Management of Severely Worn Dentition via Full Mouth Rehabilitation: A Case Report

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Abstract: It is very crucial to properly diagnose and treat Worn down dentition cases. As the treatment of this condition could be complicated and depends on many aspects, a thorough examination and sequenced treatment planning should be considered. Many aspects should be evaluated including, the causative factors, vertical dimension of occlusion (VDO), the remaining teeth structures and the periodontal condition around them. In this case, the Loss of posterior support was the most common causative factor along with the parafunctional habits the patient had. Mandibular recording device (Cadiax compact 2) was used to register the condylar and mandibular movements. The treatment included restoring the proper vertical dimension utilizing heat cured provisionals after confirming with an occlusal device. In this case many implant was placed in the posterior mandibular region along with metal ceramic porcelain fused to metal crowns to restore proper function and esthetics. Finally, an occlusal device was fabricated with and even bilateral simultaneous contact and canine guidance to protect the ceramic work and insure the longevity of treatment provided.

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Introduction:

Complete oral rehabilitation in patients with severely worn dentition is extremely challenging. Many factors can affect treatment planningin these cases, such as evaluation of existing occlusal vertical dimension (OVD), the availability of restorative space, amount of tooth loss, and the pulpal and periodontal status of each tooth (Turner et al, 1984). Severely worn dentition can be caused by many different factors, including parafunctional habits, loss of posterior support, and chemical erosion (Li et al, 2017; Doan et al, 2007). Harmonious long-term function and reliability depend on the correct relationship between anterior and posterior dentitions; periodontal support; temporomandibular joint (TMJ); neuromuscular system, for example, central nervous system activity can cause bruxism; quality of oral home care; nutrition; and overall physical and emotional health (Manavella et al, 2017).

We present this case to record all stages of oral rehabilitation, from diagnosis to final treatment and follow-up of a bruxer with severely worn dentition, some extracted teeth, and an uneven occlusal plane. We used casted posts and cores, metal–ceramic restorations, bone and soft tissue graft implants, and an occlusal splint to protect the restorations from the patient's parafunctional habits.

Case Report

A 55-year-old Caucasian man presented to the Dental Clinic. He was highly motivated, punctual, and very cooperative. His height and weight were 6' 2" and 200 lbs., respectively. He was working as acustodian at the time of presentation. He had prescription for two medications, Ramipril (10 mg), and aspirin (81 mg), to treat hypertension.

The oral health status of the patient was poor; he had undergone multiple tooth extraction procedures previously. He was diagnosed with bruxism by his previous dentist and had undergone sinus bone grafting with implant placement at site #3, #4, and #5. These implants failed one year later and were removed by a surgeon. The patient underwent another surgery where a calvarial autogenous bone graft in the right maxilla was used. After bone graft implants were positioned at site #3, #4, and #5, the dentist placed implant-supported prostheses.

Further examination revealed that the lymph nodes were within normal limits. Soft tissue screening of extra- and intraoral structures was performed, and no apparent pathology of the head and neck region was visible. No TMJ clicking or sounds were detected, and the patient exhibited a fairly symmetrical face with almost parallel interpupillary and intercommissural lines.

The patient had moderate lip line on smiling. His "F" sound position was inadequate; however, the sound itself was adequate. The patient lisped while pronouncing sibilant sounds and used his tongue in an effort to compensate for the excessive space.

The patient's soft tissue profile was concave. The interocclusal rest space was measured extra orally and determined to be 5–6 mm. The hard and soft palate, floor of the mouth, tongue, buccal mucosa, and oropharynx were within normal limits. The patient's salivary flow was adequate. His maxillary and mandibular arches were U-shaped.

Multiple maxillary teeth were missing and the splinted implant retaining ceramometal crowns, replacing teeth #3–5, was present. In addition, we noted a carious cervical lesion in tooth #6. Recurrent caries under a 3-unit bridge, replacing teeth #6–8, was recorded. Crowns replacing teeth #9–11 presented an open margin, in addition to recurrent caries under the crowns replacing teeth #10, #13, and #14. Furthermore, multiple mandibular teeth were missing. Ceramometal crowns were present on teeth #21 and #29. Open margins and recurrent caries were detected under the crowns of teeth#21 and #29, and carious lesions were visible on teeth #22 and #27. Old amalgam and old composite restorations were present on teeth #28 and 26, respectively. Both vertical and horizontal overlaps were 2 mm. Angle's molar classification could not be determined as teeth were missing.

