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Evaluation of Trends and Opinions Regarding Escalation of Periodontal Microsurgery: An Original Study

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ABSTRACT

Background: Microsurgery offers new possibilities for Periodontics that can improve therapeutic results for a variety of procedures. Periodontal microsurgery is refinement of basic surgical techniques which is made possible by the improvement in visual acuity guided with the use of surgical microscope. This study aimed to evaluate the trends, opinions and potential applications of magnification and microsurgery in the specialty of Periodontics. Here the authors have also sought to revisit the basics of periodontal microsurgery.

Materials & Methods: Pioneer workers and their contributions were compiled using popular search engines, scholarly search bibliographic databases and textbooks were searched until July 2018 using MeSH (Medical Subject Headings; PubMed) based keywords such as "Microsurgery", "Surgical Microscope", "Periodontics", "Magnification". The search was limited to original researches, reviews, systematic researches and meta-analyses in various dental journals published over the last 58 years in English language only. A total of 126 articles were identified however after examining the titles and abstracts, this number was finally condensed to 58 articles.

Statistical Analysis & Results: All the studied data were compiled and sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 21. The resultant data was subjected to relevant statistical tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI.

Conclusion: Our study results clearly showed that numerous researchers have explained the importance of magnification and microsurgery in specialty of Periodontics. However, the need of our is to have some long term genuine studies which could further enlighten the significance of magnification and microsurgery so as to build more comprehensive understanding in this perspective.

Keywords: Evidence, Implantology, Periodontal disease.

INTRODUCTION

Treatment modalities those addressing both biologic and esthetic demands are most often expected from today's periodontal practice. Modern Periodontology is closely linked to both the plastic and esthetic dentistry.[1] The use of surgical operating microscope, microsurgical instruments has opened a new era in periodontal plastic surgery. Studies have demonstrated improved vascularization and primary wound closure. Therefore, it provides better esthetic results. Literature has well evidenced and discussed about the various aspects of surgical microscope in specialty of Periodontics.[2-5] First report of

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microsurgery was available in nineteenth century when a microscope was developed for using ophthalmology. In 1694, Amsterdam merchant Anton Van Leeuwenhoek constructed the first compound lens microscope. Magnification for microsurgical procedures was introduced to medicine during the late nineteenth century. In 1921, Carl Nylen, who is considered the father of microsurgery, first used a binocular microscope for ear surgery. First surgical operation with microscope was performed in Sweden to correct otosclerotic deafness. In 1950's the first surgical microscope, with a coaxial lighting system and option for stereoscopic view, was invented and commercialized by the Carl Zeiss Company.[6-9] The micro vessel surgery revolutionized plastic and transplantation surgery was mainly developed by neurosurgeons. Microsurgery refers to procedure performed under microscope. It is a practice that embraces three distinct values. First is enhancement of motor skills to improve surgical ability.[10] This is evident in the smooth hand movements accomplished with increased precision and reduced tremor. 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 circumvent new tissue formation needed to fill surgical voids. A painful and inflammatory phase of wound healing can then be avoided.[11] The three elements, i.e. magnification, illumination and refined surgical skills, are called the microsurgical triad. Keeping this fact in mind, authors aimed to evaluate the trends, opinions and potential applications of magnification and microsurgery in the specialty of Periodontics. Here the authors have also sought to revisit the basics of periodontal microsurgery.

MATERIALS & METHODS

Executing any authentic and extended biomedical search without using internet is almost impossible in the present time. Internet provides a variety of internet-based tools that support the retrieval of biomedical information. Some of the renowned internet based popular search engines, scholarly search bibliographic databases and textbooks were searched until July 2018 using MeSH (Medical Subject Headings; PubMed) based keywords such as "Microsurgery", "Surgical Microscope", "Periodontics", "Magnification". The search was limited to original researches, reviews, systematic researches and meta-analyses in various dental journals published over the last 58 years in English language only. A total of 126 articles were identified however after examining the titles and abstracts, this number was finally condensed to 58 articles. The searched articles were divided into six groups according to their year of publication. Group I was having searches of 1961-1970 and group VI was having the search results of year 2011 onwards. We have decided to analyze the data this way since it's extremely useful in obtaining detailed information regarding clinical opinions and decision makings. They are also competent of saving time and money while analyzing the data at group or individual levels. In addition, they also give a broader range of data with better clarification and understanding. To ensure entirely comfortable data search, the study was performed in an anxiety free atmosphere. It was done to ensure fair outcome those may possibly be seen if attempted illogically. Results thus obtained was tabulated and subjected to basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

