Case Report

Prosthesis for long span Kennedy's Class III partially edentulous condition: A case report

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Abstract

Removable partial denture (RPD) is a preferred prosthesis for long span Kennedy's Class III partially edentulous conditions. Preservation of periodontal integrity of abutments, restoration of lost supporting structures and cross arch stabilization are the major advantages of RPD over Fixed Partial Denture (FPD). Formulation of sound treatment plan with emphasis on prosthesis design and mouth preparation based on clinical and radiographic findings is important for the long term success of RPD. Guiding planes, rest seats, retentive areas and path of insertion are the considerations to be taken while placing surveyed crowns on abutments. This case report describes designing of RPD with placement of surveyed crowns on abutments in long span Kennedy's Class III on a patient who had previously undergone unsuccessful FPD.

Key Words: Long span Kennedy's Class III, removable partial denture, surveyed crown

Introduction

Current practice in the management of partial tooth loss involves consideration of various types of prostheses, that includes fixed partial denture (FPD), removable partial denture (RPD), and implant supported prosthesis. Each type of prosthesis requires use of various remaining teeth and/or tissues. The objective of any prosthetic treatment includes: elimination of oral disease to greatest extent possible, preservation of the health and relationships of the teeth and the health of oral and paraoral structures, and restoration of oral functions that are comfortable, esthetically pleasing, and do not interfere with the patient's speech[1]. Prosthodontic treatment planning is a complex process that involves a combination of diagnostic information, patient desires, evidence-based outcome data, and a thorough review of the treatment alternatives[2].

However not all partially edentulous conditions can be managed with all treatment options. Contraindications for dental implant therapy include unfavorable regional anatomy, uncontrolled systemic disease, high dose head and neck radiation, and extreme surgical risk. Contraindications for FPD therapy include age of patient less than 18 years, long edentulous, loss of supporting tissues. The conditions that cannot be managed implant and FPD require placement of RPD. Indications for RPD include long-span edentulous area, no abutment tooth posterior to the edentulous space, need for cross-arch stabilization, excessive bone loss within the residual ridge, physical or emotional problems exhibited by patients, esthetics of primary concern[3].

The integration of fixed and removable prosthodontics to restore the dentition of a partially edentulous patient poses a challenge and an opportunity. Success requires diagnostic skill, perceptive treatment planning, and diligent execution[4].

Formulation of sound treatment plan with emphasis on prosthesis design and mouth preparation based on clinical and radiographic fmdings is important for the long term success of RPD. Guiding planes, rest seats, retentive areas and path of insertion are the considerations to be taken while placing surveyed crowns on abutments.

Case report

A 29 years old female with bilateral missing of lower posterior teeth for 7 years presented for prosthodontic treatment. Her primary concern was poor masticatory efficiency and esthetics. A detailed medical and social history did not reveal any contraindications to dental

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therapy. Under dental history, she had undergone treatment with FPD on both the sides of arches one and half year back, but she was not satisfied with the treatment so, she got them removed.

Clinical examination of the patient revealed missing 36, 37, 45, 46, 47; restored 16, 26, 34, 38, 48; crown preparation done in relation to 35, 38, 44, 48 with poor margin design; mesio lingually tilted 38, 48; supra erupted 15,16,17, 25, 26; thin resorbed edentulous

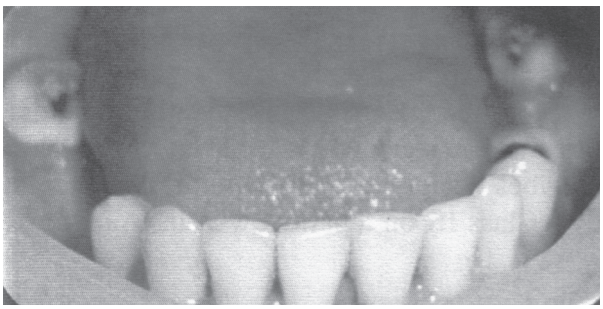

Fig. 1 Edentulous area in right side with missing 45, 46, 47 and left side with missing 36, 37.

ridge (Fig. 1). Radiographic examination revealed overhanging restoration in relation to 35; no periapical changes and secondary caries in relation to 35, 38, 44 and 48. The condition can be classified as Kennedy's Class III Modification 1. Based on patient history of failed FPD and on clinical examination the best treatment option would be placement of RPD.

