JO JOURNAL OF OSSEOINTEGRATION periodontics and prosthodontics

Comprehensive management of peri-implant soft tissue defect - a case report

S. SOUNDARAJAN, M. THAMARAISELVAN [1]

Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of medical and technical sciences, Chennai, Tamil Nadu, India
[1]Professor

TO CITE THIS ARTICLE
Soundarajan S, Thamaraiselvan M. A novel comprehensive approach in the management of peri-implant soft tissue defects: A case report. J Osseointegr 2023;15(2):134-138.

DOI 10.23805/JO.2023.356

KEYWORDS Erbium laser, Peri-implantitis, Soft tissue defect.

ABSTRACT

Background Dental implants have become the most accepted treatment option for patients needing tooth replacement because they deliver the best functional and aesthetic results with proper planning and case selection. Apart from achieving osseointegration, healthy and maintainable peri-implant soft tissue is of paramount importance. This case report focuses on the comprehensive management of peri-implant soft tissue recession in relation to implant in #22.

Case report Clinical examination showed more labially placed implant with the prosthesis in relation to #22, with labial gingival recession extending up to the vestibule, exposing three implant threads, with a clinical attachment loss of 7 mm. A combination of non-surgical periodontal therapy (Mechanical debridement using a plastic curette and laser debridement with 2780 nm Er, Cr: YSGG laser, Waterlase, USA) and surgical therapy (implantoplasty, implant surface decontamination with antimicrobial photodynamic therapy - a-PDT using 660 nm diode laser and lateral pedicle flap with sub-pedicle connective tissue graft) was performed. The patient was recalled and the surgical site was re-evaluated after 1 week, 1,3, and 6 months.

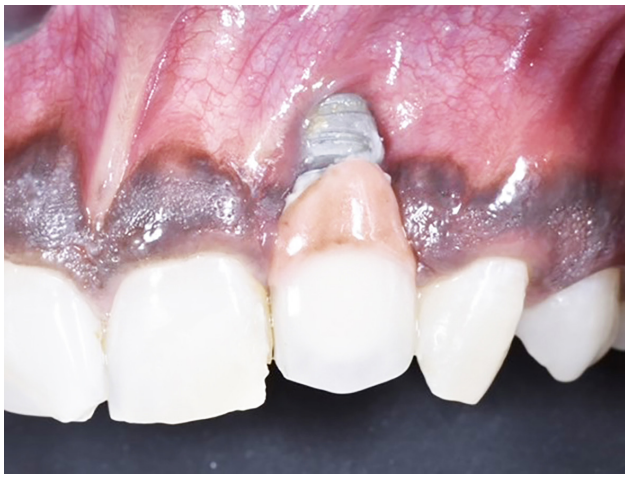
Results The follow-up examination at 1 week revealed mild inflammation and satisfactory healing, with complete coverage of the exposed implant surface. The follow-up examination at 1 week revealed mild inflammation and satisfactory healing, with complete coverage of the exposed implant surface. At the 6th month follow-up, complete coverage was still maintained with more keratinization of the augmented soft tissue.

Conclusion Comprehensive management of peri-implant soft tissue defects is the key to complete soft tissue coverage in the long term, which relies on adequate preoperative assessment, selection of a suitable surgical technique, execution of implant disinfection protocol, and correction of improper prosthetic components.

INTRODUCTION

Dental implants have become the most accepted treatment option for patients needing tooth replacement because they deliver the best functional and aesthetic results with proper planning and case selection (1). With the widespread practice of dental implants, their average success rate is reported to be more than 90% (2–5), which is usually assessed based on osseointegration and healing. An abundance of literature evidence has reported that osseointegration is highly predictable and achievable with proper surgical planning and execution of treatment with adequate protocols. A major concern for the clinicians these days are peri-implant hard and soft tissue defects like midfacial recession, gingival asymmetry, papillary deficit, and implant exposure, which might predispose to both functional and esthetic problems. Among these defects, the most commonly reported one is implant-related midfacial gingival recession which could be due to either anatomic or surgical factors (6–10). Anatomical factors at the implant surgical site may include the thickness of the labial plate, gingival phenotype, and post-surgical bone resorption. The thickness of the labial plate bone and the gingival phenotype together have a considerable influence on the possible gingival recession following implant placement (11). Surgical factors that might lead to recession of the peri-implant soft tissues are usually iatrogenic in nature, therefore they are within the control of the surgeon, and can be avoided to a large extent. This includes the appropriate implant size selection, 3-dimensional position of the implant within the surrounding hard tissue, time of delivery of the prosthesis, contour of the restoration or abutment, and violation of biologic width (12).

