International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Case Report

Initial Prosthetic Treatment of Patients with Occlusal Wear: Fabrication of Michigan Splint- A Case Report

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ABSTRACT

Restoring the vertical dimension of occlusion in cases of worn dentitions is an elusive subject. In case of such dilemma, before proceeding with irreversible tooth preparations, the adaptability of the patient to the increased vertical dimension of occlusion can be evaluated by use of an occlusal splint. Being a removable device, it is a reversible form of treatment before going for definitive restorations. A Michigan splint is an oral appliance that covers all the teeth in either the maxilla or mandible and is therefore termed a "full-coverage splint". Maxillary splints being more stable and retentive are usually preferred. Mandibular splints on the other hand are more discreet and are used for daytime use but are relatively less retentive. This paper describes a technique for modification of conventional mandibular Michigan splint with additional ball clasps to improve its retention.

Keywords: Occlusal wear, initial prosthetic treatment, occlusal splint, michigan splint with modification.

INTRODUCTION

Prosthodontic rehabilitation of a patient with occlusal wear problems is a perplexing situation for a restorative dentist. All occlusions wear to some degree. The parabolic contours of the cusps are designed to permit the maximum amount of wear without penetrating into dentin. [1] *In vivo* research data shows that enamel wears about 30 µm/year. Excessive occlusal wear can result in pulpal pathology, occlusal disharmony, impaired function and esthetic disfigurement. Physiologic wear is normal whereas excessive wear needs intervention. Therefore, it is important to identify the factors that contribute to excessive wear and evaluate the effect of worn dentition on vertical dimension of occlusion (VDO). [2]

Excessive occlusal wear refers to any level of occlusal wear that needs to be corrected in order to preserve the dentition. Excessive wear destroys anterior tooth structure which is necessary for acceptable anterior guidance, function or esthetics. If such condition has set in, restoration of the patient's vertical dimension should be considered.

Vertical dimension of occlusion is defined as the distance between two points when the occluding members are in contact. (GPT-8). Even though the vertical dimension of occlusion refers to a condition when the teeth are fully articulated, the teeth are not the determinants of vertical dimension. Rather their position is determined by the dimension of the space available between fixed maxilla and muscle-

positioned mandible. The dimension of this jaw to jaw relationship is so constant that even severe bruxing, clenching and abrading parafunctions do not alter the jaw-to-jaw dimension between bony landmarks in each jaw. [1] In many cases, the VDO is maintained by tooth eruption and alveolar bone growth. Therefore, alteration of the VDO should be conservative and should not be changed without careful consideration. Before commencing the definitive prosthodontic treatment, it is always wise to assess the treatment plan with provisional restorations as splints as a part of initial prosthetic treatment. Michigan splint is a bite splint with flat surfaces on which occlusal stability of dental arches is ensured. This paper presents a technique of making a mandibular Michigan splint more retentive.

CASE REPORT

A male patient, aged 47 years reported to the Department of Prosthodontics, Crown and Bridge, Govt. Dental college and Hospital, Patiala with chief complaint of shortened lower teeth. He complained that his teeth had worn over time and looked jagged and unaesthetic. History revealed habit of holding cardamom between his teeth and chewing it for extended periods of time which resulted in his teeth being clenched and grinded for long duration which implied bruxism. He also reported incidences of pain and tenderness around the region of temporomandibular joints. There was no other relevant medical history. On intraoral examination, considerable wear of mandibular anterior and posterior teeth was seen. Also, maxillary anterior teeth were short and presented jagged incisal edges. (Fig No.1) Also, interferences to centric closure were observed on lingual cusps of right lower molar teeth.

Since patient gave history of bruxism, a habit breaking appliance was needed to prevent further wear of teeth. Factors such as increased freeway space and facial appearance of patient suggested loss of vertical dimension. Traditionally, occlusal splints had been used in treatment of temporomandibular joint disorders or as a habit breaking appliances for parafunctional habits. In cases of occlusal rehabilitation, before definitive restorations are given, the patients acceptance of increased VDO is tested by use of provisional restorations. These provisional restorations can be in the form of temporary crowns or alternatively can be in the form of temporary splints which are fabricated at an increased vertical. It was decided that as a part of initial prosthetic treatment a permissive occlusal splint should be fabricated as a provisional restoration to test if the patient can tolerate the increased vertical dimension and this splint would also double serve as a habit breaking appliance. As the parafunctional habit persisted during the day rather than at night, a mandibular splint was chosen so that it was comfortable for the patient and less visible while talking. But because of the problem of stability and retention with conventional mandibular splint, a little modification in the form of additional ball clasps to improve the retention of the conventional Michigan splint was planned.

