

Effectiveness of SPT in Long term follow up after flap surgery - 1 year follow up study

B.A.Deepika^{1*}, Sankari Mallaippan²

¹Postgraduate Student, Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

²Professor, Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical And Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

***Corresponding author:** B.A.Deepika, Postgraduate Student, Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical And Technical Sciences, Saveetha University, Chennai, Tamilnadu, India, No.162, Poonamallee High road , Chennai 600077, Tamil Nadu, Chennai, Email: deepikaba93@gmail.com

Submitted: 08 March 2023; Accepted: 13 April 2023; Published: 04 May 2023

ABSTRACT

Background: Periodontitis is a bacterially-induced, chronic inflammatory disease that destroys the connective tissues and bone that support teeth. Active periodontal therapy aims to reduce the inflammatory response, primarily through eradication of bacterial deposits. Following completion of treatment and arrest of inflammation, supportive periodontal therapy (SPT) is employed to reduce the probability of re-infection and progression of the disease; to maintain teeth without pain, excessive mobility or persistent infection in the long term, and to prevent related oral diseases.

Aim: The aim of the study is to assess the periodontal stability during maintenance period; effectiveness of SPT in long term follow up after flap surgery.

Materials And Methods: A total of 100 subjects were included in this study. 50 females and 50 males were included, divided into 2 groups. Group 1: Non-Maintenance Phase (n=50); Group 2: Maintenance Phase (n=50). The Clinical parameters assessed were : GI (Gingival Index), PI(Plaque Index), PD(Probing depth), CAL(Clinical attachment loss), Gingival Bleeding index, Tooth mobility, Tooth loss. The Parameters were assessed at Baseline, 1 month, 3 months, 6 months and 1 year. Statistical analysis were carried out by using SPSS software 23.0

Results: The present study discussed Group 1: Non-Maintenance Phase (n=50); Group 2: Maintenance Phase (n=50). The Clinical parameters assessed were : GI (Gingival Index), PI(Plaque Index), PD(Probing depth), CAL(Clinical attachment loss), Gingival Bleeding index, Tooth mobility, Tooth loss. The Parameters were assessed at Baseline, 1 month, 3 months, 6 months and 1 year. For Gingival index, Plaque index, Probing depth, Clinical attachment loss, Gingival bleeding index, Tooth mobility, Tooth loss: Group 1: Non-Maintenance Phase; Group 2: Maintenance Phase are not significant at baseline and 1 month follow up $p>0.05$; are significant at 3 months, 6 months and 1 year follow up.

Conclusion: Periodontally compromised patients under reinforcement and maintenance phase (follow up) showed good results when compared to non-maintenance phase group subjects.

Keywords: *Supportive Periodontal Therapy, Periodontal maintenance, Maintenance phase, Patient's care, Patient's health*

INTRODUCTION

Periodontitis is a microbial infectious disease and is characterized by the presence of gingival inflammation, periodontal pocket formation, and loss of connective tissue attachment and alveolar bone around the affected teeth.^[1] Periodontitis is a worldwide health concern. Kassebaum et al. found that 7–11% of people worldwide have severe periodontitis. This makes it the sixth most common disease in 2010. The number of people affected by periodontitis increases with age and reaches a precipitous increase at the age of 38 years. It subsequently stabilizes and remains constant in older age groups.^[2] The aim of periodontal therapy is to protect and maintain the patient's natural dentition over their lifetime for optimal comfort, function and aesthetic appearance. Periodontal therapy includes surgical and non-surgical procedures.

Once the periodontal therapy is completed, patients should be placed on a schedule of periodic recall visits for supportive care to prevent the recurrence of the disease. Recurrence of periodontal disease can occur due to improper oral hygiene habits, inadequate subgingival removal, because of the microscopic nature of the dentogingival unit healing after periodontal treatment etc. Hence proper treatment should be rendered so that the recurrence of disease doesn't occur.^[3] Transfer of the patient from active treatment status to a maintenance care program is an ultimate step in total patient care that requires time and effort on the part of the dentist, staff and patient. Thus, the maintenance phase has been considered as the cornerstone of successful periodontal therapy.

