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Case Report

Treating a Complex Situation of a Single Completely Edentulous Arch Opposing a Kennedy Class 2 Modification 1 Partially Edentulous Arch—Case Report

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***ABSTRACT*:**
A single complete denture, a distal extension partial denture, and a mandibular anterior fixed partial denture for age-associated attrited abutment teeth are individually complex treatments that require careful case selection, correcting existing occlusion, accurate treatment sequencing, designing and execution, improvising designs, and finally modifying follow-up. We present these three complex situations in a single elderly male patient who had three remaining maxillary anterior teeth, opposing a unilateral distal extension partially edentulous situation with anterior modification. Treatment planning decided on a maxillary single complete tooth supported overdenture that opposed a combination of natural teeth, a fixed partial, and a cast partial denture. For each treatment type, the design considerations for complexities have been discussed. The patient was successfully treated and was very satisfied with the treatment outcome.
Key words: abutment, occlusion, fixed partial denture, cast partial denture, occlusion

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INTRODUCTION

For proper treatment planning, it is important to have a full awareness of the biomechanical problems that come with using a single maxillary complete denture against a mandibular Kennedy Class II removable partial denture (RPD) and a fixed partial denture. [1,2] The loss of natural teeth can lead to an imbalance in the orofacial structures, which in turn can lead to ineffective chewing and, eventually, occlusal discrepancy and poor aesthetics.[3] But these side effects are lessened if the missing teeth are restored.[4] while Perceived oral health is a subjective indicator of how well a person thinks their teeth and gums are doing. [5] It is believed that a person's perspective of their own oral health will be shaped by their actual oral health problems and how those problems affect their day-to-day lives. Loss of teeth can occur in a wide range of sequences, which are sometimes complex themselves or at times pose complex situations even when the loss of teeth is minimal.[6,7] a completely edentulous single arch Having a single or double partial edentulous arch in opposition is considered one of the complex partial edentulous situations since it can cause a wide array of biomechanical puzzles that may end in complications.[8] One important biomechanical factor is that the maxillary single denture has a built-in problem: it has to work against a mostly healthy lower arch that can provide strong and confined occlusal forces.[9] The Kennedy Class II partially edentulous arch is a unilateral distal extension that itself presents multiple biomechanical issues that need to be identified before starting the treatment procedures. The situation becomes complex if there is another partially edentulous situation referred to as modification within the arch. While small modifications can be treated with either a fixed partial denture or a removable partial denture (RPD), such fixed partial dentures usually require a cantilever extension to provide support to the removable partial

denture (RPD).[10] Ideally, such a situation may be classed as a full mouth rehabilitation since three out of four segments are being rehabilitated.[11] natural anterior teeth in conjunction with a fixed partial denture having a cantilever over which another removable partial denture is supported presents a very unique and rare case. The combination of natural teeth and fixed partial denture may cause occlusal stresses to build up on the front maxillary ridge and the area around the premolars.[12] This positioning makes the anterior maxillary ridge more likely to resorb, and not enough or incorrectly placed support in the back makes the back hyperocclusion more likely. Also, putting in a fixed partial denture along with the RPD makes a hard segment, which, together with possible differences in occlusal planes, might make the tipping pressures on the maxillary denture worse.[13] Classical combination syndrome primarily presents in patients with a maxillary complete denture that opposes a mandibular Kennedy Class I distal-extension RPD.[9] However, similar destructive changes can also be observed in the context of Kennedy Class II configurations, particularly in cases where there is inadequate posterior support or if the RPD is poorly designed. Research indicates that Kennedy Class II RPDs exhibit fewer typical signs of combination syndrome when compared to Class I designs. [9]

Abutment teeth play a significant role in both fixed and removable partial dentures. Any tooth that is grossly decayed or is malaligned can still serve as an abutment tooth using either cast post core restorations or conventional orthodontic treatments.[14] occlusal requirements are also essential; these include a sound anterior guidance and an esthetically pleasant and technically correct occlusal plane.[15,16] Some of the partially edentulous situations that present as modifications can be treated with implant-supported single crowns or implant-supported fixed partial dentures.[17,18] The primary objective of occlusal scheme and plane management is to achieve a harmonious occlusal plane in the mandibular arch, which includes natural teeth, fixed partial dentures (FPD), and removable partial dentures (RPD), prior to arranging the maxillary teeth.[16] This may require occlusal corrections or restorative modifications such as enameloplasty, overlay RPD, or re-contouring of FPD to idealize the occlusal plane. The goal is to establish bilateral balanced occlusion on the maxillary denture, provided the cuspal anatomy of the opposing teeth permits it. Utilizing flatter cuspal inclinations on denture teeth combined with an accentuated compensating curve (approximately 15–20 degrees) can help minimize tipping and enhance denture stability. In cases where the opposing teeth are significantly worn or misaligned, adopting a monoplane or reduced cusp anatomy, while meticulously controlling the vertical dimension, can alleviate lateral stresses and lower the risk of fracture in the single denture.[19]This case report presents a clinical rehabilitation of an elderly patient with a single complete maxillary overdenture that opposed a combination of a mandibular anterior fixed partial denture, which in turn supported a unilateral distal extension partial denture.

