Case Report

Implant-assisted removable partial denture: An approach to switch Kennedy Class I to Kennedy Class III

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Abstract

The Kennedy Class I and II distal extension situation poses a challenge to the prosthodontist as it inherently possesses a lack of stability, which may be attributed to the difference in compressibility of the mucosa and the periodontal ligament surrounding the distal-most abutment tooth. This results in a rotational tendency of the prosthesis around the line connecting its terminal abutments. Placement of osseointegrated dental implants in the posterior edentulous regions, distal to the terminal abutment provides improved vertical support to the distal extension removable partial denture, effectively converting its intraoral performance from a Kennedy Class I to a Class III situation, thereby resulting in improved stability of the prosthesis and consequently, enhanced patient satisfaction. This case report describes such an approach to the restoration of a Kennedy Class I partially edentulous situation.

Key Words: Dental implant, distal extension removable partial denture, osseointegration

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INTRODUCTION

The removable partial denture (RPD) has had a long and successful track record in the prosthetic rehabilitation of partially edentulous situations of the mouth. While fixed dental prostheses are preferred by patients as the treatment modality, due to the inherent lack of stability and retention of an RPD in comparison, many situations such as the distal extension scenario are routinely encountered where a fixed dental prosthesis cannot be provided to the patient. Dental implants have broadened the scope of traditional prosthodontic treatment; implant-supported fixed dental prostheses have successfully been used to rehabilitate the distal extension situation. However, anatomic limitations, such as proximity to the inferior alveolar nerve or the maxillary sinus, and financial constraints may preclude the placement of implants of sufficient dimensions to support a fixed dental prosthesis. It is in such situations that the RPD is indispensable for the prosthodontist.

The posterior distal extension scenario is an interesting one for a prosthodontist as it presents a number of design challenges. Distal extension RPDs are subjected to vertical, horizontal, and

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torque forces which compromise the stability and retention of the prosthesis.[1] The difference in compressibility and resilience of the periodontal ligament supporting the tooth and the mucosa overlying the edentulous alveolar ridge must be taken into account while designing the RPD to prevent accelerated alveolar bone/terminal abutment loss.[2]

The improved support to the distal extension RPD leads to a reduction in the tipping of the denture bases, resulting in improved performance of the prosthesis as well as maintaining the residual alveolar bone in an optimal state of health. The following case report describes the aforementioned approach toward the rehabilitation of such distal extension partial edentulous situations.

CASE REPORT

A 45-year-old woman came to the Department of Prosthodontics with the complaint of difficulty in chewing due to missing teeth. Oral examination showed fair oral hygiene, intact maxillary arch, and Kennedy Class II modification 1, a partially edentulous mandibular arch. Teeth # 37, 36, 35, 34, 33, 44, 46, and 47 were missing [Figure 1]. Both overjet and overbite were 1.5 mm with canine-guided occlusion scheme. RPD, implant-supported fixed dental prosthesis, fixed dental prosthesis for missing right second premolar, and tooth- and implant-supported prosthesis as treatment options were discussed with the patient. Due to financial constraints, she favored mandibular RPD as the treatment option over implant-supported fixed dental prostheses. The patient was convinced about the merits of an implant-assisted cast RPD and consented for further treatment.

Initially, both maxillary and mandibular alginate (Zelgan, Dentsply, India) impressions were taken and poured with dental stone (Dentsply, India) to obtain diagnostic casts. Mandibular cast was surveyed for implant-assisted RPD to determine the location of favorable undercuts and guide planes.

Figure 1: Preoperative mandibular arch

A favorable undercut was found on the left mandibular lateral incisor for engagement with an infrabulge cast direct retainer. Further, first premolar was restored with a 3-unit fixed dental prosthesis incorporating a distal rest seat, a distal guide plane, and an utilizable undercut located on the mesiofacial aspect of the right mandibular second premolar metal crown. Diagnostic casts were made again to design the proposed implant-assisted RPD which incorporated lingual plate mandibular major connector, mesh type minor connector, and rest seat, proximal plate, and I-bar retainer on both right mandibular second premolar and left mandibular lateral incisor.

