

Treatment of Peri-implantitis with Tongue-thrust by Cumulative Interceptive Supportive Therapy Protocol: A Case Report

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ABSTRACT

Periimplantitis is an inflammatory condition with soft-tissue inflammation along with subsequent loss of supporting bone around an implant. The present case report portrays the complete diagnosis and treatment of a patient with a loose implant-supported prosthesis. A 23-year-old male patient reported with loosened prostheses with respect to teeth #11 and #21-23. On intra-oral and radiographic examination, the case revealed peri-implantitis with implants related to #21-23. The patient also had a tongue thrust habit, which exerted extra pressure on maxillary anterior implants, causing their loosening. First, nonsurgical treatment, i.e., debridement and disinfection of implants with titanium curettes, was rendered. Surgical treatment was done by CIST Protocol D with soft-tissue diode laser and Calcium phosphosilicate putty bone graft. A habit-breaking appliance, i.e., a tongue crib, was also provided to the patient. Three- and six-month clinical and radiographic follow-up views have portrayed successful re-osseointegration with concerned teeth, resulting in full return of function and fulfilling the patient's aesthetic demands too.

Keywords: Bone grafting, Curettage, Dental implants, Diode laser, Peri-implant bone defects, Mechanical debridement, Non-surgical approach, Nova bone putty, Suprastructure, Tongue crib

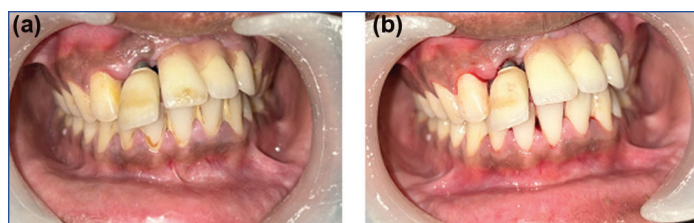
CASE REPORT

A 23-year-old male patient reported to the Department of Periodontology with the chief complaint of loosening of two implant-supported prostheses in the upper front region of the jaw for the past one month.

On intraoral examination, the authors found that three implant placements were done in the concerned region and prostheses of teeth #11 and #21-23 were given three years ago. Teeth # 11, 21, 22 and 23 were implant-supported; out of which 11 was on the verge of exfoliation [Table/Fig-1a]. The patient also had a tongue thrust habit contributing to untoward pressure to the prostheses, leading to loosening of teeth and moving the same in forward, outward and upward directions. Patient's medical history was non-contributory; he was a non-smoker who sought treatment that would make his prostheses stable.



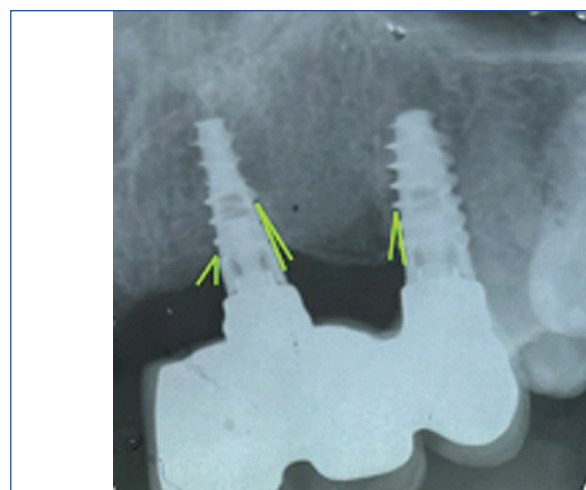
[Table/Fig-2]: Implant supported tooth #11 avulsed.



[Table/Fig-1]: Pre-operative clinical view: a) Before phase I therapy with local factors and loose implant-supported prostheses with #11 and #21-23; b) After scaling and root planing and removal of local factors.

Patient reported next day with exfoliated implant and crown of 11 [Table/Fig-2].

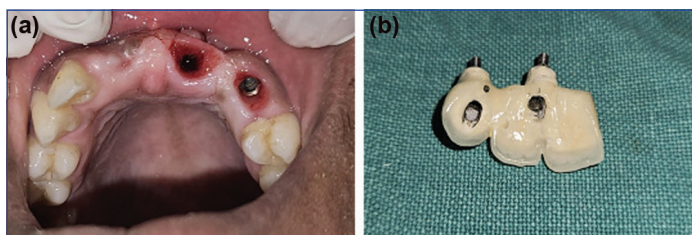
Pre-operative Peri-Implant Probing Pocket Depths (PPPD) could not be assessed at this point of time because prosthesis was adapted tightly on peri-implant tissues. Intraoral Periapical Radiograph (IOPA) (long cone paralleling technique) of 21 and 23 region showed cup-shaped defects around implants [Table/Fig-3].



