



Full Mouth Rehabilitation Involving Occlusal Plane Correction-Case Report

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Abstract

Full mouth rehabilitation is a complex dental treatment the complexity of which relates to mathematical components of occlusion that involves various angulations and inclinations. One of such component is the occlusal plane. Abnormalities in the occlusal plane develop after the loss of teeth in the form of supra eruption, migration, rotation or malposition. Correction of occlusal plane is compulsory in any form of occlusal rehabilitation. A female patient reported with chief complaint of decreased masticatory performance that developed after extraction of posterior teeth. Clinical examinations revealed a case of full mouth rehabilitation that required a multidisciplinary approach. The complex aspect of the rehabilitation was to correct an existing abnormal occlusal plane, which was successfully achieved using a custom made Broadrick occlusal plane analyzer. The relation of occlusal plane to the amount of tooth preparation has also been discussed.

Keywords: Curve of Spee, curve of Wilson, mutually protected occlusion, occlusal analyzer

Introduction

While rehabilitating a full mouth case, merely cementing a crown or a fixed partial denture on the teeth without understanding the role that each set of teeth have in each set of component of occlusion will never ensure the biological stability of the stomatognathic system. One such component of occlusion that has been erroneously restored by many in the scientific literature is the occlusal plane or the plane of occlusion. By geometric definition, a plane is the two-dimensional analogue of a point (zero dimensions), a line (one dimension) and three-dimensional space.¹ Occlusal plane is defined as the average plane established by the incisal and occlusal surfaces of the teeth.² Occlusal plane, in no way qualifies the first two dimensions of geometrical definitions (point or line). The only dimension, it represents is the three dimensional space which is

defined by the points of each cusp tip in antero - posterior and medio - lateral directions. This occlusal plane, can never be collinear, but rather it follows the different curves in different directions thus making it a noncollinear entity. The inclination of this three dimensional occlusal plane in a healthy, natural dentition is a sum of the various points that is represented by the cusp tips of all teeth which are most aptly represented by the curve of Spee and curve of Wilson. These curves are formed by individual tooth position and their alignment, which (tooth position and alignment) in an efficient masticatory apparatus should be parallel to the fibers of the most powerful muscle of the masticatory apparatus namely the masseter. This itself explains that why a natural tooth becomes inefficient in mastication if its position is changed in the occlusal complex.

Loss of a natural tooth when not replaced or replaced improperly forces slow alteration in the occlusal plane through the process of supraeruption, migration, loss of contact areas resulting in rotation/malposition and in some cases proclination and retroclination. Altered occlusal plane affects masticatory efficiency, esthetics, phonetics and stomatognathic balance, especially proprioceptive control of muscles.³ Most importantly, it prevents certain teeth (like canines) in their respective arches to provide natural protection to other teeth. Therefore, in any complex occlusal rehabilitation, correction of altered occlusal plane should be one of the primary goals. This article in the form of a case report describes a full mouth rehabilitation of an adult female patient who had developed a neuromuscular imbalance in masticatory apparatus as a result of the altered occlusal plane. A custom made Broadrick plane analyzer has also been described.

Case Report

An adult unmarried female aged 35 years reported to Comprehensive care clinics, at College of dentistry with chief complaint of inability to eat since last few years. Masticatory inability included problems in tearing, shredding and grinding of food. The patient being a non-vegetarian consumer, found it difficult to consume meat products for which she had extreme liking. Personal, social, medical and drug history was noncontributory. With home occupation, the patient consumed three meals in a day while brushing was infrequently practiced by her. The patient had undergone dental treatment in the past in the form of multiple restorations and extractions. The patient was not well educated about oral hygiene maintenance and its benefits. Extra oral examination revealed normal features of temporomandibular joint, facial form and symmetry, lymph nodes, speaking and smiling lines. Intra orally the periodontium presented features of chronic generalized gingivitis with localized periodontitis in relation to defective and migrated teeth.



Figure 1: Intra oral natural dentition status (a-e). Orthopantomograph showing existing dental condition (f).

The natural dentition showed defective restoration (# 11,12,21,22,23,31,32,41,42,43), recurrent caries (#11, 12,21,22,23,31,42,43), missing teeth (#24, 25,36,45,46,47), residual root stumps (33,38), carious decay (13,14,15,16,27,31,32,34,35,37, 41,48), generalized plaque accumulation and occlusal plane discrepancy (# 15,16,26,34,35,37,48) in the form of supraeruption and malpositioning of teeth (**Fig.1 a-e**). Radiographic and endodontic investigation revealed pulpal/periapical involvement of the teeth (#17, 23,27,33,34,37) (**Fig.1 f**). Diagnostic impressions were made using irreversible hydrocolloid Irreversible hydrocolloid (CA 37; Cavex, Haarlem, Holland) following which muscle deprogramming was done (**Fig. 2a**). Maxillary cast was mounted on a semi adjustable articulator (Whip Mix series 3000; Elite Dental Services, Inc, Orlando, Fla) using an arbitrary face bow while the mandibular casts were mounted using various interocclusal records (**Fig.2 b, c**). As clinical and diagnostic cast examination revealed supraeruption of posterior teeth, a custom made Broadrick occlusal plane analyzer⁴ was fabricated for a whip mix articulator (3000 series) (**Fig.2d, e**). Using an anterior, posterior and condylar survey point arcs were drawn on the index board on a colored paper. At the point of intersection of two arcs, a bow compass was placed and an arc was then drawn on the buccal surfaces of the posterior teeth on both sides. The occlusal analysis recordings were

