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

N. Doan and Q.T. Duong

Abstract

The purpose of this study is to evaluate the therapeutic effects of MLS laser on clinical outcomes of flapless dental implants placed using split mouth study and to measure patients' satisfaction using visual analogue scale in 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 involving the study of dental records of 26 post-menopause of 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 Mphi 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 calculated via key words: Satisfaction, Implant Survival, Visual Analogue Scale (VAS), Periotest, X-ray assessment. Results and discussion: The findings illustrated that therapeutic MLS Laser treatment had a slightly better outcomes as contrast to the control side: survival rate (100.0% and 96.9%), Utilizing VAS (0–10), MLS Laser treatment in test group had less: pain, swelling but no difference in bleeding and speech impairment and had better overall satisfaction at one day and one week than the control side ($*P < 0.05$). No significant discrepancy 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). Conclusion: Therapeutic MLS Laser in implant flapless surgery 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 as contrast to the control side.

Keywords

Laser • Therapeutic • Pain • Dental implants • Flapless surgery • Osseo-integration • Post menopause • Posterior maxilla

N. Doan (✉)
School of Dentistry the University of Queensland, Brisbane, QLD, Australia
e-mail: doanco@bigpond.com.au

Q.T. Duong
Freelance Researcher, Brisbane, Australia

T. Vo Van et al. (eds.), *6th International Conference on the Development of Biomedical Engineering in Vietnam (BME6)*, IFMBE Proceedings 63, https://doi.org/10.1007/978-981-10-4361-1_105

1 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 [2–4]. There are many propositions that survival rates of implant practices significantly reduced with age and certain health conditions, for instance post menopause osteoporosis [5, 6]. Poor bone quality and quantity for example those found in post menopause females may have a negative result on osseointegration [4]. Inferior bone quality are typically seen in post menopause females [6]. 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 [7].

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 [2, 3].

Currently there is an novel technique for management of post-operative complications post-surgical dental implant placement via the use of Multiwave-Locked System laser for instance Mphi laser. The distinctive attribute of MLS® Laser Therapy is the patented wave technology, linking twin wavelengths continuous (808 nm enhanced anti-inflammatory and anti-edema effects) and pulsed (905 nm enhance analgesic effects) waves, producing an efficient laser for handling pain and inflammation, particularly, in post-operative dental implant placement pain [8]. Mphi laser has numerous therapeutic applications including sprains, muscle tears, tendinitis, brachial neuralgia, craniofacial pain, bursitis, lumbago, arthritis, articular pain, edema, and hematoma. MLS® Laser Therapy apply its bio-stimulation influences via its anti-inflammatory and analgesic possessions of the 808 and 905 nm emissions of the laser [8]. These bio-stimulation effects are exceptionally valuable in managing of complications such as pain in post dental implant surgery.

Implants survival is an essential ways to measure the survival of dental implants and it was recorded as the existence of the implants at the end of the studied [3].

To quantify patient satisfaction, the study uses 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 [7].

Digital X-ray evaluation is the most frequent methods for bone quantity or marginal bone height appraisal [3, 10].

The purpose of this study is to evaluate the therapeutic effects of MLS laser 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.

2 Materials and Methods

This study is a retrospective split mouth study on the therapeutic effects of MLS laser on the outcomes of flapless involving the study of dental records of 26 post-menopause of 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 Mphi 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 calculated via key words: Satisfaction, Implant Survival, Visual Analogue Scale (VAS), Periotest, X-ray assessment.

MLS® Mphi laser therapy was used for the study group with the following protocols: Upper and lower wisdom teeth region—24 s for each extraction site at an intensity of 50% and a frequency of 1500 Hz, time used for each application is 6 s, and dosage of 3.25 J/cm^2 at 4 locations buccal, lingual, distal and occlusal aspect of the implant sites. Total of 6.5 J applied (Fig. 1). The control group had sham radiation 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) by the similar two assessors. Only those patients with complete clinical data were included in this study.

2.1 *Implant Survival*

Implants survival was registered as the existence of the implants at the conclusion of the studied interval (1 month or 28 days).

