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Reliability of Occlusal Contact Markings in Varied Chair Position

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Abstract

The purpose of this study is to examine the effect of biting force in relation to two dental chair positions (Supine and upright), on the number and distribution of recorded occlusal contacts. Sixteen male subjects carried out light and heavy biting on a 40 μm occlusal marking indicator in supine and upright chair positions. An occlusal photograph was taken for each experiment making a total of four photographs for each subject. Subjects showed significantly lower number of contacts in light biting compared to heavy biting in both of chair positions. No significant difference was found between upright and supine chair position during heavy biting. There was a small difference, which was not statistically significant, in the number of contacts between upright and supine chair positions during light biting. In conclusion, the recorded occlusal contacts are affected by chair position and level of biting force which should be considered during occlusal examination and adjustment.

Keywords: *Occlusal Examination; Biting; Chair Position; Ergonomic; Occlusal Adjustment*

Introduction

The use of occlusal contact indicators (articulating paper) is essential in daily restorative and prosthodontic procedures. They are used to locate and define opposing occlusal contacts when mandibular teeth encounter maxillary teeth by transferring the markings from the indicator to the corresponding contact areas [1]. The markings should be representative of existing occlusal contacts so that accurate analysis and adjustments are made to achieve occlusal harmony [1]. It is paramount to achieve accurate occlusal markings because it is the interpretation of such markings that provides the guidelines that are used to dictate or negate selected occlusal treatments [1].

A linear relationship between applied load and articulating paper mark area could not be found [2]. If an operator assumes that the largest paper mark represents the forceful contact, he/she may likely choose the wrong teeth to adjust [3]. It was concluded that the size of an articulating paper mark may not be a reliable predictor to employ in the selection of tooth contacts for occlusal adjustment treatment nor of the actual load content within the occlusal contact [2,3]. Therefore, the assessment of occlusal contact in the dental laboratory was significantly influenced by paper thickness, operator experience, biting force and time. However, the 40-μm strip was less influenced by operator experience, strength, and duration of biting [4]. Multiple use of the recording materials may lead to inaccurate results [5]. When used more than once, the articulating papers foils, silk strips, and T-Scan system tested were associated with decrease in contact numbers [5]. Furthermore, occlusal contact numbers increased greatly when the teeth were dry. Therefore, drying the mouth thoroughly before testing may improve the success of occlusal analysis [5].

Chapman found no significant differences in the final contact position in maximum intercuspation as a result of postural changes [6]. However, the mandible was positioned more posteriorly when in supine position than when sitting erect [6]. This is a very important finding, indicating that the major effect of change in head position is on initial tooth contacts [6]. Similarly, Riis., *et al.* found no difference in the number of tooth contacts between the right and left side but there were lower number of contacts when exerting light pressure [7]. The highly significant difference between the number of light and hard pressure contacts found is very important clinically [8]. It showed that instability seems to be a common condition, often stated clinically at light pressure by contacts only on one side, or lack of contacts on molars, which in both cases produces pivot effects on the mandible [8].

At light pressure, contacts are often achieved on one side or on premolars only, which may produce pivoting effects on the mandible that will have pathological consequences [9]. With different head postures, there will be different number of contacts, which indicated that adjusting contacts should be done at varying head postures [10]. Coelho., *et al*. concluded that mandibular position was influenced by increasing inclination, which was statistically significant at a 180-degree incline [11]. Riise recommended a method of occlusal adjustment by adjusting the occlusion in supine and sitting position, and instructing the patient to use light and hard pressure [9]. The aim was to bring the mean value of the number of contacts equal between light and hard pressure.

During dental clinical treatment, patient is set into different chair positions depending on the procedure itself; each chair position has a different head posture with different muscular activity. This might affect occlusal markings when checking occlusion at the end of the dental treatment.

The purpose of this study was to study the effect of two levels of biting force (light, maximum) and two dental chair positions (Supine, upright), on the number and distribution of recorded occlusal contacts.

Material And Methods

Sixteen male subjects were selected from dental interns and dental students with complete dentition (except third molars) who have class I occlusion and are free of: fixed and removable partial dentures, implants and temporomandibular disorders.

