

Complete Occlusal Rehabilitation of a Grossly Decayed Natural Dentition Using Multiple Prosthodontic Options

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Abstract Complete occlusal rehabilitation involves multiple disciplines and specialties of dentistry. Within Prosthodontics it requires meticulous planning of correcting existing occlusal problems and finding new biologically acceptable occlusal parameters which include centric occlusion, occlusal plane, aesthetic position of anterior teeth and vertical dimensions. Very less occlusal rehabilitations will be considered complete if the above parameters are not biocompatible with temporomandibular joint function. This case report of a 43-year-old housewife who presented with a chief complaint of grossly decayed natural teeth is one such case where the above parameters were all corrected. While extra oral parameters were within normal limits, intra oral dental condition was corrected by a series of extraction of teeth, endodontic (intentional and conventional), surgical crown lengthening and multiple prefabricated and cast post cores. The anterior guidance was established and corrected on the temporary restorations which was then transferred to the definitive restoration. Foundation restorations were built using multiple prefabricated fiber posts and custom made cast posts. Final restorations that included single crowns and multiple fixed partial denture were fabricated of metal ceramic. A cast partial denture was also part of the overall occlusal rehabilitation. At subsequent follow up, the patient was extremely satisfied with the outcome of the treatment.

Keywords: cast restoration, dowel, gingivectomy, endodontic, cast post core, cast partial denture

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1. Introduction

Natural permanent teeth despite being one of the highest mineralized body tissues, can undergo rapid destruction in the presence or absence of neglect depending upon the environmental factors. The natural teeth in the permanent dentition are supposed to serve the oral functions for a period of 4 to 5 decades, which is why their care must be special. If and when the permanent dentition is grossly destroyed, their rehabilitation must be planned to serve in terms of biological outcomes that should be in harmony with muscles, bone, joint and other natural teeth. [1] In cases where there is no destruction but still teeth have worn out to the level of being non-functional it is imperative to restore them to fully functional form. Rapid wear in the form of either attrition or abrasion can affect pulp, [2] occlusal harmony and are aesthetically compromised. [3] Some authors have also mentioned that the patient's mental attitude in such cases plays a major role in the final successful outcome and that one must not only stick to clinical, technical or procedural challenges. [4] Before proceeding to treating such cases, it is imperative to first identify all the factors that have contributed to either gross

decay or gross attrition. [5] Once a tooth is lost, it causes other teeth to move which in turn results in occlusal imbalance. Contact and contours alter thereby causing further challenges to both clinician and technician. [6] Vertical dimensions and centric relation are two essential and complicated aspects of such treatments. [7,8] Because the two are intricately related one must be careful in determining the effect of altering these two variables in the final restorations. Loss of teeth can result not only in malpositioning of adjacent and opposing teeth but also bring subtle but important changes in soft tissue and bone. These need to be corrected through either bone recontouring or soft tissue repositioning procedures. [9] Any changes in vertical dimensions in the final restorations should first be verified using temporary restorations that are reversible. [10,11] these are necessary so that the status of a healthy temporomandibular joint (TMJ) is maintained. The relation between a functional or a non-functional occlusion with the TMJ is described and stressed upon in scientific literature. [12] The choice of material used for final restoration is also a significant factor that must be approached with caution, although there is less evidence for the choice of materials in the long term outcome of different treatment methods in complete occlusal rehabilitation. Patient preferences in their treatment

methods have received lots of attention in the recent decades, and modification in ethical conduct demands that patient's preferences must be highly prioritized. [14] Most dental patients prefer a fixed prosthesis over a removable prosthesis and any situation that will allow rehabilitation with a fixed prosthesis must be considered. Such treatment designs include the use of a fixed movable bridge, [15], implant supported fixed partial denture, [16] cast post core crowns, customized fixed partial denture designs and other complicated choices (implant restoration attached to natural teeth). [17,18] the stresses in design associated with non-conventional prosthesis must be analysed and individualized for each clinical situation.

