

Controversy about Implant Number and Distribution in Full Mouth Implant-Supported Fixed Prosthesis: A Case Report

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Abstract:

This clinical report presents the controversy around implant number and distribution in full mouth implant-supported fixed prosthesis (FP). In this clinical report, after the teeth were extracted, eight implants were placed in the maxilla, and six were placed in the mandible. A metal ceramic FP was formed, and the patient was satisfied with the final results. At the 1-year follow-up appointment, excellent outcomes were observed.

Key Words: Fixed full-arch prosthesis, implant distribution, implant number, treatment planning

Introduction

Prosthetic treatment of a fully edentulous patient with an implant-supported fixed prosthesis (FP) is difficult for a number of factors that involve the complete rehabilitation of esthetic, phonetics, function, and facial morphology.¹ Conversely, full mouth rehabilitation with dental implants has many benefits, including fewer patient complaints, increased patient satisfaction, and higher masticatory performance compared to a conventional denture wearer.²

Implant number and distribution have an impact on force transmission and consequent stress distribution around implants, which is critical in obtaining a predictable outcome. Implant loading should not be started until all diagnostic criteria have been evaluated. The criteria include bone quality/quantity, interarch space, amount of tissue lost, intraoral and extraoral esthetics, and the need for hygiene accessibility.³

Evidence is lacking to determine the optimal number and distribution of implants that should be placed in both arches in fully edentulous patients.⁴ Based on the literature, the

placement of six to eight implants in both arches for fixed implant prosthesis is recommended^{5,6} with a minimum of four implants in each arch.⁷⁻⁹ Furthermore, there is no strict rule governing the number of implants to be placed because this depends on multiple factors, including quality of bone, anticipated force to be placed on the restoration, and the relationship between the shape of the residual ridge and the dental arch form.^{5,10,11} It has been reported that increasing the number of implants enhances the biomechanical behavior of the implants, particularly when subjected to bending forces.^{12,13} Moreover, we should give attention to implant distribution and placement, which is considered a critical step in achieving an optimum emergence profile for the final restorations and in helping the patient maintain adequate oral hygiene.¹⁴ The aim of this paper was to report the number and distribution of implant-supported FP in a fully edentulous patient.

Case Report

A 53-year-old male patient presented to the prosthodontic specialty clinic for comprehensive dental treatment. The patient was medically fit, and the clinical and radiographic findings showed few remaining periodontally compromised teeth (#11, #23, #43, #44, and #45) (Figure 1) that were diagnosed as hopeless and were planned to be extracted. After the evaluation and diagnosis of the clinical condition, different treatment options were discussed with the patient, including maxillary and mandibular conventional complete dentures; implant retained over dentures, and completes mouth rehabilitation with implant-supported FP. The patient selected definitive implant-supported FP to rehabilitate his mouth after extraction.

Impressions were made with irreversible hydrocolloid impression material (Jeltrate, Dentsply, USA), diagnostic casts were made, record block was fabricated, and patient vertical dimension and centric relations were established.



Figure 1: Initial panoramic radiograph.

The diagnostic cast mount and teeth set-up were completed, and an interim denture was fabricated in a conventional manner. Adequate bone height and width was available for the placement of dental implants to support individual FP. The bone volume and implant position were confirmed with cone beam computerized tomography made with maxillary and mandibular templates that were fabricated by duplicating the denture. In addition, surgical templates were fabricated to guide proper implant position.