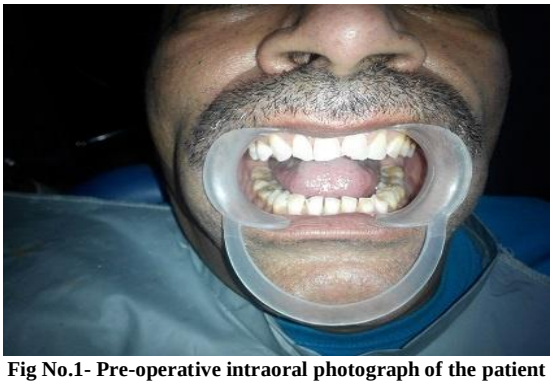

Fig No.1- Pre-operative intraoral photograph of the patient

Fig no.2- Pencil markings made 2 mm from the incisal edges or cusp tips on the labial/buccal side of each mandibular tooth


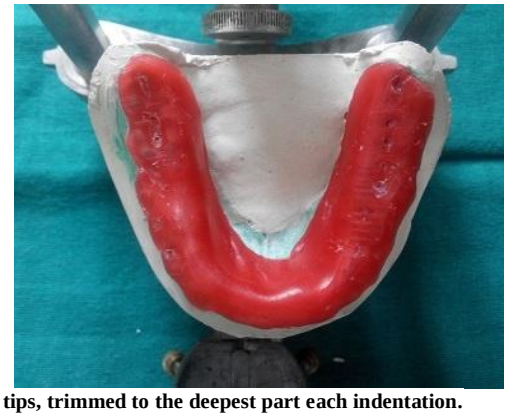

Fig No.3-Indentations in wax of the opposing cusp tips, trimmed to the deepest part each indentation.


Fig No.4-Tissue surface and occlusal surface of modified mandibular michigan splint with ball clasps.


Fig No.5- Splint in patient's mouth.

Impressions of both the maxillary and mandibular arches were made in irreversible hydrocolloid (Algitex, Dentsply) and the casts were poured in type III gypsum product (Prevest Dentpro). After face bow transfer, the upper cast was mounted on a semi-adjustable articulator (Hanau H2 articulator). Lucia jig was used for deprogramming the muscles prior to making a centric relation record in Aluwax at a vertical increased by 2mm. The lower cast was mounted using this record. Then on every mandibular tooth, pencil markings were made 2 mm from the incisal edges or cusp tips on the buccal side to indicate the areas to be covered with the template. On lingual side, template extended 1-1.5 cm from the cervical margins. (Fig No.2) Two thicknesses of base plate wax were heated and pressed together and then adapted on to the lingual side and rolled over the occlusal towards the buccal side. Excess wax was trimmed away flush with buccal and labial margins. Then wax on the occlusal surfaces was heated with a flame and the articulator was closed to the vertical established by the incisal pin. The wax was slightly indented by all the teeth. (Fig No.3) With a pencil, the deepest part of each cusp indentation was marked. All the excess wax on occlusal

surfaces was then trimmed back so that the indentations were removed except the pencil dots representing the cusp tip position. The anterior bite plane was flattened and extended 1 mm in protrusive and lateral excursions. (Fig No.3) After sealing the wax template to the cast, the ball clasps were made to fit between first and second mandibular molars on both sides to improve retention of the splint. The splint was processed in clear heat cure acrylic resin (Pyrax) using long curing cycle employing conventional compression moulding technique. The splint was carefully finished, trying to avoid touching the occlusal surfaces .It was highly polished to ensure comfort of the patient while wearing it. (Fig No.4) The splint was delivered to the patient with minimal chair side adjustments (Fig No.5) Instructions regarding wearing of prosthesis i.e. removal of splint while eating and at night, oral hygiene maintenance and cleanliness of splint were given to the patient.