CASE REPORT

An elderly male patient in his early fifties reported with the chief complaint of inability to eat and poor aesthetics. By occupation, the patient was a farmer and had 4 children, all of whom were married. The patient was living alone in his village and had no medical or systemic disturbances. His dental history included loss of teeth due to caries and periodontal disease over the period of the last 15 years, in which he lost mandibular left side posteriors first, then maxillary posteriors on the right side, followed by maxillary left posteriors, maxillary anteriors, and lastly mandibular anteriors. An extraoral examination showed all parameters within the normal range except that the mandible would deviate slightly to the right upon wide opening. An intraoral examination revealed the patient had three maxillary anterior teeth left, while the mandibular arch had a Kennedy class 2 partial edentulous area with a single modification space that was formed by the loss of mandibular anterior teeth. Radiographic evaluation showed few mandibular posterior teeth that had occlusal caries presenting as pit and fissure caries. Barring one natural tooth, which was positioned slightly rotated, all remaining teeth were in good condition. The patient was presented with a treatment plan that consisted of thorough oral prophylaxis followed by endodontic treatment of the remaining maxillary anterior teeth. The treatment plan consisted of a maxillary single complete tooth supported by an overdenture that would be opposed by a mandibular anterior FPD, which would support a cast partial denture on one side. Written consent was taken from the patient, and the treatment was initiated. All treatments, including preprosthetic prophylaxis and endodontic treatments, were undertaken under a strict infection control procedure following the covid-19 guidelines for treating patients. After oral prophylaxis, the patient was advised to maintain oral hygiene using a toothbrush and mouthwashes. The mandibular right-sided posterior teeth were restored with a posterior composite (Charisma, Herculite XR, USA), followed by finishing and polishing.

The prosthetic rehabilitation started by taking diagnostic impressions with irreversible hydrocolloid (CA 37; Cavex, Haarlem, Holland), from which diagnostic casts (Type-II dental stone, Pankaj Industries, Mumbai, India) were prepared and mounted on a semi-adjustable articulator (Hanau Widevue, Waterpik, Ft. Collins, CO, USA) using an arbitrary facebow (Hanau Quick Mount) and centric/eccentric interocclusal records. 23 in the prosthetic phase after preprosthetic mouth preparations, the first clinical steps were to prepare the maxillary teeth for a tooth-supported overdenture

(Figure 1a). Since they were endodontically treated, they were filled with permanent restorations after levelling them upto the soft tissue. The mandibular anterior teeth were prepared (right and left canine and left first premolar) for receiving a metal fused to ceramic anterior FPD (Figure 1b) (Remanium CSe, Dentaurum J.P. Winkelstroeter KG, Ispringen, Germany). Laboratory procedures were done with conventional techniques with metal framework extended as a cantilever on the left side of the arch (Figure 1c). The framework was tried in the patient's mouth (Figure 1d), while at the same time the presence of undercuts for direct retainers of an RPD was identified on the opposite side (Figure 1e). The final FPD was then cemented in place using glass ionomer cement (Ketac-Cem; 3M ESPE, St. Paul, Minn.) (Figure 1f). At this stage of the prosthetic rehabilitation, the maxillary single complete overdenture was prepared using conventional methods. To enhance thermal biocompatibility of the maxillary single complete overdenture, a metal base (Wiron 99; Bego, Bremen, Germany) was planned, which was cast simultaneously with the lower cast partial denture framework. Both frameworks were tried in the patient's mouth, following which teeth arrangement was done on a semiadjustable articulator (Figure 2a). Both the maxillary overdenture and the mandibular cast partial denture were then tried in the patient's mouth for evaluation of occlusion (Figure 2b). Following this clinical step, both dentures were processed using heat-cure denture base acrylic resin (Fortex; Lucite Intl, Durham) (Figures 2c, d). Occlusion was evaluated and corrected using a clinical remounting procedure, and then both dentures were delivered to the patient (Figure 2e), who was very satisfied with the treatment outcome (Figure 2f). The patient was instructed regarding the use and maintenance of the denture and was put on a follow-up protocol of 1 day, 1 month, 6 months, and every year. At the 1-month follow-up, the maxillary and the mandibular dentures were again corrected for occlusal errors using a clinical remount procedure.