The continuing periodic assessment and prophylactic treatment of periodontal structures, permitting early detection and treatment of new and recurring disease is supportive periodontal therapy.^[4] SPT is also known as maintenance therapy, supportive periodontal care or

supportive periodontal treatment. It begins once patients are deemed periodontally stable which is determined 6-8 weeks after completion of active treatment.^[5]

The aim of the SPT is as follows : minimise the recurrence of disease through periodic interventions.^[6] To maintain the attachment apparatus in the most stable condition possible. [7] The Goals of SPT are as follows: To prevent or minimize the recurrence and progression of periodontal disease in patients who have been previously treated for gingivitis, periodontitis, and peri-implantitis. To Prevent or reduce the incidence of tooth or implant loss by monitoring the dentition and any prosthetic replacement of natural teeth. To raise the probability of identifying and promptly treating any additional diseases or disorders that may be present in the oral cavity.

According to the American Academy of Periodontology (AAP) in order to fulfill these objectives, SPT should include:

- An update of the medical history and dental history
- Examination of extra oral and intra oral soft tissues,
- Dental examination and radiographic review,
- Evaluation of the patient's oral hygiene performance,
- Periodontal evaluation and risk assessment
- Supra gingival and subgingival removal of bacterial plaque and calculus
- Re - treatment of disease when indicated.

The objectives of SPT are to prevent the occurrence of new disease and prevent the recurrence of previous disease. Prevention of alveolar bone support. Maintenance of stable clinical attachment level. Reinforcement and re-evaluation of proper home care. Maintenance of a healthy and functional oral environment to prevent occurrence of new disease. Parts of SPT

are as follows: Preventive SPT, Trial SPT, Compromise SPT, Post treatment SPT. [8] An important focus area during SPT is supragingival plaque control, as this has proven to maintain the obtained stable periodontal condition.

The ultimate goal of SPT is to support patients' oral health and maintain the treatment results achieved at the evaluation of APT. Our team has extensive knowledge and research experience that has translated into high quality publications. [9–18] The aim of this study is to evaluate SPT on 1 year follow up after flap surgery, based on parameters: GI (Gingival Index), PI(Plaque Index), PD(Probing depth), CAL(Clinical attachment loss), Tooth mobility, Tooth loss, the periodontal stability during SPT in treated periodontitis patients.

MATERIALS AND METHODS

Study design

The subjects participating in the study are from the outpatient department of periodontics, Saveetha dental college and hospitals. Subjects were informed about the purpose of the study and informed consent was obtained and ethical number is [IHEC/SDC/PERIO-2002/22/082]. The eligibility criteria for the study population are as follows:

Inclusion criteria

1. Patients with generalized chronic periodontitis.
2. Patients in the age group of 20-65 years.
3. Systemically healthy subjects.

Exclusion criteria

1. Smokers.
2. Antibiotic therapy within last 6 months of the study
3. Pregnant and lactating women.
4. Patients undergone or having undergone periodontal therapy within the last 6 months of study.

With the above Inclusion criteria and Exclusion criteria a total of 100 subjects were enrolled in

this study. 50 females and 50 males were included, divided into 2 groups. Group 1: Non-Maintenance Phase; Group 2: Maintenance Phase. In this study, patients were entered into the SPT programme after active periodontal therapy (after flap surgery) when the periodontal condition had reached a level of improvement that was judged by the periodontist to be the best obtainable and which could supposedly be maintained by the patients when they entered the SPT programme. SPT started with a recall appointment every 1 month, 3 months which, over time, could be adapted to every six months and 1 year according to the periodontal stability. At each recall appointment, the condition of the patient's periodontium and their level of oral hygiene were checked. Clinical parameters assessed are : GI (Gingival Index), PI(Plaque Index), PD(Probing depth), CAL(Clinical attachment loss), Gingival Bleeding index, Tooth mobility, Tooth loss. Parameters assessed at Baseline, 1 month, 3 months, 6 months and 1 year.