The principal factor to be highlighted is the significant relationship between the implant's labio-palatal location and the apical migration of the soft tissue surrounding



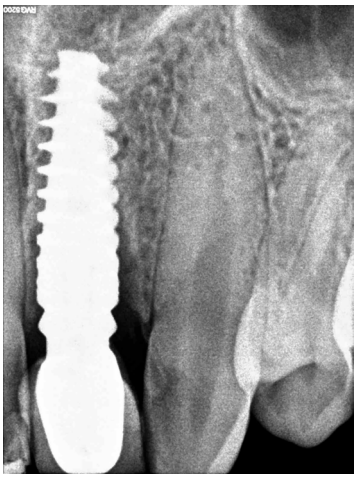


FIG. 1 Intraoral view of the defect at the first visit.

FIG. 2 Intraoral x-ray showing the bone loss in the mesial and distal aspects up to the middle third of the implant.

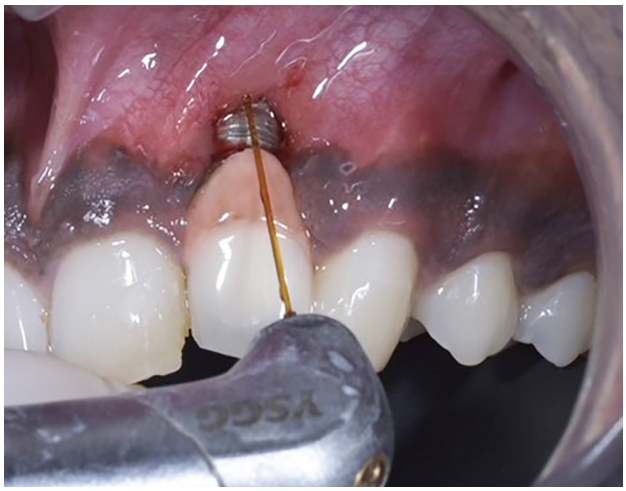


FIG. 3 Detail of laser debridement: the tip was inserted into the base of the pocket.

it. When the residual labial plate following implant placement is of minimal thickness, it exacerbates the amount of resorption during physiological bone remodeling around the implant, leading to significant bone loss. This further directly influences the extent of gingival recession around the implant, causing implant exposure (13). So all these factors influence the long-term survival of dental implants. Thus, apart from achieving osseointegration, healthy and maintainable peri-implant soft tissue is of paramount importance.

Peri-implant soft tissue esthetics involves having a thick gingival biotype, adequate papillary height, and gingival symmetry in harmony with adjacent tissues (14). So any peri-implant soft tissue defects should be managed to improve the survival of the implants. When it comes to restoring aesthetics, it is critical to replicate the form and function of a single tooth, including the papilla and facial gingiva (15).

The present case report focuses on the comprehensive management of peri-implant soft tissue recession in relation to implant in #22.

CASE REPORT

Case presentation

A 24-year-old male subject, referred to the out-patient department at the Saveetha Dental College (Chennai, India) with a complaint of implant exposure in the upper front tooth region for the past 6 months with an unesthetic appearance, especially when smiling. On clinical examination, there was a more labially placed implant with the prosthesis in relation to #22, with labial gingival recession extending up to the vestibule, exposing three implant threads.

The prosthetic crown appeared over-contoured and there was an accumulation of dental plaque around the implant threads. A peri-implant probing depth of 5 mm along the mesial and distal line angle, and clinical attachment loss of 7 mm in relation to #22, with mild inflammation in the peri-implant mucosa and inadequate keratinized tissue on the labial aspect, was present (Fig. 1). There was no evident mobility of the implant. Radiological examination showed a bone loss in mesial and distal aspects up to the middle third of the implant (Fig. 2). Based on both clinical and radiographic findings, peri-implantitis was diagnosed in relation to #22, due to a more labially placed implant.

Case management

The treatment plan was planned and discussed with the patient. It combined non-surgical peri-implant therapy with mechanical debridement (using a plastic curette) and laser debridement with 2780 nm Er, Cr: YSGG laser (Waterlase, USA) followed by surgical therapy with implantoplasty, implant surface decontamination with antimicrobial photodynamic therapy (a-PDT) using 660 nm diode laser and lateral pedicle flap with sub-pedicle connective tissue graft. After obtaining written consent, as part of the preparatory phase, recontouring of the existing over-contoured crown was done, followed by laser debridement using Er, Cr: YSGG laser.