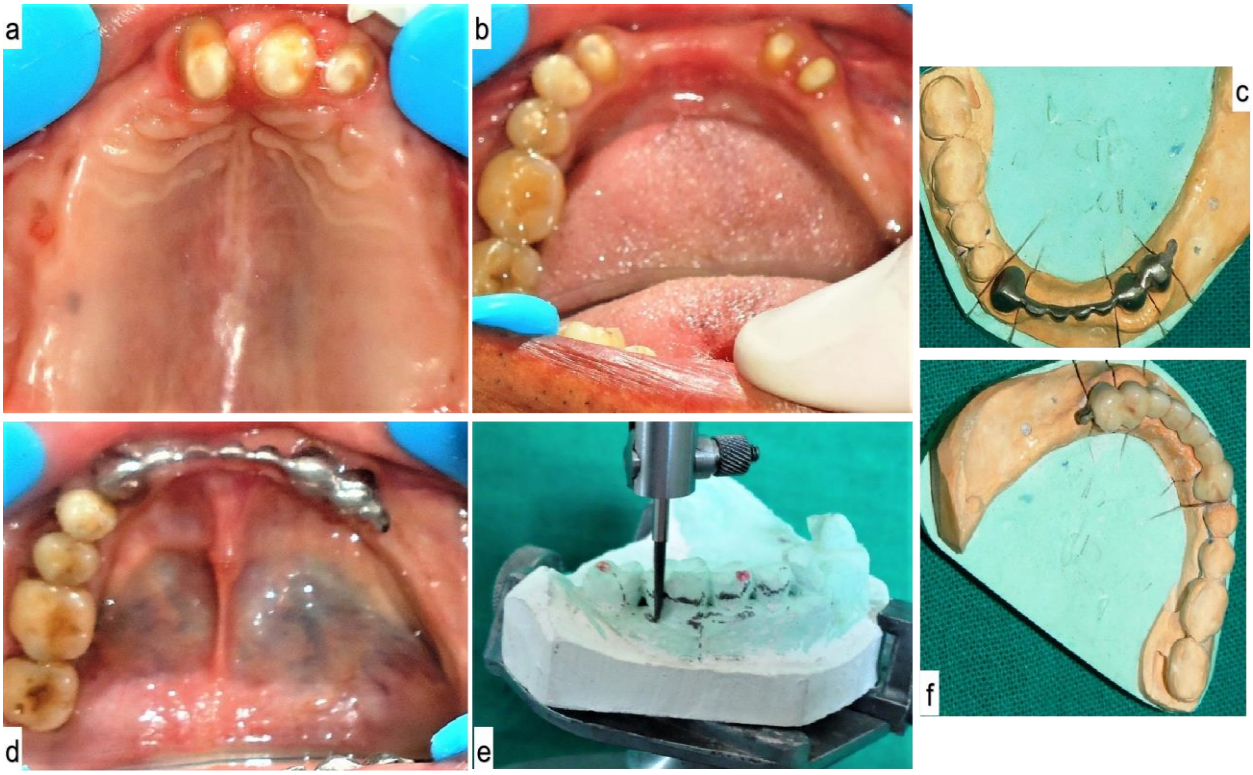

Figure 1: (a) prepared maxillary teeth to tissue levels (b) prepared mandibular teeth for receiving a fixed partial denture (c) modified metal framework with cantilevered rest seat (d) metal framework trial (e) surveying of diagnostic cast for designing of cast partial denture (f) anterior fixed partial denture after porcelain fusion to metal

Figure 2: (a) articulator showing both prosthesis in place (b) trial procedure of respective prosthesis (c) processed cast partial denture (d) maxillary base metal denture (e) denture trial before final finishing and polishing (e) maxillary denture after exaggerated smile