This article presents a case of complete occlusal rehabilitation that is unique since it presents the significance of each step with evidence based results which if not incorporated would have altered the course of successful long term outcome.

2. Case Report

A female patient aged 43 years, reported to the prosthodontic department with chief complaint of decayed natural teeth, poor facial appearance and severe malocclusion. The patient was married, a housewife with three children. Patient's medical, social and drug history were irrelevant to her dental condition. Dental history revealed that she did not use any form of oral hygiene tools and on occasions would clean her teeth with fingers. The patient reported that in the past she had pain in the teeth which either subsided on its own or after taking some medicine. The patient did not seek any professional dental treatment in the past for her condition. Extra oral examination presented with normal facial and temporomandibular joint parameters. Submandibular lymph nodes were palpable without tenderness. Intra oral examination revealed grossly decayed maxillary and mandibular permanent teeth that had resulted in loss of coronal tooth structure in both arches on both sides. An orthopantomograph revealed a full set of natural dentition with evidence of multiple root stumps in maxillary and mandibular arch (Figure 1A,D,E,F). Several mandibular teeth had developed periapical radiolucency and caries in most of the teeth was involving pulp. After removal of caries from each tooth, a clinical diagnosis and treatment plan was initiated after making a diagnostic impression using irreversible hydrocolloid (Jeltrate Alginate, Fast Set; Dentsply Intl, York, Pa). Diagnostic casts were poured with dental stone (Elite Model; Zhermack, Badia Polesine, Rovigo, Italy), following which a face bow (#8645 Quick Mount Face-Bow; Whip Mix Corp) transfer to locate the arbitrary hinge axis was used to mount maxillary cast on a semi adjustable articulator (Whip Mix series 3000; Elite Dental Services, Inc, Orlando, Fla). Centric and protrusive interocclusal records (Take 1, Kerr, Romulus, MI, USA) were made for the patient for programming the articulator. After thorough analysis the patient was presented with a treatment plan that involved extraction of central incisors, right first molar, left first and second molar in mandibular arch and extraction of first left molars in the maxillary arch. Other preprosthetic treatment included endodontic treatment of teeth (except mandibular posteriors) and

surgical crown lengthening of all teeth. The foundation restorations included prefabricated and custom made cast post cores and permanent restorations for grossly decayed teeth that did not involve the pulp. Prosthetic options included use of either implant supported crowns or fixed partial dentures or cast partial denture for partially edentulous areas and individual crowns for all teeth (all ceramic or metal ceramic). The patient was informed that the entire treatment would take between 6 to 9 months for completion and compulsory follow up would be for a period of 2 to 5 years. The patient consented to the treatment using fixed partial denture and removable partial denture using metal ceramic restorations. The entire treatment was scheduled under a multidisciplinary team that included oral physician, radiologist, oral surgeon, restorative endodontist, periodontist and a prosthodontist. All treatment procedures were ordered and sequenced in a systematic way as mentioned in previous literature. [19]