RESULTS

All the studied parameters and records were assembled and sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, USA). The resultant data was subjected to relevant statistical tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. For the ease of study and data categorization, the searched articles were divided into six groups according to their year of publication. P value less than 0.05 was considered significant ($p< 0.05$). Each and every group was studied and analyzed carefully to draw significant inferences. Group I was having searches of 1961-1970, Group II was having searches of 1971-1980, Group III was having searches of 1981-1990, Group IV was having the search results of year 1991-2000, Group V was having the search results of year 2001-2010, Group VI was having the search results of year 2011 onwards. Group I had only 2 studies and the p value was not significant with Chi Square Test (Pearson

χ2) value 0.01. Group II had 3 studies and the p value was not significant with Chi Square Test (Pearson χ2) value 0.05. Group III had also 3 studies and the p value was not significant with Chi Square Test (Pearson χ2) value 0.05. Group IV had 16 studies and the p value was significant with Chi Square Test (Pearson χ2) value 0.18. Group V had 24 studies and the p value was significant with Chi Square Test (Pearson χ2) value 0.16. Group VI had only 10 studies and the p value was not significant with Chi Square Test (Pearson χ2) value 0.03 (Table 1-2 and Graph 1-3).

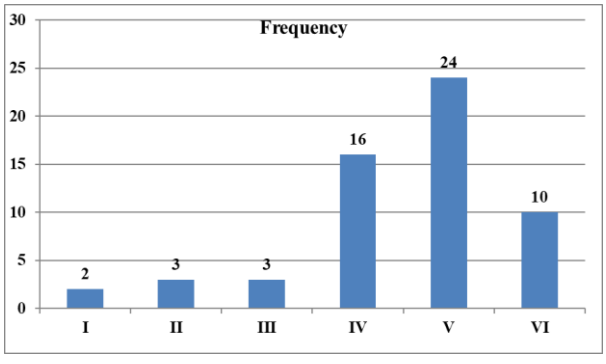
Table 1: Year wise distribution of screened works (Group I to VI) with their Frequency, Standard Deviation and Standard Error.

Group	Year Range	Frequency	Standard Deviation	Standard Error
I	1961-1970	2	0.077	0.017
II	1971-1980	3	0.092	0.096
III	1981-1990	3	0.063	0.432
IV	1991-2000	16	0.672	0.029
V	2001-2010	24	0.992	0.612
VI	2011- Till Date [July 2018]	10	0.282	0.042

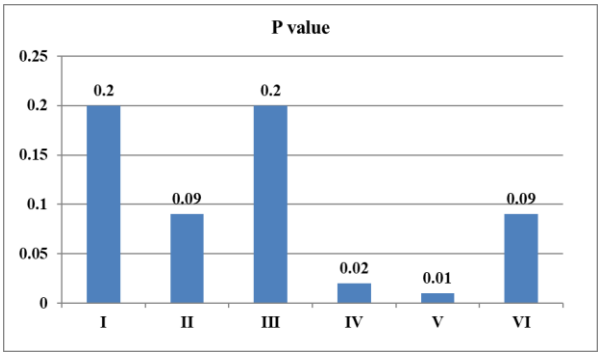
Table 2: Year wise distribution of screened works (Group I to VI) with Chi Square Test (Pearson χ2) and evaluation of level of significances (p value)

Group	Year Range	Chi Square Test (Pearson χ2)	P value	Std. Deviation
I	1961-1970	0.01	0.20	1.653
II	1971-1980	0.05	0.09	1.212
III	1981-1990	0.05	0.20	0.454
IV	1991-2000	0.18	0.02*	1.363
V	2001-2010	0.16	0.01*	1.188
VI	2011- Till Date [July 2018]	0.03	0.09	0.132

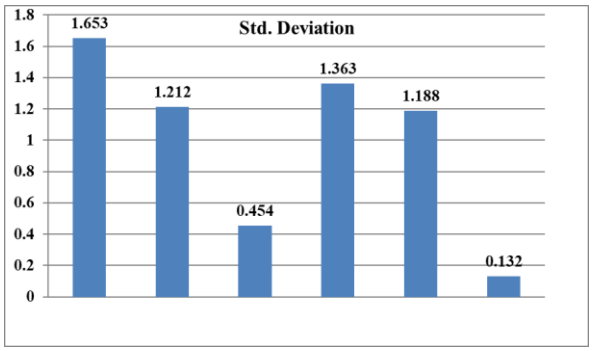
***p<0.05 significant**



Graph 1: Frequency table showing group wise distribution of literature screening.