Under local anesthesia (2% lignocaine hydrochloride solution with 1:80,000 adrenaline), laser debridement was performed using 2780 nm Er, Cr: YSGG laser (Waterlase,

USA), with the following settings: 14 mm length, 500 µm diameter radial firing periodontal tip (RFPT5), power 1.5 W, frequency 30 Hz, 50% water, 40% air, 50 mJ/pulse, 140 s pulse duration. The tip was inserted into the base of the pocket, as parallel as possible to the long axis of the implant (Fig. 3). Once the tip made contact with the bone, it was gently withdrawn and moved apico-coronally, and side to side, i.e. either buccolingually or mesiodistally, using slow, smooth overlapping sweeping strokes. This was done until all the contaminated implant surfaces and inflammed pocket surfaces were covered with overlapping strokes.

The patient was recalled after 2 weeks for a surgical soft tissue augmentation procedure (Fig. 4). As the gingival recession defect was deep and wide, with good width of attached gingiva in the adjacent tooth (#23), a lateral pedicle flap was planned. The recipient site #22 was prepared with beveled incisions around the gingival margin to generate a vascularized bed. A pedicle flap was elevated from the adjacent region (#23) by a submarginal incision 1.5 mm from the gingiva edge and a vertical relieving incision on the distobuccal aspect of #23. After exposure of 2-3 mm of bone, a partial-thickness flap was elevated for adequate flap mobility and displacement (Fig. 5). Additionally a tunnel was prepared on the mesial side of the peri-implantsoft tissue defect in relation to #21 without involving the gingival margin. Implantoloplasty of the exposed implant threads was done using a combination of diamond burs to smoothen the implant threads. To eliminate irregularities from the implant surface, an Arkansas stone bur and abrasive-impregnated silicone polisher were used till a smooth surface was observed with the naked eye. During the entire procedure of implantoplasty, copious saline irrigation was done to remove the leached-out titanium and other residual particles.

Plastic hand curettes were used to perform peri-implant supra- and subgingival mechanical debridement, followed by implant surface decontamination using a-PDT, which was done by injecting methylene blue (0.005%) into the deepest buccal peri-implant pocket for 10 seconds. The dye was irradiated with diode laser (660 nm, SiroLaser, Dentsply) with the following settings: continuous wave, 600 µm diameter tip, 150 mW power output, laser energy fluence of 0.0125 J/cm^2, and total energy of 3 joules per site, for a duration of 60 seconds per site. The flexible fiber tip was inserted into the peri-implant pocket and slow, overlapping strokes were given.

Following implantoplasty and a-PDT in the recipient site, the trap door approach was used to obtain a connective tissue graft of the desired size from the right palate (#14 and 15 regions). The graft was subsequently sutured using a 4.0 resorbable suture (VicrylR, Ethicon suture) to the recipient site (#22). The pedicle flap was then sutured to cover the exposed implant, at the level of the cervical third of the crown, using a 4.0 non-resorbable polypropelene (SeamleneR) (Fig. 6). the graft was stabilised at the recipient site by inserting one end of the connective tissue graft into the tunnel prepared mesial to the imp'lant and sutured with pTFE sutures. The rest of the graft is stabilised over the implant surface and distal to it using sling sutures. Postoperative instructions and

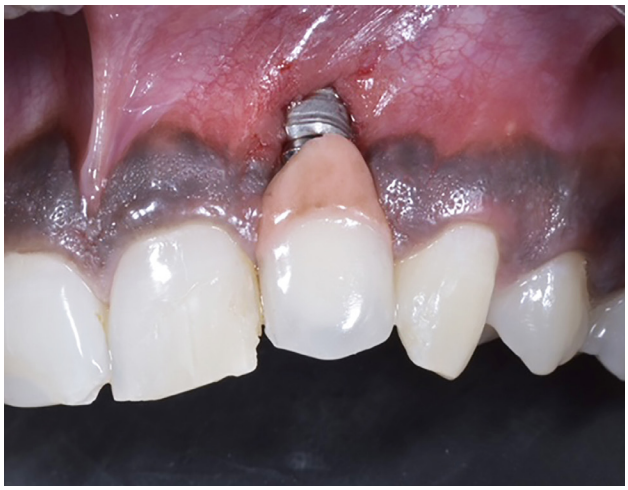


FIG. 4 After 2 weeks surgical recession coverage procedure was performed.