The first treatment procedure started was the extraction of planned teeth followed by endodontic treatment of desired teeth (intentional and indicated) (Figure 1B). Extraction of third molars was considered necessary since their position was not conducive as they were interfering during eccentric movements. This was followed by crown lengthening procedures in both arches on all quadrants. While the reason varied but the main objective was to increase the length of the crowns to the desired level to enhance retention of the prosthetic crowns. [20] However, during post-surgical follow up, it was noticed that the gingival emergence profile could have been improved by altering the zenith of right central incisor. Multiple prefabricated (Aestheti-Post, Bisco, Schaumburg, Illinois; FibreKor Post, Jeneric/Pentron, Wallingford, Connecticut) and cast post cores (Remanium CSe, Dentaform J.P. Winkelstroeter KG, Ispringen, Germany) were a part of the pre prosthodontic foundation restoration which was accomplished successfully (Figure 1C). Diagnostic wax up (Moyco Industries, Inc, Philadelphia, PA) that was done initially was altered after evaluating the occlusal plane with a customized broad rick occlusal plane analyser (Figure 2A). The occlusal plane was marked and transferred on the mandibular cast (Figure 2B) following which the maxillary wax up was modified by adding incisal portions of the predesigned wax up (Figure 2C). Once the wax up was planned, putty indices (Reprosil, Dentsply/Caulk; Milford, DE, USA) that would help in the fabrication of temporary restorations were made for both arches in multiple sections (Figure 2D). All tooth preparations were designed according to the overall treatment plan and to the requirement of a cast partial denture. After tooth preparations routine fixed partial denture clinical and laboratory procedures were followed till the completion of definitive restorations. Each tooth prepared was then temporized using provisional acrylic resin (Dental on Plus; Heraeus Kulzer, Wehrheim, Germany). Once the provisional crowns were cemented, the patient was put on a routine follow up for a period of three months (Figure 3A). This was to ensure that the vertical and centric relations were biologically acceptable by the patient's stomatognathic system. At the end of the three months of wearing temporary restorations, new impressions were made with temporary to record and transfer the suitable anterior guidance as mentioned in the

literature (Figure 3B). [21] At the same time final impressions were made in sections for anterior and posterior segments of both arches using a combination of dual mix and putty relined impression techniques for fixed partial denture fabrication. [22,23] metal trial for all metal ceramic crowns was done in a single appointment (Figure 3C). The shade chosen was decided based on the principles of complete denture fabrication since the existing shade was not considered suitable for the patient's overall appearance. Distribution of shade in terms of value, hue and chroma was done from anterior to posterior segments and in each crown from incisal to the cervical area. Feldspathic porcelain (VMK-95 Metal Keramik; Vita Zahnfabrik, Bad Sackingen, Germany) was fired on the metal copings and a porcelain trial was done. All definitive restorations were cemented following the principles of cement selection as described in earlier literature. [24] All centric contacts were identified and

corrected during porcelain trial. The centric contacts were designed to make an even and uniform occlusal contact in posterior teeth (Figure 4A), while having no contact during protrusion (Figure 4B). The patient's facial appearance was examined while speaking (Figure 4C) and at rest (Figure 4D). The patient was given post cementation instructions regarding oral hygiene maintenance care at home. The patient was put on a follow up visit of 1 day, 7 days, 1 month, 3 months followed by yearly clinical evaluation. The post endodontic follow up for the decayed teeth with periapical lesion included evidence of bone formation verified through comparative radiographs between previous and current lesion. While initial healing was evidenced at 4-month interval, the patient is on a follow up of the same for a period of at least 2 years. During the follow up appointment, the patient claimed that she was highly satisfied with the outcome of the treatment.

