

A REVERSIBLE DIAGNOSTIC METHOD FOR OCCLUSAL, ESTHETIC AND FUNCTIONAL EVALUATION OF FULL ARCH RE-CONSTRUCTION: A NOVEL APPROACH USING THERMOPLASTIC RETAINERS

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ABSTRACT

Patients presented for extensive tooth wear frequently need elaborated case study and analysis for all occlusal, muscular and TMJ factors before final and definitive treatment is commenced. This includes thorough and comprehensive assessment of the occlusal scheme. A preoperative visualization of the final esthetic results in vivo is essential before deciding to go for a particular treatment option, especially when tooth preparation is part of the treatment plan.

The two major factors that concern patients with extensive tooth surface loss are increasing occlusal vertical dimension and esthetic modification to the present situation, where some patients cannot visualize the new situation even when seen on animated software or modified photographs for illustrated purposes

In this paper the authors have discussed a reversible and versatile method for esthetic and occlusal assessment for cases of sever tooth wear, which would allow patients to “practice” their new treatment in reality, and allow them to evaluate its functional and esthetic merits before deciding to choose that particular treatment option. In this diagnostic method, the masticatory system is allowed to adapt to the new treatment approach easily with the option of modifications at all levels or even cancelling the whole treatment without any adverse effect on the teeth or the masticatory apparatus.

Key Words: *Thermoplastic retainer, splint, temporization, full mouth rehabilitation.*

INTRODUCTION

Cases which need full arch or full mouth re-construction at altered occlusal vertical dimension, usually face inevitable decision of preparing all the involved teeth and fabrication of a new temporary restoration based on the wax-up of the articulated models, followed by a period of occlusal, functional and esthetic evaluation of the future permanent prostheses by using temporary extra-coral restorations.

In such cases, the patient has no choice of starting the adaptation period while retaining his original teeth neither has the option of cancelling the treatment for any reason.

In this paper we will discuss a reversible and versatile method for esthetic and occlusal assessment

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for cases of sever tooth surface loss, which would allow patients to “practice” their new treatment in reality and allow them to evaluate its functional and esthetic merits before deciding to choose that particular treatment option. In this diagnostic method, masticatory system is allowed to adapt to the new treatment approach easily with the option of modifications at all levels or even cancelling the whole treatment without any adverse effect on the teeth or the masticatory apparatus.

CLINICAL TECHNIQUE

This treatment was carried out in the department of dentistry in King Hussein Medical Center of the Royal Medical Services, a central referral hospital in Amman-Jordan. The authors got a formal ethical approval letter from the ethical committee of the Royal Medical Services after explaining and defending the safety and reversibility of this treatment option.

For demonstrating the concept and the merits of this technique, a 65 years old male patient was selected, who attended this clinic seeking treatment for a generalized and extensive tooth surface loss involving both maxillary and mandibular dental arches (Fig 1-3). The technique was clarified to the patient, and all the proposed advantages and the possible disadvantages of this approach were discussed and

allowed him to consider the situation before proceeding. Further the patient gave his consent and showed his interest to go ahead.

Maxillary and mandibular alginate impressions were taken and the casts were transferred via face-bow to semi-adjustable articulator. The technician did a wax-up on the models at arbitrary increased vertical dimension (Fig 4).

The wax-up model was duplicated in stone and 0.01 inch hot-mounted thermoplastic sheet was pressed over it and cut back to the level of gingival margins labially/buccally and palatally/lingually exposing the dental papilla. That will serve two purposes; to prevent locking of the acrylic material in the interdental spaces and to allow the gingival margins of teeth to act as reference point on which we need to stop at when placing the acrylic-loaded splint.

In the patient's mouth, the teeth were isolated and dried with air stream; the interdental spaces are blocked with wax to prevent temporary material locking-in. The teeth were then lubricated with petroleum jelly ensuring that unset temporary acrylic material will not stick to it and peel off the splint during removal.

The temporary acrylic material shade A3 was mixed and applied to the internal surface of the occlusal splint, bringing a very thin layer with hand instrument or carver to the palatal/lingual and buccal/labial aspects. The splint was then carefully placed against the arch and seated firmly with bilateral controlled and balanced pressure until the reference point on the gingival margins were met to prevent over seating and consequently loosing the newly formed vertical dimension.

The excess acrylic resin serves as setting indicator, by which when the dough staged is reached, the splint is carefully moved and vertically withdrawn and replaced several times to ensure smooth removal and insertion, therefore to prevent splint locking and unwanted horizontal movement during lateral excursions.