2.2 *Visual Analogue Scale (VAS) Assessment*

To determine patient satisfaction, the study uses 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

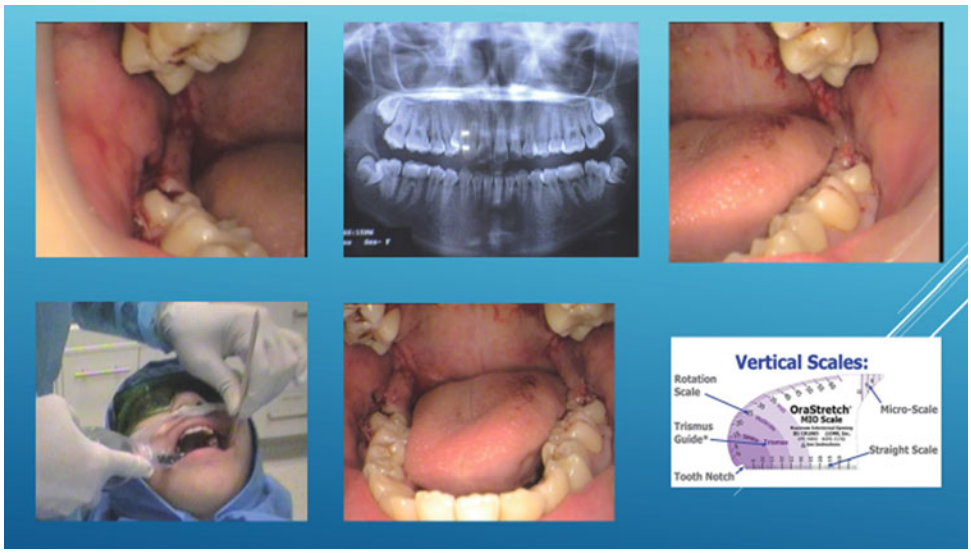

Fig. 1 Shining Mphi laser at control and study site after flapless implant placement in Posterior Maxilla of Post Menopause Women

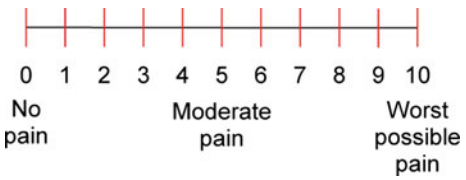

Fig. 2 Pain assessment using Visual Analogue Scale

visual-analogue-scale with 0% being totally unsatisfied and 100% being completely satisfied (Fig. 3). The 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.

2.3 *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 tips was pressed flat right angle to the implant post, and it was positioned as near to the alveolar crest as possible. The entire implants included in the study were appraised in lateral directions. Acceptable readings were attained only when the device recorded the comparable results in three successive readings.

