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CLINICAL REPORT

Complete Rehabilitation of a Patient with Occlusal Wear: A Case Report

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Abstract Prosthodontic management of occlusal wear problems is a demanding task on the part of the prosthodontist. Various factors such as vertical dimension of occlusion, centric relation, occlusal contact pattern, esthetics and phonetics need to be considered simultaneously for both anterior and posterior teeth during occlusal rehabilitation. This may be further complicated by existing restorations, pulpal exposure, missing teeth and tooth sensitivity. Different philosophies have been documented for rehabilitation of such cases and the choice of the treatment plan depends on the skill and experience of the clinician. This case report gives an overview of the different philosophies used for rehabilitation of such cases and a report which utilises Hobo's twin stage technique for the same.

Keywords Occlusal rehabilitation · Occlusal wear · Hobo's twin stage technique

Introduction

Wear caused by attrition of teeth is a common clinical finding. Physiologic attritional wear is a slow process and occurs at a rate of around 68 μm per year [1]. The progressive loss of tooth structure is compensated by continuous eruption of teeth and by secondary dentinal deposition. However, dentin is less hard as compared to enamel and as the wear eventually reaches dentin, the rate of attritional wear is greatly increased. The amount of wear that takes place is related to factors such as bruxism, diet, tooth composition, exposure to various chemical agents, loss of posterior support and opposing restorations [2]. Many times patients are unaware about the ongoing process and realise it only when sufficient loss of tooth structure has occurred. It is the duty of the treating dentist to identify the possible cause of such rapid wear and to educate the patient regarding the same. Sometimes rapid wear can occur in spite of absence of local factors or parafunctional activity. This occurs when defective mineralisation of the tooth is present as in case of dentinogenesis or amelogenesis imperfecta [3].

Why to treat attrition?

1. To prevent the ongoing loss of tooth structure and arrest further damage.
2. To prevent a loss of vertical dimension of the patient.
3. To maintain the masticatory efficiency by retaining/restoring the tooth morphology.
4. To eliminate interferences and provide a mutually protected occlusion.

When to treat attrition?

Severe wear associated with broken restorations, esthetic impairment, dentinal exposure and/or tooth sensitivity are the indications for active treatment of dental wear.

Diagnosis and treatment planning: [2]

1. Preservation of the remaining tooth structure is the crucial factor in limiting the damage and it involves identifying the possible contributing factors and their reduction or elimination.
2. Amount of wear: With moderate amount of wear associated with acceptable esthetics, absence of missing teeth, lack of tooth sensitivity, advanced age and reasonable rate of wear; no active treatment may be

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deemed necessary and periodic observation, behaviour modification and fabrication of a night guard may suffice.
3. Evaluation of vertical dimension of occlusion: Use of phonetics especially sibilant and 'M' sounds, use of interocclusal distance, soft tissue contours and swallowing method provide a close approximate to the therapeutic vertical dimension of occlusion.
4. The interocclusal distance should be measured at the physiologic rest position which is around 2–4 mm. A freeway space of more than 4 mm may suggest a loss of vertical dimension of occlusion.

Turner and Missirlian [3] have classified patients based upon the existing vertical dimension into three categories:

1. Excessive wear with loss of vertical dimension (category 1).
2. Excessive wear without loss of vertical dimension but with space available (category 2).
3. Excessive wear without loss of vertical dimension but with limited space (category 3).

Category 3 patients are typically seen with a slow rate of wear associated with compensatory supraeruption.

Two philosophies are widely documented and used for full mouth rehabilitations.

1. Hobo's technique
2. Pankey–Mann–Schuyler (PMS) philosophy.

The PMS philosophy [4–6] aims at achieving the following principles of occlusion advocated by Schuyler.

a. Coordinated and static contacts of maximum number of posterior teeth in centric relation position of the mandible.
b. Functionally harmonious anterior guidance during lateral excursive movements.
c. Disclusion of the posterior teeth during protrusion determined by the anterior guidance.
d. Absence of interferences during lateral excursions on the non-working side.
e. Group function on the working side during lateral excursions.

The sequence advocated by the PMS philosophy is as follows:

a. Part I: Examination, diagnosis, treatment planning, prognosis
b. Part II: Harmonisation of the anterior guidance for best possible function, esthetics and comfort.
c. Part III: Restoration of the mandibular posterior occlusion after selecting an acceptable occlusal plane so that it will not interfere with condylar guidance and is in harmony with the anterior guidance.
d. Part IV: Restoration of the maxillary posterior occlusion so that it is in harmony with the anterior and condylar guidance. The functionally generated path is an important aspect of this technique and is often considered a part of it.

Concept of Hobo's Twin Table Technique [7, 8]

As the name suggests this technique utilises two different customised incisal guide tables. First table is fabricated with only the posterior segments and the second fabricated with the anterior and posterior segments. A removable die system with anterior and posterior segments is needed for this technique. First table is to achieve uniform contacts in the posterior restorations, termed as the *incisal guide table without disocclusion*. This ensures uniform and equal contacts during eccentric motion. Next, another customised incisal guide table is made when the articulator is placed in a position to simulate border movements by placing 3 mm plastic seperators behind the condylar elements. This is termed as the *incisal guide table with disocclusion.* After tooth preparations are complete, the first table is used to fabricate the posterior wax patterns and the second guide table is used for achieving the anterior guidance with disocclusion.

