

Case Report

Total Rehabilitation of Worn Dentition in a Self-Reported Female Using Pankey-Mann-Schuyler Concept and Methodology- A Case Report

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Abstract: Tooth wear has intrigued restorative dentists due to its multifactorial etiology. Loss of tooth structure may occur through non carious processes like abrasion, attrition, erosion and possibly abfraction, acting alone or in combination. Behavioral factors that may contribute to parafunctional habits and/or nocturnal tooth grinding (bruxism) are also important to understand and in order to successfully restore and maintain a healthier dentition. Restorative treatment decisions must be based on the patients' needs, severity of wear and potential for progression of the wear. This article describes the management of worn dentition in a self reported bruxer who presented with occlusal wear and concomitant non-carious cervical wear. Pankey-Mann-Schuyler philosophy along with functionally generated pathway technique was employed to achieve optimal results.

Keywords: Tooth wear, Bruxism, Broadrick flag, Pankey-Mann-Schuyler philosophy, Full mouth rehabilitation.

INTRODUCTION

Tooth wear has intrigued restorative dentists due to its multifactorial etiology. Loss of tooth structure may occur through various non carious processes [1]. Non-carious cervical abrasions usually lead to the destruction of dental hard tissue. These processes may include abrasion, attrition, erosion and possibly abfraction, acting alone or in combination. Attrition is defined as the physiologic loss of tooth structure as a result of the masticatory processes; erosion is the chemical dissolution of structure that does not involve the carious process; and abrasion is the mechanical wearing away of structure. Abfraction is supposed to happen when undue cyclic, non-axial tooth loading leads to cusp flexure and stress concentration in the susceptible neck region of teeth. Such stresses are then considered to honestly contribute to tooth structure loss, by dominant bondings among hydroxyapatite crystals, or ultimately lead to loss of tooth structure by making the tooth more liable to future breakdown by further abfraction and other processes (e.g., abrasion and corrosion) [2].

In order to successfully restore and maintain worn dentitions, one must gain thorough insight into how the teeth arrived at this state of destruction. While all occlusions wear to some degree over the lifetime of

the patient, normal physiological wear usually does not require correction. Assessment and diagnostic procedure must account for the patient's diet, history of eating or gastric disorders, along with the current state of occlusion. Some other aspects like behavioral factors that may contribute to parafunctional activities like bruxism are also essential to comprehend. Such assessments are deemed necessary for successfully restoring and maintaining the healthier dentition [3-4]. This article describes the management of a case of worn dentition that presented occlusal wear and concomitant non-carious cervical wear.

CASE REPORT

A 52 yr old female reported with a chief complaint of worn out teeth that made her smile unsightly. The teeth were also sensitive to cold drinks since six months. Her medical history was non-contributory. She gave history of clenching and grinding her teeth at night since many years. She visited a dentist earlier who had advised her restorations of worn teeth in the lower jaw. She was also advised root canal treatment of lower anterior teeth for the commencement of post endodontic prosthetic restorations. Extra-oral examination showed a symmetric, brachycephalic face; followed by TMJ examination which revealed no significant findings.

Palpation of masticatory muscles elicited no pain. Intra-oral examination showed generalized attrition and abfractions in anterior teeth (Fig.1). The occlusion was Angle's Class I, with diastemata in the maxillary and mandibular anteriors. Due to severely worn dentition, the anterior teeth had traumatic contacts in maximum intercuspation. Gingival recession was seen in lower anteriors, maxillary canines and maxillary first molars (teeth # 3,14). The discrepancy between vertical measurement at rest and at occlusion was 3mm. She was diagnosed as a case of collapsed vertical dimension due to severely worn dentition and associated clinical changes like non-carious cervical Lesions (abrasion, abfractions), gingival clefts and recession in the maxillary and mandibular anteriors, generalized occlusal wear (attrition); attributed to ensuing occlusal loads from bruxing. Full mouth rehabilitation was planned for her after completion of endodontic treatment of all teeth (Fig. 2) as the available restorative space was inadequate. The steps towards rehabilitation were in the following sequence:



