Evaluation of Therapeutic Effects of MLS® on the Outcomes of Flapless Dental Implant Surgery in Posterior Maxilla of Post Menopause Women.

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ABSTRACT

The purpose of this study is to evaluate the therapeutic effects of MLS® on clinical outcomes of flapless dental implants using split mouth study in post menopause women age 50 years or over. This is a retrospective split mouth study involving the analysis of dental records of post-menopause patients undergoing bilateral implant surgery in the posterior maxilla. Sixty-five implants with no augmentative procedures were selected from 26 patients. Flapless implant technique was used for both sides of the jaw. The patients were divided into two groups: 32 implants in the sham group and, 33 implants in the MLS® group . Treatments were performed at day one, day 7 and day 28. Results were analyzed by: Satisfaction, Implant Survival, Visual Analogue Scale (VAS), Periotest, X-ray assessment. MLS® treatment had slightly better outcomes respect to the control side (survival rate: 100.0% and 96.9%), MLS® group had less pain and swelling and better overall satisfaction at one day and one week (*P<0.05). No difference was observed in bleeding and speech impairment. No significant difference in bone resorption at 3 months. After 6 months, bone change in the control group vs the test group was statistically significant [-0.56 (±0.52) vs +0.12 (±0.50), **P<0.05]. No statistical dissimilarity in Periotest Value (PTV). In flapless implant surgery, MLS® treatment is an adjunctive minimally invasive, and innovative method that can deliver a significantly superior early phase satisfaction, minimal bone loss, less pain, less complications, and similar PTV respect to the control side.

INTRODUCTION

Dental implants have become a household name in dentistry in the last twenty years [1]. Mentioning of dental implants one cannot ignore the term osseo-integration. Osseo-integration implies a series of events that happens directly after insertion of a dental implant into the jaw bone, comprises several steps that can be influenced by multiple elements such as patients' health status, implant sites, surgical techniques, systemic and local conditions, and remedy employed [3, 4, 5]. There are many propositions that survival rates of implant practices significantly reduced with age and certain health conditions, for instance post menopause osteoporosis [6,7]. Poor bone quality and quantity, for example those found in post menopause females, may have a negative result on osseointegration [5,7].]. Normally, in initial phase of osseointegration, radiographical imaging can detect a minute quantity of peripheral bone loss adjoining dental implants, and this is accepted as a norm [8].

Literature review of dental implants use in the posterior maxilla region illustrates that flapless surgery could be a practical and foreseeable therapy for dental implant insertion, showing both efficacy and clinical effectiveness with certain reserve [3,4].

Currently a novel technique is emerging for the management of post-operative complications in post-surgical dental implant placement, involving the use of Multiwave-Locked System (MLS®) laser devices. The distinctive attribute of MLS® Laser Therapy is a patented technology based on two synchronized wavelengths, one emitted from continuous source (808 nm) and the other pulsed (905 nm), which produces an efficient laser for handling pain and inflammation, particularly, in post-operative dental implant placement pain [2]. MLS® laser has several therapeutic applications including sprains, muscle tears, tendinitis, brachial neuralgia, craniofacial pain, bursitis, lumbago, arthritis, articular pain, edema, and hematoma [11-17]. MLS® Laser Therapy exerts its effect via anti-inflammatory and analgesic action [2]. These biological effects are exceptionally valuable in managing of complications such as pain in post dental implant surgery. Implants survival is an essential parameter of evaluation and it was recorded as the existence of the implants at the end of the study [4]. To quantify patient satisfaction, the study used McGill questionnaire on a visual analogue scale (VAS) [9].

The Periotest machine was used to establish the firmness of implants (Periotest Values or PTV) at implant laying stage [8]. Digital

Figure 1 - Overall implant and MLS® treatment procedure: Shining MLS® Mphi laser (lower right corner) at control (sham) and study site after flapless implant placement in Posterior Maxilla in Post Menopause Woman (top right corner)