[Table/Fig-3]: Cup-shaped peri-implant lesions around implant w.r.t #21 and 23 and green arrows indicate angular bone loss around implants.

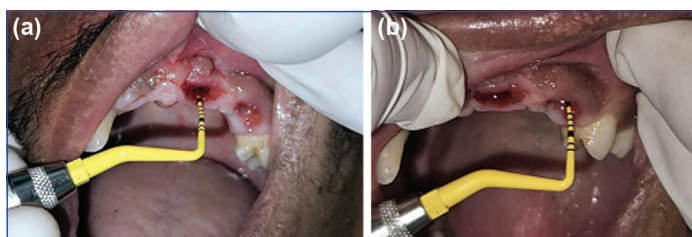
The present case was categorised into early peri-implantitis [1], Class Ib [2], Class II [3] and the therapy for peri-implantitis was planned according to the CIST Protocol D [4]. Orthodontic consultation for the correction of tongue thrust was also sought. The authors obtained written informed consent from the patient for employment of diagnostics, treatment modalities and photographs.

Full mouth supra- and sub-gingival scaling and root planing and necessary blood investigations such as Complete Blood Count (CBC), Random Blood Sugar (RBS), required pre-operatively were done. Then, a complete treatment plan was explained to the patient, which was carried out according to the CIST protocol D, including mechanical debridement with titanium curettes, regeneration, along with antiseptic and antibiotic therapy. Supra-structure over implants in teeth # 21 and 23 was removed [Table/Fig-4a,b].



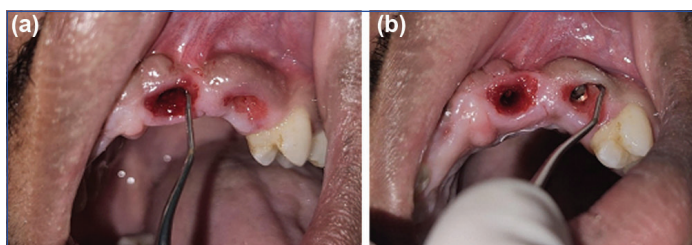
[Table/Fig-4]: (a) Suprastructure was removed. (b) Image of suprastructure

Pre-operative clinical status showed inflamed peri-implant soft-tissues, presence of Bleeding On Probing (BOP), having plaque index scores of 2 (Turesky-Gilmore-Glickman modification of Quigley-Hein Plaque Index, 1970), increased PPPD (≥ 6 mm), which were assessed with plastic periodontal probe (Colorvue Periodontal Probe, Hu-Friedy®) [Table/Fig-5].



[Table/Fig-5]: Peri-Implant Probing Pocket Depth (PPPD) measurement (using Colorvue Plastic Periodontal Probe, HuFriedy®); (a) PPPD w.r.t. #21 - 6 mm and (b) PPPD w.r.t. #23 - 6 mm.

Percussion test revealed a metallic sound with both implants, indicating that a breach in osseointegration was in early stages [5]. Implant surfaces were debrided with titanium curettes (Titanium Curettes no.3,4; Osung®) [Table/Fig-6] followed by irrigation with normal saline, dried with autoclaved gauze, then laser therapy was employed using 980 nm diode laser in pocket sterilisation contact mode (10 Watts Laser multipurpose unit, IMDSL®).



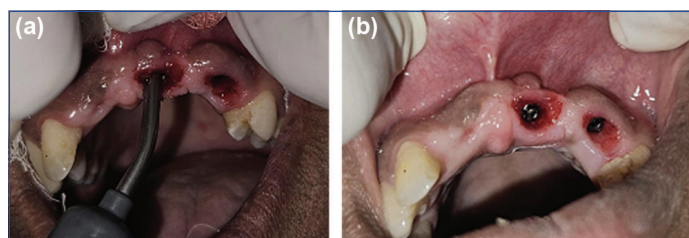
[Table/Fig-6]: (a) Debridement w.r.t. #21; (b) Debridement w.r.t. #23.

