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IP Annals of Prosthodontics and Restorative Dentistry

Journal homepage: https://www.aprd.in/

Case Report

Prosthetic rehabilitation with implant-supported fixed prosthesis in a completely edentulous patient: A clinical report

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ARTICLE INFO

Article history:
Received 01-05-2023
Accepted 02-06-2023
Available online 15-06-2023

Keywords:
Basal implants
Immediate loading
Fixed prosthesis

ABSTRACT

Objective: To present clinical strategies for prosthetic rehabilitation of completely edentulous patients using immediate-loading basal implants.

Case Report: A 58-year-old female patient was referred to the Department of Prosthodontics for restoration of her completely edentulous maxilla and mandible with a fixed full-arch implant-prosthetic rehabilitation. Since the patient lacks adequate bone in the posterior maxilla and is not willing to undergo a removable interim prosthesis, an immediate loading protocol along with 8 single-piece basal implants, including 2 pterygoid implants in the maxillary arch and 6 single-piece basal implants in the mandibular arch, was selected as the treatment option, followed by an acrylic provisional restoration. Four months later, a definitive fixed implant-supported prosthesis was delivered.

Conclusion: This treatment strategy may be considered for rehabilitating patients with atrophic ridges demanding fixed provisional prostheses throughout the healing period and can be employed even in immediate implant placement after extraction.

1. Introduction

Rehabilitating a completely edentulous patient with a fixed implant-supported prosthesis requires a carefully designed and well-executed treatment strategy. The transition from a failing natural dentition to an implant-supported fixed prosthesis poses various challenges in treatment planning. Branemark's original surgical protocol involved a healing period where implants had to be submerged within the bone for 4-6 months before loading.[1] Fully or partially edentulous patients had to refrain from wearing dentures for two weeks following surgery and spend an extended period wearing a removable prosthesis during this healing phase. Later on, Ledermann introduced an immediate loading protocol to surmount these shortcomings, and it is well documented that this period is not necessary for implant success, provided factors contributing to bone-to-implant healing are given paramount importance.[2] The survival rate of immediately loaded implants is comparable to the long-term outcomes achieved with the conventional 2-stage implant protocol.[2–4] A sufficient bone quantity is required in the conventional surgical approach (at least 13–15 mm length and 5-7 mm width) for a successful treatment outcome.[5] Successful osseointegration with immediately loaded implants requires excellent primary stability, prolonged implant stabilization by splinting during the healing phase, controlled occlusion, and a biocompatible prosthetic material.[6] The implant-bone interface will be characterized by noncalcified, collagenous, poorly vascularized scar tissue if there is excessive relative motion (macro motions) that exceeds 150 mm.[7–9] A rough implant surface is advised to prevent the detrimental effects of micromotions and to prevent fibrin clot adherence on the implant surface during the early stages of recovery.[10]

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https://doi.org/10.18231/j.aprd.2023.023

Primary implant stability is influenced by bone quality and quantity, implant design, and surgical technique. To obtain adequate primary implant stability, dentists must modify the drilling technique and fixture selection for the clinical scenario based on the type and quantity of the bone.[11] However, in patients with atrophied jaw bones, implant placement is difficult, especially if immediate loading needs to be implemented. In such cases, alternative treatment options such as bone augmentation techniques, bone regeneration techniques, maxillary sinus lift procedures, etc. need to be considered. Basal implants and pterygoid implants can be contemplated as an alternative treatment strategy to avoid the risks of extensive surgical procedures requiring multiple surgeries, eliminating patient discomfort and treatment expenditure. The basal bone, which is less prone to resorption and infection, possesses a high load-bearing capacity so that the basal implants can be immediately loaded.

The purpose of this case report was to describe the oral rehabilitation of an edentulous patient with an atrophied maxilla and mandible using a fixed implant-supported prosthesis utilizing an immediate loading protocol and basal implants, thus eliminating the necessity of using a removable provisional prosthesis.