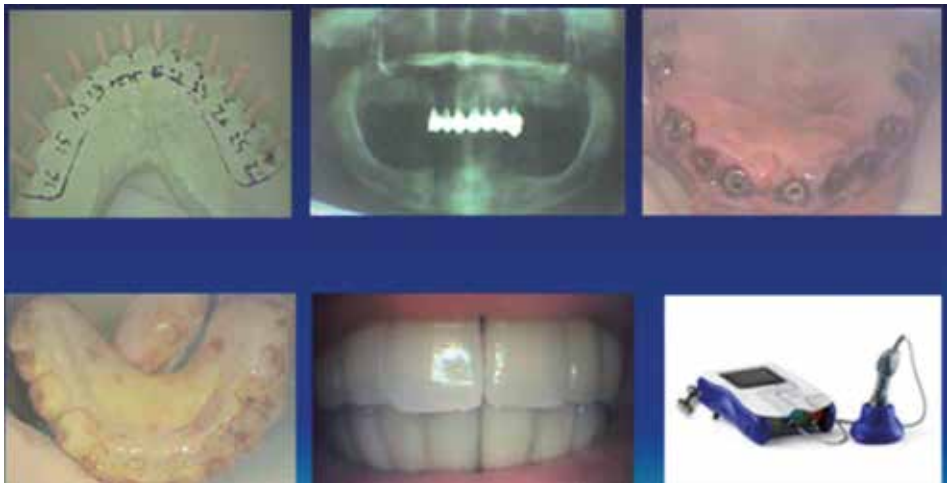
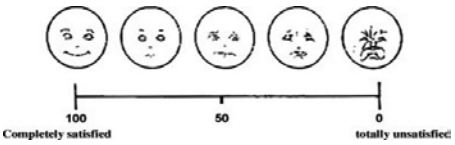


Figure 2 - Pain assessment using Visual Analogue Scale

Figure 3 - A measure of overall satisfaction



x-ray evaluation is the most frequent method for bone quantity or marginal bone height appraisal [4,10]. The purpose of this study was to evaluate the therapeutic effects of MLS® treatment on clinical outcomes of flapless dental implants placed using split mouth study and to measure patients' satisfaction using visual analogue scale and implant survival status in post menopause women age 50 years or over.

MATERIALS AND METHODS

This study is a retrospective split mouth study on the therapeutic effects of MLS® laser on the outcomes of flapless dental implant involving the study of dental records of 26 post-menopause patients undergoing bilateral implant surgery in the posterior maxilla. A total of 65 implants with no augmentative procedures were selected from 26 patients for the study. Flapless implant technique was used for both sides of the jaw. The patients were divided into two groups: the control group had 32 implants and had sham MLS® laser treatment, and the test group consisted of 33 implants treated with MLS® laser at day one, day 7 and day 28. Only those patients with complete dental record were involved in this study. The treatment results were assessed as follows: Satisfaction, Implant Survival, Visual Analogue Scale (VAS), Periotest, X-ray assessment.

MLS® laser therapy was applied with a Mphi D device (ASA S.r.l., Arcugnano (VI) Italy) and using the following protocols: upper posterior teeth region- 24 seconds for each implant site at an intensity of 50% and frequency of 1500 Hz, time used for each application is 6 seconds, and dosage of 3.25 J/cm^2 at 4 locations (buccal, lingual, distal and occlusal aspect of the implant sites). Total energy applied was 6.5 J (Fig. 1). The control group had sham laser treatment and standard management. The degree of postoperative pain and swelling, was recorded for both groups at day one, day 7 (one week) and day 28 (4 weeks).

A. Implant survival

Implants survival was registered as the existence of the implants at the conclusion of the studied interval (28 days).

B. Visual Analogue Scale (VAS) assessment

To determine patient satisfaction, the study used McGill questionnaire on a visual analogue scale (VAS) spans from 1 to 10 of which 1 as having no pain and 10 is the worst pain (Fig. 2). The patients were questioned to register their total satisfaction on sensation of discomfort on a visual-analogue-scale with 0% being totally unsatisfied and 100% being completely satisfied (Fig.3). The total satisfaction VAS scores were recorded for both sides at one day, one week, one month and three months follow up. The VAS scores obtained were analyzed for statistical significance.

C. Periotest values (PTV)

The Periotest device was employed to determine the stability of implants at implant placement stage as well as at subsequent recall appointments at one month and three months. The Periotest's scale varies from -8 to +50. The lesser the Periotest value, the greater is the stability / hampering effect of the test object (tooth or implant). At these assessing visits, healing abutments were connected to those implants which had no

healing posts, and the patient was placed so that the maxilla is in a horizontal position. The Periotest tip was pressed flat right angle to the implant post, and it was positioned as near to the alveolar crest as possible. The implants included in the study were appraised in lateral directions. Acceptable readings were attained only when the device recorded comparable results in three successive readings.