Two chair positions were selected for the experiment, the supine and upright position which were previously saved in the dental chair's memory to insure a standardized dental chair position for all subjects. Subjects are first seated in the upright position, teeth were dried with gauze and air, then they were instructed to tap their teeth lightly in the intercuspal position on a 40µm occlusal marking indicator. Intra-oral photographs of the occlusal surfaces were taken using a camera, mirror and cheek retractors with a fixed lighting, focus and magnification. Markings are then wiped with gauze and alcohol and the subject were instructed to do heavy biting and another photograph was taken. The procedure was repeated again in a supine position with light and heavy biting so each subject will have a total of 4 photographs as follows:

- Upright position with light biting force.
- Upright position with heavy biting force.
- Supine position with light biting force.
- Supine position with heavy biting force.

The contacts were moved into a chart so the chart will have the exact number and location of contacts shown on the photographs regardless of the size and shape of each contact (Figure 1).

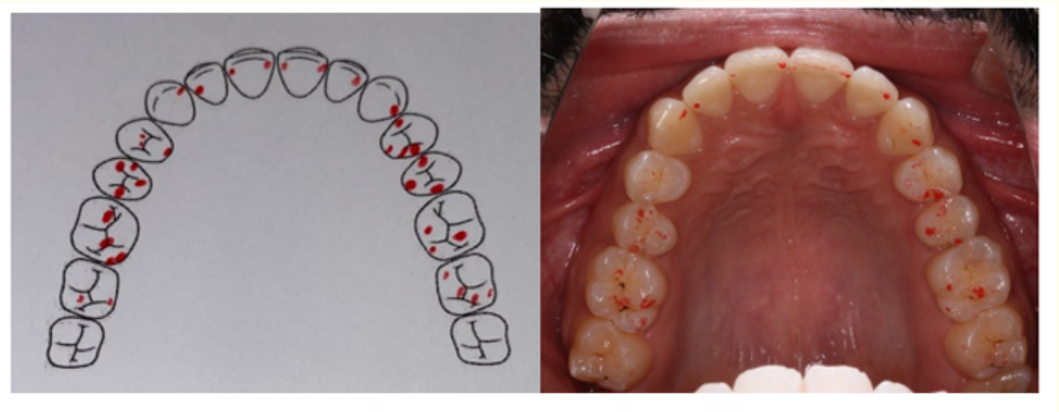

Figure 1: *Teeth alignment.*

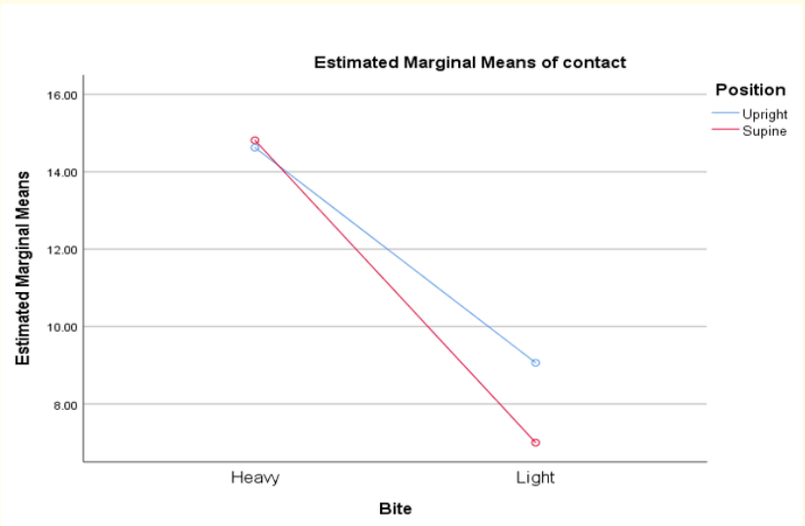

Figure 2: *Marginal mean of biting position.*

Number of contacts were compared between patients, positions and level of biting. The t-test was used between subjects and Mann-Whitney test for within subjects at 0.05 significance level.

Results

When comparing the number of contacts between heavy and light biting, subjects had significantly lower number of contacts in light biting for both chair positions with a mean of (x = 9.063), (x = 14.63) in upright position and a mean of (x = 7.0), (x = 14.81) in supine position for light and heavy biting respectively (Table 1).

Position		Mean
Upright	Heavy	14.625
	Light	9.063
Supine	Heavy	14.813
	Light	7.000

Table 1: *Positioning of biting.*

Within subjects, there was almost no difference between the upright and supine chair position in heavy biting with means of (x = 14.625) and (x = 14.813) respectively.

When comparing upright and supine chair positions in light biting, there was a slight difference in the number of contacts (although not statistically significant), upright position had a mean of (x=9.063), while supine position had a mean of (x = 7.0).