Figure 1. (a) Pre-operative, and (b) post-operative, frontal view of teeth

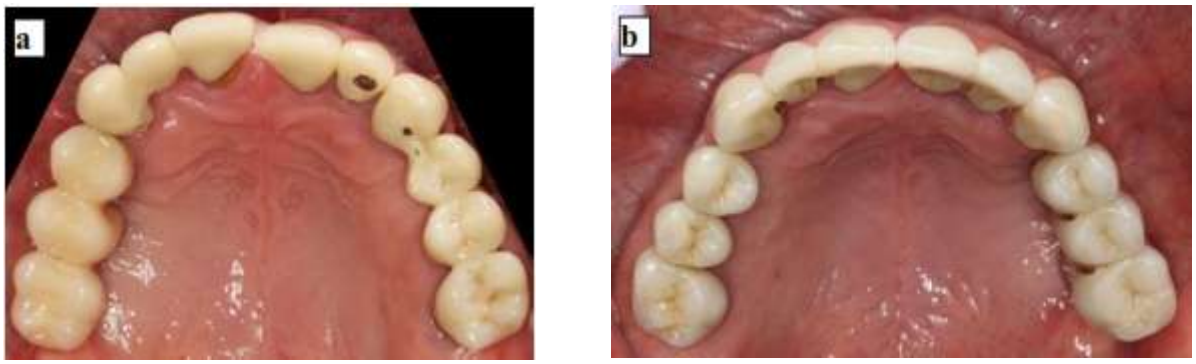

Figure 2. (a) Pre-operative, and (b) post-operative, occlusal view of the maxillary arch

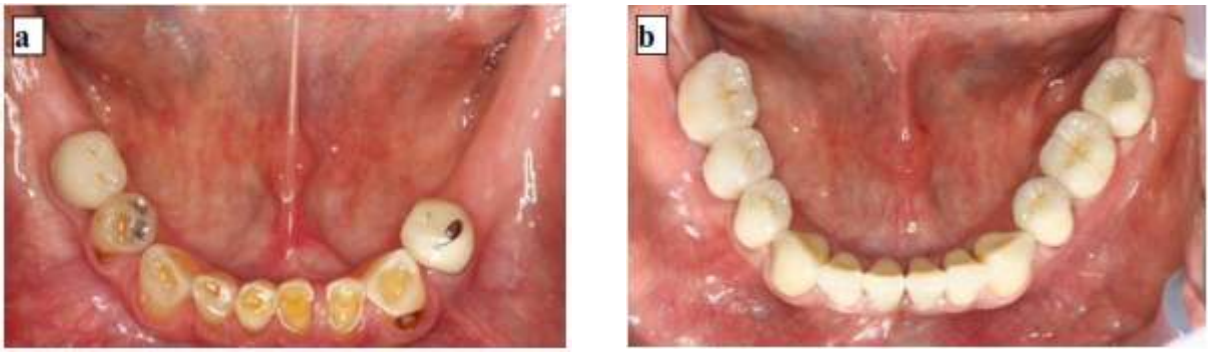

Figure 3. (a) Pre-operative, and (b) Post-operative, occlusal view of the mandibular arch

Upon initial evaluation, the patient exhibited poor oral hygiene with a plaque index (O'Leary) of 56% and a bleeding index (Tufts) of 70%. The patient presented with generalized marginal redness and thick biotype tissue. Gingival recession ranging from 1–3 mm was present on teeth #5, #6, #8, #11, and #23–28; however, we did not observe any furcation involvement. Probing depths of 3–5 mm were recorded for teeth #3, #4, #11, #13, #14, and #22, while tooth #8 had a probing depth of 8 mm. The patient exhibited generalized widening of the periodontal ligament (PDL) space.

Seibert Class III deformity of the ridges was noted on the mandible residual ridge and also on the area of tooth #7. Full-mouth periapical radiographs displayed mild horizontal bone loss, and severe bone loss was visible in the right maxillary quadrant due to a previously failed implant. Overall, the patient demonstrated a generalized pattern of woven trabecular bone and intact lamina dura with a slight widening of the PDL space.