2. Case Report

A 58-year-old female patient was referred to the Department of Prosthodontics, Government Dental College, Trivandrum, for restoration of her completely edentulous maxilla and mandible with a fixed full-arch implant-prosthetic rehabilitation. The patient had been completely edentulous for one year and according to the patient's history, she had undergone numerous dental procedures to save her remaining teeth before becoming completely edentulous. Most of her teeth were removed due to severe decay. Extraoral examination revealed no facial asymmetry, swelling, or palpable lymph nodes with a convex facial profile. No abnormalities were detected on the TMJ examination. Intra-oral examination disclosed a well-healed, completely edentulous maxillary and mandibular arch covered by adequate attached and keratinized mucosa (Figure 1) and a proclined premaxilla, indicating skeletal class II relation. A detailed diagnostic work-up was carried out, including panoramic X-rays, cone beam computed tomographic evaluations, and prosthodontic, and implant-surgical evaluations. Computed tomograms and panoramic radiographs were used to support the clinical information that was obtained. Radiographic findings revealed insufficient bone height in the posterior maxilla in the sinus region and the posterior mandible bilaterally (Figure 2). A comprehensive treatment plan was subsequently proposed as the patient insisted on a fixed prosthesis, which is the least traumatic, so that the treatment could be completed in a short period of time. The patient agreed to have maxillary and mandibular fixed implant-supported prostheses after listening to the advantages, disadvantages, and other considerations of various treatment alternatives.

2.1. Initial phase

Maxillary and mandibular diagnostic casts were made. Tentative jaw relation and vertical dimensions were recorded. Routine blood examinations and blood glucose level assessments were done, and the results were within normal limits.

2.2. Surgical phase

The patient was prepared according to the standard surgical protocol.[12] Posterior superior alveolar, infraorbital, nasopalatine, and greater palatine nerve blocks were administered bilaterally in the maxillary arch, and the inferior alveolar nerve block was administered bilaterally in the mandibular arch. Eight implants were placed in the maxilla and six implants were placed in the mandible using a flapless surgical procedure (Figure 3). Two pterygoid implants were placed bilaterally, engaging the lateral pterygoid plates. A post-surgical panoramic radiograph revealed the placement of basal implants in the proper orientation (Figure 4). Maxillary and mandibular impressions were made using irreversible hydrocolloid material at the same appointment. An acrylic resin provisional prosthesis was fabricated by indirect technique at the established vertical dimension for both the maxillary and mandibular arch and cemented using zinc oxide eugenol temporary restorative cement. The patient was advised to follow a soft diet for the next 4 months, and chlorhexidine gluconate 0.2% was prescribed for rinsing the oral cavity for chemical plaque control.

2.3. Definitive prosthodontic treatment

The patient was recalled after 4 months of post-operative healing. Radiographic evaluation revealed successful osseointegration. The acrylic provisional restorations on both arches were removed. Maxillary and mandibular impressions were made using the addition silicone elastomeric impression material using a two-step putty wash impression technique, and casts were poured in die stone (Type V gypsum).[13] Acrylic custom trays were fabricated for both the maxillary and mandibular arch, with an occlusal made over them and tentative jaw relations recorded using Aluwax. The master cast was then articulated in a semi-adjustable articulator via facebow transfer and interocclusal record (Figure 5). A diagnostic wax mockup was made to assess the shape and placement of the definitive restorations. A putty index of the wax mock-up was made, and provisional restoration was fabricated using an indirect technique. Intraoral and extraoral

factors, such as the facial midline, vertical dimension of occlusion, and smile analysis, were evaluated. The aesthetic appearance, comprising tooth length, width, and form, was also evaluated. The metal framework was cast in cobalt-chromium alloy, and intraorally, a framework try-in was done, followed by verification of the centric relation record using the bite registration from the articulator (Figure 6). After a successful metal try-in, definitive interocclusal records were obtained using Zhemack Occlufast rock bite registration material. In the next appointment, an intra-oral bisque try-in was performed, and occlusal adjustments were made to create a canine-guided mutually protected occlusion (Figure 7). The final cement-retained metal-ceramic prosthesis was subsequently glazed and polished (Figure 8). The occlusion in both centric and lateral excursions, phonetics, and aesthetics was verified before cementation. (Figure 9). The definitive cement-retained implant-supported metal-ceramic prosthesis was then luted with resin-modified glass ionomer cement. Post-treatment patient assessment and occlusal evaluation were carried out following a strict recall every month for six months. The patient was satisfied with the prosthesis in terms of aesthetics and function (Figure 10).

