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EFFECT OF TWO TECHNIQUES OF COMPLETE DENTURE CONSTRUCTION ON THE MUSCLE ACTIVITY AND OCCLUSAL LOAD

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ABSTRACT

Objective: to evaluate the effect of two techniques of denture construction on the muscle activity using electromyography the occlusal load using T-scan.

Materials and method: Twenty completely edentulous patients were selected and allocated into two groups: **Group I:** The upper and lower denture were processed in the usual manner and delivered to the patient. **Group II:** The upper waxed denture we processed only then remounted against the waxed lower denture any occlusal adjustment was done in the lower waxed denture then the processing the lower denture was performed - Electromyography recording were performed with the patient seated in relaxed upright position. -Electromyography recording device was used to evaluate the action potential of the masseter and anterior fibers of temporalis muscle. -The T-scan III was used for bite force measurement to detect the location, timing and magnitude of occlusal forces.

Results: There was statistically significant difference between both groups during chewing soft and hard food diet for masseter and temporal is muscles. The highest mean differences muscle activity were recorded for patients received conventional denture while the lowest values recorded for patients received denture in muscle activity of group II**.**

Conclusion: The Schlosser's technique is considered as predictable methods of complete denture construction. The more harmonious occlusion result from this technique results in an improvement of the muscle activity and biting force.

INTRODUCTION

A complete denture faces a number of problems if there is uneven or interceptive contacts in centric relations. These number of problems include lack of uniform distribution of occlusal forces to the basal seat causing inflammation, ulcers in the supporting tissues, more rapid residual ridge resorption, increased patient discomfort, increase parafunctional movements and the need for frequent adjustment.[1]

On the other hand, good quality dentures with harmonious occlusion caused patients to be satisfied

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with not only their dentures but also of their masticatory efficiency and performance. They even adapt to their dentures much faster than those with interceptive contacts.[2]

Clinical and laboratory remount has been conducted by researchers for its effect on eliminating uneven occlusal contact for denture prognosis. Adequate occlusal contact are critical for masticatory function.[3].

Schlosser's technique was introduced by Rudolph Oscor Schlosser as a solution for further occlusal adjustments for complete dentures that proved to decrease the occlusal discrepancies.[4]

Electromyography is frequently used for assessment of masticatory muscle function both quantitatively and quantitatively. It is described as a research tool for evaluating the electrical activity of muscle function during mastication and command mandibular movement.[5,6]

The computerized occlusal analysis system is the only occlusal indicator that demonstrates the initial tooth contact till the maximum intercuspation. It anayzed the time and force of each contact.[7] It balance of the occlusion in an active movie or real-time window using a graphic percentage of force (POF) markers. The center of force trajectory (COF) represents the ideal location of the center of force for any maximum intercuspation closure and acts as a guide which respect to normal occlusion.[8]

Aim of this study is to evaluate the effect of two techniques of denture construction on the muscle activity using electromyography the occlusal load using T-scan.

MATERIALS AND METHODS

Twenty completely edentulous patients were selected from the outpatient clinic of prosthodontic department Faculty of Oral and Dental Medicine, Cairo University.

Patients were selected according to the following criteria:

- Age ranged between 45-65 years.
- Patients were free from any systemic or skeletal muscle disorders and without any T.M.J disturbances.
- The ridges were selected angle class I jaw relation and free from severe undercuts.
- Patients had no previous denture history.
- Patients with very flat or very high v-shaped palatal vaults were excluded from the study.

Denture construction:

- Primary impression was made with alginate impression material and poured in plaster stone to obtain primary cast.
- Acrylic special tray is done to make secondary impression using zinc oxide eugenol in impression paste after border molding for both upper and lower special trays.
- Occlusion blocks were prepared on the master cast.
- Vertical dimension of occlusion and centric occluding relation were recorded using the wax wafer technique.
- Casts were then mounted on semi-adjustable articulator; setting up of the teeth was done.
- Try in of the waxed denture in the patient mouth was done and check the denture retention, extension stability, occlusal plane orientation, vertical dimension and facial appearance.

Grouping the patients:

Group I: The upper and lower denture were processed in the usual manner and delivered to the patient.

Group II: The upper waxed denture we processed only then remounted against the waxed

lower denture any occlusal adjustment was done in the lower waxed denture.

- o Processing the lower denture.
- o Delivered the denture to the patient.
- Electromyography recording were performed with the patient seated in relaxed upright position.
- Electromyography recording device was used to evaluate the action potential of the masseter and anterior fibers of temporalis muscle.
- The electrode was attached to the rubbed skin at the posterior portion of the lower part of the masseter muscle and over the anterior portion at the area of the greatest distention of the temporalis muscle.
- The T-scan III was used for bite force measurement to detect the location, timing and magnitude of occlusal forces.
- The patient was seated in on upright chain position; the proper T-scan sensor support was chosen and inserted into the hand piece in which is connected to the computer via USB cable.
- The patient was instructed to bite down normally on the sensor for 2 seconds and then opened slowly; three records will be taken for each patient.
- Analyzing occlusal force for the left and right half of the arch as well as for the quadrants posterior right and left-were performed for patents in each group at insertion, Six, and Twelve months post insertion.
- Occlusal force is presented by percentage as displayed automatically by the T-scan electronic system. The change in occlusal force at different intervals was obtained.
- During each test session, standard 1 cm cubes of two different foods (carrots and banana) were given to each patient. Measurements of muscle activities were recorded as number of chewing stroke until the patient swallowed. The measurements were recorded at insertion six a and twelve months post insertion.
- The data were collected, tabulated and statistically analyzed.