Figure 4. Pre-operative orthopantomogram

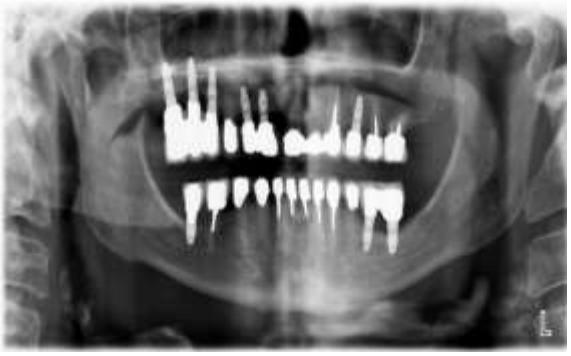

Figure 5. Post-operative orthopantomogram

Radiographic evaluation also revealed several missing teeth with moderate horizontal bone loss of the mandibular alveolar ridge. No signs of pathology were noted. The patient was informed of the treatment plan, including objectives and limitations. Selected restorations, restorative materials, esthetic requirements, and possible complications were discussed with patient.

The patient received oral prophylaxis and instructions for oral hygiene. Two sets of preliminary casts were made using an irreversible hydrocolloid and improved dental stone. Cadiax® evaluation was performed to assess the condylar function and posterior determinants of occlusion. The maxillary cast was mounted on a Denar® Mark II articulator using an arbitrary face bow. The mandibular cast was mounted using a silicone relation record at Centric Relation (CR) registration with an anterior jig at the estimated treatment position for the OVD. Heat-activated acrylic resin provisional shells were created and teeth were prepared using vacuum-formed clear matrices as a guide. Provisional restorations were aligned in the patient's mouth and placed on the prepared teeth. All defective restorations were removed and caries control was performed for all remaining teeth. A mandibular interim partial denture was positioned to provide the appropriate amount of posterior support. Following this, provisional restorations were reevaluated to assess the patient's adaptation to the proposed OVD and occlusal plane. Phonetics and esthetics were evaluated following provisional restoration.

The patient was referred for periodontal treatment, including bone and soft tissue grafting of teeth #7 and #8 and extraction of teeth #8 and #10, which were extensively damaged. A cone beam computed tomography scan, assisted by a radiographic guide, was performed to evaluate the need for a potential bone graft and plan the implant positions. A surgical guide was created, and implant placement was performed on teeth #7, #8, #12, #19, #20, and #30. In addition, the patient was referred for endodontic treatment on teeth #11, #13, #14, #22–26, and #29. Cast dowel posts for teeth #11, #13, #14, #22–26, and #29 were created due to limited coronal tooth structure. The patient was referred for crown lengthening of teeth #13 and #14. Full-contour wax-up was performed to provide the patient with a second set of provisional crowns. Subsequently, heat-activated acrylic resin provisional shells were created. Provisional restorations were aligned in the patient's mouth and placed on the prepared teeth and implants, and reevaluated for phonetics and esthetics. The patient reported that they were happy and accepted the overall esthetic outcome. Next, irreversible hydrocolloid impressions of the existing provisional restorations were made. Gingival retraction was achieved using plain cords soaked in an aluminum chloride solution. Maxillary and mandibular master impressions were created using a polyether impression material.

CR records were created for the prepared teeth and provisional restorations toallow for cross-mounting of the casts on a Denar® Mark II articulator using an arbitrary face-bow and CR records with an anterior jig. Next, dies were prepared, and the margins were marked and sealed with a cyanoacrylate resin adhesive. Two coats of die spacer were applied to each trimmed die. Following this, a custom anterior guide table was created using provisional casts. The mounted casts were sent to the laboratory with the custom anterior guide table to create the castings and custom abutments.

A ceramometal alloy was used for metal ceramic restorations. After the castings and custom abutments were received from the laboratory, they were evaluated in-mouth, examined for fit and occlusion, and returned to the laboratory for porcelain application. The restorations were returned at the bisque stage and examined for fit, contour, and occlusal and interproximal contacts. Complete restorations were then received from the laboratory and luted with resin-modified glass ionomer cement.

A daily routine of thorough brushing, flossing, and fluoride application was emphasized to the patient. In addition, a maxillary hard/soft night guard was provided to protect the prosthesis. The patient returned for further examination two weeks after prosthesisinsertion, and reported that he could function well with the restorations, and was pleased with the esthetic outcome and prosthesis comfort. The patient was reminded that follow-up care would be necessary, and periodontal and prosthetic recall examination and maintenance at three months was recommended. The long-term prognosis is expected to be fair, but will depend on following consistent and continued good oral hygiene practices, occlusal guard use, and further periodic recall examinations.