Two 4.2 mm × 11.5 mm dental implants Dentin, Dentin Implants Technologies Ltd.,Israel (DENTIN) were planned to place through two-stage surgical approach in the right and left mandibular region distal to the most posterior denture teeth (2nd molar region). A surgical template fabricated from a diagnostic wax-up of the proposed prosthesis was used to guide implant location. The size of dental implants was determined with the help of dentascan taken preoperatively.

After anesthesia was induced, mucoperiosteal flaps were raised and implant osteotomy was prepared with sequentially increasing drill sizes as recommended by the manufacturer. Two dental implants were placed at planned sites having gained a torque value of 40 Ncm and left to heal undisturbed for 3 months [Figures 2 and 3]. During this period, an interim RPD with tissue surface relined with temporary soft liner was given to the patient.

Following osseointegration of the implants, stage II surgery was performed to uncover the implants, and healing abutments were placed. Three weeks later, healing abutments were replaced by transfer copings, and an impression was made with irreversible hydrocolloid impression material (Kromopanidrocolloide; LascodSpA, Firenze, Italy). Implant analogs were connected to the transfer coping, and a cast was prepared. Permanent abutments were placed on the implant analogs and were reduced to a suitable height to provide space for the metal framework of the RPD. Mouth preparation was performed conforming to the design outlined on the diagnostic casts after the initial survey. Maxillary and mandibular

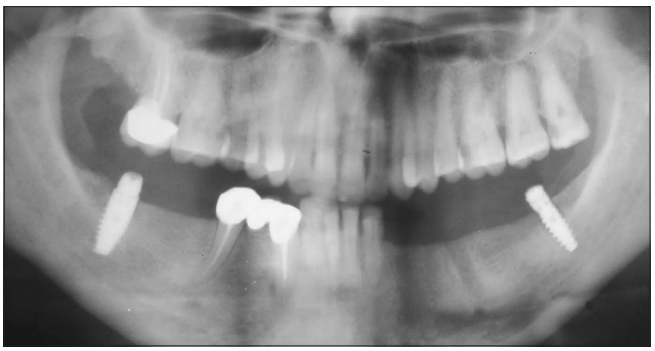

Figure 2: OPG after dental implant placement

definitive rubber base addition silicone impressions (Coltene, Whaledent, Switzerland) were made and poured to obtain the master cast. Abutments were placed over the implants. The master casts were surveyed once again to confirm the accuracy of the mouth preparation. Wax patterns of the implant-assisted RPD were fabricated according to the proposed design and casted. Following finishing and polishing procedures, the fitting of the metal framework was verified in the patient mouth [Figure 4]. Wax occlusal rim was made on metal framework; face bow transfer and jaw relation records were made, and both maxillary and mandibular casts were mounted on Hanau wide vue articulator. Artificial teeth (Acry Rock, Ruthinium, Italy) were arranged in wax occlusal rim and followed group function occlusal scheme. After try-in, RPD was processed with heat cured acrylic resin and delivered to patient with proper home care instructions [Figures 5 and 6]. Following postinsertion appointments, the patient was recalled for checkup after 1 and 6 months. The patient was satisfied by improved retention, masticatory efficiency, and esthetics having the healthy periodontal condition.

DISCUSSION

The distal extension RPD presents difficulties in design and performance of the prosthesis due to the difference in nature of the tissues supporting the prosthesis. Under function, the teeth are displaced by 0.2 mm into the periodontal ligament, whereas the mucosa overlying the residual alveolar bone may be displaced by as much as 1 mm.[3] As a result, there exists a significant difference in the support offered by the teeth and the residual ridge to the distal extension RPD. This difference in compressibility also results in rotation of the RPD around a horizontal axis extending between the distal rests of the terminal abutments.[4] Over a long-term, this may lead to accelerated bone loss of the edentulous ridge and loss of the terminal abutment teeth. To counter such rotational tendencies, the design of the distal extension RPD must differ from those for Kennedy Class III and Class IV partially edentulous arches, requiring features such as a mesial rest on the terminal abutment teeth, flexible direct retention, and indirect retainers located as far anteriorly to the fulcrum line as possible.[5] All this results in a prosthesis that is inherently unstable, inadequate retention, requiring frequent relines, more number of maintenance visits, and decreased patient satisfaction.