2.4 *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

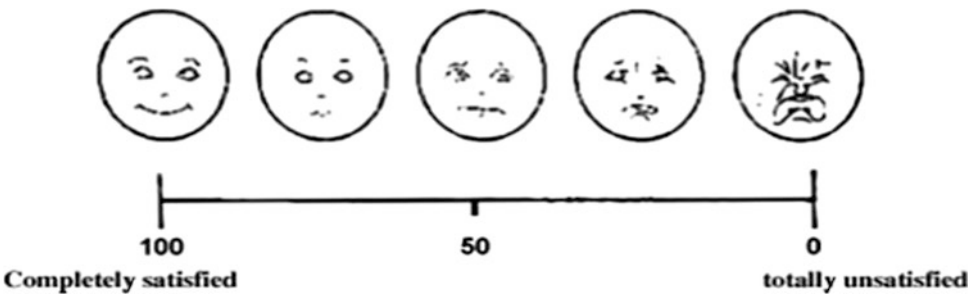

Fig. 3 A measure of overall satisfaction

Table 1 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	2
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 (visual analogue scale 0 = lowest and 100 = highest)	1 day	71.6 (±7.53)*	95.0 (±8.68)*	83.3 (±8.1)
	1 week	76.6 (±8.6)*	96.8 (±9.18)*	86.7 (±8.9)
	1 month	82.2 (±7.4)	97.4 (±8.28)	89.8 (±7.84)
	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)	−0.63 mm (±0.08)
Bone changes (6 months) in mm (+ = gain and − = loss)		−0.56 (±0.05)**	+0.12 (±0.02)**	−0.22 mm (±0.04)
Periotest value [−8 (least mobile) to +20 (most mobile)]	Day 0	−3.40 (±0.84)	−3.68 (±0.89)	−3.574 (±0.87)
	1 month	−3.40 (±1.18)	−3.62 (±1.54)	−3.51 (±1.36)
	3 month	−5.18 (±1.46)	−5.48 (±1.56)	−5.33 (±1.51)

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

by means of a grid to determine the dimension of the implant and the proportion of bone loss in millimeters.

2.5 *Statistical Analysis*

One way analysis of variance was performed for statistical significance.

3 Results

The results of this study are found in Table 1.

The findings illustrated that therapeutic MLS Laser treatment had a slightly better outcomes as contrast to the control side: survival rate (100.0 and 96.9%).

Utilizing VAS (0–10), MLS Laser treatment in test group had less: pain and swelling [*$P < 0.05$] but no difference in bleeding and speech impairment [$P > 0.05$] and had better overall satisfaction at one day and one week than the control side [*$P < 0.05$].

No significant discrepancy in bone resorption at 3 months [$P > 0.05$]. 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) [$P > 0.05$].

4 Disscussion

This study has showed that application of MLS Mphi laser after flapless dental implant surgery is a minimal invasive novel technique that can help to reduce pain and swelling after flapless implant placement. Though implant survival rate was better in the laser group as compare to the control counterpart the sample size should be bigger to achieve better power of the study. It has also reinforced the notion that Mphi laser may offer an anticipated outcome with greater efficiency and efficacy even in poor quality bone such as those found in post menopause women in this study. If the cost of this laser can be reduced then it may be a very useful tool for management of pain after implant surgery.

Visual analogue scales (VAS) are 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 compare to the control group. The 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 though digital X-rays employed for the appraisal in this study dimensional did not the capability to perform three-dimensional assessment. Hence, digital periapical radiographs along with Periotest apparatus were found to provide the best reliable evaluation of an implant's condition, especially, under the effect of MLS Mphi laser in this scenario.

In term of overall satisfaction, patients appeared to be more satisfied in the early stage of the MLS Mphi laser treatment, and not at the later stage when the implants where wound were almost healed then satisfaction rate appeared to be of no difference.

5 Conclusion

Therapeutic MLS Laser in implant flapless surgery 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 as contrast to the control side.

Acknowledgements This research is a self-funded project.

Conflict of Interest The authors declare that they have no conflict of interest.

References

1. Gaviria L et al (2014) Current trends in dental implants. J Korean Assoc Oral Maxillofac Surg 40(2):50–60
2. Doan N et al (2012) Is flapless implant surgery a viable option in posterior maxilla? A review. Int J Oral Maxillofac Surg 41 (9):1064–71
3. 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
4. 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 10 Nov 2011
5. Mundy G et al (1999) Stimulation of bone formation in vitro and in rodents by statins. Science 286(5446):1946–9
6. Horiuchi N, Maeda T (2006) Statins and bone metabolism. Oral Dis 12(2):85–101
7. Huang HL et al (2017) Effects of elasticity and structure of trabecular bone on the primary stability of dental implants. J Med Bio Eng 30(2):85–89
8. Chen LC et al (2008) Comparison of different methods of assessing alveolar ridge dimensions prior to dental implant placement. J Periodontol 79(3):401–405
9. Bennett CA, Olmos SR (2015) Treatment of chronic craniofacial pain with Mphi laser and orthotic. Energy Health 13:4–8
10. Sewitch M (2003) Measuring differences between patients' and physicians' health perceptions: the patient–physician discordance Scale. J Behav Med 26(3)