D. X-ray assessment for bone level

A digital periapical X-ray was performed for each implant by means of same holders to measure marginal bone height at the time of surgery, at one month, three months, and six months. The digital X-rays were calibrated to compute the changes in bone height and bone loss. The pertinent implant features such as: site, sizes, design, and other relevant characteristics were recorded. The X-rays were appraised by two experienced and unbiased assessors by means of a grid to determine the dimension of the implant and the proportion of bone loss in millimeters.

E. Statistical analysis

One-way analysis of variance was performed for statistical significance.

RESULTS

The results of this study are found in Table 1. The findings illustrated that MLS® treatment had a slightly better outcome in terms of survival rate (100.0% and 96.9%), respect to the control MLS® treated group reported less pain and swelling [*P<0.05] but no difference in bleeding and speech impairment [P>0.05]. Additionally, MLS® treated group had better overall satisfaction at one day and one week than the control side [*P<0.05]. No significant difference in bone resorption was observed at 3 months [P>0.05]. While, after 6 months, bone change in the control group vs the test group was statistically significant [-0.56 (±0.05) vs +0.12 (±0.02), **P<0.05]. No statistical dissimilarity in Periotest Value (PTV) [P>0.05] was observed.

Table I - Overall results

		Control group Sham laser treated	Test group MLS laser treated	Overall results
Number of implants placed		32	33	65
Number of implants failed		1	0	1
Survival rate (6 months)		96.9%	100.0%	98.5%
Visual Analogue Scale (0 = lowest and 10 = highest)	Pain	3.5 (±1.85)*	1.6 (±1.75)*	2.6 (±1.80)
	Swelling	4.8 (±1.86)*	1.6 (±1.48)*	3.2 (±1.88)
	Bleeding	1.8 (±1.80)	1.4 (±1.74)	1.6 (±1.77)
	Speech impairment	2.7 (±1.30)	2.1 (±1.24)	2.4 (±1.27)
Percentage (%) of Overall Satisfaction (0 = lowest and 100 = highest)	Day 1	71.6 (±7.53)*	95.0 (±8.68)*	83.3 (±8.1)
	Day 7	76.6 (±8.6)*	96.8 (±9.18)*	86.7 (±8.9)
	Day 28	82.2 (±7.4)	97.4 (±8.28)	89.8 (±7.84)
	Day 54 (3 months)	93.6 (±16.4)	98.8 (±17.8)	96.2 (±17.1)
Bone resorption at 3 months in mm (+ = gain and - = loss)		-0.69 (±0.10)	-0.56 (±0.08)	-0.63mm (±0.08)
Bone changes (6 months) in mm (+ = gain and - = loss)		-0.56 (±0.05)**	+0.12 (±0.02)**	-0.22mm (±0.04)
Periotest value [-8 (least mobile) to +20 (most mobile)]	Day 1	-3.40 (±0.84)	-3.68(± 0.89)	-3.574 (±0.87)
	Day 28	-3.40 (±1.18)	-3.62 (±1.54)	-3.51 (±1.36)
	Day 54 (3 months)	-5.18 (±1.46)	-5.48 (±1.56)	-5.33 (±1.51)

Statistical significance: *P<0.05 and **P<0.005

DISCUSSION

This study showed that the application of MLS® treatment after flapless dental implant surgery is a minimal invasive novel technique that can help to reduce pain and swelling after flapless implant placement. This is in line with MLS® laser anti-inflammatory, anti-edema and analgesic effects. Though implant survival rate was better in the laser group as compared to the control counterpart the sample size should be bigger to achieve better power of the study. The outcome of the study also confirmed that MLS® laser can offer an anticipated outcome with greater efficiency and efficacy even in poor quality bone, such as that found in post menopause women.

Visual analogue scale (VAS) is employed extensively for pain measurement, though it is subjective, but continue to be a valuable means for quantifying subjective data, if it is utilized correctly. In this study, it illustrated the greater satisfaction of study group as compared to the control group.