Graph 2: P value table showing group wise status of level of significance.



Graph 3: Std. Deviation values for Group I to VI.

DISCUSSION

For having more comprehensive understanding, first we need to understand the basic characteristics of magnifiers and magnification. The Power of Magnification is the ability of the lens to increase the visual size of the object. X denotes the number of times the visual size has been increased.[12-14] Working Distance or the Focal Length is the distance measured from the eye lens location to the object in vision. Field of View is the area of the object that can be seen through the magnifier. Depth of Field is the distance that a magnifier can be moved from an object and still have the object in focus; the higher the power, the shorter the depth of field. Distortions of image are known as aberrations. Aberrations in loupes are usually of two kinds, Chromatic and Spherical 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.[15-18] 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. Most of the pioneer workers had used three types of loupes (Simple, Compound, Prism loupes).[19-23] About the adjustment of magnifying loupes, we must know that loupes are worn in a fixed position relative to the eye, presenting different problems in adjustment. Well adjusted loupes position the exit pupil right in the middle of the iris. If the exit pupil misses the centre and hits the edge of the iris, a crescent shaped portion of the field of view is cut-off and light is reduced.[24,25] A clinician cannot simply move his head relative to the loupes and adjust this error. Instead, the clinician has to move the loupes relative to the eyes. If the error is small, and does not cause double vision, it may not be noticed. Uncorrected, the eyes will attempt to accommodate the error by converging, dilating and focusing. This causes fatigue of the ciliary and extraocular muscles and results in rapid eyestrain. 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. The surgical microscope was introduced to dentistry by Apothekar in 1981. Few researchers have published a series of papers documenting the use of the surgical microscope in dentistry and termed it "Microscope Assisted Precision Dentistry" (MAP) (Table 3).[26-32]

Table 3: Features and functions of Periodontal Microscopy and other related parameters.

FEATURE	FUNCTION
Coated optics with acromatic lenses	Provides the best optical resolution and most efficient illumination.
Galilean optics with binocular eyepieces that are joined by offsetting prisms to establish parallel optical axes	Permits stereoscopic vision without eye convergence. Optical element is more advanced, thus enhancing depth of focus and field of view characteristics
Rotating variables magnification	Allows the clinician to change working magnification easily to a value appropriate for the clinical task at hand.
Assistant eye piece attachment	Facilitates the surgical assistant's visibility during microsurgery procedure.
Fiberoptic coaxial illumination	Focuses the light parallel to the microscope's optical axis to eliminate shadows. This allows the surgeon to look directly into the deepest reaches of the oral cavity, such as pockets and angular bony defects.
Micro vision	Micro vision allows definitive visualization of

	root surface deposits and irregularities. The surgeon can view previously unseen periodontal anatomy, thus facilitating better clinical judgment. Permits easy identification of ragged wound edges during surgery for trimming and suturing.
Video and still imaging cameras and attachments	Idea for documenting periodontal pathology and procedure of all types, using a digital or 35 mm image producing beam splitter camera attachment. High documentation is possible through quality video beam splitter attachments.

