MICROPERIODONTICS- Refining our professionalism

J Vishnusripriya1,*, Anil Melath2, Mohammed Feroz3, Subair4
1 Postgraduate student, Department of Periodontics, Mahe Institute of dental sciences and hospital, Chalakkara, Palloor, Mahe, 673310
2 HOD, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Chalakkara, Palloor, Mahe, 673310
3 Professor, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Chalakkara, Palloor, 673310, Mahe
4 Professor, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Chalakkara, Palloor, 673310, Mahe, India

ARTICLE INFO

Article history:
Received 12-06-2020
Accepted 02-07-2020
Published 31-08-2020

* Corresponding author.
J Vishnusripriya
vishnusripriya.j@gmail.com

https://doi.org/10.38138/JMDR/v6i1.2

ABSTRACT

Surgical Precision to restore both biologic and aesthetic demands of patients is most important in today's periodontal practice. Technical skills of the clinician are challenged by the limited range of visual acuity. Periodontal microsurgery increases the efficiency of basic periodontal surgical procedures by improving normal vision through magnification along with advance lighting system. Incorporation of magnification in periodontal practice gives precise outcomes which are not achieved with traditional macro surgery in terms of improved visual acuity, ergonomic benefits, decreased patient morbidity, enhanced patient acceptance, rapid healing, passive wound closure and reduced tissue trauma. The aim of this review is to enlighten about periodontal microsurgery, its role in magnification, micro-surgical instrumentation, microsurgical suturing techniques, clinical advancement and application.

Keywords: Ergonomics; magnification; microsurgery; precision; techniques

1 INTRODUCTION

Dental sciences have evolved through a lot of changes in its concepts and techniques. The aim of surgical therapy is not just the survival of a patient or an organ but also to restore its function and to improve patient comfort. These demands are mostly met owing to a minimally invasive surgical approach.\(^1\)

This led to the entry of microscope into dental practice which led to the era of the greatest advances in modern dentistry. This article provides an overview of microsurgical principles, ergonomics, instruments, suturing techniques and various application of periodontal microsurgery.

1.1 History

In 1921, Carl Nylen, the father of microsurgery, was the first person to use a binocular microscope to correct otosclerotic deafness. Later in 1978 Apotheker and Jako introduced microscope to dentistry. Shenalec and Tibbetts conducted a course on periodontal microsurgery at the annual meeting of the American academy of periodontology in 1993.\(^2\)

1.1.1. Principles of microsurgery

1. Improved motor skills, enhancing surgical ability.
2. Passive wound closure with primary apposition of the wound edge.
3. Micro surgical instrumentation and suturing in reducing tissue trauma.

1.1.2. Ergonomic in microsurgery

The operator must be in relaxed, with comfortable body posture, supported hand, and a stable hold on instrument.\(^3\)

Figure 1

To accomplish precise finger movements, the ulnar surface of the forearm and wrist should be supported on a flat surface, and angled at approximately 20° to reduce muscle tremor.\(^4,5\)

The operator is seated upright (back straight and head erect) with feet flat on floor and thighs parallel to the floor. If the patient's head is assumed in the 12 o'clock position in front of and perpendicular to microsurgeon’s chest, the most precise rotary suturing movement for a right handed
Fig. 1: The Magnification Continuum, showing the operator moving from the naked eye on the left to the operating microscope on the right. In this case, note the improved posture allowed with increasing levels of magnification; the longer working distance provides a more neutral and balanced posture.

person is from the 2 o’clock to the 7 o’clock position, while for left-handed people it is from the 10 o’clock to the 4 o’clock position. The forearm should be slightly supine, positioning the knuckles away from clinician, so that the ulnar border of his/her hand, wrist, and the elbow are all well-supported, allowing the weight of the hand to be on the ulnar border.

The most commonly used finger grip for micro-surgical procedures is pen grip also known as internal precision grip [Figure 2].