After setting, the excess acrylic material was carved off the margins, finished and polished and reinserted for any occlusal adjustment and/or equilibration that might be needed prior to dismissal (fig 5-6). Using articulating paper, the centric occlusal stops are verified and made sure that they are properly and evenly distributed on the functional cusps, then the lateral excursion movements is also verified according to bilateral canine guidance. The incisal guidance is also checked for proper amount of posterior disclusion.

Freeway space, vertical dimension, phonetics and esthetics are also evaluated and made sure that they are all met at this stage (Fig 7).

The patient was instructed to use the splint during the daytime and eating soft diet. A proper oral hygiene and mouth wash were emphasized to prevent food impaction and plaque accumulation.

Patient follow-up

Initially, the patient was instructed to use this

non-preparation full arch temporization to enhance muscular apparatus adaptation before attempting to prepare the teeth. After one week, further minor adjustments to the occlusion or to the esthetic parameters were needed. The patient reported a well adaptation period, with minor discomfort and difficulty in eating certain food like meat. Speech and esthetics were excellent as the patient claimed. Weekly revision was scheduled for the next four weeks to follow-up the progress and the adaptation to the new vertical dimension.

After four weeks, it was decided to proceed for the permanent restoration. The splint was considered at this point as template or matrix for the temporary fixed restoration. The teeth were prepared and rubber impression was taken, then the splint was relined with the same acrylic material which was used before and cemented temporarily over the prepared teeth. The new occlusal relationship that took four weeks of adaptation was transferred via face-bow to semi-adjustable articulator for use as a guide for the construction of the permanent restorations (Fig 8).

DISCUSSION

Hot mounted thermoplastic sheets were invented by Dr. John J. Sheridan and had been used for many years in modern orthodontics to aid in retention of the occlusal arch after orthodontic treatment due to their clear transparency and being nearly invisible in the patient mouth¹ and for the fabrication of temporary bridges in prosthodontics.²

With the rapid development of implant dentistry and the need for immediate temporization over the newly inserted implants, new methods have been invented to aid in restoring esthetics and function to the implant space without being exerting any pressure to the implant site until osseointegration of the implant.

There uses have been recently expanded to house acrylic teeth to act as non-loading temporary in implant patients.³

Many methods have been advocated for temporization after full mouth tooth preparation to enhance esthetics, function and muscular adaptation.⁴ Most of which are depending on articulated wax-up of the diagnostic cast and construction of template or index, in which, a temporary resin material will be injected and placed over the prepared teeth.⁵

Prefabricated and hot mounted thermoplastic sheets were used to construct temporary or permanent diagnostic occlusal splints⁶, where Acrylic resin are added to the occlusal surface of these sheets to modify the occlusal pattern and restoring the occlusal parameters to allow the masticatory apparatus to adapt. This method, although useful for solving clenching or bruxism, yet of little or no value for patients with sever tooth surface loss. It will not restore the esthetic profile of the patient and was nearly impossible to speak or eat with such device.

In our model, we hybridized the use of the articulated wax-up model and the addition of acrylic resin by reversing the surface on which the resin is



Fig 1: Preoperative View



Fig 5: The thermoplastic sheet after relining with acrylic



Fig 2: Preoperative Maxillary arch



Fig 6: Thermoplastic retainer inserted



Fig 3: Preoperative mandibular arch



Fig 7: Evaluation of esthetic and function



Fig 4: Articulated wax up casts



Fig 8: Transfer the new relationship to the articulator

added. Where we added the acrylic to the inner surface of the hot mounted plastic sheet to restore the shape and form of the worn teeth and their occlusal features in a reversible mode where we hoped that our patient will be able to evaluate his future prosthesis in both function and esthetic without having his teeth prepared.

We aimed to simulate and mimic the final result of our treatment in advance by minimizing the thickness of the sheet (0.01 inch) so that the occlusal morphology of the wax-up is preserved whenever possible to help the patient using this appliance in eating and speaking, therefore a more realistic feedback can be obtained.

The occlusal surface was covered entirely even if not all teeth need occlusal work, and that was not to create problems related to unwanted teeth movement or overeruption.⁷ The occlusal features were restored and we were able to provide canine guidance at both sides and incisal guidance with posterior disclusion. There were non-functional cusps occlusal interferences upon articulating paper testing, which was solved at the insertion visit. However there was a little encroachment of the freeway space during speaking at the time the appliance constructed, but that was overlooked at this stage until the next visit which will be after one week.