4. Discussion

Here, we report the full oral rehabilitation of a 55-year-old man with severely worn dentition due to bruxism. We report the examination, diagnosis, and insertion of ceramic restorations to the satisfaction of the patient. CR position at the correct vertical dimension should always be repeatable and recordable (Galeković et al, 2017). A proper vertical dimension can be achieved *via* restoration of the previous vertical dimension or increasing the current vertical dimension, particularly in cases involving loss of posterior support. In our case, posterior support was provided with implants and a fixed partial denture, which provides more support when compared with a removable partial denture.

A dental implant is subject to mechanical forces due to the load placed on the prosthesis. Forces can be compressive, tensile, and shear. Compressive forces tend to maintain the integrity of an implant. In general, implant-supported dentures can accommodate compressive forces; however, shear and tensile forces can distract or disrupt the implant interface. The manner in which forces are distributed over a surface is referred to as mechanical stress. The magnitude of this stress is dependent on two variables: force magnitude and cross-sectional area. In our case, there was segmental bone resorption on the upper right side due to previous bone graft failures; therefore, the crown-to-implant ratio was uneven due to severe bone resorption. This led to the use of implants that were splinted, and a customized abutment made of titanium and splinted crowns with gold fused to porcelain were used to allow excessive forces to pass to the cement line instead of directly passing to the screw.

Anterior bone and soft tissue grafts in the maxillary ridge were incorporated with the implants. A soft tissue graft was used due to the bone fenestration present in the maxillary ridge. Three provisional restorations were manufactured to restore function, esthetics, and phonetics. As the patient suffered from bruxism, metal reinforced provisional implants were used to avoid fracture and withstand high muscle activity. Metal fused to an acrylic, temporarily removable partial denture was used in the mandible, with a ladder design to facilitate implant placement. The crown-lengthening and proper ferrule effect was provided as part of the core to reinforce the root-filled teeth (Stanbkiewicz et al, 2002).

Incisor, canine, and molar classifications should always be accurately used to diagnose and plan the final occlusion. Initially, it was not possible to determine canine and molar classifications due to missing molars and canines. Molars can be defined asclass I, II, (full unit), or III (Galeković et al, 2017); however, our goal was to provide the patient with a mutually protected occlusion, and harmonious and smooth anterior guidance to separate and protect posterior teeth. In addition, we sought to provide smooth canine guidance in lateral excursions, which would assure long-term stability for the patient's occlusion. We created a horizontal overlap of approximately 1 mm to establish slight freedom of movement during centric occlusion, which can preserve the efficacy of the proprioceptive impulses (Thornton, 1991).

The restoration of worn-out dentition presents a substantial challenge; careful evaluation to examine the etiology, history, and factors relative to the OVD was performed during our treatment plan (Nikolopoulou et al, 2006). Cadiax® compact is an electronic condylograph that can record horizontal condylar inclination, Bennett angle, and relative shape of the articular eminence. Bio JVA™ was used to analyze the TMJ using friction and motion. When smooth surfaces rub together, some friction is created and vibration

can occur. Furthermore, when these surfaces become rough, friction and vibration occur when these surfaces articulate. In this case, an examination of the TMJ revealed clicking (Alhangari et al, 2012).

Analysis of phonetics and esthetics is crucial when evaluating new case, while the restoration of natural teeth is dependent upon pre-extraction records to achieve established objectives (Jain et al, 2014). If these records are missing, it is difficult to determine the position of artificial teeth. Therefore, we used phonetics as a guideline for the proper placement of artificial teeth (Igić et al, 2015). Tooth quantity and quality were evaluated, and percentages of the walls present were checked for all root-filled teeth to achieve adequate restoration. The intraradicular resistance, retention form, and crown-to-root ratio were evaluated before obtaining impressions for crowns and creating custom-made posts and cores (Shamseddine et al, 2016). We identified bony anatomy with respect to the teeth prior to surgery, which allowed determination of the regions where implant–bone interface could be maximized. This led to optimization of the prosthetic result. The completely limiting design was used because it is a superior design concept. Computer-aided planning and image-guided surgery were performed to allow precise implant positioning and optimal use of the available bone (D'haese et al, 2017).