Periotest is useful in calculating the rigidity level of an implant. Though Periotest can identify terminal or unsuccessful implants, it has fundamental disadvantage in recognizing bone quantity in typical osseointegration. Thus, digital imaging seems to be a more reliable method of substantiating peri-implant bone loss. A standardized same designed parallel x-ray holder was used to improve consistency. Even so, digital periapical radiographs along with Periotest apparatus were found to provide the best reliable evaluation of implant condition.

In term of overall satisfaction, as expected the greater difference between the two groups (control and treated) of patient was found in the early stage of the MLS® treatment,

and not at the later stage where the implant wounds were almost healed, therefore, satisfaction rate appeared to be not significantly different. The encouraging results of this study using the state of the art MLS was in line with those found in previous studies [11-17].

CONCLUSION

The application of therapeutic MLS® Laser in dental implant flapless surgery in posterior maxilla of post menopause women, is a an adjunctive minimal invasive, efficacious, and innovative method that can deliver a significantly superior early phase satisfaction, minimal bone loss, less pain, less complications, and similar PTV respect to the control.

REFERENCES

1. Gaviria, L, et al. (2014) Current trends in dental implants. J Korean Assoc Oral Maxillofac Surg. 2014 Apr; 40(2): 50–60.
2. Bennett C AL, Olmos SR (2015) Treatment of Chronic Craniofacial Pain with Mphi Laser and Orthotic. Energy for Health; 13: 4-8
3. Doan N, et al. (2012), Is flapless implant surgery a viable option in posterior maxilla? A review. International journal of oral and maxillofacial surgery, 2012. 41(9): p. 1064-71.
4. Doan N. (2014). An evaluation of clinical procedures used in dental implant treatment in posterior maxilla using flapless technique. Dissertation for the degree of Doctor of Philosophy, Queensland University of Technology.
5. Du Z, Doan N, Ivanovski S, Xiao Y (2011) Serum bone formation marker correlation with improved osseointegration in osteoporotic rats treated with simvastatin. Clin Oral Implants Res, 2011, Nov 10.
6. Mundy G, et al., (1999). Stimulation of bone formation in vitro and in rodents by statins. Science, 286(5446): p. 1946-9.
7. Horiuchi N and T Maeda, (2006) Statins and bone metabolism. Oral diseases, 2006. 12(2): p. 85-101.
8. Huang HL et al. Effects of Elasticity and Structure of Trabecular Bone on the Primary Stability of Dental Implants. Journal of Medical and Biological Engineering, 30(2): 85-89.
9. Sewitch M (2003) Measuring Differences Between Patients' and Physicians' Health Perceptions: The Patient–Physician Discordance Scale Journal of Behavioral Medicine, Vol. 26, No. 3, June 2003.
10. Chen LC, et al. (2008) Comparison of different methods of assessing alveolar ridge dimensions prior to dental implant placement. J Periodontol, 2008; 79(3):401–405.
11. Caruso G, Gervasi S, Salvadori D Physical treatment of post traumatic gonalgia by NIR laser therapy: a case report. Energy for Health, 2012: 9: 15-17.
12. Gworys K, Gasztych J, Puzder A, et al. Influence of Various Laser Therapy Methods on Knee Joint Pain and Function in Patients with Knee Osteoarthritis Ortop Traumatol Rehabil. 2012;14 (3): 269-77
13. Kędzierski T, Stańczak K, Gworys K et al. Comparative Evaluation of the Direct Analgesic Efficacy of Selected Physiotherapeutic Methods in Subjects with Knee Osteoarthritis. Preliminary Report Ortop Traumatol Rehabil. 2012;14 (6):537-44
14. Alayat MS, Ali MM Efficacy of class IV diode laser on pain and dysfunction in patients with knee osteoarthritis: a randomized placebo-control trial Bulletin of Faculty of Physical Therapy 2017; 22:40–45
15. Doan N, Nguyen-Pham L, Liang C, Duong QT. Application of Concentrated Growth Factors (CGF) and Mphi Laser to Treat Defects in the Oral and Maxillofacial Region. A two-case report. Energy For Health 2017;16:4-9.
16. Viliani T. Laserpuncture with MLS® (Multiwave Locked System) system Mphi: safety and clinical efficacy in joint disease, preliminary data. Energy For Health 2014; 13:14-18.
17. Momanu A. Comparison of analgesic and anti-inflammatory effects of the classical low laser therapy and multiwave locked system in inflammations of serous bursae Sports Medicine Journal / Medicina Sportiva, 2013; 9 (4): 2234-224.