Study group

GROUP I: Non- Maintenance phase (Patients without SPT)

GROUP II: Maintenance phase (Patients with SPT)

The assessment criteria included Gingival Index (GI) score, Plaque Index (PI) score, Probing Depth (PD), Clinical attachment loss (CAL) score, Gingival Bleeding Index, Tooth mobility, Tooth loss that were measured at baseline, 1 month, 3 months, 6 months and 1 year.

Statistical analysis

Differences between the study groups were statistically analyzed by SPSS Software 23.0 version; PAIRED T TEST was done to analyze the difference between the groups. Mean and Standard Deviation were assessed for statistical analysis and the results are tabulated .

RESULTS

TABLE 1: The Table depicts the GINGIVAL INDEX with mean and standard deviation for
GROUP I: Non- Maintenance phase (Patients without SPT)
GROUP II: Maintenance phase (Patients with SPT)

Gingival Index	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	2.00+_0.42	1.75+_0.50	0.077
1 month	1.83+_0.38	1.50+_0.57	0.013
3 months	1.75+_0.45	1.35+_0.50	0.005
6 months	1.25+_0.45	1.25+_0.50	0.003
1year	1.01+- 0.23	0.9+- 0.26	0.001

The significance of statistical tests for Gingival Index at Baseline and 1month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the gingival index is significant $p<0.05$ for both the groups.

TABLE 2: The Table depicts the PLAQUE INDEX with mean and standard deviation for
GROUP I: Non- Maintenance phase (Patients without SPT)
GROUP II: Maintenance phase (Patients with SPT)

Plaque Index	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	3.33+_0.49	3.00+_0.81	0.281
1 month	3.08+_0.51	2.75+_0.50	0.134
3 months	2.75+_0.45	2.50+_0.57	0.050
6 months	2.67+_0.49	2.50+_0.50	0.003
1year	2.45+_0.45	1.25+_0.50	0.001

The significance of statistical tests for plaque Index at Baseline and 1 month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the plaque index is significant $p<0.05$ for both the groups.

TABLE 3: The Table depicts the PROBING DEPTH with mean and standard deviation for
GROUP I: Non- Maintenance phase (Patients without SPT)
GROUP II: Maintenance phase (Patients with SPT)

Probing Depth	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	3.33+_0.49	1.62+_0.22	0.281
1 month	3.08+_0.51	1.44+_0.21	0.134
3 months	2.75+_0.45	1.28+_0.17	0.050
6 months	2.67+_0.49	1.08+_0.17	0.002
1year	2.0+_0.45	1.01+_0.50	0.001

The significance of statistical tests for Probing depth at Baseline and 1 month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the probing depth is significant $p<0.05$ for both the groups.

TABLE 4: The Table depicts the Clinical Attachment loss (CAL) with mean and standard deviation for

GROUP I: Non- Maintenance phase (Patients without SPT)

GROUP II: Maintenance phase (Patients with SPT)

CAL	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	2.28+_0.53	2.00+_0.14	0.134
1 month	2.18+_0.46	1.80+_0.14	0.132
3 months	1.94+_0.46	1.64+_0.08	0.050
6 months	1.68+_0.38	1.32+_0.10	0.050
1year	1.25+_0.45	0.9+_0.50	0.001

The significance of statistical tests for Clinical Attachment Loss at Baseline and 1 month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the Clinical Attachment loss is significant $p<0.05$ for both the groups.

TABLE 5: The Table depicts the BLEEDING INDEX with mean and standard deviation for

GROUP I: Non- Maintenance phase (Patients without SPT)

GROUP II: Maintenance phase (Patients with SPT)

Bleeding index	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	2.00+_0.42	1.75+_0.50	0.771
1 month	1.83+_0.38	1.50+_0.57	0.134
3 months	1.75+_0.45	1.35+_0.50	0.005
6 months	1.25+_0.45	1.25+_0.50	0.050
1year	1.01+- 0.23	0.9+- 0.26	0.001

The significance of statistical tests for Bleeding Index at Baseline and 1month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the Bleeding index is significant $p<0.05$ for both the groups.

