

Evaluation of Efficacy, Patient Comfort and Accuracy of Biart in Occlusal Analysis

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Abstract:

Occlusal rehabilitation is an important step in full mouth rehabilitation to stabilize the occlusion. It is very important to identify and eliminate the occlusal interferences to equilibrate the forces and reduce stresses on the periodontium. The present study revolves around a new instrument called BiArt, a bilateral articulating paper holder which can be used to simultaneously check the centric and eccentric occlusal contacts on the right and the left side. It is crucial to check the centric occlusal contacts bilaterally in order to ensure the patient is biting in a repeatable position. This study aims at evaluating the patient comfort and the contacts created by BiArt in comparison with a unilateral articulating paper holder. Occlusal analysis of 15 patients was done using intra-oral occlusal photographs of dental articulating paper marks made using BiArt (to hold the articulating paper bilaterally) was compared with the occlusal contacts made using the conventional articulating paper holder (holding a unilateral paper). A VAS scale was used to evaluate the patient's experience. The marks made by the articulating paper using BiArt were 21.14% higher than the marks made using a unilateral articulating paper. There were some unique marks when using unilateral papers which accounts to 25.14% which are not true interferences. However, these could lead to unnecessary grinding. The results of this study give significant evidence on the efficacy, patient comfort and accuracy of Bi-Art compared to unilateral articulating paper holder. BiArt can be used as a reliable tool for occlusal adjustments compared to the conventional methods.

Keywords: BiArt, articulating paper, occlusal contacts, interferences.

Introduction:

Occlusal rehabilitation is extremely crucial to equilibrate the forces and reduce stresses on the periodontium. There are various aids used to evaluate

the occlusal contacts during the occlusal adjustments such as articulating paper and shimstock foil ((Harper & Setchell, 2002). The use of articulating paper evolved from occlusal adjustment from ink markings on the tooth surface, to determine the occlusal forces. However, the findings of study by Qadeer et al indicate that size of articulation paper mark is an unreliable indicator of applied occlusal force, to guide treatment occlusal adjustments(Qadeer et al., 2012a).

The literature evidence mainly describes the physical properties of the articulating paper such as thickness, composition, ink substrate and plastic deformation ((Dawson, 2007; McNeill, 1997; Okeson, 2014)). When articulating paper is employed intraorally, it is subject to fragmentation and perforation during patient intercuspations, showing that its' marking repeatability is poor. Despite this lack of scientific evidence, it has been repeatedly advocated in textbooks on occlusion that mark area is representative of the load contained within the mark(Dawson, 2007; McNeill, 1997; Okeson, 2014). It is a very common practice to use the articulating paper holder unilaterally to check the contact of each side.

Any unilateral object is considered as an interference by the brain, the jaw deviates in that direction to deflect the interference in the path of closure(Gowers, 1885). This would give an error in the process of occlusal adjustment. It would be more ideal to use the articulating paper bilaterally as it would aid in uniform and centric closure of the jaw. Holding two articulating paper holders simultaneously would be cumbersome, as well as difficult to position correctly (Austin et al., 2013). Secondly, it would not allow the dentist to ensure complete coverage due to difficulty in visibility towards the end and lack of dexterity. Hence our aim of the study was to evaluate the efficacy of bilateral articulating paper holder (BiArt)vs conventional articulating paper holder.

Material and Methods:

The study was carried out in Department of Prosthodontics and Oral implantology, Saveetha Dental College and Hospital, Saveetha University, Chennai. Fifteen patients undergoing treatment at Saveetha Dental College and Hospital were chosen for the study.

Fifteen intra-oral occlusal photographs of dental articulating paper marks made using BiArt (to hold the articulating paper bilaterally) was compared with the occlusal contacts made using the conventional articulating paper holder (holding a unilateral paper) . The marks made were photographed to compare the marks. Prior to an individual subject's participation, each subject was given instructions that explained the study protocol, and had the opportunity to ask questions about the protocol, so as to accept or reject their participation in the study. The photographs of the occlusal surfaces were superimposed to identify the uncommon points to get the number of different contacts.

The marks were differentiated by using different coloured articulating papers, where in blue coloured paper was used for centric contacts and red coloured paper was used for eccentric contacts. The difference was calculated as a percentage based on the total number of centric contacts.