Laser irradiation with a power of 1W in pulsed mode was applied to the implant holding the fibre-optic electrode parallel to the degranulated implant surface. Each affected surface was irradiated three times, for 10 seconds, moving from one end and encircling the whole implant, keeping in mind that the base of the peri-implant pocket was at least 1 mm from the tip of the laser; as performed by Renvert S et al., and Papadopoulos CA et al., [Table/Fig-7] [6,7].



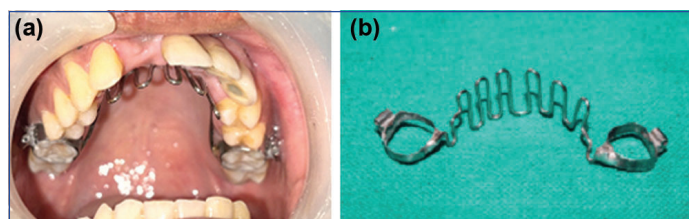
[Table/Fig-7]: Laser irradiation - pocket sterilisation treatment mode.

Following this, regenerative treatment was done by placing Calcium phospho-silicate putty bone graft material (Nova Bone Dental Putty®) with the nozzle attached to the carpule; then helping its insertion into the peri-implant area with thin-beaked non-toothed tissue forceps and very small saline-soaked cotton pellets) around the implant surface [Table/Fig-8].



[Table/Fig-8]: Bone graft placement: (a) Intraoperative; and (b) Immediate postoperative

Bone graft retention was possible without sutures, as it was a closed approach to treating peri-implantitis in narrow (width ≤ 3 mm) angular defects without flap incisions, which would have otherwise caused bone resorption with an open surgical approach [8]. Suprastructure was rescrewed at its original position with an implant driver in the implant kit (Noris®), further enhancing retention of the bone graft. The abutment screws of #21 and 23 were then concealed with Teflon tape and dental composite restoration. It was ensured that there was enough clearance between the crowns and their antagonists. Habit-breaking appliance, i.e., tongue crib fabricated by a skilled orthodontic technician, under the guidance of an orthodontist [Table/Fig-9a,b] was delivered to the patient.

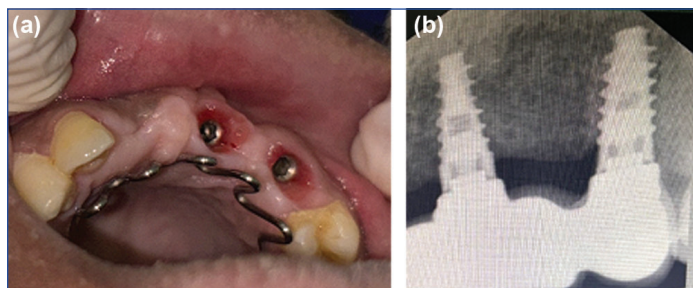


[Table/Fig-9a,b] Suprastructure was placed and the tongue crib was delivered to the patient on the same day.

Postoperative and habit-breaking instructions, along with antibiotic and analgesic coverage, were given. Oral hygiene maintenance education was given to the patient and motivation was provided for the same. He was advised to take Amoxicillin 500 mg TID, Metronidazole 400 mg TID, Aceclofenac 100 mg + Paracetamol 325 mg BD and Pantoprazole 40 mg OD one day before and two days postoperatively; avoid spitting for 24 hours and apply ice-pack on and off intermittently once an hour for 24 hours to avoid bleeding, swelling and pain by vasoconstriction [9,10]. Patient was instructed to have a soft diet, avoid hot, hard and spicy food; avoid biting with

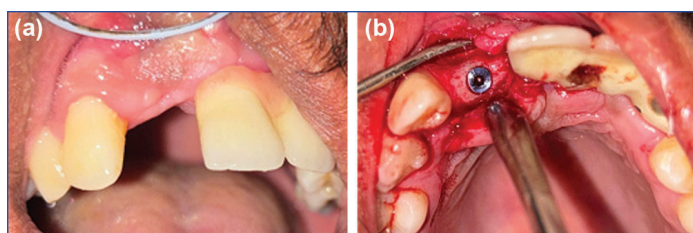
anterior teeth. Patient was advised to maintain oral hygiene and rinse twice a day with 0.2% chlorhexidine gluconate solution for two weeks after 24 hours.