TABLE 6: The Table depicts the TOOTH MOBILITY with mean and standard deviation for

GROUP I: Non- Maintenance phase (Patients without SPT)

GROUP II: Maintenance phase (Patients with SPT)

Tooth mobility	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	3.33+_0.49	3.00+_0.81	0.281
1 month	3.08+_0.51	2.75+_0.50	0.134
3 months	2.75+_0.45	2.50+_0.57	0.050
6 months	2.67+_0.49	2.50+_0.50	0.003
1 year	1.25+_0.45	1.25+_0.50	0.001

The significance of statistical tests for Tooth mobility at Baseline and 1 month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the Tooth mobility is significant $p<0.05$ for both the groups.

TABLE 7: The Table depicts the TOOTH LOSS with mean and standard deviation for
 GROUP I: Non- Maintenance phase (Patients without SPT)
 GROUP II: Maintenance phase (Patients with SPT)

Tooth loss	Group 1 Mean and standard deviation	Group 2 Mean and standard deviation	P value
Baseline	3.33+_0.49	1.62+_0.22	0.281
1month	3.08+_0.51	1.44+_0.21	0.134
3 months	2.75+_0.45	1.28+_0.17	0.050
6 months	2.67+_0.49	1.08+_0.17	0.003
1year	2.54+_0.45	1.00+_0.50	0.002

The significance of statistical tests for Tooth loss at Baseline and 1month for both groups are not significant $p>0.05$. For 3 months, 6 months and 1 year the Tooth loss index is significant $p<0.05$ for both the groups.

DISCUSSION

Periodontal diseases are multifactorial diseases where host-microbial interactions lead to the destruction of periodontal hard and soft tissues. Chronic periodontitis is an infectious disease caused by an opportunistic microflora. The infection triggers host inflammatory responses resulting in the destruction of the tooth supporting tissues. Neither the infection nor the host's inflammatory responses are completely understood. Epidemiological studies suggest that in adult populations the prevalence of chronic periodontitis is common. [19]

Untreated chronic periodontitis has been described as a slowly progressive disease affecting individual teeth or tooth sites, showing evidence of periods of stability and periods of progression. [20] Thus, at untreated tooth sites, clinical measures of oral hygiene, gingivitis, pocket probing depths, and clinical attachment levels were poor predictors of disease activity over 18 months. In fact, Reddy et al.'s study demonstrated that a majority of untreated sites (approximately 75%) experienced no progression of disease or improved in the absence of care. This suggests that the evaluation of the efficacy of supportive periodontal therapy (SPT) must be carried out over an extended period of time. [21]

Various forms of Periodontitis can be efficiently treated with Non surgical and Surgical therapy, but periodic periodontal maintenance is important for the maintenance of Periodontal

health after active Periodontal treatment. Periodontal maintenance is defined as the procedures that are performed at select intervals after active periodontal treatment to assist the periodontal patient in maintaining oral health. Periodontal maintenance is an integral part of periodontal treatment and is performed at regular intervals on the patient by the dentist.

Maintenance care is an essential part of periodontal therapy. It is continuing periodic assessment and prophylactic treatment of the periodontal structures that permit early detection and treatment of new or recurring abnormalities or disease. The Patient who complies to suggested SPT intervals has more stable periodontium and loses fewer teeth than the patient who does not comply or complies erratically. [22]

The main aim of the present study was to assess the efficacy of the SPT in long term follow up after flap surgery - 1 year follow up study. People treated for periodontitis can reduce the probability of re-infection and disease progression through regular supportive periodontal therapy (SPT). SPT starts once periodontitis has been treated satisfactorily, meaning that inflammation has been controlled and destruction of tissues supporting the tooth (bone and gums) has been arrested. SPT aims to maintain teeth in function, without pain, excessive mobility or persistent infection over the long term. SPT treatment typically includes ensuring excellent oral hygiene, frequent monitoring for progression or recurrence of disease, and removal of microbial deposits by dental professionals.