Results:

The marks made by the articulating paper using BiArt were 21.14% higher than the marks made using a unilateral articulating paper. There were some unique marks when using unilateral papers which accounts to 25.14%. There was only 55.42% coincidence between the marks made between the two techniques. This clearly demonstrates that when we check bilateral occlusal contacts, we get a more uniform display of the patients maximum intercuspation. Using unilateral

papers makes the patient deviate while trying to come into contact which gives what we see as interferences. 25.14% of those marks are not true interferences. They are recorded only when unilateral papers are used. This could lead to unnecessary grinding when the clinician uses unilateral papers.

This study evaluated the patient comfort following occlusal correction using Bi-Art compared to conventional unilateral articulating paper. The VAS scale showed a score of 8.3 for Bi-Art in comparison to a score of 5.6 for unilateral articulating paper. Patient even expressed that they found it easier to occlude in the same position while using Bi-Art. There was a statistically significant difference between Uni Art and Bi Art with respect to recording of occlusal contacts, pseudo contacts and patient comfort ($P < .05$) [Table 1].

Table 1: Variables of interest

Variables	UniArt	BiArt	Pvalue
Recording of occlusal contacts	62.74%	83.88%	<.05
Pseudo contacts	25.14%	2.3%	<.05
Patient comfort (VAS)	5.6	8.3	<.05

Discussion:

The results of the study indicate that there is a distinct difference in the occlusal contacts between the unilateral articulating paper marks vs bilateral articulating paper marks. It indicates that the bimanual manipulation of the mandible is very important to get correct occlusal adjustments. The results of the study shows there was only 50% coincidence between the marks made by the unilateral and the bilateral articulating paper, which is quite a significant difference.

Impression waxes originally were based on the same concept of bilateral balance (Kimoto et al., 2006). But, with the advent of articulating papers and shim stock foil, the practice for occlusal evaluation moved from entire arch to segmental evaluation. The intensity of the marks made by the articulating paper was assumed to correlate with the occlusal forces until it was disputed by subsequent research. (Connelly, 1998)

The activation of the brain changed from the contralateral somatosensory cortex to the bilateral somatosensory cortices after the removal of the experimental occlusal interference. In tapping tasks with experimental occlusal interference of 0.75 mm or 0.5 mm, activation was detected in Brodmann's Area and the contralateral teeth-related primary sensory cortex (Oda et al., 2014). This would give an error in the process of occlusal adjustment. It would be more ideal to use the articulating paper bilaterally as it would aid in uniform and centric closure of the jaw.

Oral dysfunction due to occlusal interference affects oral sensation and chewing movement (Yashiro et al., 2015), but also that the associated discomfort leads to activation of emotional areas (Bushnell et al., 2013). This further leads to increased activation of the hypothalamus, which is a stress response center. Changes in activation of these emotional areas correlate with subjective assessment, thus suggesting that inappropriate, irreversible occlusal treatment may

elicit chronic stress and have systemic effects (Hadjistavropoulos et al., 2007; Salzmann, 1976). This stress leads to altered jaw movements and incorrect centric relation (Wong et al., 2000; Belser & Hannam, 1985).

Marks which would appear to be interferences but are false positive account for almost 1/4th of the marks. This can change the occlusal dynamics quite a bit. Incorrect selective grinding can cause discomfort to the patient in chewing food and loss of essential contacts (Belser & Hannam, 1985; Yurkstas, 1965). Patients said they were more comfortable while using BiArt. It was easier for the patients to bite and follow the instructions of the dentists. Similarly, the dentist also found the patients gave a more repeatable bite while using BiArt. It was interesting to note that there was a smaller variation in the contacts of single complete denture wearers between BiArt and unilateral articulating papers. (Bates et al., 1976) With the recent advances in technology, occlusal analysis aids such as T-Scan can be used to further give evidence on the amount of force and effect of BiArt on occlusal corrections and analysis.

Conclusion:

The results of this study give significant evidence on the efficacy, patient comfort and accuracy of BiArt compared to unilateral articulating paper holder. BiArt can be used as a reliable tool for occlusal adjustments compared to the conventional methods.

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