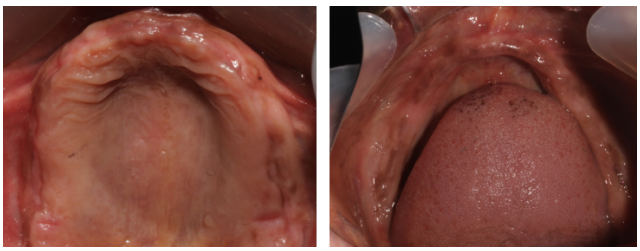

Fig. 1: Maxillary and mandibular residual alveolar ridge

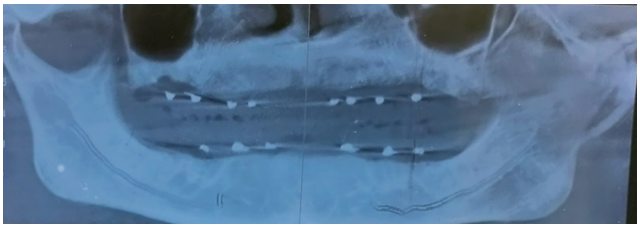

Fig. 2: Pre-operative CBCT with radiographic resin template on both arches

3. Discussion

Rehabilitation of a completely edentulous patient with a fixed implant-supported prosthesis requires a detailed pre-treatment evaluation and a proper understanding of various treatment options and prosthetic designs. The two treatment options that could be considered for this particular patient are conventionally loaded implants and immediate

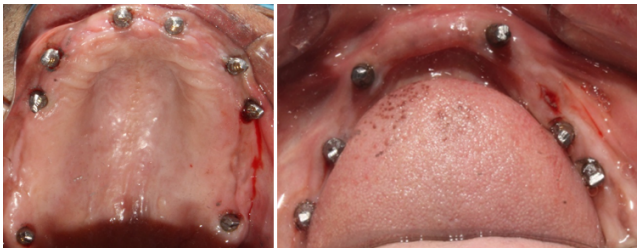

Fig. 3: Post operative view after flapless implant placement

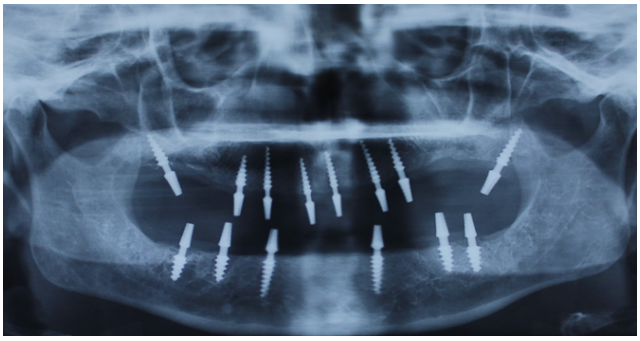

Fig. 4: Post operative radiographic view

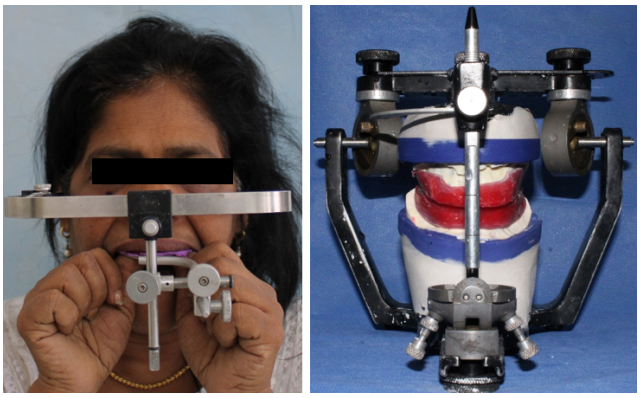

Fig. 5: Facebow record transfer to semi adjustable articulator for articulating the master casts.