DISCUSSION

A very rare and unique clinical case of a maxillary single-tooth-supported overdenture opposed by a unilateral cast partial denture that was supported on a modified fixed partial denture has been presented. The only negative finding from the patient's case history was his social history, which indicated that the patient was actually a victim of elder maltreatment in the form of neglect, which has been associated with negative treatment outcomes in multiple medical and dental clinical treatments.[20] Since the natural teeth were presented on only one segment, this case qualifies to be a full occlusal rehabilitation case since the entire occlusion was established after insertion of both prostheses. The single complete maxillary tooth-supported denture has fewer complexities than a single complete mucosa-supported complete denture. Design considerations for maxillary dentures emphasize using a rigid, well-extended base, preferably with metal reinforcement, to withstand fracture from applied forces.[21] The occlusal contact should evenly distribute forces across posterior units, minimizing anterior guidance to prevent overload.[22] Regular follow-ups are crucial to assess ridge resorption, denture fit, and occlusal changes, allowing for early relining or adjustments to mitigate destructive alterations.[21] Clinical planning for the mandibular occlusal plane involves evaluating and potentially restoring it, including FPD contours and RPD occlusal rests, before proceeding with maxillary jaw relations and tooth setup.[23] For designing a Kennedy Class II RPD, focus was on maximizing posterior support to distribute stress broadly and provide proper support, thus functioning more like a Class III to minimize torque and an anterior shift.[24] It is also crucial to minimize steep anterior guidance and avoid heavy anterior contacts during excursions, potentially utilizing balancing ramps or second-molar ramps on the maxillary denture to maintain bilateral balance while preventing anterior overload.[15] Distal-extension removable partial dentures (RPDs) opposing complete dentures can create significant stresses on abutment teeth due to their lever-like action, leading to potential periodontal issues, loosening, or fractures.[24,25] Poorly designed rests, connectors, or indirect retainers may increase rotation of the RPD base during function, negatively impacting occlusion and overloading both the abutments and denture base.[26] In the anterior bridge, the height of the crowns was less due to age-associated attrition, which complicated the making of a self-cleansing fixed partial denture. Improperly designed gingival and occlusal embrasures can lead to failure of FPDs, which produce adverse effects on the gingiva and the periodontium.[27]

Clinical and technical difficulties in dental procedures arise from the critical importance of correct jaw relations and articulator mounting. Errors in vertical dimension or centric relation are particularly problematic when one side is mucosa-borne and the other tooth-borne.[24] Therefore, all errors that are induced by materials used for impression, pouring and mounting casts, and laboratory processing should be dimensionally accurate and stable over a long period

of time. Elastomers are the first choice when it comes to long-duration dimensional stability.[28,29] Occlusal adjustments, which may involve reshaping natural teeth or partial denture surfaces, are essential to maintain esthetics, function, and long-term stability. Achieving occlusal balance is vital for maxillary denture stability, as it distributes forces evenly, preventing tipping or sliding during function. The occlusal balance was achieved by increasing the steepness of the anterior occlusal curves while decreasing the lateral occlusal curves. When it comes to complete dentures, balanced occlusion means that the upper and lower teeth are in stable, synchronous contact with each other, which allows for easy movement of both jaws.[30] Dentures are more stable and easier to wear during chewing and swallowing because the mandible can move freely without putting stress on the bases of the dentures. Dislodgment, rocking, and accelerated ridge resorption can result from an imbalance. Occlusal schemes that are well-balanced reduce the transmission of potentially damaging forces, facilitate the transfer of physiological loads, and enhance patient comfort while preserving the underlying tissues from damage. In addition to the abovementioned complexities, the general precautionary steps of infection control were taken for all multidisciplinary clinical procedures involved, which have been modified after the pandemic to encounter viral infectious agents.[31] existing permanent natural teeth were restored with posterior composite, which matched the shade of each concerned tooth (dual shaded).[32] For maintaining the periodontal health of the remaining natural teeth, which could be compromised by the wearing of the partial denture and its components, the patient was advised to follow an oral hygiene maintenance program, which recommended that he use both mechanical and chemical means of plaque control.[33] Finally, the instructions to use and maintain the tooth-supported complete denture, the fixed partial denture, and the removable cast partial denture were too many; therefore, both written and audio modes were used to deliver those instructions, which have been found effective for understanding and following complex instructions associated with complete denture maintenance.[34]

CONCLUSION

A single maxillary complete tooth-supported overdenture is more preferable and less damaging than a tissue-supported single complete denture; therefore, every option must be exhausted to save natural teeth even if they are grossly destroyed till the tissue levels. A fixed partial denture can support a cast partial denture, provided careful, scientific designing is done to minimize the associated stresses.

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Conflict of interest: None

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