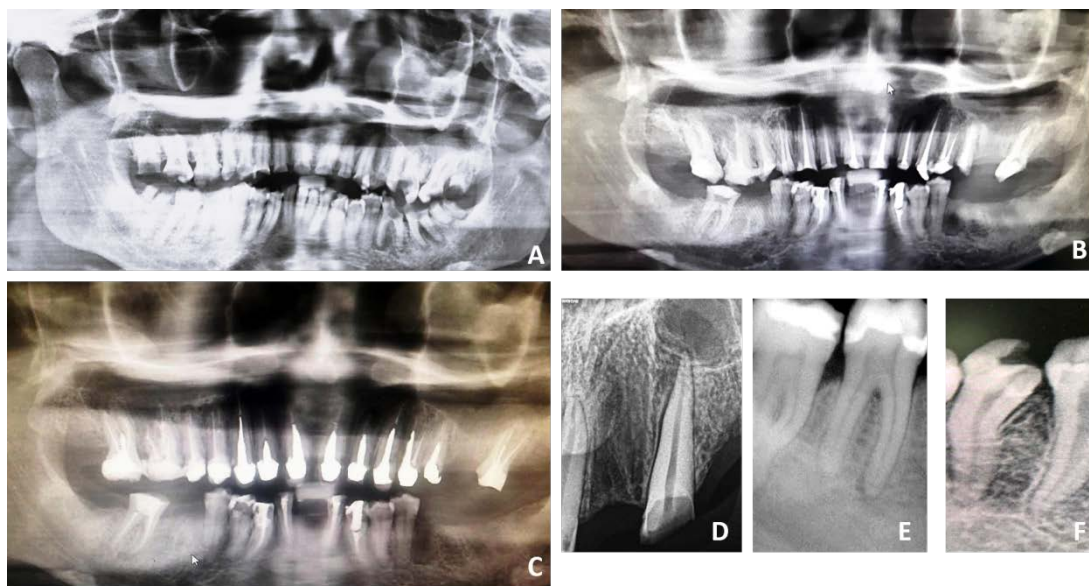


Figure 1. (A) Preoperative orthopantomograph showing the scale of tooth destruction (B) Orthopantomograph showing endodontic treatment of planned retained dentition (C) Orthopantomograph showing the status of foundation restoration used (D) Intra oral periapical radiograph of a tooth that was retained as a strategic treatment plan (E) Peri apical radiograph of mandibular molar with apical periodontitis (F) Radiograph showing a curved root canal

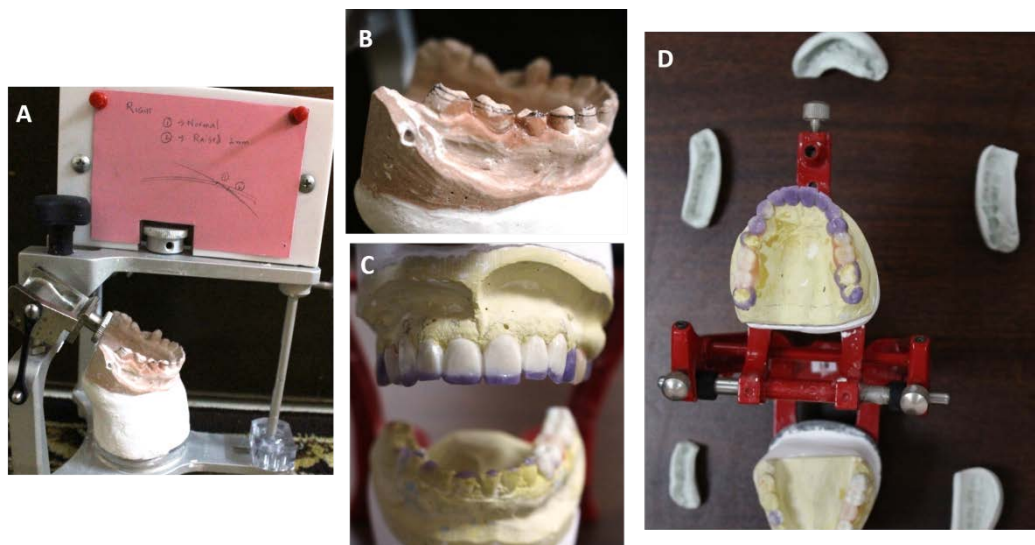


Figure 2. (A) Customized Broad rick occlusal plane analyzer to evaluate existing and planned occlusal plane (B) Diagnostic cast with occlusal plane scribed on the buccal surface of teeth (C) Corrected diagnostic wax up denoted by different colored wax (D) Entire wax up with related putty indexes