1.2. Magnification
Can be achieved by using loupes and operating microscope. One should know the optical principles under which the loupes work namely Working distance, Depth of field, Width of field /field of view, Viewing angle, Magnification. Most periodontists find 2.5X magnification appropriate.

Based on these principles there are 2 mechanism under which it works.

1. Keplerian optics: Here it has 2 lenses where it angled to focus an object. Loupes works on this mechanics. (Figure 3 a)

2. Gallilean optics: It have binocular eyepiece which is joined by offset prisms to establish a parallel optical axis & permit stereoscopic vision without any eye strain and convergence. (Figure 3 b).

1.2.1. Illumination
Achieved through fibreoptic technology, improves the method of focusing light on site of interest which is an important feature of surgical microscopes.

Fig. 2: Precision grip

Fig. 3: a) Keplerian optics b) Gallilean optics
1.2.3. *Increased precision in the surgical skills*

The third component of microsurgical triad, is the synergistic result of illumination and magnification.

### 1.3 Microsurgical instrumentation

#### 1.3.1. Magnifying instruments

(Table 1 and Figure 4)

1. Loupes
   - Simple loupes
   - Compound loupes
   - Prism loupes

2. Operating microscope

![Microscope Images](image1.jpg)

Fig. 5: Relative size of Conventional and Microsurgical a) Blade and b) Needle holder

#### 1.4 Microsurgical instruments

(Table 2 and Figures 5, 6 and 7)

1. Microneedle holder (Straight, Curved)
2. Microforceps (Straight Jeweller Forceps, Curved Jeweller forceps)
3. Microscissors (Straight, Curved)
4. Micro Surgical Blades and Knives (Breaker, Crescent, Minicrescent, Spoon)
5. Micro Retractors and elevator
6. Micro osseous Hoes and Chisels
7. Micro needles and
8. Micro sutures

![Sutures Images](image2.jpg)

Fig. 6: Periodontal microsurgical knives: 1) blade breaker; 2) crescent; 3) minicrescent; 4) 260° spoon; 5) lamella, and 6) sclera

Fig. 7: Relative size of different sutures
### Table 1: Differential features of Magnifying Loupes and Operating microscope

| Loupes | Compound | Prism | Microscope |
|--------|----------|-------|------------|
| Simple | A pair of single positive side by side meniscus lenses. Most primitive system. | It uses converging multiple lenses with intervening air spaces to gain additional refractive index. | Designed on Galilean principle. It uses the application of the magnifying loupes in combination with changer, binocular viewing system so that it employs parallel binocular for protection of the eyes. |
|        | The magnification can be increased only by the manufacturer to increase the size. | Poor magnification, working distance, & depth of field. | Contains Schmidt or roof top prism that lengthen for light path through a series of mirror reflection within the loupes |
|        | Highly subjected to chromatic aberration which destruct the image of the object that is being viewed. | It is achromatic | Achromatic |
|        | Because of its size and weight limitation, they have no practical use beyond a magnification range of 1.5 X | Magnification can be increased by lengthening the distance between lenses without excessive increase in size or weight | Surgical operating microscope is a system of lenses that allow binocular viewing of an object. |
|        | Advantages: Light weight. Cheap. Disadvantages: Fixed focal length and working distances which lead to a poor working posture and possibly neck and back pain. Depth of field is not adjustable. Eye strain. Optical and chromatic aberration | Advantages: Better magnification. Wider depth of field. Longer working distances. Larger fields of view are produced by these loupes than other loupe types. Superior optical clarity. Disadvantages: More expensive. | In contrast to loupes, both light beams fall parallel onto the retinas of the observer so that no eye convergence is necessary and the demand of eye muscle is minimal. |

These instruments are made of titanium because of its strength, lightness and nonmagnetic characteristics and the working tips are much smaller than those of regular instruments and their handles should be rounded, so as to execute finely controlled rotating movements.\(^{(4,12)}\)

The instruments should be about 18 cm long and should weigh around 15 to 20 gm in order to avoid arm and muscle fatigue.