Fig. 6: Metal framework try in and definitive interocclusal records

Fig. 7: Bisque try in

Fig. 8: Final single unit cement retained implant supported fixed prosthesis

Fig. 9: Prosthesis in situ- in centric occlusion

Fig. 10: Pre operative and post operative photographs

loading implants. The drawback of conventional loading implants is that the patient has to wear a removable prosthesis throughout the healing period. During this healing phase, the implant site has to be in a non-loaded environment, ideally according to Branemark's surgical protocol.[3] Immediate loading provides the benefit of providing a fixed prosthesis option throughout the interim period, which shortens the treatment phase and avoids an edentulous situation. A literature search analysis by Romanos et al. reported that the survival rate for implants that are immediately loaded is comparable to the long-term outcomes attained with the traditional 2-stage implant strategy. The assumption that osseointegration with implants under immediate functional occlusal loading can be successfully achieved was supported by histologic evidence based on human and animal investigations.[3] A fixed prosthesis can be supported in the fully edentulous mandible with four or more immediate loaded implants, with a success rate of 95–100% as reported by Ostman et al.[6] The data from the 5-year retrospective study on the survival rate of immediately loaded dental implants in the edentulous maxilla suggests that a favorable outcome of immediately loaded implants in the edentulous maxilla can be anticipated if good primary implant stability is attained in sites with medium to dense bone quality.[14] When implants are stable on insertion and are rigidly splinted with implant-retained prostheses, immediate occlusal loading of splinted mandibular implants is a successful treatment option.[15] In the present clinical scenario, single-piece basal implants were selected rather than conventional two-stage implants because of the insufficient bone height available in the posterior maxilla. The basal implants are embedded in the basal bone, which is more dense, stable, and resistant to resorption and infections. Therefore, the masticatory forces are very well distributed to areas that are resistant to resorption.[16] In comparison to the traditional flap method, basal implants requiring a flapless surgical technique have reportedly been shown to provide several benefits, including less postoperative bleeding, patient discomfort, a shorter surgery time, and faster healing.[17] This design prevents manipulating the implant/soft tissue contact after initial healing and eliminates the implant/abutment interface and the need for connecting abutments as a later surgery.[17] Offering a beneficial implant-prosthetic interface, using pterygoid implants in full-arch rehabilitation enables the avoidance of distal cantilevers, an extension of the posterior occlusion, and an appropriate distribution of functional loads. The great primary stability of pterygoid implants is further enhanced by their engagement with the thick cortical bone of the pterygoid plates.[18] Furthermore, splinting transfers masticatory stresses from the bone surrounding the implants to additional cortical regions.

A single-piece, full-arch fixed implant-supported metal-ceramic cement-retained prosthesis was chosen for both

the maxillary and mandibular arch. Studies using 3D finite element analysis have shown that unseparated superstructures are superior to separated ones at reducing peri-implant bone stress when simulating occlusion at maximal intercuspation.[19] This finding offers credibility to the hypothesis that rigid splinting of the entire mandibular arch can provide greater resistance, thus minimizing the effects of mandibular flexure in the presence of a 1-piece superstructure.[20]

The clinical significance of this case report lies in the strategic treatment planning employing an immediate loading protocol along with single-piece basal implants in atrophic ridges, eliminating the necessity of a removable prosthesis with enhanced patient comfort.

4. Conclusion

The use of short implants in premaxillary regions and pterygoid implants in pterygomaxillary regions is an additional strategy that accelerates the healing process, lowers the chance of surgical challenges, and reduces patient discomfort and expense.[18,21] The stability of implant prosthetic restorations is enhanced, and a prosthetic distal cantilever can be eliminated by employing pterygoid implants. Immediate loading can be employed as a successful treatment option for providing function and aesthetics with the added benefit of reduced treatment time compared to conventional loading protocols, which meet the demands of the patient as well.

5. Conflict of Interest

There are no conflicts of interest in this article.

6. Source of Funding

None.