Maxillary and mandibular complete-arch impressions were made using irreversible hydrocolloid Alginate impression material. Diagnostic casts were fabricated from Type III dental stone and mounted on a semi-adjustable articulator (Whip Mix) using a face-bow transfer (Quick Mount Face-Bow; Whip Mix) and centric relation record (Fig.2). To satisfy the

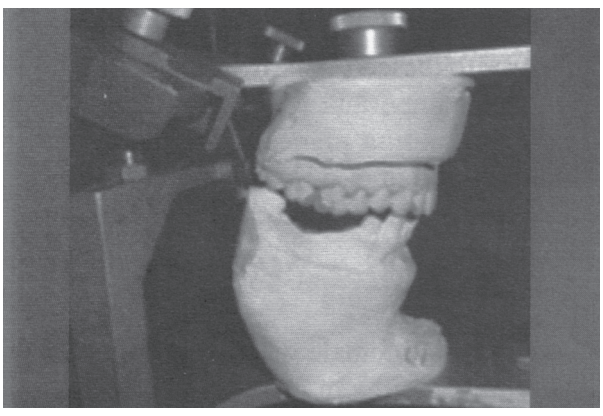

Fig.2. Mounted diagnostic cast showing supraerupted maxillary posteriors and mesially tilted third molar

patient's primary concerns, a treatment plan was developed that included oral prophylaxis, removal of overhanging restoration in relation to 34, placement of provisional crowns 35, 38, 44, 48, and interim RPD for missing teeth. Although a plan of orthodontic treatment for intrusion of supraerupted teeth and uprighting of mesiolingually tilted third molars was presented to the patient as part of the primary treatment option, the patient declined these treatment modalities due to the financial burden. For occlusal equilibration, coronoplasty was planned for supraerupted maxillary posterior teeth, followed by placement of surveyed metal crowns in 38, 48 and metal crowns with porcelain facings in 35, 44 and construction and placement of RPD.

Following an oral prophylaxis, diagnostic cast was surveyed for interference to placement of major connector; abutments to be restored with crowns were surveyed. Designing of RPD was done in diagnostic cast. Design consists of lingual bar major connector; cast circumferential clasp with disto-occlusal rest for 35 and 44; ring clasp with supporting strut and mesio-occlusal and disto-occlusal rest for 38 and 48; lattice work minor connector. Distance between gingival

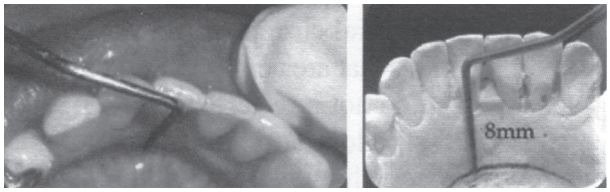

Fig.3 Determination of height from floor of the mouth

margin and floor of mouth was determined with tongue in elevated position for placement of lingual bar major connector (Fig. 3). It was measured 8 mm and there should be at least 7 mm between gingival margin and floor of mouth. Tripoding of diagnostic cast was done for orientation of master cast in same relationship to path of insertion. Tooth preparation was done in relation to 35 and 44 of metal crown with porcelain facing; 38 and 48 for metal crown. Proximal surfaces of the preparation were made parallel with lingual path of insertion for 38 and 48. Disto occlusal rest seat were prepared in 35 and 44; mesio-occlusal and disto-occlusal rest seat in 38 and 48. Impression of preparation was made in custom tray with putty consistency and light body addition silicone. Cast was poured in Type IV dental stone, and dies were sectioned. The casts were mounted on a semi-adjustable articulator

(Whip Mix) using a face-bow transfer (Quick Mount Face-Bow; Whip Mix) and centric relation record.