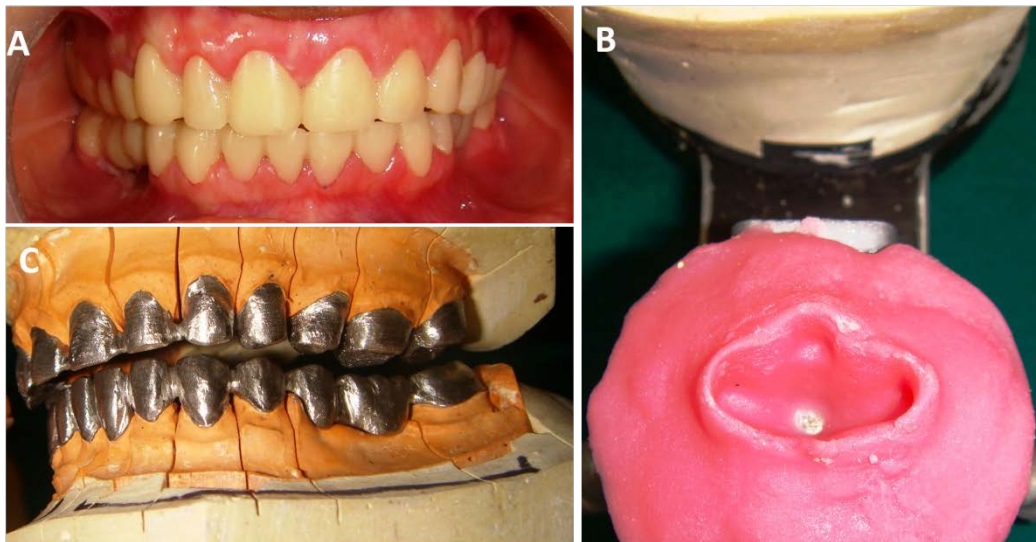


Figure 3. (A) Temporary restorations that were worn for diagnostic purpose (B) Anterior guidance as determined by stabilized temporary restorations after 3 months (C) Metal frameworks during metal trial procedure

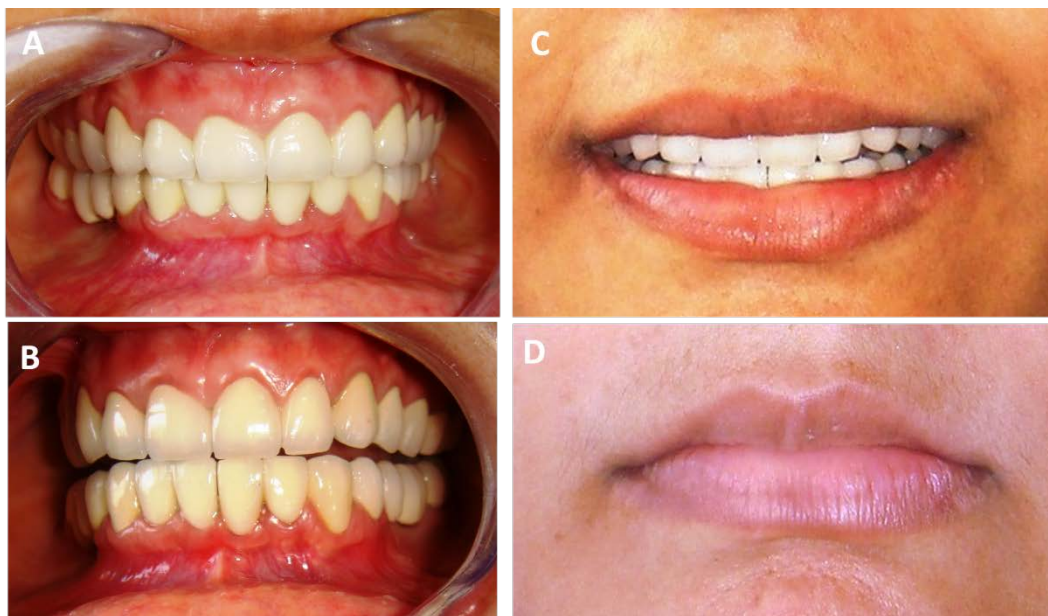


Figure 4. (A) Frontal view of complete occlusal rehabilitation (B) Anterior guidance that is functional and discludes posterior teeth (C) Extra oral photograph presenting patients esthetics while speaking (D) Extra oral photograph showing the patients competent lip positions after rehabilitation