Literature has shown many of the advantages of Microsurgery in Periodontics in terms of Posture and Procedure.[33-36] As reported, less discomfort to the back and neck protects the spinal column from future problems. One can work at the same distance from the object at all times, avoiding tiring the eyes, as there is no need to make constant adjustment. There is no need for the dentist to wear prescription spectacles. If the eyes are different, all microscopic binoculars have corrective mechanisms to compensate. Procedure efficiency considerably improves over manual abilities as operating field is light magnified.[37-42] Unwanted collateral vision decreases, e.g. the area surrounding the visual field is dark removing unnecessary visual information and improves sharpness of vision. Recording operations can assess the techniques followed and detect procedural errors or problems Psychological. Microsurgery in Periodontics often decreases occupational, physical and postural stress.[43,44] It also increases personal, professional satisfaction with the improved quality of surgical treatments. It further improves clinical results, with less post-operative discomfort to the patient. Microsurgery in Periodontics also gives patient the idea of high degree of professional qualification, as well as the impression of being up to date with new optical, digital and computerized technological applications and the patient feels more confident. In addition, it is easy to make reports, by referring dentists, legal assessment reports or damage valuation reports for insurance companies. Also, it is easier to record diagnostic sequences and treatment in video format and shows a magnified image of the operating field on the monitor for the assistant or auxiliary worker. Microsurgery in Periodontics also allows clinical videos of interventions or techniques to be recorded and presented at conferences, or as part of training.[45-49]

Microsurgical instruments differ from conventional instruments in a number of ways. They must be capable of delicately manipulating structures barely visible to the naked eye, but with handles large enough to hold comfortably and securely. They must also take into account the tremor of the surgeon's hand, greatly amplified under magnification. The armamentarium mainly includes; tissue forceps, micro scissors, breakable carbon steel blade, scalpel handle, needle holder, micro mirrors (Furcation and Interdental), micro elevators, micro retractors, root resection instruments, vascular clamps (for controlling bleeding) and clamp applicators, irrigators (for washing structures in the surgical field), vessel dilators (for opening up the cut end of a blood vessel), various standard surgical tools. The surgical microscope has proven to be an effective tool in endodontics and restorative Dentistry.[50-53] In Periodontics, microsurgery can be very useful in the following: diagnostic procedures, crown lengthening, regenerative periodontal surgeries, root coverage procedures, papilla reconstruction, smile designing, implantology. Periodontal microsurgery has proven to be an effective means of improving the predictability of gingival transplantation procedures used in treating recession with less operative trauma and discomfort. Correct diagnosis, with microsurgical techniques, makes complete root coverage extremely predictable in class I and class II marginal tissue recession defects with a variety of procedures. The partial root coverage results achieved in class III and class IV marginal recession with conventional surgery can also be greatly enhanced through the use of microsurgery.[54] Microsurgical principles and methodology application has made all gingival transplant procedures extremely reliable. The use of microsurgical approach makes even papillary reconstruction a realistic possibility. Microsurgery provides a predictable means of improving the

reliability of the three broad types of gingival transplantation procedures used in treating gingival recession.[55] The high survival rate of the vascularized graft is due to the retained blood supply from base of the pedicle, which can be enhanced through microsurgery. The lack of full root coverage predictability with this procedure is due to the high degree of operator and technique sensitivity. Microsurgery offers the possibility of greatly enhanced results with the avascular graft, composite tissue graft and papillary reconstruction. Usually, flaps are used, conventionally for access to root surface, resection procedures, establishing biologic width, regenerative procedures, ridge augmentation and for implant placement and exposure.[56] The use of surgical microscope has introduced the reality of considerably less invasive surgical incisors and flap reflections in periodontics. 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. Few other researchers suggested that 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. 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 in vivo. 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.[57] Magnification achieved by the surgical microscope is instrumental in implant site development and placement. The surgical microscope may be of value in the location and visualization of a variety of substances and defects. Such is the case with deposits on the surfaces of the teeth that may escape the naked eye. Further debridement can be carried out under magnification to ensure complete detection and removal of the deposits. The surgical microscope can be invaluable in facilitating a detailed inspection of tissue defects such a Stillman's cleft or an aberrant frenal pull. The importance of root debridement is recognized universally as an essential and inevitable component of periodontal therapy.[58] A patient with generalized chronic periodontitis had SRP performed as the initial phase of therapy using unassisted vision. Its clear magnification greatly improves the surgeon's ability to create a clean, smooth root.

CONCLUSION

Periodontal microscopy is seems to be in its infancy stage but expectedly will play a greater role in near coming future. Its execution is technique sensitive and more demanding than the conventional periodontal procedures. As the benefits of microscope will be realized, it will be applied more universally. Periodontal microsurgery does not compete with the conventional periodontal surgeries. It is the evolution of the surgical techniques so as to permit reduced trauma. Microsurgery will also seems to shift the focus of periodontal procedures from a macro-field, thus, achieving precise results with this technique seems a reality. Nevertheless, the magnification escalation in dentistry is likely to be continued. Our study results clearly showed that numerous researchers have explained the importance of magnification and microsurgery in specialty of Periodontics. However, the need of our is to have some long term genuine studies which could further enlighten the significance of magnification and microsurgery so as to build more comprehensive understanding in this perspective.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Shanelec DA. Periodontal Microsurgery. J Esthetic Restorative Dent 2003;15:118-23.