Concept of Hobo's Twin Stage Technique [5]

So as to provide disocclusion, the cusp angle should be shallower than the condylar path. A methodical approach is required in this technique which can be summarised as follows:

a. A cast with a removable anterior and posterior segment is required.
b. Occlusal morphology of the posterior teeth is established without the anterior segment. This produces a cusp angle coincident with the standard values of effective cusp angle. This is referred to as "**Condition I**".
c. Anterior morphology is then established and anterior guidance is provided for, which produces a standard amount of disocclusion. This referred to as "**Condition II**".

Case Report

A 55 year old male patient reported to the department of Prosthodontics with a chief complaint of excessive tooth wear (Figs. 1, 2, 3). On examination the patient was grouped under category 3 that is excessive wear without loss of vertical dimension and limited space available. A HOBO's twin stage technique for full mouth

reconstruction was selected as the treatment of choice. Diagnostic impressions were made using irreversible hydrocolloid alginate (Neocolloid, Zhermack) and the cast were mounted on a Hanau Wide Vue semi adjustable Arcon articulator. A modelling compound (Y-DENTS, MDM Corp.) anterior deprogramming jig was made and centric relation was recorded with modelling wax (Hindustan modelling wax) (Figs. 4, 5). A diagnostic wax up was done using white diagnostic wax (ivory wax, Renfert) (Fig. 6). Tooth preparations were carried out and retaraction was achieved using knitted retraction cord (Fig. 7) (KnitTrax and GelCord, Pascal, Inc) impressions were made using addition silicone (Express XT; 3M, ESPE) in a single step putty wash technique. Using a previously made modelling compound jig at the predetermined vertical dimension centric relation was recorded using polyether bite registration material (Ramitec, 3M-ESPE) (Fig. 8). The casts were then sectioned for individual die preparation using the DI-LOK trays. Two coats of die spacer (PicoFit) were applied 1 mm short of the margin.

Fig. 1 Tooth wear (facial view)

Fig. 2 Tooth wear (right and left lateral view)

Fig. 3 Tooth wear (right and left lateral view)

Fig. 4 Occlusal view

Fig. 5 Occlusal view

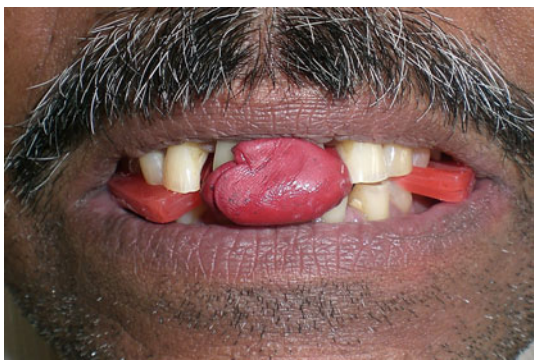

Fig. 6 Anterior deprogramming jig fabricated and transferred to the articulator

Fig. 7 Anterior deprogramming jig fabricated and transferred to the articulator

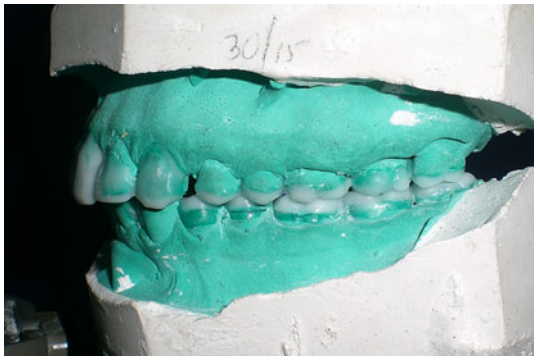

Fig. 8 Diagnostic mock up done

Fabrication of Wax Patterns

Condition I

Articulator settings are kept as follows:

Horizontal condylar guidance of 25°, lateral condylar guidance of 15°
Anterior guidance of 25°, lateral anterior guidance of 10°

Posterior wax patterns are made using crown wax (Renfert, Germany) so that there are smooth gliding contacts from centric relation to protrusive and lateral movements (Figs. 9, 10). This would ensure a uniform amount of posterior disclusion during lateral and protrusive excursions when the anterior guidance is established later.

Condition II

In condition II the anterior segment of the removable die system is replaced onto the cast and wax patterns are fabricated with the following articulator settings:

The horizontal condylar guidance is changed to 40° and lateral condylar guidance is maintained at 15°.

