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Periodontal Microsurgery-A Review

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Abstract:- The primary intention of any surgery is not just survival of the patient or his organs, but an attempt for preserving functionality and improving wellness. This is achieved due to minimal invasive surgical modes. This brought about the use of the microscope in precision dental practices, resulting in an evolutionary step in modern dentistry. The purpose of this article is to elucidate about periodontal microsurgeries : functions of magnification, microsurgical instrumentation and microsurgical applications .

I. INTRODUCTION

There has been tremendous advancement in the medical and dental fields to meet the patient's expectations along with achieving desired therapeutic objectives [1]. Microsurgery can be defined as a surgery done under microscope. Serafin, further explained this in 1980, as a method, modification and fine-tuning of current surgical procedures utilizing magnification to enhance visualization, in every multi-specialty application [2,3].

➢ *History*

Microsurgery has been brought into Dentistry from the Medical field. Carl Nylen (1921) father of microsurgery, utilized surgical operating microscopes for treating otosclerosis [4].

Apothe and Jako introduced commercial operating microscopes into dentistry in 1981[5]. Thereafter microsurgery first happened in the field of periodontics in 1992[6]. A continuing education course was subsequently conferred by Shanelec and Tibbetts on periodontal microsurgery at the yearly meet of American Academy of Periodontology held in 1993[7].

II. CLINICAL PHILOSOPHY

It incorporates three distinctive values:

1. Enhancement of motor skills. This is accomplished through improved visual acuity and precise hand grip.
2. Minimal tissue trauma. This is made possible through smaller incisions.
3. Primary passive wound closure. This is accomplished by microsuturing.

III. MICROSURGICAL TRIAD

Operating microscope offers three explicit benefits of illumination, magnification, and increased precision, collectively known as the microsurgical triad [8]. The absence of these three makes microsurgery impossible.

1**.Magnification**

There is an extensive array of simple and complex magnifying devices including three kinds of magnifying loupes and the operating microscopes.

➢ *Magnifying Loupes:*

These are primarily dual monocular microscopes with side-by-side lenses angled inward (convergent optics) for focussing on objects. Though widely used, the main flaw is that as the eyes have to converge for view images, this may result in eye strain, fatigue or vision changes with extended usage. The three popular types of magnifying loupes are:

1) Simple loupes: These comprise paired single, positive, side-by-side meniscus lenses, each having two refracting surfaces. One occurs as light enters while the other occurs as it leaves the lens. Being cost effective is the main advantage of these simple loupes.

2) Compound loupes: These utilize multi-element lenses with intermittent air gaps for gaining extra refracting planes. Their magnification could be enhanced by increasing distance between lenses, thus avoiding undue size and weight. Compound lenses can be achromatic and produce a color-correct image. However, these show optical inefficiency at magnifications greater than 3×.

3) Prism loupes: Being the most sophisticated loupes, prism telescopic loupes utilise Schmidt or "rooftop" prisms to extend light paths through a series of switchback mirrors between the lenses. These in turn create better magnification, longer working distances and bigger areas of view. Here magnification is increased to 4×. Besides, the coaxial fiberoptic lighting enhances properties of illumination.

➢ *The Surgical Microscope*

This complex device of lenses allows Binocular viewing at magnification of about 4Xto 40 [9].These use Galilean optics, with binocular eyepieces connected by offset prisms. These create a parallel optical axis, allowing stereoscopic vision without eye convergence or strain .Through coated achromatic lenses and high optical resolution, the depth-of-focus and field-of-view characteristics are enhanced. Mountings are available for the ceiling, wall, or floor. Fiberoptic coaxial illumination is a key advantage since it eliminates shadows. The beam splitter and camera attachment help capture digital images. The foot-control switch permit surgeons to record, even while procedure unfolds, without interruption of surgery.

2. Illumination

Most manufacturers provide collateral lighting devices that are beneficial ,especially for magnification of 4X or more. Certain points must be borne in mind while selecting accessory lighting source.

1. Total weight, quality, and brightness.
2. Ease of focusing and directing the light inside field of view.
3. Easy transportability between surgeries.

3. Micro surgical instruments

Their main feature is the capability to make a clean incision and closure which prepares the wound for healing. A periodontal microsurgical instrument kit comprises:

a)Knives and scalpel blades: Knives used for periodontal microsurgeries are the same as those used for ophthalmic or plastic surgeries. The different types of knives used are blade breaker knife,crescent knife,minicrescent,lamella knife,sclera knife and spoon knife. Scalpel blades consist of mini cresent microsurgical blades. The incisions are made at right angles to the surface by the use of ophthalmic microsurgical scalpels.

b)Micro scissors: These are employed to dissect tissues, nerves and blood vessels.. Though the commonly used microscissors are 14 cm and 18 cm long, , microscissors of 9-cm length is preferred for dissection of delicate parts. The Straight scissors cuts sutures and trims adventitia of vessels or nerve endings. The Curved scissors dissects vessels and nerves.

c) Micro forceps: These can handle tiny tissues without causing any damage and help to handle delicate sutures while knotting them. Jeweler forceps being strong can help separate fine vessels and nerves.