Microsurgical instruments have colour coated surface in order to avoid the metallic reflection under the light of microscope. A basic set of micro surgical kit comprises of a needle holder, micro scissors, micro scalpel holder, anatomic and surgical forceps and a set of various elevators.\(^{(4,12,13)}\)

#### 1.4.1. Microneedle Holder
The length of most commonly used micro needle holder are 14 cm and 18 cm. The needle holder tip can be straight or gently curved. The nature of the suture determines the choice of the needle holder. Usually a minute tip (0.3 mm) is used for 8-0 and 10-0 sutures. The needle holder with a 1-mm tip is used for 5-0 and 6-0 sutures.\(^{(14)}\) A needle holder should ensure that a needle is held steadily without slipping.

#### 1.4.2. Micro forceps
Micro forceps can make those manoeuvres that cannot be performed by hand. The most popularly used micro forceps are 15 cm long, with round handles and 0.2- to 0.3-mm tips. There are variety of Micro forceps for different operations.

1. Straight Jeweller Forceps
2. Curved Jeweller Forceps
| NAME                                | TYPE                                | SUBTYPES                                      | ADVANTAGE                                                                 |
|-------------------------------------|-------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------|
| Knives                              |                                     | a.Blade breaker knife b.Crescent knife c.Minicrescent knives d.Spoon knife e.Lamellar knife | Extremely sharp Small size Etched rather than ground produce more precise wound edge |
| Microsurgical Periodontal Knives    | a.Orban periodontal knife (KO1/2MBH) b.Kramer–Nevins gingivectomy knife(KKN7MBH) |                                      | Very sharp                                                                 |
| Microsurgical blades                | a.Ophthalmic blade b.Blade no 15 c.Blade no 12 d.Blade no 390 e.Blade no 390 c | No.15c No.12d                                    | Curved in a ‘J’ shape Can be run under the papilla to separate It from the underlying bone support, progressing in the narrow space of the dental embrasure Fine incision |
| Microsurgical Periosteal Elevator   | a.Periosteal Schlee PPSCHLEE Handle 6 b.Pritchard periosteal (PPRMBH) c.Hourigan periosteal (PH2MBHKD) |                                      | Precise undermining and release of flap                                      |
| Microsurgical Periodontal Retractors| KP Retractors                       | a.KP 1 Retractor b.KP 2 Retractor c.KP 3 Retractor | Wider and thinner serrated ends provide better anchorage on bone and prevent accidental slipping |
| Microsurgical Tissue Forceps        |                                     | a.Microsurgical anatomic tissue pliers TPASTMBH b.Microtissue forceps 180 | Handle minute tissue without damaging                                       |
| Microsurgical Chisels               | a.Rhodes chisel b.Wedelstaedt chisel c.Fedi chisel |                                      | Precise bone cutting                                                        |
| Microsurgical Curettes              | Lander curettes                     | a.SL1/2RMBH b.SL3/4RMBH c.SL5/6RMBH            |                                                                            |
| Microsurgical Needle Holder         | Microneedle holder schlee (NHSLSCHLEE) |                                      | Lock to firmly secure the needle Can be guided through coarse gingival tissue with controlled grip pressure Slender shape allows them to reach far into interproximal areas |
| Microsurgical Suturing Forceps      |                                     |                                              |                                                                            |
| Microscissors                       | a.Micro-vannas tissue scissors b.Goldman-Fox scissors c.Ligature scissors FD252R |                                      | Smooth cutting of fine and coarse tissue Reduced tissue trauma         |
| Microsutures                        | 6-0 to 10-0                         | Vicryl polyglactin (7-0 to 10-0) Ethilon polyamide (7-0,9-0) Prolene polypolypropyle (8-0,10-0) | Better wound closure Minimizing gaps or voids at the wound, rapid healing with less post-operative inflammation, pain and risk of scar formation |
| Microsurgical Needles               | a.Reverse cutting needles with precision tips b.Spatula needles with microtips |                                      | Shallow needle track and precise needle point allows extremely accurate apposition and closure of flap |
Jeweller forceps are strong and cheap, with a variety of tips available. They can be classified as straight or curved at different degrees, such as 45° or 90°. They are usually 11–12 cm long and suitable only for superficial operations. Their handles are flat, which makes rotating and changing the direction of the instrument less efficient.