Cosgarea.et.al, demonstrated that clinical and microbiological effects of subgingival instrumentation (SI) alone and combined with

LDD / PDT in periodontitis patients followed up with SPT for 3 & 6 months . 105 patients were randomly assigned into 3 groups . Group A - SI+ PDT ; Group B - SI+ LDD ; Group 3- SI. The study indicates that periodontal patients enrolled in SPT, treatment of persistent/recurrent pockets with SI alone or combined with either PDT or LDD may lead to comparable clinical improvements and the adjunctive use of LDD appears to provide better microbiological improvements for some periodontal pathogens than SI alone or combined with PDT. [23]

Soundarajan et.al., stated that Nonsurgical periodontal therapy of chronic periodontitis using Er, Cr: YSGG, and a-PDT as an adjunct to SRP was significantly more effective than SRP alone in reducing PD, CAL, GI, and PI at 3 months follow up. Adjunctive use of Er,Cr:YSGG laser with SRP showed better clinical outcomes than a-PDT with SRP. However, the long-term positive benefits of the laser therapies are yet unknown and more research with longer follow-ups are required. [24]

Yamashitha.et.al.,BOP significantly improved from 100% to 33% in the PDT group, whereas it hardly changed in the irrigation group. No adverse events were observed in any patients. a-PDT may be useful as a noninvasive treatment in the maintenance phase, especially in patients with relatively deep periodontal pockets. [25]

SPT interventions based on oral prophylaxis and oral hygiene instructions might be an adequate SPT intervention for a substantial number of treated periodontitis subjects. [26] Supragingival prophylaxis alone followed by weekly oral hygiene checkups during the entire period of 6 months resulted in significant PPD and BOP reductions as well as gain of clinical attachment even in sites with PPD \geq 6 mm. [27]

Checchi et al., studied 92 patients, who after active periodontal treatment were introduced to supportive periodontal treatment. After 6.7 years of maintenance, 64% of patients were regular compliers; 126 teeth were extracted during active periodontal treatment, whereas 50 teeth were lost during supportive periodontal treatment (40 because of periodontal reasons). Patients complying erratically were 5.6 times at greater

risk of tooth loss after active periodontal treatment than regular compliers. [28]

Periodontal therapy without maintenance was of little value in terms of restoring periodontal health. [29] Studies showed that when patients are collaborative and comply with supportive periodontal treatment protocols, periodontal support is maintained and most teeth can be retained for many years. [30] Our study discussed Group 1: Non-Maintenance Phase (n=50); Group 2: Maintenance Phase (n=50). The Clinical parameters assessed were : GI (Gingival Index), PI(Plaque Index), PD(Probing depth), CAL(Clinical attachment loss), Gingival Bleeding index,Tooth mobility, Tooth loss. The Parameters were assessed at Baseline, 1 month, 3 months, 6 months and 1 year. For Gingival Index at Baseline and 1month for both groups are not significant $p>0.05$; at 3 months, 6 months and 1 year the gingival index is significant $p<0.05$ for both the groups.

CONCLUSION

During supportive periodontal treatment, most patients abandon the recommended regimen during the first 6 months or 1 year. Approximately 50% of treated periodontitis patients follow the recommended supportive periodontal treatment regimen long term. Compliance with supportive periodontal treatment promotes plaque and bleeding on probing reductions, minimizes progression and recurrence of disease, and reduces tooth loss. Reinforcement and motivational intervention should become a primary concern of the dental team prior to the completion of active therapy and throughout the supportive periodontal treatment of the patient. Periodontally compromised patients under reinforcement and maintenance phase (follow up) showed good results when compared to non-maintenance phase group subjects.

