of a uniform thickness periodontal flap that has a scalloped butt-joint margin. This facilitates precise adaptation of the tissue to the teeth or the

opposing flap in an edentulous area. Such dissection requires the use of appropriate microsurgical instrumentation[1].

Precise and crisp initial incisions, made at right angles to the surface tissue, are best done using a blade of carbon steel, fractured with a blade breaker to the desired size. Secondary incisions ie the vertical releasing incisions are made with a double-edged ophthalmic blade.

Miniaturized instrumentation is necessary for handling the soft tissue for microsurgical access. Therefore, avoids traumatizing the tissue by stretching, distorting, or tearing a flap[1]. Initially, microscopic magnification may be used only to make the initial incisions however with experience becomes an integral part of the total surgical technique, which opens the surgeon's vision for minute details which are otherwise not possible without such magnification and a higher standard of routine care.

3) Application in Periodontal Plastic Surgery

The term mucogingival surgery was introduced into the periodontal literature in the 1950s. The current terminology, periodontal plastic surgery, is defined as surgical procedures performed to correct or eliminate anatomic, developmental, or traumatic deformities of the gingiva or alveolar mucosa. (Wennström JL. 1996)[11] Improvement in esthetics is a major indication for periodontal plastic surgery. One way to achieve more consistent mucogingival surgical treatment results is to use microsurgical techniques. Most periodontists have found that gingival recession represented a significant cosmetic impairment, which through conventional surgical means, was difficult to return to normal appearance and function. Periodontal microsurgery has proven to be an effective means of improving the predictability of root coverage procedures with less operative trauma and discomfort.

a) Root Coverage Procedures

Success of root coverage procedure involves atraumatic surgical approach, dexterity of surgeon and excellent visualization of the operating field. All these factors can be fulfilled using a surgical microscope. It has to be realized that factors influencing the degree of coverage such as root preparation, delicate tissue handling, tissue thickness and meticulous plaque control have to be controlled in order to maximize treatment outcomes. In that respect Burkhardt et al (2005)[12] have demonstrated significant contribution (coverage 8%) by using microsurgical approach. In addition the degree of shrinkage is influenced by surgical approach. With microsurgical procedures providing significantly improved outcomes than conventionally performed mucogingival surgery.

b) Papilla Reconstruction Procedures

The reconstruction of lost interdental papillae remains a challenge. Predictable results are hindered by the small dimensions of the interproximal space and the pattern of vascular supply to this end organ. Many surgical techniques have been described to augment soft tissue around dental implants and teeth. Among all techniques microsurgical procedure is an atraumatic procedure to position donor tissue under a deficient interdental papilla. Because of the small dimensions of the interdental papilla and the limited access, surgical magnification and microsurgical instruments are recommended, as they assist the surgeon by increasing visibility, eliminating unnecessary releasing incisions or unintentional incisions, and facilitating access, thus improving the predictability of the process. The surgery is accomplished without the use of releasing incisions, thereby increasing the likelihood of donor tissue survival and minimizing tissue trauma, excessive bleeding, scarring, and pain. Because the vascular supply remains intact, donor tissue survival is optimized.

4) Application for Microsugery for Periodontal Regeneration

Outcomes of periodontal regenerative procedures is dependent on a variety of factors like, depth of the intrabony defect, number of residual bony walls and/or probing depth. (Tonnetti et al 1996) . Among the technical/surgical factors, membrane, graft exposure and contamination have been associated with reduced outcomes. Therefore Harrel (1998)[13] described a periodontal minimally invasive surgery technique for the placement of bone grafts in periodontal defects. He reported the bone grafting using minimally invasive surgery was appeared to give superior results

Minimally Invasive Surgery Technique (MIST)

The minimally invasive surgery technique (MIST) was designed specifically to treat isolated intrabony defects using periodontal regeneration. The foundations for the MIST include:

- Application of largely tested modified papilla preservation technique (MPPT)
- Simplified papilla preservation flap (SPPF)
- Application of passive internal mattress sutures to seal the regenerating wound from the oral environment.
- The primary objectives of the MIST include the following:
- Reduced surgical trauma
- Increased flap/wound stability
- Creation of a stable primary closure of the wound
- Reduced surgical chair time
- Minimization of patient discomfort and side effects.