1.4.3. **Micro scissors**

These are used for dissection of tissues, blood vessels, and nerves. Most commonly used scissors are 9cm, 14 cm and 18 cm long. The tips of the scissor blades are of two types, straight and curved. Straight scissors are used to cut sutures and Curved scissors dissect vessels and nerves.

1.4.4. **Surgical Knives**

Surgical knives are extremely sharp and small in size. Compared with the standard 15 blades commonly used in periodontics, the smaller size of the ophthalmic knives facilitates surgical work.

1. Blade-breaker knife has an ophthalmic razor blade affixed to its a handle. This is used in place of a no. 15 blade.

2. The Crescent knife is used for intrasulcular procedures. It can be used in connective tissue graft procedures to tunnel, to prepare the recipient site, or to obtain the donor graft.

3. The Spoon knife is used to undermine the sulcular region in preparation for grafts site in regenerative surgical procedures.

Recently developed instrument system of interchangeable blades and handles for flexible and efficient work is Feather Microsurgical Blades, which are made of high-quality stainless steel using high-precision grinding technology producing ultra-sharp cutting edges which allows precise incision and minimize the risk of tissue injury. All blades are gamma-sterilized. The handles are available in different shapes and sizes. (Figure 8)

1.5. **Three principle goals of using Micro Needles & Sutures in surgery are**

1. Eliminating dead space,
2. Closing with sufficient but appropriate tension,
3. Immobilizing the wound

1.5.1. **Microsurgery Needles**

Vary in size, shape and curvature, but most needles used in dental procedures are of 3/8 curvature. A reverse cutting needle of size 16 to 19mm is used most commonly in periodontal surgery.

Example is Spatula needle, 6.6mm in length and curvature of 140 degrees, allowing precise apposition, closure, and immobilization of the soft tissue graft.

![Fig. 8: Feather Microsurgical Kit](image)

---

1.5.2. **Basic Suturing Techniques**

Accurate dissection & suturing of tissues under the microscope depends on visual feedback which is affected by:

1. Magnification
2. Lighting intensity
3. Glare
4. Colour contrast
5. Other visual features, including visual health, binocularity, trained perception, skill, experience & fatigue

When variable magnification is available, higher magnification is used to place sutures & lower magnification to knot the sutures. Finer needles & suture materials are used in microsurgery, which, in turn, demand precision miniaturized needle holders & tissue forceps to handle the tissue gently for precise positioning. A skilled microsurgeon uses proper basic suturing techniques & skills as a foundation for the advanced techniques.

1.5.3. **Suture geometry**

1. Angle of needle entry and exit should be slightly less than 90 degrees
2. Bite size of suture should be approximately 1.5 times the thickness of the tissue
3. Equal bite sizes on either side of the wound
4. Needle passage should be perpendicular to the wound
1.5.4. **Knot Tying**
Knot tying using the microscope is done using a microsurgical needle holder in the dominant hand and a microsurgical tissue pick up in the non-dominant hand. The working tip of the instruments only is visible in the microscopic field. Well tied microsurgical knots are stable and resist loosening, even under functional load. (6)

1.5.4.1. **Ethicon (1985)** recommended the following principles for knot tying (14).