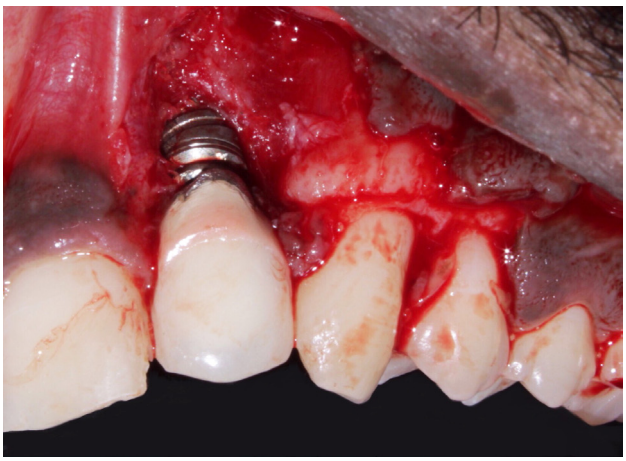


FIG. 5 The exposed implant threads.

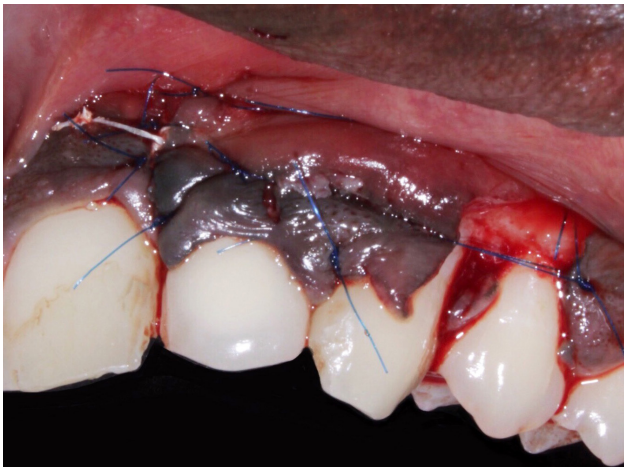


FIG. 6 Intraoral view before pedicle flap was sutured to cover the exposed implant.

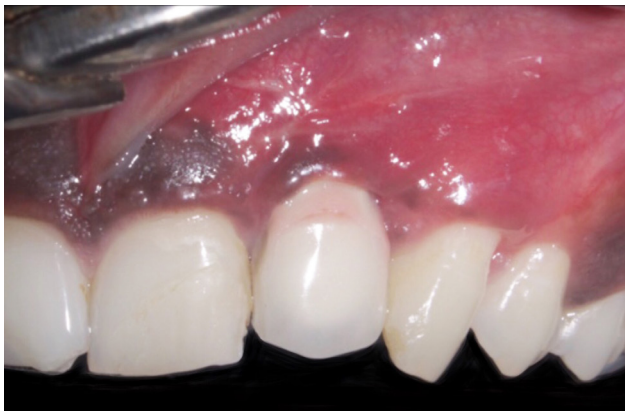


FIG. 7 At the 6-month follow-up, complete coverage was still maintained with keratinization of the augmented soft tissue.

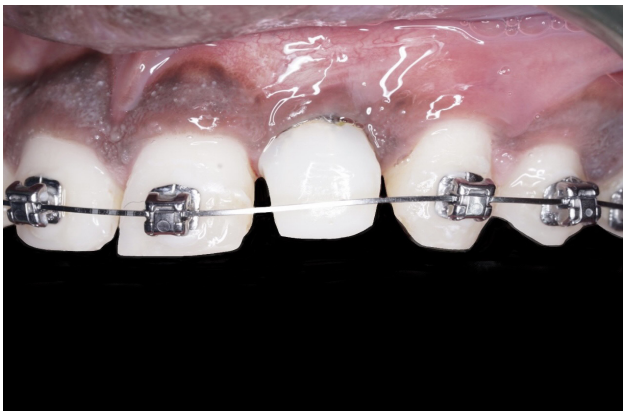


FIG. 8 Further at 1 year follow up, there was an evidence of creeping attachment seen with more matured keratinized tissue.

medications were prescribed and the patient was recalled and the surgical site was re-evaluated after 1 week, 1, 3, and 6 months.