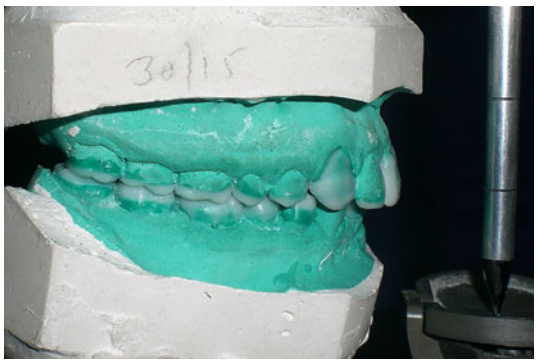

Fig. 9 Diagnostic mock up done

Fig. 10 Tooth preparations done and retraction achieved

The anterior guidance is increased to 45° and lateral anterior guidance set at 20°.

Anterior dies are replaced onto the casts and wax up is completed to achieve adequate esthetics. The palatal contours are adjusted according to the anterior guidance to provide immediate disclusion away from centric relation (Figs. 11, 12, 13).

After cutback to create space for porcelain, the wax patterns were casted with a nickel chromium metal ceramic alloy (WIRON 99). The crowns were tried onto the cast and trimmed so as to achieve uniform bilateral contacts in centric relation. Metal try in was subsequently done intraorally and

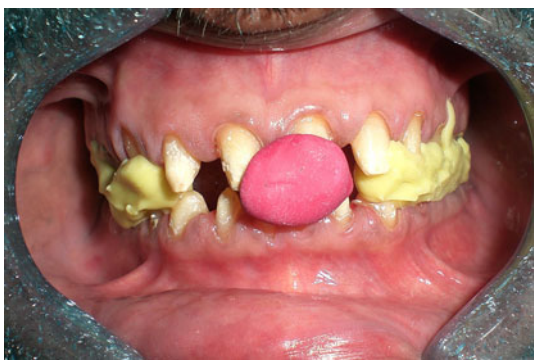

Fig. 11 Centric relation recorded

Fig. 12 Posterior wax patterns made and checked for gliding contacts

Fig. 13 Posterior wax patterns made and checked for gliding contacts

verified for fit and contacts (Fig. 14). Ceramic layering (Ceramco 3, Dentsply) was subsequently carried out and the prosthesis was cemented using Glass Ionomer luting cement (GC, Fuji I) (Figs. 15, 16, 17, 18). The patient was recalled after 1 week and no discomfort was reported by the patient (Figs. 19, 20, 21, 22, 23, 24, 25).

Summary

Mutually protected occlusion has now established its role as an important factor for maintaining the harmonious

Fig. 14 Posterior wax patterns made and checked for gliding contacts

Fig. 15 Posterior wax patterns made and checked for gliding contacts

Fig. 16 Gliding contacts checked on working and non working sides

Fig. 17 Gliding contacts checked on working and non working sides

Fig. 18 Gliding contacts checked on working and non working sides

Fig. 19 Gliding contacts checked on working and non working sides

Fig. 20 Gliding contacts checked on working and non working sides

Fig. 21 Metal try in

Fig. 22 Final prosthesis cemented using glass ionomer luting cement

Fig. 23 Final prosthesis cemented using glass ionomer luting cement

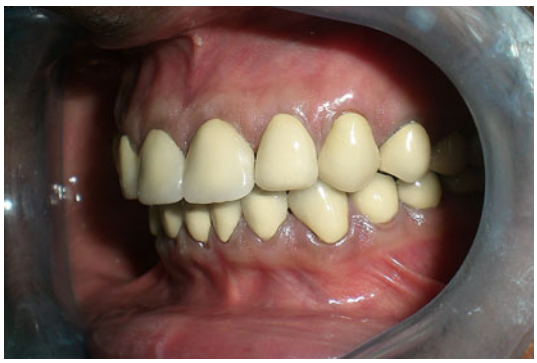

Fig. 24 Final prosthesis cemented using glass ionomer luting cement

Fig. 25 Final prosthesis cemented using glass ionomer luting cement

functioning of the masticatory system [6]. The principle behind it being that the anterior teeth which are away from the fulcrum line will transmit less force to the supporting tissues when the mandible is in eccentric position. Also, the temporomandibular joint will withstand the forces of mastication adequately when the condyle disk assembly is in centric relation position. Since the joint loses its musculoskeletally stable position during excursion, axial loading of the joint is not possible which necessitates that the forces acting on it be reduced. The canines and anterior teeth thus function as natural stress breakers leading to disclusion of the posteriors.

Condylar path has always been regarded as a key determinant of occlusion. However, according to the work by Hobo and Takayama [5], condylar path has shown to have deviation and exerts a minor influence on disclusion. According to the mathematical calculations done, when the sagittal inclination of the incisal guidance was increased by 1°, the amount of disclusion on protrusion, nonworking and working side was increased by 0.038, 0.042 and 0.039 mm respectively. Similarly, every degree rise in cusp angle the amount of disclusion was increased by 0.046 mm on protrusion, 0.046 on nonworking side and 0.041 mm on the working side. However, it was found that every degree rise in the horizontal condylar guidance, the amount of disclusion is increased by only 0.020 mm during protrusion, 0.015 mm on nonworking side and −0.002 mm on the working side.

Thus, the cusp angle and the anterior guidance are more important determinants to achieve disclusion and use of an average angulation of the horizontal condylar guidance can be successfully used to achieve a mutually protected occlusion.

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