References

1. Adell R, Lekholm U, Rockler B. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. *Int J Oral Surg*. 1981;10(6):387–416. doi:10.1016/s0300-9785(81)80077-4.
2. Ledermann P. Bar-prosthetic management of the edentulous mandible by means of plasma-coated implantation with titanium screws. *Dtsch Zahnarztl Z*. 1979;34(12):907–11.
3. Romanos G, Froum S, Hery C. Survival Rate of Immediately vs Delayed Loaded Implants: Analysis of the Current Literature. *J Oral Implantol*. 2010;36(4):315–24. doi:10.1563/AAID-JOI-D-09-00060.
4. Immediate/Early Loading of Dental Implants: a Report from the Sociedad Espanola de Implantes World Congress Consensus Meeting in Barcelona, Spain, 2002 - Aparicio - 2003 - Clinical Implant Dentistry and Related Research - Wiley Online Library, https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1708-8208.2003.tb00183.x (accessed 14 April 2023). *Clin Implant Dent Relat Res*. 2002;5(1):57–60. doi:10.1111/j.1708-8208.2003.tb00183.x.
5. Kumar S, Kumar K, Singh R. Basal implants- A new era of prosthodontic dentistry. *IP Ann Prosthodont Restor Dent*. 2020;6(1):1–3. doi:10.18231/j.aprd.2020.001.
6. Ostman PO. Immediate/early loading of dental implants. Clinical documentation and presentation of a treatment concept. *Periodontol*. 2000;47:90–112. doi:10.1111/j.1600-0757.2007.00244.x.
7. Brunski JB, Moccia AF, Pollack SR, Korostoff E, Trachtenberg DI. The influence of functional use of endosseous dental implants on the tissue-implant interface. I. Histological aspects. *J Dent Res*. 1979;58(10):1953–69. doi:10.1177/00220345790580100201.
8. Brunski JB, Hipp JA, Cochran GVB. The Influence of Biomechanical Factors at the Tissue-Biomaterial Interface. *MRS Online Proc Lib (OPL)*. 2011;110:505. doi:10.1557/PROC-110-505.
9. Pilliar RM, Deporter DA, Watson PA, Valiquette N. Dental implant design–effect on bone remodeling. *J Biomed Mater Res*. 1991;25(4):467–83. doi:10.1002/jbm.820250405.
10. Davies JE. Mechanisms of endosseous integration. *Int J Prosthodont*. 1998;11(5):391–401.
11. Sennerby L, Roos J. Surgical determinants of clinical success of osseointegrated oral implants: a review of the literature. *Int J Prosthodont*. 1998;11(5):408–20.
12. Misch CE. Contemporary implant dentistry. *Implant Dent*. 1999;8(1):90.
13. Idris B, Houston F, Claffey N. Comparison of the dimensional accuracy of one- and two-step techniques with the use of putty/wash addition silicone impression materials. *J Prosthet Dent*. 1995;74(5):535–41. doi:10.1016/s0022-3913(05)80358-0.
14. Degidi M, Piattelli A, Felice P. Immediate functional loading of edentulous maxilla: a 5-year retrospective study of 388 titanium implants. *J Periodontol*. 2005;76(6):1016–24. doi:10.1902/jop.2005.76.6.1016.
15. Drago CJ, Lazzara RJ. Immediate Occlusal Loading of Osseotite® Implants in Mandibular Edentulous Patients: A Prospective Observational Report with 18-Month Data. *J Prosthodont*. 2006;15(3):187–94.
16. Scortecci GM, Misch CE, Odin G. Basal Implantology. In: Scortecci G, editor. Principles of Basal Implantology. Cham: Springer International Publishing;. p. 3–34.
17. Siepenkothen T. Clinical performance and radiographic evaluation of a novel single-piece implant in a private practice over a mean of seventeen months. *J Prosthet Dent*. 2007;97(6 suppl):S69–78. doi:10.1016/S0022-3913(07)60010-9.
18. Bidra AS, Huynh-Ba G. Implants in the pterygoid region: a systematic review of the literature. *Int J Oral Maxillofac Surg*. 2011;40(8):773–81. doi:10.1016/j.ijom.2011.04.007.
19. Martin-Fernandez E, Gonzalez-Gonzalez I, Dellanos-Lanchares H, Mauvezin-Quevedo MA, Brizuela-Velasco A, Alvarez-Arenal A. Mandibular Flexure and Peri-Implant Bone Stress Distribution on an Implant-Supported Fixed Full-Arch Mandibular Prosthesis: 3D Finite Element Analysis. *Biomed Res Int*. 2018;p. 8241313. doi:10.1155/2018/8241313.
20. Yokoyama S, Wakabayashi N, Shiota M. Stress analysis in edentulous mandibular bone supporting implat-retained 1-piece or multiple superstructures. *Int J Oral Maxillofac Implants*. 2004;20(4):578–83.
21. Signorini L, Faustini F, Samarani R. Immediate fixed rehabilitation supported by pterygoid implants for participants with severe maxillary atrophy: 1-Year postloading results from a prospective cohort study. *J Prosthetic Dent*. 2021;126(1):67–75. doi:10.1016/j.prosdent.2020.04.005.

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Cite this article: Wilson T, Nair VV, Harshakumar K, Prasanth V. Prosthetic rehabilitation with implant-supported fixed prosthesis in a completely edentulous patient: A clinical report. *IP Ann Prosthodont Restor Dent* 2023;9(2):111-116.