Clinical outcomes

The follow-up examination at 1 week revealed mild inflammation and satisfactory healing, with complete coverage of the exposed implant surface. At the 10-day follow up, suture removal was done and the patient was reinforced on oral hygiene maintenance. This complete coverage of the implant surface (clinical attachment level gain of 7 mm) was maintained till the 1st, 3rd, and 6th month follow up. At the 1-month follow up there was a complete resolution of inflammation, with a reduction in the probing depth to 2 mm, but there was barely any keratinized tissue formation. At the 3-month follow-up, there was evidence of adequate keratinization of the augmented soft tissue, which facilitated oral hygiene maintenance by the patient. The existing crown was replaced with a properly contoured temporary crown. At the 6-month follow-up, complete coverage was still maintained with more keratinization of the augmented soft tissue (Fig. 7). Further at 1 year follow up, there was an evidence of creeping attachment seen with more matured keratinized tissue. (Fig.8)

DISCUSSION

This clinical case report emphasizes the necessity of modifying surgical protocol to correct peri-implant soft tissue defects that are very challenging and unpredictable due to the complex anatomic factors (exposed impant threads) and biologic factors (avascular implant surface, contaminated implant surface, absence of periodontal ligament to ensure collateral vascular supply to the graft). The technique described here might ensure predictable soft tissue augmentation around the implant. A good peri-implant soft tissue dimension facilitates good oral hygiene and extends the survival of the implant. Corrective soft tissue procedures around implants are very challenging as there is a lack of adequate vascularity necessary for graft survival (16).

In the present case, there was complete soft tissue coverage of the exposed implant surface, by a combination of non-surgical and surgical treatment modalities, that was maintained up to the 6-month follow-up. This was supported by two other studies where a mean coverage of peri-implant soft tissue recession of 86-89.6% was reported (17, 18). As in the present case, implant retrieval was not considered as a treatment choice, since there was a total lack of keratinized tissue to cover a newly placed implant or any hard tissue graft. Furthermore, the same reason precluded hard tissue augmentation, and only soft tissue augmentation was planned in the present case.

In the present case, in the preparatory phase, implantoplasty of the exposed implant threads was performed to obtain a smooth implant surface, helping the new attachment of soft tissues. This was concurrent with an earlier report showing that a combination of implantoplasty with grafting procedures resulted in complete soft tissue coverage (19,20). Additionally, in the present case the application of PDT using diode laser for debridement of the inner epithelial lining and disinfection of the exposed implant surface using Er, Cr: YSGG laser was performed, which aided in a CAL gain of 7 mm. This result is similar to earlier reports on adjunctive use of diode and Er, Cr: YSGG laser that improved clinical attachment levels in peri-implantitis (21). Apart from complete coverage, it was observed that results obtained after surgery were maintained up till the 6-month follow-up. This is probably due to the firm epithelial attachment between the implant and soft tissues, facilitated by a combination of implantoplasty and PDT.

Irrespective of the wide and deep soft-tissue defect, complete soft tissue coverage was achieved in our case due to the selection of appropriate surgical techniques. Sub-pedicle CTG technique was chosen over a free gingival graft to achieve the harmonious gingival color that matches with the adjacent tissue since the defect was in the esthetic zone. The recipient site preparation involved

creating a tunnel mesial to the soft tissue defect which receives the CTG. The tucking of one end of the graft into the tunnel ensures adequate vascular supply to the graft to compensate for the avascular implant surface and lack of collateral vascular supply from the periodontal ligament. Also, the pedicle flap assured predictable survival of the CTG, which was placed over an avascular implant surface. This is in accordance with the study by Panda et al., that reported pedicle graft techniques to produce predictable survival of the graft and increase in keratinized gingival width (22). Also in the present case, the keratinization of the tissues began at 3 months, which helped in withstanding the mechanical trauma during oral hygiene maintenance, thus aiding in the maintenance of complete soft tissue coverage up to 6 months after surgery.

CONCLUSION

The present case report emphasizes the importance of a comprehensive management of peri-implant soft tissue defects with adequate preoperative assessment, selection of suitable surgical technique, execution of implant disinfection protocol, and correction of improper prosthetic components, altogether contributing to complete soft tissue coverage with long-standing results.

Conflict of interest

None.

Acknowledgements

The authors acknowledge Thamaraiselvan Murugan as the corresponding author.