later used during fabrication of the definitive restorations. Based on the lines drawn on posterior teeth the need for intentional endodontic treatment and the amount of crown lengthening was determined. The supra erupted teeth present on the diagnostic casts were then altered so as to establish a favorable occlusal plane. They were reduced till they allowed anterior teeth to perform its function of posterior disclusion. At this stage a clear acrylic (Fortex; Lucite Intl, Durham) surgical guide was fabricated that would assist crown lengthening procedures. After the diagnostic cast analysis was done the patient was presented with treatment plan involving four phases which she consented unconditionally. In phase 1 carious material was removed followed by temporary restorations and patient was put on oral hygiene maintenance for a period of 16 – 20 weeks. Phase 2 involved extraction of residual roots, endodontic treatment of indicated teeth followed by permanent restorations and crown lengthening procedures for all supra erupted teeth.



Figure 2: Muscle deprogramming (a), face bow transfer (b), mounted diagnostic casts (c) and Broadrick occlusal plane analysis (d,e)



Figure 3: Tooth preparation (a), temporization (b), Interocclusal index (c), definitive restorations with effective anterior guidance and corrected occlusal plane during lateral excursions (d, e), anterior restorations with effective canine guidance during protrusion (f,g)

Phase 3 included fixed Prosthodontics that involved individual crowns and a four unit fixed partial denture for maxillary Kennedy class 3 partial edentulous situation and a cast partial denture for mandibular Kennedy class 3 situation. Full mouth rehabilitation was based on the principles given by Pankey Mann Schulyer⁵ while following Dawsons quadrant arch approach, bilateral manipulation and long centric concepts.⁶ Tooth preparations were done on, one arch at a time, followed by temporization to maintain vertical dimensions (**Fig 3. a, b**). Once all the teeth were prepared, the patient wore temporary crowns for a period of 6 weeks, following which final impressions were made with a special tray using elastomeric impression materials (Elite H-D; Zhermack). Various interocclusal records (Hiflex silky touch, Prevest denpro) were made to transfer relations to the semi adjustable articulator (**Fig.3c**). Definitive restorations were cemented using zinc phosphate cement (Harvard) (**Fig 3 d-g**). Long centric was provided that primarily involved anterior teeth. This was achieved by moving the lingual inclines of maxillary teeth forward so that the jaw is free to close without restriction in centric relation. A cusp tip to fossa contact was provided on the occlusal surfaces of all posterior restorations. A mutually

protected occlusion was provided by steepening the anterior guidance while at the same time correcting the occlusal plane posteriorly. The patient was given instructions regarding the oral hygiene maintenance and was put on regular follow up for a period of one year. The patient was highly satisfied with the functional outcome of her occlusal rehabilitation.

Discussion

The plane of occlusion should not be visualized as a flat plane, but rather three dimensional plane that is represented by the average curvature of the occlusal surfaces. The incisal surfaces of anterior teeth are the anterior determinant while as the plane extends posteriorly the cusp tips of posterior teeth become its determinants. Two curves namely the curve of Spee and the curve of Wilson determine which position posterior restorations should occupy in relation to the occlusal plane. The purpose of these curves in natural dentition is to free the posterior teeth from interfering when the mandible is taken into any eccentric position. As shortly as a tooth supra erupts or migrates, it stirs up the curves with the consequence that there is a modification in the occlusal plane. In such instances, the supra erupted tooth does not allow the anterior guidance to perform the function of posterior disclusion during eccentric movements. This is not only harmful to the health of the individual tooth, but also proprioceptive and neuromuscular influences are affected. These influences may affect muscle engrams, habitual muscle patterns, head posture and temporomandibular joint health.^{7,8}

No rehabilitation of occlusion should be accomplished, therefore without correction of the occlusal plane. The decision to retain a supra erupted tooth or to extract, is based on its ability to be corrected within the confines of existing curves in that particular natural occlusion. Most of the supra erupted teeth can be corrected with occlusal equilibration, new crowns with or without a crown lengthening procedure. The Broadrick occlusal plane analyzer^{4,9,10} helps in arbitrary locations of cusp tips of posterior teeth, which indirectly also guides for the amount of tooth preparation needed.

Based on an arbitrary location of occlusal plane one can also decide the amount of crown lengthening required and need for intentional root canal treatment.⁹ In cases where due to some reason, the supraerupted teeth cannot be corrected, then steepening the anterior guidance will result in discluding of the posteriors.¹¹ The custom made analyzer developed for this case constituted of two split plastic plates that were screwed together. Four pins that had one specific location only for each ensured that the analyzing records can be placed again at the same place so that diagnostic planning could aid in developing same definitive restorations. The analyzer served three purposes, namely the determination of the acceptable occlusal plane, determination of amount of tooth reduction and/or need for intentional endodontic treatment and finally the determination of the height of each cusp tip in final restorations.

Conclusion

The integral occlusal plane is essential for maintaining the physiologic status of the stomatognathic system. Broadrick occlusal plane analyzer is a simple instrument that every occlusal rehabilitationist can make on his own. Any tooth that violates occlusal plane in any form should be corrected first before proceeding to its replacement or restoration.

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