Fig-1; Pre treatment intra oral view



Fig-2: Orthopantomogram (OPG) after Endodontic treatment

Deprogramming splint; Reversible occlusal therapy

The maxillary and mandibular arch preliminary impressions were made in alginate. The maxillary diagnostic cast was mounted on a semi adjustable, arcon articulator (Hanau Wide Vue, Water Pik, United States) following a face-bow transfer. A deprogramming jig was made in impression compound and interocclusal records were made in centric relation

using bite registration elastomer (Futar D Fast, Patterson Dental Supply, Minnesota, United States). Mandibular cast was mounted using interocclusal records. An acrylic stabilization splint was fabricated on a duplicated maxillary cast to the proposed vertical dimension and the patient was asked to wear it for 3 weeks (Fig. 3). Meanwhile, a diagnostic wax-up (Fig. 4) was made to serve as a blue-print for the provisional restorations. The provisionals were fabricated from putty indices (Aquasil, Dentsply, Gurgaon, India) of the diagnostic wax-up. The posterior occlusal plane was established with an indigenous Broadrick flag stabilized in acrylic resin [5] (DPI RR cold cure, Mumbai, India) (Fig.5). The provisional restorations (Protemp Plus, 3M ESPE, United States) were cemented with Zinc Oxide Non-Eugenol temporary cement (RelyX Temp NE, 3M ESPE, United States) after minimal preparation of teeth. The patient was left to function with provisionals for 6 weeks.



Fig-3: Occlusal splint on maxillary teeth

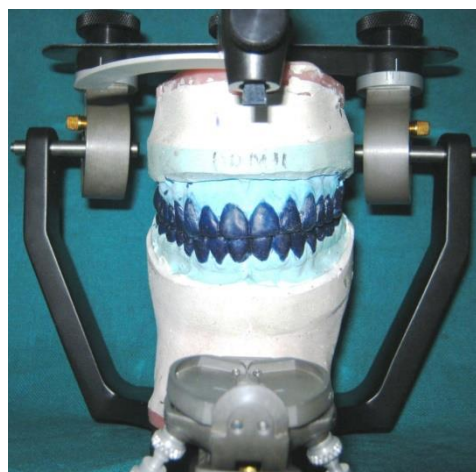


Fig-4: Diagnostic wax-up

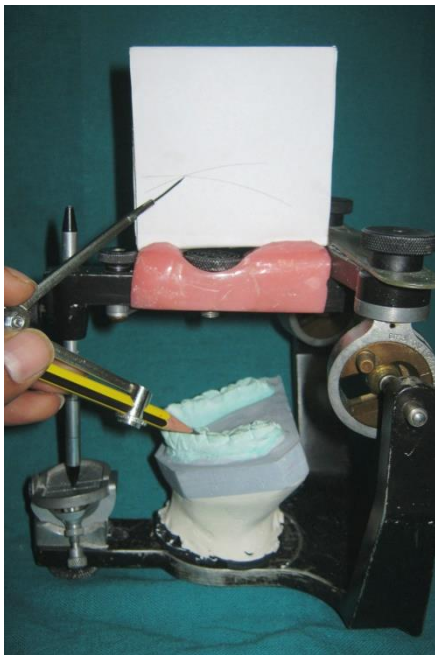


Fig-5: Occlusal plane analyzed using Broadrick Flag

Preparing anterior teeth for Porcelain Fused to Metal crowns and provisional cementation

After confirmation of painless functioning, the anterior provisionals were removed and final tooth preparations were done. Gingival retraction (Ultrapak, Ultradent Products Inc., South Jordan, Utah and United States) and impressions were followed by bite registration while the posterior provisionals remained in place to maintain the bite. Metal ceramic crowns were fabricated (Fig 6A and 6B) for the maxillary and mandibular anteriors and cemented with provisional cement (RelyX Temp NE, 3M ESPE, United States).



Fig-6: A) Anterior metal-coping trial with posterior provisional restorations in place and B) Anterior definitive crowns (Anterior guidance established first)

Preparing posterior teeth for Porcelain Fused to Metal crowns and provisional cementation; Master key to achieve Functionally Generated Pathway (FGP)

Mandibular posterior temporaries were removed and teeth were prepared for final crowns. The mandibular posterior PFM crowns were cemented provisionally (Rely X Temp NE, 3M ESPE). A Functional recording tray was fabricated in self cure clear acrylic resin over Maxillary posterior prepared dies. The tray loaded with Aluwax (Aluwax, Michigan, United States) inserted in the mouth and patient is asked to perform functional mandibular movements (Fig 7). A functionally generated impression of mandibular posterior teeth is recorded in Aluwax which was poured to get functional core (functionally generated pathway). This functional core is sectioned into right and left posterior parts which were later articulated on verticulator with its corresponding and opposing master cast dies (verticulator allows only up and down movement) (Fig 8A and B). The ceramic build-up on maxillary posterior teeth completed on the verticulator using functional core as a guide. Maxillary posteriors contoured with such technique would be most compatible to the various functional movements of mandible.