REFERENCES

1. Carranza's Clinical Periodontology, 11 Edition. By Newman, Takei, Klokkevold, Carranza
2. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJL, Marcenes W. Global burden of severe periodontitis in 1990– 2010: a

- systematic review and meta- regression. *J Dent Res.* 2014;93(11):1045- 1053
3. *Clinical Periodontology and Implant Dentistry*, Sixth Edition, Edited By Niklaus P Lang, And Jan Lindhe.
 4. Periodontol A. AAP. Consensus Report: Periodontal diagnosis and diagnostic aids. In *Proceedings of the World Workshop in Clinical Periodontics*. ed. The American Academy of Periodontology 1989; Pp I/23-I/33.
 5. Morrison EC, Ramfjord SP, Hill RW. Short-term effects of initial, nonsurgical periodontal treatment (hygienic phase). *J Clin Periodontol.* 1980 Jun;7(3):199-211. doi: 10.1111/j.1600-051x.1980.tb01963.x. PMID: 7000853.
 6. Armitage GC, Xenoudi P. Post-treatment supportive care for the natural dentition and dental implants. *Periodontol* 2000. 2016 Jun;71(1):164-84. doi: 10.1111/prd.12122. PMID: 27045436.
 7. Echeverría JJ, Manau GC, Guerrero A. Supportive care after active periodontal treatment: a review. *J Clin Periodontol.* 1996 Oct;23(10):898-905. doi: 10.1111/j.1600-051x.1996.tb00509.x. PMID: 8915017.
 8. Axelsson P, Lindhe J. The significance of maintenance care in the treatment of periodontal disease. *J Clin Periodontol* 1981; 8: 281-94.
 9. Vadivel JK, Govindarajan M, Somasundaram E, Muthukrishnan A. Mast cell expression in oral lichen planus: A systematic review. *J Investig Clin Dent.* 2019 Nov;10(4):e12457.
 10. Panda S, Jayakumar ND, Sankari M, Varghese SS, Kumar DS. Platelet rich fibrin and xenograft in treatment of intrabony defect. *Contemp Clin Dent.* 2014 Oct;5(4):550–4.
 11. Mehta M, Dhanjal DS, Paudel KR, Singh B, Gupta G, Rajeshkumar S, et al. Cellular signalling pathways mediating the pathogenesis of chronic inflammatory respiratory diseases: an update. *Inflammopharmacology.* 2020 Aug;28(4):795–817.
 12. Venkatesan J, Singh SK, Anil S, Kim SK, Shim MS. Preparation, Characterization and Biological Applications of Biosynthesized Silver Nanoparticles with Chitosan-Fucoidan Coating. *Molecules* [Internet]. 2018 Jun 12;23(6). Available from: <http://dx.doi.org/10.3390/molecules23061429>
 13. Bhansali KJ, Balinge KR, Raut SU, Deshmukh SA, Senthil Kumar M, Ramesh Kumar C, et al. Visible light assisted sulfonic acid-functionalized porphyrin comprising benzimidazolium moiety for photocatalytic transesterification of castor oil. *Fuel.* 2021 Nov 15;304:121490.
 14. Deepanraj B, Senthilkumar N, Mala D, Sathiamourthy A. Cashew nut shell liquid as alternate fuel for CI engine—optimization approach for performance improvement. *Biomass Conversion and Biorefinery.* 2022 May 1;12(5):1715–28.
 15. Kamath M, Rao SK, Jaison, Sridhar, Kasthuri, Gopinath, et al. Melatonin delivery from PCL scaffold enhances glycosaminoglycans deposition in human chondrocytes – Bioactive scaffold model for cartilage regeneration. *Process Biochem.* 2020 Dec;99:36–47.
 16. Paramasivam A, Priyadharsini JV. Novel insights into m6A modification in circular RNA and implications for immunity [Internet]. Vol. 17, *Cellular & Molecular Immunology.* 2020. p. 668–9. Available from: <http://dx.doi.org/10.1038/s41423-020-0387-x>
 17. Li Z, Veeraraghavan VP, Mohan SK, Bolla SR, Lakshmanan H, Kumaran S, et al. Apoptotic induction and anti-metastatic activity of eugenol encapsulated chitosan nanopolymer on rat glioma C6 cells via alleviating the MMP signaling pathway [Internet]. Vol. 203, *Journal of Photochemistry and Photobiology B: Biology.* 2020. p. 111773. Available from: <http://dx.doi.org/10.1016/j.jphotobiol.2019.111773>
 18. Nambi G, Kamal W, Es S, Joshi S, Trivedi P. Spinal manipulation plus laser therapy versus laser therapy alone in the treatment of chronic non-specific low back pain: a randomized controlled study. *Eur J Phys Rehabil Med.* 2018 Dec;54(6):880–9.
 19. Manresa C, Sanz-Miralles EC, Twigg J, Bravo M. Supportive periodontal therapy (SPT) for maintaining the dentition in adults treated for periodontitis. *Cochrane Database of Systematic Reviews.* 2018(1).
 20. Schoenmakers MG, Willems EJ, Slot DE, Van der Weijden GA. Success of supportive periodontal therapy in periodontitis patients—A retrospective analysis. *International Journal of Dental Hygiene.* 2022 May;20(2):318-27.
 21. Trombelli L, Farina R, Pollard A, Claydon N, Franceschetti G, Khan I, West N. Efficacy of alternative or additional methods to professional mechanical plaque removal during supportive periodontal therapy: A systematic review and meta-analysis. *Journal of Clinical Periodontology.* 2020 Jul;47:144-54.
 22. Ramfjord SP. Maintenance care and supportive periodontal therapy. *Quintessence Int.* 1993 Jul;24(7):465-71. PMID: 8210315.
 23. Cosgarea R, Eick S, Batori-Andronesco I, Jepsen S, Arweiler NB, Rößler R, Conrad T, Ramseier