5) Applications of Microsurgery in Implant Therapy

The novel applications of microsurgery are in the sinus lift procedure and immediate implant placement. Studies show that motor coordination and accuracy is generally increased when surgeons use a microscope. Increased visual acuity, improved ergonomics, and body posture are closely related to those improvements. 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. (Shanelec D 2005,Duello GV. 2012)[14,15]

5. Summary

Viewing periodontal surgery under magnification impresses the periodontal surgeon with the coarseness of conventional surgical manipulation. What appears to the unaided eye as gentle surgery is revealed under magnification to be gross crushing and tearing of delicate tissues. Periodontists have long advocated atraumatic surgery to achieve primary wound closure. However, the limits of normal vision made

this goal impossible. Periodontal microsurgery is the natural transition from conventional surgical principles to a surgical ethic in which the microscope is employed to permit the most accurate and atraumatic handling of tissue to enhance wound healing. Periodontal microsurgery introduces the potential for, less invasive surgical approach in periodontics. This exemplified by a decreased need for vertical releasing incisions and greater use of smaller surgical sites. Periodontal surgeons, as with other microsurgeons, continue to notice the extent to which reduced incision size and surgical retraction are directly related to decreased postoperative pain and rapid healing.

References

[1] Daniel RK. Microsurgery: Through the looking glass. N Engl J Med 1979; 300:1251–7.
[2] Serafin D. Microsurgery: Past, present and future. Plast Reconstr Surg 1980; 66:781–5.
[3] Shanelec, D. A., and L. S. Tibbetts. "Periodontal microsurgery, continuing education course." 78th American Academy of Periodontology annual meeting. 1992.
[4] Kim S, Pecora G, Rubinstein R. Comparison of traditional and microsurgery in endodontics. Color atlas of microsurgery in endodontics. Philadelphia: WB Saunders. 2001:5-11.
[5] Rubinstein R. The anatomy of the surgical operating microscope and operating positions. Dental Clinics of North America. 1997 Jul;41(3):391.
[6] Jain R, Kudva P, Kumar R Periodontal Microsurgery-Magnifying Facts, Maximizing Results. J Adv Med Dent Scie Res 2014;2(3):24-34.
[7] Price PB. Stress, strain and sutures. Ann Surg 1948; 128:408–421.
[8] Shenelec DA Tibbetts LS . The Status of periodonyal microsurgery Continuing education course 79th americal academy of periodontology annual meeting , Chicago cited in periodontal microsurgery . Dent Clin North Am 1998;42:339-359
[9] Buchanan SA, Robertson PB. Calculus removal by scaling/root planing with and without surgical access. Journal of periodontology. 1987 Mar;58(3):159-63.
[10] Caffesse RG, Sweeney PL, Smith BA. Scaling and root planing with and without periodontal flap surgery. Journal of clinical periodontology. 1986 Mar 1;13(3):205-10.
[11] Wennström JL, Zucchelli G. Increased gingival dimensions. A significant factor for successful outcome of root coverage procedures?. Journal of Clinical periodontology. 1996 Aug 1;23(8):770-7.
[12] Burkhardt R, Lang NP. Coverage of localized gingival recessions: comparison of micro-and macrosurgical techniques. Journal of clinical periodontology. 2005 Mar 1;32(3):287-93.
[13] Harrel SK. A minimally invasive surgical approach for periodontal bone grafting. International Journal of Periodontics & Restorative Dentistry. 1998 Apr 1;18(2).
[14] Shanelec DA. Anterior esthetic implants: microsurgical placement in extraction sockets with immediate plovisionals. Journal of the California Dental Association. 2005 Mar;33(3):233.
[15] Duello GV. An evidence-based protocol for immediate rehabilitation of the edentulous patient. Journal of Evidence Based Dental Practice. 2012 Sep 30;12(3):172-81.