Caries management by risk assessment (CAMBRA) protocol and analysis was used as part of the treatment plan because it is the correct approach to prevent or treat dental caries. Caries-protective factors include biological and/or therapeutic measures that can be used to prevent or arrest pathological challenges posed by caries risk factors. Patients are motivated to adhere to medical recommendations because this is important to achieve successful caries management (Kashish et al, 2014).

Our patient was extremely satisfied with the improvement in his esthetic outcomes. A maxillary night guard with a mutually protected occlusion having anterior and canine guidance was constructed for the patient (Koyano et al, 2008). Recall examinations and reviews of the implant and restorations were scheduled every three months for the first year to help prevent infections and implant failure. After one year, the interval between maintenance visits was based on the patient's general health and implant status and home care (Seki et al, 2017).

References

1. Alhangari AH, Torabi K, Pour SR, Ghodsi S. Evaluation of the cadiax compact II accuracy in recording preadjusted condylar inclinations on fully adjustable articulator. Journal of Contemporary Dental Practice. 2012;13(4):504:8.
2. D'haese J, Ackhurst J, Wismeijer D, De Bruyn H, Tahmaseb A. Current state of the art of computer-guided implant surgery. Periodontology 2000. 2017;73(1):121-33.
3. Doan PD, Goldstein GR. The use of a diagnostic matrix in the management of the severely worn dentition: clinical report. Journal of Prosthodontics. 2007;16(4):277-81.
4. Galeković NH, Fugošić V, Braut V, Ćelić R. Reproducibility of Centric Relation Techniques by means of Condyle Position Analysis. Acta Stomatologica Croatia. 2017; 50(1),13-21.
5. Igić M, Krunić N, Aleksov L, Kostić M, Igić A, Petrović MB, Dacić S, Igić S, Igić A. Determination of vertical dimension of occlusion by using the phonetic vowel "O" and "E". Vojnosanitetski Pregled, 2015;72(2):123-31.
6. Jain CD, Bhaskar DJ, Agali CR, Singh H, Gandhi R. Phonetics in Dentistry. International Journal of Oral Health and Medical Research.2014;1(1):31-37.
7. Kashish. J, Nasim I. Caries management strategies by risk assessment-prevention and treatment. IOSR Journal of Dental and Medical Sciences.2014;13(11):36-43.
8. Koyano K, Tsukiyama Y, Ichiki R, Kuwata T. Assessment of bruxism in the clinic. Journal of Oral Rehabilitation.2008;35(7):495-508.
9. Li Z, Yang Z, Lan T, Zhao H, Liu Y. Worn is born: The role of the maxillo-mandibular relation in management of worn dentition. Medical Hypotheses. 2017;104:156-9.
10. Nikolopoulou F, Ktena-Agapitou P. Rationale for chocies of occlusal schemes for complete dentures supported by Implants', Journal of Oral Implantology.2006;32(4):200-3.
11. Manavella V, Romano F, Corano L, Bignardi C, Aimetti M. Three-Dimensional Volumetric Changes in Severely Resorbed Alveolar Sockets After Ridge Augmentation with Bovine-Derived Xenograft and Resorbable Barrier: A Preliminary Study on CBCT Imaging. International Jouranl of Oral & Maxillofacial Implants. 2017;10(4):373-82.
12. Seki K, Nakabayashi S, Tanabe N, Kamimoto A, Hagiwara Y. Correlations between clinical parameters in implant maintenance patients: analysis among healthy and history-of-periodontitis groups. International Journal of Implant Dentistry.2017;1(45):45.
13. Shamseddine L, Chaaban F. Impact of a Core Ferrule Design on Fracture Resistance of Teeth Restored with Cast Post and Core. Advances in Medicine, 2016;10(15):8-16.
14. Stankiewicz NR, Wilson PR. The ferrule effect:

a literature review. International Endodontic Journal.2002;35(7):575-81.
15. Thornton LJ. Anterior guidance: Group function/canine guidance. A literature review. Journal of Prosthetic Dentistry. 1990;64(4):479-482.
16. Turner KA, Missirlian DM. Restoration of the extremely worn dentition. Journal of Prosthetic Dentistry. 1984;52(4):467-74.

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