- CA, Sculean A. Clinical and microbiological evaluation of local doxycycline and antimicrobial photodynamic therapy during supportive periodontal therapy: A randomized clinical trial. *Antibiotics*. 2021 Mar 9;10(3):277.
24. Soundarajan S, Rajasekar A. Comparative evaluation of combined efficacy of methylene blue mediated antimicrobial photodynamic therapy (a-PDT) using 660 nm diode laser versus Erbium-chromium-yttrium-scandium-gallium-garnet (Er, Cr: YSGG) laser as an adjunct to scaling and root planing on clinical parameters in supportive periodontal therapy: A randomized split-mouth trial. *Photodiagnosis and Photodynamic Therapy*. 2022 Sep 1;39:102971.
25. Yamashita Y, Mae M, Oohira M, Ozaki Y, Ohba S, Asahina I, Yoshimura A. Clinical efficacy and safety of antimicrobial photodynamic therapy in residual periodontal pockets during the maintenance phase. *Pharmaceuticals*. 2022 Jul 25;15(8):924.
26. Eke, P. I., Dye, B. A., Wei, L., Slade, G. D., Thornton -Evans, G. O., Borgnakke, W. S., ... Genco, R. J. (2015). Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012. *Journal of Periodontology*, 86, 611–622.
27. Gomes, Sabrina Carvalho, Piccinin, F. B., Susin, C., Oppermann, R. V., & Marcantonio, R. A. C. (2007). Effect of Supragingival Plaque Control in Smokers and Never -Smokers: 6 - Month Evaluation of Patients With Periodontitis. *Journal of Periodontology*, 78(8), 1515–1521. <https://doi.org/10.1902/jop.2007.060462>
28. Checchi L, Montevicchi M, Gatto MR, Trombelli L. Retrospective study of tooth loss in 92 treated periodontal patients. *J Clin Periodontol*. 2002;29(7):651–656.
29. Lee CT, Huang HY, Sun TC, Karimbux N. Impact of patient compliance on tooth loss during supportive periodontal therapy: a systematic review and meta-analysis. *J Dent Res*. 2015;94(6):777- 786.
30. McFall WT Jr. Tooth loss in 100 treated patients with periodontal disease. A long-term study. *J Periodontol*. 1982;53(9):539-549.