At the first follow up visit, the patient was asked about his experience during the last week, where he reported an excellent feedback regarding esthetics from his family and friends at the social level, comfort and relieving from muscular tenderness in general with slight discomfort at the left side of the mandible. A further occlusal adjustment had been performed with slight leveling of the occlusal plane of the lower anterior teeth. The number of the proper or ideal occlusal contacts were not without some non-ideal contacts, in particular during function and while time elapse using the retainer. Some authors reported that thermoplastic retainers do have change the occlusal contacts over long term orthodontic retention period, with no significant differences at the short-term retention period.⁸ In our method the ideally located occlusal contacts over the functional cusps were verified at the insertion period of the retainer and revised after one week for further refinement, where more non-ideally located contacts were found and corrected.

Eating with such device was not as we expected, as the patient experienced some difficulty in eating some types of chewing food like meat and biting some types of sandwiches. While food eaten by fork or spoon the patient reported a manageable or average acceptability without being of high efficiency, but very good for a trial period of no more than four weeks, which is more than the time which we were planning to extend our treatment beyond. However, knowing that this is a temporary measure before the permanent restorations, the patient has the freedom to eat without the splint if he chooses to do so, providing that he is using it during the day for speaking and socialization as part of the adaptation process.

Regarding the oral hygiene and oral health, we instructed our patient to remove the splint and clean it with tooth brush and toothpaste after each meal, and we recommended a chlorhexidine immersion at night to maximally control the accumulation of bacterial biofilm as recommended by Chang et al 2014.⁹ Although the splint was finished in a way that leaves the gingival margins accessible for cleaning, a certain level of mild gingivitis was observed in the interproximal areas where gingiva is directly covered with the splint. Thermoplastic retainers are said to increase the retention of lactobacillus and streptococcus colonies, and therefore have significant influence on the number of viable microorganisms. That was our justification for the marginal gingivitis observed even with the good oral hygiene maintained by the patient as we thought.¹⁰

CONCLUSION

Thermoplastic mounted sheets provide a suitable temporary simulation and illustration of full mouth rehabilitation cases without the need for tooth preparation. Being thin and clear, the patient will be able to use this diagnostic prosthesis to adapt his muscles of mastication and evaluate the esthetic and probably the function after full mouth reconstruction.

Reline of this splint is easy to perform to be used as temporary cementation after tooth preparation, and the new relationship is easy to be transferred to the articulator.

It also proved to be a viable option to reline this splint to be used as temporary restoration after teeth preparation.

REFERENCES

- 1 John J. Sheridan, William Ledoux, Robert M. Essix Retainers: Fabrication and Supervision for permanent Retention Journal of Clinical Orthodontics. Jan-1993: 37-45.
- 2 John J. Sheridan, William Ledoux, Robert M. Essix Technology for the fabrication of Temporary Anterior Bridges Journal of Clinical Orthodontics. Aug1994: 482-486.
- 3 RE Santosa. Provisional restoration options in implant dentistry. Australian dental Journal 2007;52(3): 234-42.
- 4 Cutbirth ST. Full-mouth restoration of a severely decayed dentition. Dent Today. 2013 Dec 32(12):68; 70-73.
- 5 Nazarian A. Utilizing an effective protocol for full-mouth reconstructions. Dent Today. 2014 Mar 33(3): 100; 102-03.
- 6 Christidis N, Doepel M, Ekberg E, Ernberg M, Le Bell Y, Nilner M. Effectiveness of a prefabricated occlusal appliance in patients with temporomandibular joint pain: a randomized controlled multicenter study. J Oral Facial Pain Headache. 2014 28(2): 128-37.
- 7 Chate RAC, Falconer DT. Dental appliances with inadequate occlusal coverage: a case report. British Dental Journal. 11-Feb-2011: (210); 109-10.
- 8 Müfide Dinçer and Belma Işık Aslan. Effects of thermoplastic retainer on occlusal contacts. European Journal of orthodontics 2010; (32): 6-10.
- 9 Chang CS, Al-Awadi S, Ready D, Noar J. An assessment of the effectiveness of mechanical and chemical cleaning of Essix orthodontic retainer. J Orthod 2014; Feb 17 (Epublication ahead of print).
- 10 Türköz C, Canigür Bavbek N, Varlık S, and Akça G. Influence of Thermoplastic retainers on streptococcus mutans and lactobacillus adhesion. Am J Orthod Dentofacial Orthop 2012; May 141(5); 598-603.