1. The completed knot must be tight, firm and tied so that slippage won't occur
2. To avoid wicking of bacteria, knots should not be tied on incision lines
3. Knots should be small with ends cut short (2-3mm)
4. Avoid excessive tension to finer gauge materials because breakage can occur
5. Avoid using any jerking motion that may break the suture
6. Avoid crushing or crimping of suture materials by not using haemostat or needle holders on them except on the free end for tying.
7. Do not tie the suture tightly cause tissue necrosis can occur. Knot tension should not produce tissue blanching.
8. Maintain adequate traction on one end to avoid loosening the first loop while tying
9. The surgeons knot and square knot strength, generally not needing more than two throws, still will have increased strength with an additional throw.
10. Granny knots and coated and monofilament sutures require additional throws for securing the knot and to prevent slippage

1.5.5. **Ideal Needle–Thread Combination (Non-Resorbable) for use in Periodontal Microsurgery**

1. For buccal releasing incision following combinations can be used:
   - A suture made up polypropylene (Prolene) of gauge 7-0, with the needle having a 3/8th curvature, cutting needle with precision tip and a length of 7.6 mm.
   - A suture made up polypropylene (Prolene) of gauge 7-0, with asymptomatic curved needle, cutting needle tip with round body and a length of 8.9 mm.
   - A suture made up polyamide (Ethilon) of gauge 9-0 with a spatula needle having a 3/8th curvature and a length of 5.2 mm.
2. In anterior areas interdental sutures can be placed with the following:
   - A suture made up Polypropylene (Prolene) of gauge 6-0, with the needle having a 3/8th curvature, cutting needle with precision tip and a length of 11.2 mm.
   - A suture made of Polyamide (Ethicon) of gauge 7-0, with the needle having a 3/8th curvature, cutting needle with precision tip & length of 11.2 mm.

1.5.6. **Clinical applications**
Periodontal microsurgery is the descendant of conventional periodontal surgery in an attempt to reduce the surgical trauma and opens the horizons for better patient care. (Table 3 and Figure 9 and Figure 10)

**Fig. 10:** Periodontal microsurgical procedures a) Before (A), during (B), and 8 weeks after healing (C) of microsurgical connective tissue graft. b) Microsurgical connective tissue graft. Minimal tissue trauma during incisions, surgical manipulation, and suturing is accomplished after microsurgical principles. c) Papilla reconstruction. A, Before surgery. B, Microsurgical view. C, After surgery.

1. **Root surface debridement**
This procedure is an essential component of periodontal therapy. (17) It is effective when done under illumination (18) along with an improved early healing index and less postoperative pain (19) and with micro ultrasonic instruments. The smaller size 0.2–0.6 mm in diameter and variable power settings 25,000 to more than 40,000 cycles per second of these instruments allows subgingival treatment in deep pockets. (20) Moreover, these instruments have active working sides on all surfaces; deliver ultrasonically activated lavage in the working area and can be used with minimal water spray.

2. **Periodontal Regeneration**
Microsurgical approach is used for the treatment of isolated or multiple intrabony defects. Isolated interproximal defects that are usually limited to interproximal site are considered ideal for bone grafting with Minimally Invasive Periodontal Surgery (MIPS).

Recently, a novel microsurgical approach for periodontal regeneration “Entire Papilla Preservation Technique” (EPP) technique is used, where an interdental tunnel is made through the defect associated papilla by a beveled vertical releasing incision in the buccal gingiva of the adjacent interdental space. (21) After removing granulation tissue and
debridement of root surface, regenerative materials such as bone grafts and enamel matrix derivative is applied.

3. Mucogingival Surgery

Trained and skilled Periodontal Micro surgeon offers an evident positive result in root coverage procedures and interdental papilla augmentation. Microsurgical techniques have been shown to offer many advantages when compared with conventional macro-surgical techniques for treating gingival recession. Using micro surgical techniques, increases vascularity of the graft, a efficient increase in thickness and width of keratinized tissue, an appreciable esthetic outcome, with decreased patient morbidity.

4. Implant Therapy

Different stages of implant treatment ranging from implant placement to implant recovery and peri-implantitis management is done with more precision under magnification. One of the novel applications of microsurgery is in the sinus lift procedure with a success rate of 97%. The surgical microscope can aid indirect visualization of the sinus membrane and minimizes the risk of perforations.