Discussion

Riise (1982) showed that there was a fewer number of contacts in light pressure compared with heavy pressure [8]. This finding was confirmed by the present study with a means of (x = 14.6) and (x = 14.813) in heavy biting, and the means of (x = 9.063) and (x = 7.0) in light biting, for upright and supine position respectively.

In natural dentitions, the occlusion of opposing teeth when the mandible is in RCP (retruded contact position) may or may not coincide with the ICP (Intercuspal position). This results in a slide between RCP and ICP that varies between subjects in size and direction. This slide is the anterior and superior movement of the mandible from first tooth contacts to maximum intercuspation. The difference between the number of contacts in the light and heavy biting could be explained by the fewer number of contacts in light tapping of teeth as the teeth slide from the initial contacts position to their contact position in maximum intercuspation. A similar result was shown before [7]. A change in the position of contacts between supine and upright position was expected in light biting but was not seen.

There was no significant difference in the number of contacts between the right and left side in maximum intercuspation and in both chair positions. However, some subjects showed a marked difference in the number of contacts between right and left in light biting which could be due to presence of premature contacts on one side.

Laurell and Lundgren (1987) concluded that substantially higher force levels can result from contacts that are only 80 µm higher than other tooth contacts [12]. This emphasizes the need of an ideal occlusal adjustment method that will achieve the most accurate results to avoid pivoting effects and pathogenic loading of individual teeth, and to avoid alteration in muscular activity. A stable occlusion should have equal number of contacts in light and hard pressure and that should be the goal of occlusal adjustment after restorative and prosthodontic procedures [8].

During light biting, the number of contacts in supine position was less than the number of contacts in upright position (although not statistically significant). This is expected since the gravitational forces will position the mandible more posteriorly in the supine position, hence, closing into a retruded position, an observation reported earlier [6]. These results indicate that the occlusal adjustment procedure should always be initiated in the supine position with the patient instructed to exert light biting pressure, before the upright position then should be ended with the patient instructed to exert maximum biting force.

Conclusion

The number of occlusal contacts are significantly less in light biting compared to heavy biting, especially in the supine position. Furthermore, the number of occlusal contacts and position were not affected by the chair position during maximum intercuspation (heavy biting). The clinician should take into consideration the chair position and level of biting when examining occlusal contacts.

Bibliography

1. Philip L Milldstein and A Maya. "An Evaluation of Occlusal Contact Marking Indicators: A Descriptive, Qualitative Method". *Quintessence International* 14.8 (1983): 813-836.

2. Carey Jason., *et al.* "Determining a Relationship Between Applied Occlusal Load and Articulating Paper Mark Area". *The Open Dentistry Journal* 1 (2007): 1-7.

3. Qadeer Sarah., *et al.* "Relationship between articulation paper mark size and percentage of force measured with computerized occlusal analysis". *The Journal of Advanced Prosthodontics* 4.1 (2012): 7-12.

4. Stefano Carossa., *et al.* "Evaluation of Occlusal Contacts in the Dental Laboratory: influence of Strip Thickness and Operator Experience". *The International Journal of Prosthodontics* 13.3 (2000): 201-204.

5. Ahmet Sarac¸og˘lu and Birgu¨l O¨ zpinar. "*In vivo* and *In vitro* evaluation of occlusal indicator sensitivity". *The International Journal of Prosthodontics* 88.5 (2002): 522-526.

6. RJ Chapman. "Occlusal contact variation with changes in head position". *International Journal of Prosthodontics* 4.4 (1991): 377-381.

7. Riise C. "A clinical study of the distribution of occlusal tooth contacts in the intercuspal position at light and hard pressure in adults". *Journal of Oral Rehabilitation* 10.6 (1983): 473-480.

8. Claes Riise. "A clinical study of the number of occlusal tooth contacts in the intercuspal position at light and hard pressure in adults". *Journal of Oral Rehabilitation* 9.6 (1982): 469-477.

9. Claes Riise. "Rational performance of occlusal adjustment". *Journal of Prosthetic Dentistry* 48.3 (1982): 319-327.

10. Gupta S. "Effect of head posture on tooth contacts in dentate and complete denture wearers using computerized occlusal analysis system". *The Journal of the Indian Prosthodontic Society* 17.3 (2017): 250-254.

11. Coelho MF. "Influence of dental chair backrest inclination on the registration of the mandibular position". *Journal of Prosthetic Dentistry* 114.5 (2015): 693-695.

12. Laurell L and Lundgren D. "Interfering occlusal contacts and distribution of chewing and biting forces in dentitions with fixed cantilever prostheses". *Journal of Prosthetic Dentistry* 58.5 (1987): 626-632.

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