2. Tibbetts LS, Shanelec D. Principles and Practice of Periodontal Microsurgery. Int J Microdent 2009;1:13-24.

3. Hegde R, Sumanth S, Padhye A. Microscope Enhanced Periodontal Therapy: A Review &

Report of 4 Cases. J Contemp Dent Pract 2009;10:5-9.

4. Joshi N, Nirwal A, Arora VK, Chatterjee S, Bhattacharya HS, Shankar S. Periodontal Microsurgery: J Dent Sci Oral Rehabil 2015;6(4):192-6.

5. Dalaya D. Microsurgery in periodontics- a review. Int J Sci Res 2015;4:77-9.

6. James M, Belcher. A Perspective on Periodontal Microsurgery: Int J Periodont Restorative Dent 2001;21:191-6.

7. Gupta P, Jan SM, Behal S, Mir RA, Shafi M, Teli ZA. IOSR J Dent Medical Sci 2014:12-7.

8. Satyanarayana D, Reddy GV, Babu R. Periodontal Microsurgery. A Changing Perspective. Ind J Dent Adv 2011;3(4):698-704.

9. Serafin D. Microsurgery: past, present, and future. Plast Reconstr Surg 1980;66:781-5.

10. Sunnel S, Rucker L. Surgical magnification in dental hygiene practice: Int J Dent Hygiene 2004;4:26-35.

11. Padma R. Microsurgery in Periodontics. Healtalk 2010;3:16-20.

12. Kapadia JA, Bhedasgoankar SY, Bhandari SD. Periodontal Microsurgery: A Case Report. J Ind Soc Periodontol 2013;34:33-9.

13. Sheets CG, Paquette JM. Microscopy In Dentistry- Perspective: J Esthet Restorative Dent 2001;13:187-90.

14. Burkhardt R, Lang NP. Coverage of localized gingival recessions: comparison of micro and macro surgical techniques: J Clin Periodontol 2005;32:287-93.

15. 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: J Ind Soc Periodontol 2013;34:40-5.

16. Jindal U, Pandit N, Bali D, Malik R, Gugnani S. Comparative evaluation of recession coverage with sub-epithelial connective tissue graft using macrosurgical approaches: A randomized split mouth study: J Ind Soc Periodontol 2015;36:65-9.

17. Francetti L, Calace S, Weinstein RL. Microsurgical Treatment of Gingival Recession: A Controlled Clinical Study. Int J Periodontics Restorative Dent 2005;32:21-7.

18. Francetti D. Application in gingival recession coverage. Int J Periodontics Restorative Dent 2004;24(3):496-504.

19. Sitbon Y, Attathom Y. Minimal Intervention Dentistry II: Part 6. Microscope and Microsurgical techniques in Periontics. British Dent J 2014;216:73-9..

20. Nordland WP, Sandhu H. Int J Periodontics Restorative Dent 2008;28:543-9.

21. Dennis A, Leonard SS. Tibbets Periodontal Microsurgery. Perio 2000 1996;11:58-64.

22. Deepa D, Mehta DS, Munjal V. Periodontal Microsurgery- A must for perio-aesthetics. Ind J Oral Sci 2014;5:21-8.

23. Cortellini P, Tonetti MS. Microsurgical approach to periodontal regeneration. J Periodontol 2001;72(4):559-69.

24. Harrel SK. A minimally invasive surgical approach for periodontal regeneration: Surgical techniques and observations. J Periodontol 1999;70(12):1547-57.

25. John Y. Contemporary Oral Hygiene 2006:5:50-8.

26. Shanelec DA, Tibbets LS. Recent advances in surgical technology. Carranza's Clinical Periodontology 12th Edition. 2014.

27. Windisch P, Sculean A, Klein F. Comparison of Clinical Radiographic and Histomeric Measurements Following Treatment With GTR or Enamel Matrix Protein In Human Periodontal Defects. J Periodontol 2002;73:409.