5. Crown Lengthening

Comparative studies of crown lengthening and ridge augmentation with microsurgical methods are limited, still it is evident that magnification is beneficial in such procedures.

i. Infection control

Magnifying loupes get deposited with debris from various dental procedures. Ideally, all areas of loupe should be disinfected with high level disinfectant after every patient. Disinfecting with high ethyl alcohol solution is popularly recommended. If they are water resistant, Lysol disinfectant spray must be sprayed into a gauge sponge and used to wipe the frames and lenses.

ii. Advancement

Recent advances in microsurgery include 3D on-screen microsurgery system; allowing three-dimensional view of the working surgical field on a video monitor obviating the need of direct physical visualization; HDTV single camera 3D system; involves attachment of a high-definition display with microscope; and mechanical optical rotating assembly interface allows the clinician to work at different seating positions.

iii. Disadvantages

Disadvantages include restricted areas of vision, loss in depth of field and visual reference point, steep learning curve, and a relatively higher initial cost of microsurgical setup.
2 SUMMARY

The world of microsurgery has challenges in dexterity and perception which when mastered can increase the innovative methods of treatment for better results. Its execution is technique sensitive and is more demanding than the conventional periodontal procedures. An important factor in recent public and professional acceptance of microsurgery is the significant decrease in morbidity. Microsurgery offers reduced trauma and relatively less painful, making it an efficient alternative to traditional surgical approaches. Periodontal microsurgery offers an improvement in predictability, cosmetic outcomes and patient comfort level than conventional periodontal surgical procedures.

REFERENCES

1) Burkhardt R, Lang NP. Periodontal plastic microsurgery. In: J L, editor. Clinical Periodontology and Implant Dentistry. 5 th. Wiley-Blackwell Publishers. 2007; p. 1029–1073.
2) Belcher JM. A perspective on periodontal microsurgery. Int J Peri Rest Dent. 2001;21:191–196.
3) Tibbetts LS, Shanelec D. Principles and practice of periodontal microsurgery. Int J Microdent. 2009;1:13–24.
4) Barraquer JJ. The history of the microscope in ocular surgery. Microsurgery. 1980;1(4):288–299. Available from: https://dx.doi.org/10.1002/micr.1920010407.
5) Acland R. Practice Manual for Microvascular Surgery. St. Louis: CV Mosby. 1989.
6) Bunke H, Chater N, Szabo Z. The Manual of Microvascular Surgery. K R, et al., editors;Daves Medical Centre. 1975.

7) Sunell S, Maschak L. Positioning for clinical dental hygiene care. Preventing back, neck and shoulder pain. Probe. 1996;30:216–219.
8) Sunell S, Rucker LM. Ergonomic risk factors associated with clinical dental hygiene practice. Probe. 2003;37:159–166.
9) Shanelec DA. Optical principles of loupes. J Calif Dent Assoc. 1992;20:25–32.
10) Karmakar S, Das D. Periodontal microsurgery: useful tool or just another gimmick? International Journal of Research and Review. 2019;6(4):179–184.
11) Klokkevold PR, Caranza FA, Tuke H. Carranza’s Clinical Periodontology. 10th ed. and others, editor;New York WB Saunders. 2010.
12) Dennis A, Shanelec. Periodontal microsurgery. J Esthet Restor Dent. 2003;15.
13) Leonard S, Tibbetts DA, Shanelec. Principles and practice of periodontal microsurgery. Int J Microdent. 2009;1:13–24.
14) Diebart S. Practical periodontal plastic surgery. and others, editor. 2006.
15) Belcher JM. A perspective on periodontal microsurgery. Int J Periodontics Restorative Dent. 2001;21:191–196.
16) Annals of Periodontology. 1996.
17) Pihlstrom BL, Ortiz-Campos C, McHugh RB. A Randomized Four-Year Study of Periodontal Therapy. Journal of Periodontology. 1981;52(5):227–242. Available from: https://dx.doi.org/10.1902/jop.1981.52.5.227. doi:10.1902/jop.1981.52.5.227.
18) Reinhardt RA, Johnson GK, Tussing GJ. Root Planing with Interdigital Papilla Reflection and Fiber Optic Illumination. Journal of Periodontology. 1985;56(12):721–726. Available from: https://dx.doi.org/10.1902/jop.1985.56.12.721. doi:10.1902/jop.1985.56.12.721.
19) Perumal MB, Ramegowda A, Lingaraju A, Raja J. Comparison of microsurgical and conventional open flap debridement: A randomized controlled trial. Journal of Indian Society of Periodontology. 2015;19(4):406–406. Available from: https://dx.doi.org/10.4103/0972-124x.156884. doi:10.4103/0972-124x.156884.
20) Kwan JY. Enhanced periodontal debridement with the use of micro ultrasonic, periodontal endoscopy. J Calif Dent Assoc. 2005;33:241–
21) Aslan S, Buduneli N, Cortellini P. Entire papilla preservation technique in the regenerative treatment of deep intrabony defects: 1-Year results. *Journal of Clinical Periodontology*. 2017;44(9):926–932. Available from: [https://dx.doi.org/10.1111/jcpe.12780](https://dx.doi.org/10.1111/jcpe.12780).