3. Discussion

A case of complete occlusal rehabilitation has been presented in this case report. The unique feature of this case report is that it presents the significance of using Broadrick occlusal plane analyser during establishment of the occlusal plane. It shows how the incisal edges of the diagnostic wax up had to be changed after analysis of the occlusal plane. Occlusal plane analysis and correction is one of the basics of occlusal rehabilitation and is not dependent on the philosophy used. For all philosophies of complete occlusal rehabilitation (Pankey Mann Schuyler (PMS), Hobo twin table and Hobo twin stage) the occlusal plane correction is applied. [25] The stress on correcting the existing occlusal plane has also been reiterated by several authors. [26,27] the occlusal plane is initiated anteriorly by the existing incisal position of the anterior teeth and proceeds posteriorly along the cuspal inclines. Its abnormalities are observed in case of supraeruption,

rotation of teeth or intrusion of a tooth. The vertical and horizontal space present between the anterior teeth is not only crucial for phonetics, but it plays an important function of discluding posteriors during mandibular protrusion. [28] Gradual wear of teeth can alter anterior guidance which results in the occlusion shifting from canine protected to group function. [29] The occlusal plane is also individualized dependent upon the skeletal frame of the individual and keeps on changing with the age. [30,31] The occlusal plane correction becomes difficult when teeth supra erupt to the opposing edentulous space to the extent that necessary crown lengthening procedures become essential. Same was the problem in this case, where the mandibular posteriors had erupted due to lack of occlusal contacts. Since the opposing occlusal surfaces were gradually destroyed by caries, the opposing teeth continued to supra erupt. In one of the tooth, the supra eruption had taken place to the extent that crown lengthening would have exposed the root surface. Such teeth can either be

corrected using crowns after intentional endodontic therapy or they need to be extracted as part of the strategic planning to achieve the long term objectives.

Another important feature of this case report is the extensive pre prosthetic preparation that was required to fulfil the rehabilitation. Overall, 5 individual teeth and two posterior roots were filled using a prefabricated glass fiber post while remaining teeth were founded with cast post cores. When foundation restorations are cast post cores, the communication with the dental technician becomes significant. The technician must make a core that allows normal contacts and contours over all the surfaces of the involved tooth. [32,33] The cast post core also equips the grossly decayed tooth with a mechanical advantage by strengthening the weakened tooth. [34] When no adjacent teeth are present, it becomes difficult for a dental technician to impart axial inclination of the core. This case also presented a similar problem. The problem was however overcome by using the technique described by Muneera et al. [35] The case described in this article had however one more additional problem, which was to correct the occlusal plane in two teeth that had to be restored with a cast post core. After achieving a crown height of about 3 millimeters, it was still difficult to prepare a core that would allow space for the crown restoration. This is required for crown to have a life like aesthetics in which the incisal third of the crown is added with extra enamel porcelain. It was anticipated that these two teeth will compromise the esthetic results. However, slight over the preparation of the core did not allow such aesthetic compromise to be made. The anterior guidance that was established in this case was done using temporary restorations. Provisional acrylic allows correction of guidance when they are worn over a period of time. In this case the patient wore temporary for three months. During this time, the patient was asked to notice any discomfort in oral musculature upon performing functions. Temporary restorations had an anterior guidance that allowed discussion of posterior teeth upon protrusion. This was in accordance to basic occlusal concepts described in the past and recent literature. [36,37]

4. Conclusion

Occlusal plane correction, centric relation and vertical dimensions are critical to complete occlusal rehabilitation. Any compromise in these parameters does not qualify to be called complete occlusal rehabilitation. Foundation restorations are essential to correction of occlusion in cases where natural tooth structure is grossly destroyed.

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Conflict of Interest

None.

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