Fourteen root form International Team for Implantology dental implants (Straumann AG, Waldenburg, Switzerland) were placed: Eight in the maxillary arch (four on each side in the central incisor area, canine, first premolar, and first molar area) and six in the mandibular arch (three on each side in the canine area, first premolar, and first molar area), ranging in diameter from 4.1 to 4.8 mm (Figure 2). A 1-stage technique was used, and healing abutments were placed. The tissues healed adequately, and after 6 months from the installation of the implants, the restorative process was started. Fixture-level open tray impressions were made with polyvinyl siloxane (Examix; GC America Inc.), and the impression was poured with Type IV dental stone to fabricate the master cast. Maxillo-mandibular relationships were then made at an appropriate occlusal vertical dimension, interarch space, and centric relation with the maxillary and mandibular occlusal rims, and the master casts were mounted on a semi-adjustable articulator (Whip mix 8500 articulator, Whip mix Corp). Seven metal frameworks were fabricated with Type III gold (Goldenian C-75, Shinhung, Seoul, Korea), four in the upper arch and three in the lower arch. The fit of these frameworks was evaluated clinically and radiographically. The frameworks were then veneered with feldspathic porcelain (Ivoclar Vivadent, Liechtenstein Germany). The metal ceramic prostheses were tried and adjusted, and any interference was eliminated before glazing. After glazing, the metal frameworks were tightened into place with the recommended torque, and the metal ceramic prosthesis was cemented using zinc oxide eugenol cement (Figures 3 and 4). The patient was given oral hygiene instructions. Follow-up appointments after 24 h, 1 week, 1 month, and 1 year (Figure 5) revealed excellent outcomes with no complications.

Discussion

Full-arch implant-supported fixed dental prostheses were well-documented restorative applications for completely edentulous patients.¹⁵

According to the literature, a minimum of four implants is necessary for a fixed restoration, but if sufficient bone is available, more implants should be placed to avoid cantilever crowns.^{4,11}

In this clinical report, eight implants were placed in the maxillary arch, and six were placed in the mandible. The



Figure 2: Symmetrical implant placement in the maxillary and mandibular arch.



Figure 3: Panoramic radiograph after prosthesis delivery.

distribution of implants varies in the literature, and there is a dilemma between the maximum and a minimum number of implants. They concluded that the placement of six to eight implants was acceptable, with a minimum of four implants in fixed implant-supported prostheses. Furthermore, recent meta-analyses have concluded that the benefit of placing more than six implants was unclear from the current evidence, and most of the studies reported the survival rate for full-arch fixed denture prosthesis supported by four to six implants without concentrating on the implant distribution.⁴ In addition, the number and distribution of implants influences the magnitude of occlusal forces on implant-supported FP, and it has been concluded that a higher force is observed in a decreasing number of implants.^{16,17}

The most important objective of implant distribution, particularly in the esthetic zone, is to achieve harmonious gingival margin without abrupt changes in tissue height while preserving the papilla and a convex contour of the alveolar crest and achieving excellent esthetics.¹⁸ There is controversy regarding the number and distribution of implants to be placed in the esthetic zone. It has been reported that the placement of two implants in the canine area shows high strain value in the cortical area while placing four implants shows minimum strain value.¹⁹

In this clinical report, segmented prosthetic designs were used. It has been reported in a recent systematic review that biological and technical complications are frequently encountered with full-arch implant-supported FP.²⁰ Therefore,



Figure 4: Final implant supported fixed prosthesis.

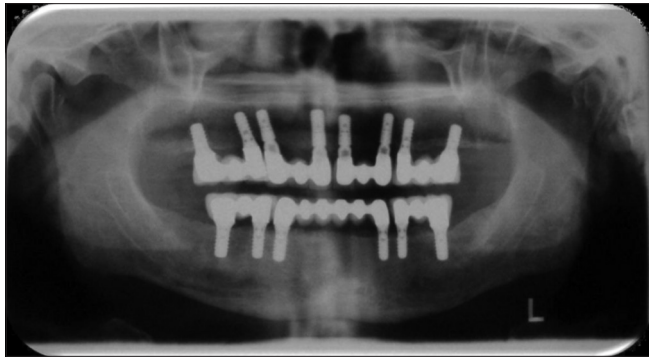


Figure 5: Panoramic radiograph after 1 year follow up.

a segmented prosthetic design may be recommended for full-arch implant rehabilitation because of superior hygiene, simplicity of fabrication, and prosthetic maintenance.²¹

Conclusion

This clinical report demonstrated that even under good clinical conditions of bone and tissue support, there remains a dilemma regarding the number and distribution of implants to be placed, which depends on prosthetic design and the patient's financial situation.

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