REFERENCES

1. Belser UC, Buser D, Hess D, Schmid B, Bernard J-P, Lang NP. Aesthetic implant restorations in partially edentulous patients ? a critical appraisal. Periodontology 2000 1998;17:132–150.
2. Zucchelli G, Mazzotti C, Mounssif I, Mele M, Stefanini M, Montebugnoli L. A novel surgical-prosthetic approach for soft tissue dehiscence coverage around single implant. Clin Oral Implants Res 2013 Sep;24(9):957-62.
3. Khoury F. Bone and soft tissue augmentation in implantology. Quintessenz Verlag; Berlin: 2021.
4. Cardaropoli G, Lekholm U, Wennstrom JL. Tissue alterations at implant-supported single-tooth replacements: a 1-year prospective clinical study. Clinical Oral Implants Research 2006;17:165–171.
5. Evans CDJ, Chen ST. Esthetic outcomes of immediate implant placements. Clin Oral Implants Res 2008 Jan;19(1):73-80.
6. Brunsvold MA. Gingival recession around implants: a 1-year longitudinal prospective study. Implant Dent 2001;10:46.
7. Juodzbalys G, Wang H-L. Soft and hard tissue assessment of immediate implant placement: a case series. Clin Oral Implants Res2007;18:237–243.
8. Yoshino S, Kan JYK, Rungcharassaeng K, Roe P, Lozada JL. Effects of connective tissue grafting on the facial gingival level following single immediate implant placement and provisionalization in the esthetic zone: a 1-year randomized controlled prospective study. Int J Oral Maxillofac Implants 2014;29:432–440.
9. Rouck TD, De Rouck T, Collys K, Wyn I, Cosyn J. Instant provisionalization of immediate single-tooth implants is essential to optimize esthetic treatment outcome. Clin Oral Implants Res 2009 Jun;20(6):566-70.
10. Pellicer-Chover H, Peñarrocha-Diago M, Aloy-Prosper A, Canullo L, Peñarrocha-Diago M, Peñarrocha-Oltra D. Does apico-coronal implant position influence peri-implant marginal bone loss? a 36-month follow-up randomized clinical trial. J Oral Maxillofac Surg 2019;77:515–527.
11. Nisapakultorn K, Suphanantachat S, Silkosessak O, Rattanamongkolgul S. Factors affecting soft tissue level around anterior maxillary single-tooth implants. Clin Oral Implants Res 2010;21:662–670.
12. Saadoun AP. Esthetic Soft Tissue Management of Teeth and Implants. Wiley: Hoboken; 2013. p 20–65 (The dentoalveolar gingival unit).
13. Araujo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. J Clin Periodontol 2005;32:212–218.
14. Al-Sabbagh M. Implants in the Esthetic Zone. Dent Clin North Am 2006;50:391–407.
15. Lazzara RJ. Effect of implant position on implant restoration design. J Esthet Restor Dent 1993;5:265–269.
16. Cosyn J, De Bruyn H, Cleymaet R. Soft tissue preservation and pink aesthetics around single immediate implant restorations: a 1-year prospective study. Clin Implant Dent Relat Res 2013;15:847–857.
17. Roccuzzo M, Dalmasso P, Pittoni D, Roccuzzo A. Treatment of buccal soft tissue dehiscence around single implant: 5-year results from a prospective study. Clin Oral Investig 2019;23:1977–1983.
18. Roccuzzo M, Gaudioso L, Bunino M, Dalmasso P. Surgical treatment of buccal soft tissue recessions around single implants: 1-year results from a prospective pilot study. Clin Oral Implants Res 2014;25:641–646.
19. Monje A, Pons R, Amerio E, Wang H, Nart J. Resolution of peri-implantitis by means of implantoplasty as adjunct to surgical therapy: A retrospective study. J Periodontol 2022;93:110–122.
20. Suh J-J, Simon Z, Jeon Y-S, Choi B-G, Kim C-K. The use of implantoplasty and guided bone regeneration in the treatment of peri-implantitis: two case reports. Implant Dent 2003;12:277–282.
21. Sivaramakrishnan G, Sridharan K. Photodynamic therapy for the treatment of peri-implant diseases: A network meta-analysis of randomized controlled trials. Photodiagnosis Photodyn Ther 2018:21:1–9.
22. Panda S, Del Fabbro M, Satpathy A, Das AC. Pedicled buccal fat pad graft for root coverage in severe gingival recession defect. J Indian Soc Periodontol 2016;20:216–219.