Follow Up:

On third day after insertion, patient did not report any discomfort which was a good prognostic sign. It ruled out any possibility of internal derangement of the TMJs. Even after one week, the patient was comfortable while wearing the splint and there was no incidence of pain. It was planned to make the patient wear the splint for three months before the definitive treatment. The splint was quite retentive and did not exhibit any movement when patient was asked to carry out mandibular and tongue movements.

DISCUSSION

An interim prosthesis constructed before the definitive treatment serves the purpose of space maintenance, esthetics and improves patient's tolerance of advanced restorative treatment. For patients with reduced vertical dimension of occlusion due to extensive wear of teeth, initial prosthetic treatment includes evaluating the patients' tolerance to the restoration of vertical dimension. This may involve modification of an existing denture or provision of an interim prosthesis such as an occlusal splint, or use of temporary onlays or crowns. Temporary restorations in form of full coverage crowns can be used to test the tolerance of the patient to the apparently raised bite, but these involve tooth preparation of teeth that have already undergone much occlusal wear. This particular patient was reluctant to reduction of his already shortened teeth until his definitive treatment was planned. So, an occlusal splint seemed to be a better option as patients' full complement of teeth were present and he was not in need of any partial denture.

Occlusal splints are of two types- permissive and directive. Permissive splints are known as muscle deprogrammers and are designed to remove deviating tooth inclines from contact. These are centric relation occlusal splints and put no constraints on positioning of condyles. Directive splints on the other hand are designed to position the mandible in specific relation to maxilla, and splint determines the position of the condyles at intercuspated position.

The splint used in this case report is a permissive splint because joints were functioning in a physiologically acceptable relationship. Two types of permissive splints are widely used-maxillary and mandibular. Michigan splint is most often indicated for the maxilla, but esthetic and phonetic reasons can also indicate its placement on the mandibular teeth. [3] Maxillary splints are usually preferred due to better retentive properties as they cover more surface area due to palatal coverage. [4] But these splints are visible when a patient talks or smiles due to extension of splint onto the facial surfaces. So, these are used as night time splints. This splint can be made invisible if extension onto the facial surfaces is avoided but that markedly reduces the retentive capacity of the splint.

If the splint is to be used during daytime it may be preferred, for esthetic reasons, to make a mandibular splint which may be less visible. [5] Upon thorough

history taking, the patient revealed habit of holding cardamom between his teeth and chewing it for extended periods of time which resulted in his teeth being clenched and grinded for long duration. He also admitted to having episodes of teeth grinding when under stress due to personal issues. Since, the reason for accelerated occlusal wear of teeth in this patient was a daytime habit, a daytime splint was needed and hence a mandibular splint was planned. But since, mandibular splints have an issue of being less retentive due to smaller surface area of mandible as compared to maxilla, it was decided to incorporate ball clasps into the splint to improve its retentive capacity. Since this patient was able to carry out mandibular and tongue movements without any mobility of the splint, so it can be stated that addition of ball clasps definitely improved retentive properties of conventional michigan splint.

The initial treatment comprises different and to a certain extent, specific procedures and means the main feature of which is to be as non-invasive as possible. [6] In clinical application, use of Michigan splint is uncomplicated in initial treatment of muscular pain and TMDs. It is also an excellent provisional restoration to test the need of increasing the vertical dimension of occlusion as it is a removable appliance and is very easy to fabricate. Since, fabrication of an occlusion splint is an easy and economical procedure, vertical dimension of occlusion can be slowly raised with occlusal splints fabricated at sequentially increasing VDO, which ensures patient comfort. Patient's motivation and cooperation is imperative when planning such provisional restorations. Also, during treatment, it is important to take into account the patients' judgment and analyze the occlusal relations of the splint to prevent supraeruption of antagonistic teeth.

CONCLUSION

An occlusal splint is a reliable method to assess patients' neuromuscular response to the increase in vertical dimension of occlusion. In patients where parafunctional habits have led to occlusal wear, occlusal splints are a better treatment option that serves to break the habit as well as restore the vertical dimension of occlusion.

ACKNOWLEDGEMENT

Mr. Ashok Oberoi, Dental mechanic, Department of prosthodontics, crown and bridge, Govt. dental college and hospital, Patiala, Punjab

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How to cite this article: Nidhi D, Kanika J, Rajat C et al. Initial prosthetic treatment of patients with occlusal wear: fabrication of michigan splint- a case report. Int J Health Sci Res. 2017; 7(7):376-380.

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