Wax patterns were fabricated for metal crowns with porcelain facing with disto-occlusal rest seats in relation to 35 and 44; and metal crowns with mesio-occlusal and disto-occlusal rest seats in relation to 38 and 48 (Fig. 4). Retentive undercuts were created

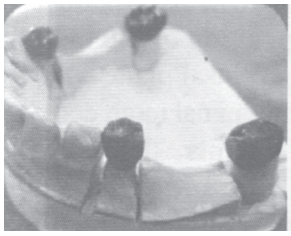

Fig.4 Wax pattern for 35, 38, 44 and 48

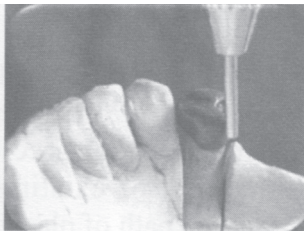

Fig.5 Surveying of wax patterns for guiding planes, HOC, path of placement and removal, rest seat preparation

mesiobuccally in 35, 44 and mesio-lingually in relation to 38, 48. Wax patterns were surveyed for guiding planes, height of contour (HOC), path of placement and removal (Fig. 5). Metal crowns were fabricated for 38 and 48; metal crown with porcelain facing for 35 and 44. All the crowns were surveyed for guiding planes, height of contour, retentive undercuts (Fig. 6).After desirable contours were achieved and finishing and polishing of metal crowns and glazing of crowns with porcelain facing they were cemented luiting cement (GC Gold Label, GC Corporation, Tokyo, Japan) (Fig. 7).

Special tray was fabricated for proper recording of vestibule. Border molding was done with greenstick. Special tray was painted with tray adhesive (Caulk Tray

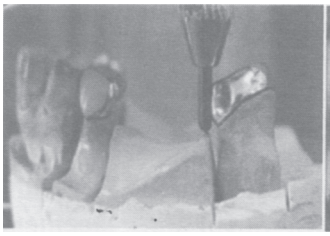

Fig.6 Surveying all crowns in working cast for parallel guiding planes, desirable height of contour and retentive undercuts

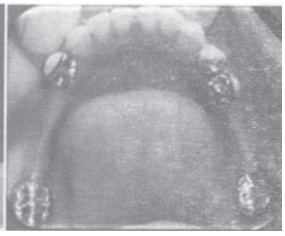

Fig 7 Cemented metal crowns in 38, 48 and metal crowns with porcelain facing in 35, 44

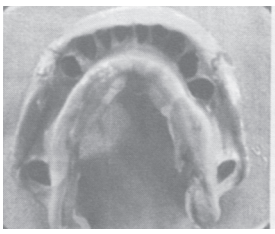

Fig.8 Final impression made with medium viscosity and light body addition silicone

Fig. 9 Master Cast poured in Type IV dental stone

Adhesive, Dentsply) and final impression was made with medium body (Aquasil Monophase, Dentsply, USA) and light body (Reprosil, Dentsply, USA) addition silicone (Fig. 8). Master cast was poured in Type IV dental stone (Fig. 9).

Master cast for duplicated, tripod marks were transferred and designing of RPD was done in refractory cast (Fig. 10).

Laboratory procedures of sprue attachment, investment, burn out and casting was done. Finishing and polishing of framework was done and tried in patients' mouth (Fig. 11).

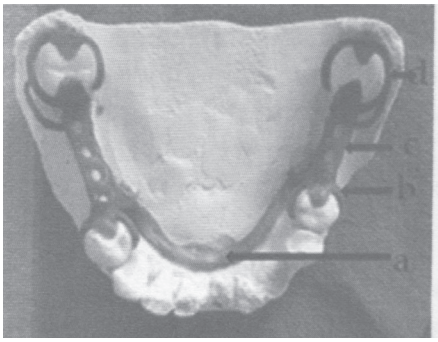

Fig.10 a. Lingual bar; b. Simple circlet clasp; c Lattice work minor connector; d. Ring clasp