Fig-7: Functional recording plate to capture functionally generated path

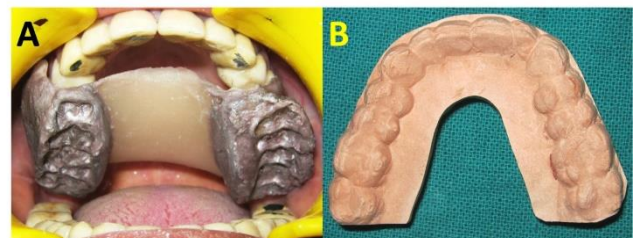


Fig-8: Functionally generated impression of mandibular posterior teeth in Aluwax (A) and Obtained functional core (B)

Final cementation after a 2 week follow up

The finished metal ceramic crowns were provisionally cemented (Rely X Temp NE, 3M ESPE).

The definitive crowns were cemented (Fig 9) with luting Glass Ionomer Cement (Type I GIC, GC, Fuji) after a two week follow-up and intra oral occlusal adjustment was done using 12 μ metallic articulating paper (Arti-Fol, Bausch) as it possesses good color transfer (unlike the conventional shim-stock) and high spots can easily be detected, especially on ceramic. The patient was placed on a maintenance recall of 3 months initially for assessment of hygiene and periodontal health.



Fig-9: Post cementation view of protrusive-light contacts on anteriors and posterior disocclusion

DISCUSSION

Every system in the body depends on nature's universal law of balance between equal and opposite forces. Functional disharmony is accompanied almost always by structural alterations - and vice versa. Structural changes include the movement or abrasion of teeth, alterations in the contour, position, or alignment of the condyle-disc assembly, or changes in bony structures. The challenge in diagnosis is to determine a cause for every effect, and then to decide whether the causative factor is still active or has run its course in producing its effect. When harmony of form and function does not exist, the result is an instability that is almost always manifesting in the dentition as at least one of three signs [6];

- Hypermobility
- Excessive wear
- Vertical or horizontal realignment

The initial clinical presentation of this case involved generalized attrition and non-carious cervical lesions along with gingival recession in the lower anteriors. The patient was aware of clenching and grinding her teeth. Clinical studies have shown associations between abfraction lesions, bruxism and occlusal factors, such as premature contacts and wear

facets, but these investigations do not confirm causal relationships [2]. A host of dental problems have been ascribed to bruxism, such as attrition mechanical wear, fractures / failures of restorations or dental implants, headache and pain in the masticatory system (temporomandibular disorder pain; TMD pain). Treatment of bruxism is indicated when the disorder causes any one of these possible consequences. Unfortunately, there is a striking paucity of high-quality evidence regarding management of bruxism [7].

In this case, the chief concerns to be addressed were- severe generalized wear, the collapsed vertical dimension of occlusion, the cervical lesions and the resultant hypersensitivity. Restorative treatment of cervical lesions can eliminate cervical dentinal hypersensitivity, restore proper tooth form and contour, prevent further loss of tooth structure toward the pulp, improve gingival health by providing food deflection, prevent food and plaque accumulation, strengthen the tooth and reduce the likelihood of fracture, relieve discomfort caused by sharp cavosurface edges and improve esthetic appearance. Traditionally, restorative therapy of teeth with gingival recession and carious or non-carious lesions has been achieved through operative procedures. Restorative (operative) procedures by different authors have included direct and indirect methods using gold foils, gold inlays, gold crowns, ceramic crowns, porcelain inlays, conventional and resin modified GIC, microfill and hybrid composites, and compomers. Terry *et al.* have suggested a 'perioesthetic approach', which considers the harmonious integration and interrelationship of the gingival and tooth complex instead of using only operative procedures to deal with clefts. They opined that periodontal plastic surgical procedures like free gingival autografts, subepithelial connective tissue grafts, coronally repositioned flaps, enamel matrix derivative grafts, guided tissue regeneration should be included in the armamentarium to restore the dentogingival complex as a whole, when clefts result in gingival recession and denuded root surfaces [8-9]. Once a complete understanding of the etiology of the dentition's present state is appreciated, a treatment plan can be formulated, taking into account the number of teeth to be treated, condylar position, the periodontal status, space availability, the vertical dimension of occlusion (VDO), and the choice of restorative material. Further, an occlusal scheme that can avoid future trauma to the periodontium was clearly needed. Therefore full coverage, Porcelain Fused to Metal (PFM) crowns was planned with a mutually protected occlusion scheme to achieve this. The finest vertical dimension is the one that gratify the aesthetic needs of patient and the clinician's functional aspirations with the most conservative approach [3].