Three and six-month clinical and radiographic follow-ups demonstrated resolution of clinical inflammation, absence of BOP and reduction in PPPDs in addition to beautiful radiographic bone fill [Table/Fig-10a,b].

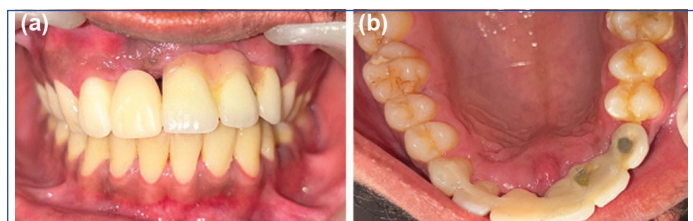


[Table/Fig-10]: Six months postoperative images: (a) Clinical; and (b) Intraoral periapical radiograph showing healing around the implants.

Implant placement with #11 was done. As immediate loading of the implant could not be done for reasons of osseointegration, a temporary prosthesis with a prefabricated acrylic crown (for concerns of aesthetics) was retained with a fibre splint (InFibra® reinforcement ribbon and retention) [Table/Fig-11,12]. Permanent restoration will be done after osseointegration of the implant in #11, tentatively, in three months.



[Table/Fig-11]: Implant placement #11; (a) Pre-operative clinical view; and (b) Implant placement.



[Table/Fig-12]: Temporary prosthesis with fiber splint #11; (a) Buccal view; and (b) Palatal view.

DISCUSSION

Use of titanium dental implants for reconstructing lost dentition has demonstrated a high degree of success in achieving osseointegration and long-term predictability. Implant-related complications, both biological and mechanical, do occur, namely peri-implant diseases [11]. Peri-implantitis is an inflammatory phenomenon with soft-tissue inflammation along with subsequent loss of supporting bone around an implant [12]. The most common defect is diagnosed radiographically as typical saucer-shaped destruction of the crestal bone. Crestal bone loss on an average of 0.9-1.6 mm is noted during the first post-surgical year and then a yearly loss of 0.015-0.02 mm is observed [13]. According to the American Academy of Periodontology (AAP) and European Federation of Periodontology (EFP), 2017 [14] for diagnosis and treatment of peri-implantitis, peri-implant health and disease are classified into four groups: a) Peri-implant health characterised by absence of BOP, erythema, swelling and suppuration; b) Peri-implant mucositis indicates bleeding on gentle probing, erythema, swelling, suppuration and may/may not portray increase in Pocket Depth (PD) as compared to previous examination; c) Peri-implantitis depicting radiographic bone loss,

presence of BOP, erythema, swelling, suppuration and increased PD since previous examination; d) Peri-implantitis with inadequate baseline records identified by bone loss ≥ 3 mm apical from crest and PD ≥ 6 mm.

Various peri-implantitis classifications have been proposed for diagnosis and treatment: Stuart F and Paul F 2012 provided a standardised classification describing about clinical and radiographic status of implant [1]: Early peri-implantitis (PD ≥ 4 mm, BOP and/or suppuration on probing, bone loss ranging from 25% to 50% of the implant length), moderate peri-implantitis (PD ≥ 6 mm, BOP and/or suppuration on probing, bone loss 50% of the implant length), and advanced peri-implantitis (PD ≥ 8 mm, BOP and/or suppuration on probing, bone loss $>50\%$ of the implant length). Monje A et al., 2019 [2] classified the peri-implantitis defects into three major defect categories: Class I—infraosseous; Class II—horizontal; Class III—Combination of class I and II, which were then subclassified into: (a) dehiscence; (b) 2/3-wall; and (c) circumferential-type defect. Tinti C et al., classified peri-implantitis defects into four categories: Class 1 shows slight horizontal bone loss with minimal peri-implant defect, Class 2 - Moderate horizontal bone loss with isolated vertical defects, Class 3 - Moderate to advanced horizontal bone loss with broad circular bony defects, Class 4 - Advanced horizontal bone loss with broad circumferential vertical defects, as well as loss of oral and/or vestibular bony wall [3].

Bacterial biofilms are the primary aetiological factor for the initiation and progression of this condition. However, once peri-implantitis has been established, the cardinal aim of therapy consists of disruption of biofilm adhered to the implant surface to resolve the inflammation [15].