22) Agarwal SK, Jhingran R, Bains VK, Srivastava R, Madan R, Rizvi I. Centered evaluation of microsurgical management of gingival recession using coronally advanced flap with platelet-rich fibrin or amnion membrane: A comparative analysis. *Ear J Dent*. 2016;10:121–8209.

23) Nordland WP, Sandhu HS, Perio C. Microsurgical technique for augmentation of the interdental papilla: Three case reports. *Int J Periodontics Restorative Dent*. 2008;28:543–8209.

24) Burkhardt R, Lang NP. Coverage of localized gingival recessions: comparison of micro- and macrosurgical techniques. *Journal of Clinical Periodontology*. 2005;32(3):287–293. Available from: [https://dx.doi.org/10.1111/j.1600-051x.2005.00660.x](https://dx.doi.org/10.1111/j.1600-051x.2005.00660.x).

25) Andrade PF, Grisi MFM, Marcaccini AM, Fernandes PG, Reino DM, Souza SLS, et al. Comparison Between Micro- and Macrosurgical Techniques for the Treatment of Localized Gingival Recessions Using Coronally Positioned Flaps and Enamel Matrix Derivative. *Journal of Periodontology*. 2010;81(11):1572–1579. Available from: [https://dx.doi.org/10.1902/jop.2010.100155](https://dx.doi.org/10.1902/jop.2010.100155).

26) Pandey S, Mehta DS. Treatment of localized gingival recession using the free rotated papilla autograft combined with coronally advanced flap by conventional (macrosurgery) and surgery under magnification (microsurgical) technique: A comparative clinical study. *Journal of Indian Society of Periodontology*. 2013;17(6):765–765. Available from: [https://dx.doi.org/10.4103/0972-124x.124500](https://dx.doi.org/10.4103/0972-124x.124500).

27) Duello GV. The use of surgical microscopes in contemporary implant therapy. *Pract Proced Aesthet Dent*. 2005;17:717–8209.

28) Steiner GG, Steiner DM, Herbias MP, Steiner R. Minimally Invasive Sinus Augmentation. *Journal of Oral Implantology*. 2010;36(4):295–304. Available from: [https://dx.doi.org/10.1563/aoaid-joi-d-09-00010](https://dx.doi.org/10.1563/aoaid-joi-d-09-00010).

29) Cosyn J, Pollaris L, der Linden FV, Bruyn HD. Minimally Invasive Single Implant Treatment (M.I.S.I.T.) based on ridge preservation and contour augmentation in patients with a high aesthetic risk profile: one-year results. *Journal of Clinical Periodontology*. 2015;42(4):398–405. Available from: [https://dx.doi.org/10.1111/jcpe.12384](https://dx.doi.org/10.1111/jcpe.12384).

30) Ryo M, Schigeaki K. HDTV single camera 3D system and its application in microsurgery. Stereoscopic displays and virtual reality systems. *Proc SPIE*. 2001.