28. Enhanced Periodontal Debridement with the use of Microultrasonic Periodontal Endoscopy. Contemporary Oral Hygiene May 2006 pp. 89-132.

29. McCrea SJJ. Microsurgical Repair of Labial Gingival Tissues following excision of an Epulis: A Case Report with 18 month follow up. Oral Surg 2009;2(3):126-35.

30. Dohlman GF. Carl Olof Nylen and the birth of the otomicroscope and microsurgery. Arch Otolaryngol 1969;90(6):813-7.

31. Barraquer JM. The history of the microscope in ocular surgery. J Microsurg 1980;1:288-99.

32. Chen ZW, Replantation of an amputated forearm. Chinese J Surg 1963;11:767-9.

33. Apotheker H, Jako GH. A Microscope for Use in Dentistry. J Microsurg 1981;3:7-10.

34. Carr GB. Microscopes in Endodontics. J Calif Dent Assoc 1992;20(11):55-61.

35. Rubinstein R. The Anatomy of the Surgical Microscope and Operating Positions. DCNA 1997;41(3):391-413.

36. Tamai S. History of Microsurgery. Plast Reconstr Surg 2009;124:281-4.

37. Johnson and Johnson. Wound Closure Manual. Somerville NJ: Ethicon: 1994.

38. Rose LF, Mealy BL. Periodontics: Medicine, Surgery and Implants. J Calif Dent Assoc 1999;22(11):25-31.

39. Cobb CM. Non Surgical Pocket Therapy: Mechanical. J Periodontology 1996;1:443-90.

40. Campbell D. Magnification is major aids to dentists and how micro dentistry's time has come. Future Dent 1989;4(3):11-9.

41. Langer B, Langer L. Subepithelial Connective Tissue Graft Technique for Root Coverage. J Periodontol 1985;56(12):683-9.

42. Shanelec D. Anterior Esthetic Implants: Microsurgical Placement in Extraction Sockets with Immediate Provisional's. CDA J 2005;33(3):233-40.

43. Shanelec DA. Periodontal microsurgery. J Esthet Restor Dent 2003;15(7):402-7.

44. Clark DJ. Operating Microscopes and Zero-Defect Dentistry. Canadian J Restorative Dentistry Prosthodontics 2008:43-50.

45. Tibbetts LS, Shanelec D. Current status of Periodontol Microsurgery. Curr Opin Periodontol 1996;3:118-25.

46. Tibbetts LS, Shanelec D. A perspective on the future of periodontal microsurgery. Periodontology 2000 1996;11:58-64.

47. Shanelec DA. periodontal microsurgery. J Esthet Restor Dent 2003;15:I18-23.

48. Calderón MG, Lagares DT, Vázquez CC. The application of microscopic surgery in dentistry. Med Oral Patol Oral Cir Bucal 2007;12:311-6.

49. Shanelec DA. Optical principles of Loupes. Calif Dent Assoc J 1992;20:25-9.

50. Tibbetts LS, Shenelac D. Periodontal microsurgery Dent Clin North Am 1998;42(2):339-59.

51. Rubinstein R. The anatomy of surgical operating microscope and operating positions. Dent Clinic North Am 1997;41(3):391-412.

52. James M, Belcher A. Perspective on Periodontal Microsurgery Int J Periodontics Restorative Dent 2001;21:1911-6.

53. La Bagnara J. A review of absorbable suture materials in head and neck surgery and introduction of Monocryl: A new absorbable suture. Ear Nose Throat J 1995;74:409-15.

54. Barraquer JI. The history of the microsurgery in ocular surgery. J Microsurg 1980;1292-9.

55. Shanelec D, Tibbetts L. An overview of periodontal microsurgery. Curr Sci 1993;2:187–93.

56. Azzi R, Etienne D, Carranza F. Surgical reconstruction of the interdental papilla. Int J Periodontics Restorative Dent 1998;18:466–73.

57. Azzi R, Etienne D, Sauvan JL, Miller PD. Root coverage and papilla reconstruction in Class IV recession: A case report. Int J Periodontics Restorative Dent 1999;19:449–55.

58. Azzi R, Takei HH, Etienne D, Carranza FA. Root coverage and papilla reconstruction using autogenous osseous and connective tissue grafts. Int J Periodontics Restorative Dent 2001;21:141–7.