As in all prosthetic procedures, the aim of full mouth rehabilitation is not only to restore the worn teeth, but also to preserve the remaining tooth structure. Here in this occlusal design, maximum intercuspation coincides with the most favorable condylar position of the mandible i.e, centric relation. The posterior teeth are in contact with forces being directed along their long axis. Usually anterior teeth either contact slightly or are too slightly out of contact (around 25µm), relieving them of the laterally directed forces that would be the result of anterior tooth contact. During lateral or protrusive excursions, the six anterior maxillary teeth, together with the six anterior mandibular teeth guide the mandible so that no posterior occlusal contacts occur. The required outcome of this is the relative absence of frictional wear. We can thus see how this occlusion is mutually protective the posterior teeth protect the anterior teeth at centric relation, while anterior guidance protects posterior teeth during all excursive movements [10]. The main feature which enables dentists to restore the teeth of patient at increased vertical height is the adaptive capacity of the muscle fiber to modify their length, and the suppleness of the mandibular sling muscles [11].

The three requirements for successful occlusal treatment, as stated by Dawson [6], were achieved in the following manner:

- Comfortable condyles:-achieved by using a deprogramming jig and registering centric inter occlusal record followed by occlusal splint usage,
- Anterior teeth in harmony with the envelope of function: achieved by provisional modelled after an esthetic diagnostic wax-up and custom incisal guidance incorporated in the final PFM crowns.
- Non-interfering posterior teeth:- achieved by mutually protected occlusion and also grinding away all lateral interferences and preserving the centric stops alone.

In this case the Pankey-Mann- Schuyler philosophy modified by Dawson was adopted. The anteriors were restored first [12]. The anterior occlusal plane was established using esthetics and phonetics as guides [10]. The posterior occlusal plane was analyzed during the diagnostic work-up using a Broadrick flag [13,14]. The wax-up was modified accordingly and provisional crowns were fabricated. The treatment objectives - esthetics, function and occlusal stability are all incorporated into provisional restorations replicated from a diagnostic wax-up. The goal of the treatment sequence is to transfer the proposed esthetic and functional occlusal changes from the diagnostic wax-up via the provisional restoration to the patient's mouth, which is the key to a successful definitive restoration [15-19]. While fabricating the provisional restorations,

care must be taken to achieve excellent marginal integrity and positioning, a well planned emergence profile, esthetic contact areas adequate thickness for the proposed restorative materials, incorporation of the esthetic goals, and maintenance or establishment of a physiologic and functional occlusion [20-21].

CONCLUSION

Occlusal wear is considered as one of the most common destructive dental state, leading to a lot of potentially worsening problems. Expensive and very invasive prosthetic rehabilitation remains the mainstay of treatment. Since accurate diagnosis play very important role in successful treatment, the clinician must gather adequate information to help avoid further progression of disease. Adopting an occlusal scheme that restores the worn dentition to optimal function and esthetics along with comfortable function of the temporomandibular joint is the key to success. The articulated study casts and a diagnostic wax-up should be carried out prior to formulating comprehensive treatment options for each individual. It is important to understand that abfraction is still a theoretical concept, as it is not backed up by appropriate clinical evidence. It is suggested that differing, irreversible treatments those done for correcting abfraction lesions, be avoided unless tooth wear has advanced with related hypersensitivity. Also, clinicians should be aware of the striking paucity of evidence regarding the management of bruxism. There is a vast need for well-designed studies on the management of bruxism and tooth wear in general.

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