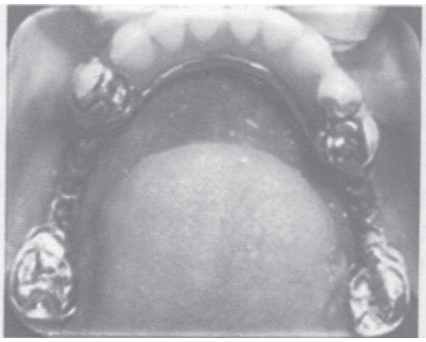

Fig. 11 Framework evaluated intra orally for fit, stability and occlusion

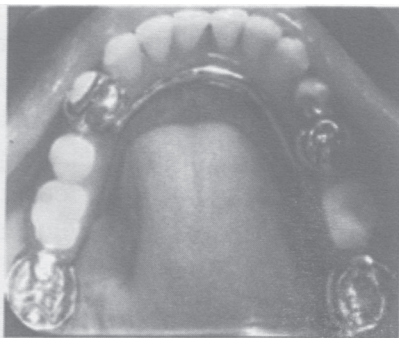

Fig. 12 Final RPD inserted

Teeth arrangement was done and after laboratory procedures and proper finishing and polishing the prosthesis was inserted (Fig. 12).

Post insertion instructions were given regarding oral hygiene and prosthesis hygiene, denture wearing habit, way of removal and placement of prosthesis and frequent follow up visits. After 7 days recall, the patient was comfortable with prosthesis with improved masticatory ability and oral hygiene, denture hygiene were reinforced.

Discussion

Excessive flexing under occlusal loads may cause failure of a long-span FPD. It can lead to fracture of a porcelain veneer, breakage of a connector, loosening of a retainer, or an unfavourable soft tissue response and thus render prosthesis useless. The relationship between deflection and length of span is not simply linear but varies with the cube of the length of the span[5]. Movements caused by the application of chewing loads to a FPD are predictable. The location and magnitude of tensile and shear stresses affecting cement within retainers during mastication is related to the type of movement and determined by differences in mobility of abutments at each end of the FPD, length of span, and point of chewing load[6]. Long bridges (5 and more units) had lower survival than the shorter ones[7]. Long span bilateral edentulous areas can be successfully managed with RPD rather that with FPD. The cause for FPD failure in this case could be due to long span edentulous area with mesiolingually tilted posterior abutments leading to flexure of prosthesis and discomfort to the patient. So, it is very important that the best possible treatment should be provided to the patient.

The value of RPD as a treatment must include subjective considerations. Social, biomechanical, and economic aspects are variable in its ecology[8]. The objective of the dentist should be to make a prosthesis that the patient can easily seat and remove from the mouth and yet, when seated, the prosthesis will resist the dislodgment potential caused by masticatory function, especially mastication of sticky foods. The problem involves an interaction of engineering and biologic elements, so a biomechanical approach should be used for its solution. On this basis, it is imperative that diagnostic casts for all RPDs be analyzed with a dental parallelometer (surveyor)[9].

Dental surveyor permits the dentist to plan, study, and design an RPD that will provide adequate retention, support, stability, and esthetic appearance[10, 11]. The clinical and radiographic findings must be carefully considered in prosthesis design and mouth preparation. Particular attention must be given to the proper placement of guiding planes and well-made rest seats and the use of surveyed crowns on abutment teeth[12].

The construction of crowns for teeth that will serve as abutment teeth for RPD is an important and technically demanding procedure. The preparation of the tooth itself must include provision for the components and path of placement of the RPD and at the same time conform to all the parameters associated with proper tooth preparation. Some of the factors unique to surveyed crowns that must be considered include the position of the tooth in relation to the proposed occlusal plane with the RPD, the type of facial and lingual tooth contours desired for the direct retainer, the size and suitability of existing restorations, and the proposed path of placement and removal of the RPD relative to the orientation of the abutment tooth as well as to other adjacent teeth. The design requirements for the RPD must be determined before treatment is initiated, to account for all of these factors[13]. Porcelain-to-metal crowns are routinely fabricated with retentive contours in the veneering porcelain[14].

The wax patterns should be surveyed to obtain desirable guiding planes, proper level of height of contour with desirable retentive undercuts, rest seats prepared for ultimate achievement of desirable path of insertion. This helps to avoid undesirable forces on remaining teeth and underlying ridge providing functional and comfortable prosthesis.

Conclusion

For successful management of partially edentulous conditions, the treatment that best suits the patients' intraoral condition should be selected with appropriate treatment plan developed. This will help in enhancing function, comfort preserving the health of remaining oral structures.

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