Mombelli A 2002 put forward five considerations in therapy of peri-implantitis [16]: i) Removal/disturbance of bacterial biofilm in peri-implant pocket; ii) Decontamination & conditioning of surface of implant; iii) Correction of implant sites by reduction/elimination to make site self-cleansable; iv) Setting up of an efficient plaque control regimen to prevent mucositis and reinfection of residual pockets; and (v) Re-osseointegration of bone.

CIST protocol suggested by Lang NP et al., 2004 describes a systematic approach for treating peri-implantitis [4]:

Treatment protocol A (mechanical debridement): For cases with evident plaque and/or calculus deposits adjacent to only slightly inflamed peri-implant tissues (BOP is positive, PD ≤ 3 mm).

Treatment protocol B (antiseptic treatment): It is performed when, in addition to plaque and BOP, PD is 4-5 mm.

Treatment protocol C (antibiotic treatment): When PD > 5 mm, then, along with protocols A and B, an antibiotic is administered systemically or locally to eliminate gram-negative anaerobic bacteria.

Treatment protocol D (regenerative or resective therapy): After achieving infection control successfully by protocols A, B and C, bony support of the implant is restored by means of resective/regenerative techniques.

The present case fell into type d) peri-implantitis with inadequate baseline records. It was diagnosed and treated successfully, as mentioned above in the case report.

Corroborating findings of other authors related to this topic, diode lasers are among the preferred lasers in therapy for peri-implant diseases [17-20]. Alpaslan Yayli NZ et al., suggested that the use of erbium, chromium-doped: yttrium, scandium, gallium, garnet (Er, Cr: YSGG) laser, in addition to mechanical treatment, helps to achieve more efficient results at clinical and molecular levels as compared with the diode laser [18]. But, Ladiz MA et al., in their study, reported that a diode laser at 940-nm dose had an inhibitory effect on the viability of gingival fibroblasts, which might improve implant stability [21]. Similarly, Mettraux GR et al., reported that the application of 810-nm diode laser to peri-implant sites for 30

seconds at baseline and after seven and 14 days was significantly beneficial compared to mechanical debridement alone [19]. Based on these different trials, in this case, the authors used a 980 nm diode laser along with minimally invasive regenerative therapy and achieved results (reduction in peri-implant inflammatory signs and symptoms and pocket depths) similar to those reported by Lee J et al., by minimally invasive therapy along with the use of a titanium brush for debridement of peri-implant plaque [8].

Tamim AN et al., in their case report, treated peri-implantitis using the CIST protocol, which successfully controlled the infection and bone loss around implants [22]. The article also highlighted the importance of allowing adequate time for the CIST protocol to show the effects in managing a failing implant.

In this case, while plaque was the primary etiologic factor in the pathogenesis of peri-implantitis, tongue thrust habit also contributed significantly to the condition. Diagnosis of this habit was made by the periodontists (first and the second authors) when the patient reported with loose implants. The patient, while swallowing saliva, was pushing implant-supported prostheses in forward, upward and outward directions. As rightly mentioned by Ray HG and Santos HA in their article [23], in normal swallowing, the dorsum of the tongue is in contact with the hard and soft palates, exerting its pressure against them in upward and lateral directions. Its tip and edges do not protrude against anterior teeth at any point in time. The tip does not come forward ahead of the palatal gingival margins of maxillary incisors, and also does not rest on incisor teeth. On the contrary, in tongue-thrusting cases, the tongue lies flat in the mouth instead of arching up in the palatal vault. Due to this, it needs more room laterally, hence, protrudes anteriorly, causing the maxillary anteriors to be pushed forward, upward and outward.

In the present case, a habit-breaking appliance (tongue crib) was delivered on the day of treatment of peri-implantitis with soft-tissue diode laser and regenerative therapy and will be continued until eight to nine months from day one, as suggested by the respective orthodontist.

CONCLUSION(S)

The present case was diagnosed as failing implants and treated by CIST Protocol D with soft-tissue diode laser and regenerative method with the use of Calcium phosphosilicate putty bone graft, along with a break in the habit of tongue thrust. Follow-up clinical and radiographic views have portrayed successful re-osseointegration with concerned teeth, resulting in full return of function and fulfilling the patient's aesthetic demands, too.

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