Figure 3: Intraoral view of mandibular arch after implant placement and fixed partial denture for missing mandibular right first premolar

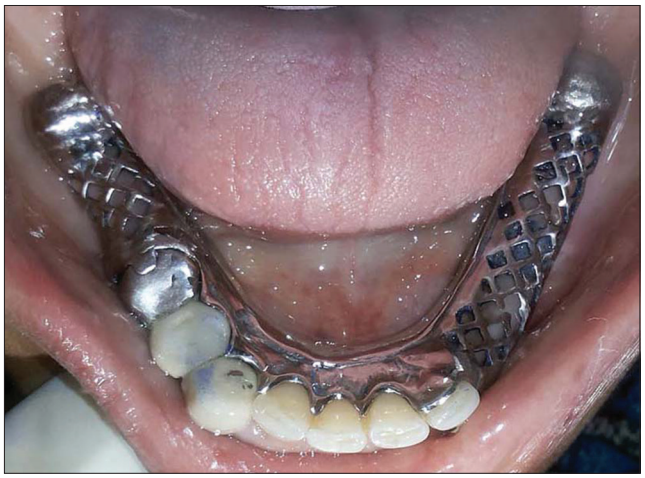

Figure 4: Try-in of metal framework of removable partial denture

Figure 5: Occlusal view of implant supported removable partial denture inserted in patient mouth

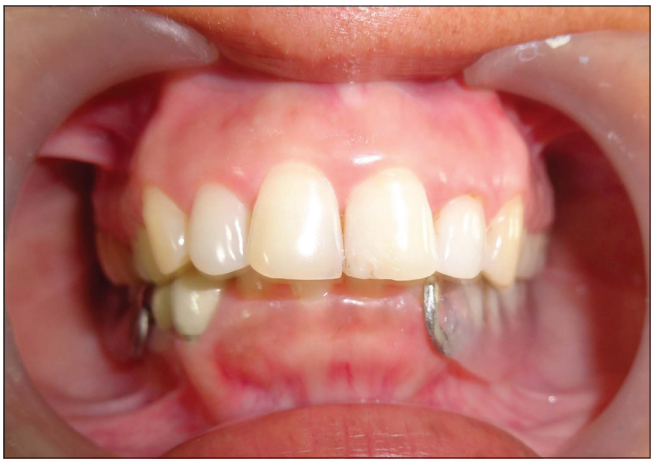

Figure 6: Maxillary and mandibular arch at occlusion

Placement of implants to assist a distal extension RPD effectively converts the classification of the partially edentulous arch to Kennedy Class III from a Kennedy Class I arch.[6] Thus, implant-assisted distal extension RPDs are not significantly reliant on support from the residual ridge.[7] The rotational tendencies of the prosthesis are greatly reduced, contributing to the simpler design for the implant-assisted RPD. Such RPDs may safely be fabricated with distal rests on the terminal abutments along with circumferential clasps engaging the undercut remote to the edentulous area without fear of adverse tipping forces on terminal abutment teeth.

The additional support gained from osseointegrated implants also aids in maintaining the height of the residual alveolar ridge, resulting in better stability of the prosthesis, and along with less frequent prosthetic maintenance visits.[8] Implants and ball attachment retainer over a free-end RPD resulted in smaller swallowed median particle size and improved nutrient intake.[9] Strategic placement of implants under the existing dental prostheses improves oral health-related quality of life in RPD treatment groups.[10]

Implants serving as support beneath a distal extension RPD have less stringent dimensional requirements in comparison to implants serving as abutments for a fixed dental prosthesis. Hence, shorter and narrower implants may be selected when considering an implant-assisted RPD for a patient. This may be, especially critical when faced with anatomic limitations, such as proximity to the inferior alveolar nerve or maxillary sinus.[8]

Removable restorations also provide greater latitude in implant placement than fixed restorations since the implant abutments are located within the confines of the denture bases. This eliminates the problems of emergence of screw access channels when attempting a fixed, screw-retained implant restoration.

CONCLUSION

The case report describes the conversion of a tooth-mucosa supported removable prosthesis to a tooth-implant-supported RPD, with accompanying benefits of improved support and stability of the prosthesis and increased patient satisfaction. This article attempts to illustrate the scope and possibilities that osseointegrated implants offer to prosthodontic therapy.

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Conflicts of interest
There are no conflicts of interest.

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