d) Micro Needle Holder: This grasps the needle, pulls it through tissues, and ties knots. This should be held between its middle and lower thirds at the distal tip. If held close to the top, the anastomosis between the vessel's two ends cannot be finished in a single stitch. If held close to the bottom, keeping steady control may be difficult, affecting the direction of the tip.

e) Needles:The sharpest or reverse cutting needles with precision tips or spatula needles with micro tips help reduce tissue trauma in microsurgeries.

f) Suture Material: Periodontal microsurgeries use about 6 to 7sutures while Periodontics use only about 4 to 5. The geometrics of microsurgical suturing comprises these aspects :

1) Angle of entry and exit of needle of slightly less than 90 degrees.
2) Suture bite size roughly 1.5 times the thickness of the tissue.
3) Symmetrical bite sizes (symmetry) on either side of the wound
4) Needle pathway perpendicular to wound

Microscopic Knot tying is done with instrument ties, having the microsurgical needle holder in the dominant hand and The microsurgical tissue pick-up in the other hand.

IV. THE ADVANTAGES OF USING MICROSCOPES IN DENTISTRY

Postural: Posture of the patient must be just right so not to cause physical discomfort . The microscope enables us to maintain the same working distance from the object every time. This helps avoid fatigue.as there is no need to make constant adjustments.

Procedural: It greatly enhances manual capabilities due to the magnified operating field.

Psychological: It reduces occupational and bodily stresses and heightens personal and professional satisfaction by enhancing surgical performances.

Educational: Clinical images and photographs can be easily gathered as the camera could be incorporated. Also, diagnostic sequences and treatment in video format can be easily recorded. The magnified version of the operating field appears on the screen to aid the auxiliary workers.

➢ *Benefits of microscopes in periodontics*

1. Increased precision while delivering surgical skills, results in precise incisions through smaller instrumentation thus causing less trauma and faster recovery.
2. Accurate tissue repositioning with smaller needles and sutures.
3. Magnified view enables accurate removal of calculus and enhances root smoothness.

➢ *Application of microsurgery in periodontics*

Clinical expertise transcending visual acuity is essential in varied applications. Periodontal plastic surgery, guided tissue regeneration, crown lengthening, ridge augmentation and implant placement are some of these. Thus microsurgery is a very vital aspect of periodontics

i) Esthetic surgical procedures: Being"technique-sensitive", this is more complex than other periodontal methods and include rotational, free gingival, double papilla, and the sub-epithelial connective tissue grafts for coverage. This it because microsurgery reduces trauma levels to a minimum and enhances recovery [10]. Microsurgical instruments when combined with delicate surgical modes permit crisp and accurate incisions, gentle tissue handling and precise suturing.

ii) Root coverage: Precise diagnosis with microsurgical systems enables predictable root coverage in Class I and II marginal tissue recessions. Microsurgery also enhances partial root coverage results of conventional surgery in Class III & IV marginal recession. According to studies microsurgical techniques, when employed depicted a greater increase in the width and thickness of keratinized tissue unlike macro- surgical techniques [11,12].

iii) Pappilla reconstruction: Other than the various root coverage practices used, mucogingival surgeries like papilla reconstruction and ridge augmentation around natural teeth and implants can also be done.

iv) Root surface conditioning: This is crucial as it addresses how the soft tissue attaches itself to the root during root coverage surgery. Many modes of root preparation are recommended for acquiring new periodontal ligament attachment of the graft with the tooth using new cementeum and Sharpey's fibers. These include the mechanical, chemical and biological aspects of root preparation. Some results of successful root coverage are based on histologic evidence while others are based on empirical observation. However, all these are deemed crucial.

v) Crown lengthening: Although the comparative studies of crown lengthening and ridge augmentation with microsurgical methods are limited, it seems logical to substantiate the fact that magnification is beneficial for all such procedures.

vi)Implant surgery: Microsurgery has proved its worth in implant placement and implant site development by utilizing both the flap and flapless methods.

vii) Sinus lift procedures: These procedures done through the microsurgical approach are gaining recognition. The periodontal endoscopes permit subgingival root surface visualization at magnifications of 24x to 48x.This is achieved through the 0.99 mm fibre optic bundle which is a 10,000- pixel capture bundle surrounded by multi-illuminative fibres. This is then delivered to the gingival margin, attached to the "explorer" instrument. A single use sterile sheath isolates the fibre, to facilitate repetitive use. The image captured on the screen provides "real time "video of the magnified field. The surgical microscope aids indirect visualization of sinus membrane and minimizes risk of perforations. Incorporation of microsurgical techniques for an improvement of altered sensation due to implants encroaching on the Inferior alveolar nerve even without unscrewing them has also been reported.

V. CONCLUSION

Periodontal microsurgery though in its formative stages, holds tremendous possibilities.This skill requires practice for gaining optimum proficiency in the relevant area. Microsurgery presents special challenges in dexterity and perception and when effectively mastered can increase innovative modes of treatment for excellent results. In spite of being technique sensitive and more demanding than any other conventional periodontal procedure,its benefits once realized, will eventually be applied all over the world.

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