Fig. (1) The processed upper denture mounted against the lower waxed denture

Fig. (2) Showing the Tscan III sensor used to detect the patient's occlusal parameters

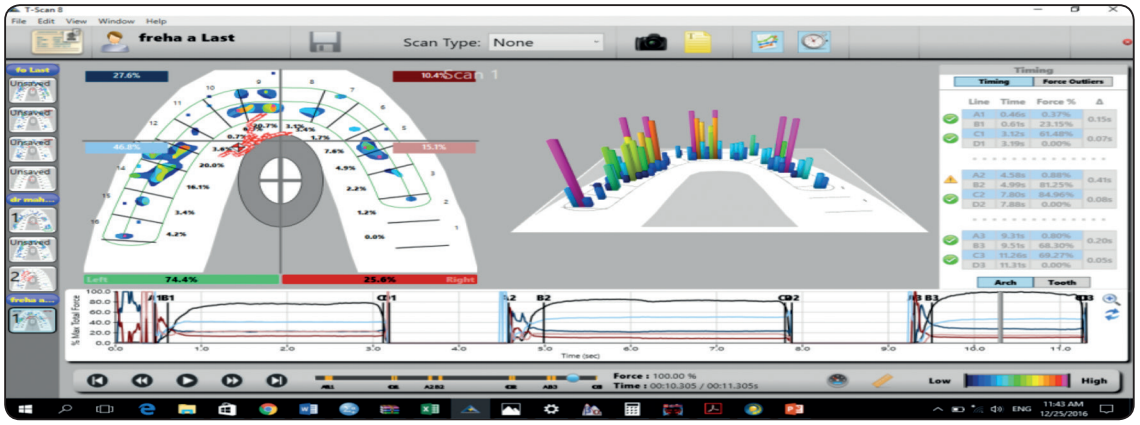

Fig (3) Showing Tscan soft ware system

RESULTS

Comparison between the two groups at each time interval was performed using independent T-test during hard and soft food chewing.

TABLE (1): Comparison between both groups regarding masseter and temporalis muscle for hand and soft food chewing from insertion tell 6 months intervals

		Hard food		Soft food	
		Group I	**Group II**	**Group I**	**Group II**
Masseter	**MD**	317.58	149.98	278.4	66.54
	SP	98.55	13.06	84.15	0.08
	P-value	0.00**		0.00**	
Temporalis	**MD**	311.13	154.31	322.57	123.78
	SP	81.53	13.5	77.9	29.23
	P-value	0.00**		0.00**	

MD: Mean difference, SD standard deviation, P-probability level ** significant difference

TABLE (2): Comparison between both groups regarding masseter and temporalis muscle for hard and soft food chewing during insertion to twelve month interval

		Hard food		Soft food	
		Group I	**Group II**	**Group I**	**Group II**
Masseter	**MD**	339.18	156.93	298.86	70.12
	SP	104	4.06	87.53	0.37
	P-value	0.00**		0.00**	
Temporalis	**MD**	315.26	163.03	341.49	130.37
	SP	52.72	7.55	80.69	23.92
	P-value	0.00**		0.00**	

MD: Mean difference, SD standard deviation, P-probability level ** significant difference

TABLE (3): Comparison between both groups regarding mean and S.D occlusal load for all sides among follow-up period

		Group I		Group II	
		M	S.D	M	S.D
Insertion	Right	1.30	0.32	0.44	0.050
	Left	1.30	0.029	0.44	0.050
	Overall	1.34	0.032	0.54	0.042
6 months	Right	0.85	0.033	0.39	0.07
	Left	0.87	0.039	0.33	0.05
	Overall	0.88	0.035	0.39	0.04
12 months	Right	0.371	0.077	0.269	0.022
	Left	0.371	0.077	0.269	0.022
	Overall	0.305	0.22	0.301	0.023

DISCUSSION

Patients for this study where selected and thoroughly examined, they were and suffering from any muscle disease or T.M.J disorders and with no burning or clenching habits as these conditions might have an effect on muscle activity, muscle response and EMG record ***(van der Bilt et al., 2006).***[9]

Patients selected had no previous experiences in denture wearing to eliminate the expected adaptation of the muscles to the previous situation that might mark the results ***(Nakamaura et al., 2010).***[10]

Occlusal load analysis was performed using T-scan in to detect location timing and distribution of occlusal loads.

The proper size of T-scan sensor support and pressure sensor where chosen according to the size of the patient jaws to avoid improper centralization of the teeth on the sensor.

T-scan hand piece act as a guide for easy insertion of pressure sensor into its place to avoid its wrinkling and distortion which may affect the results of this scan.[11]

The patients were instructed to bite normally on the pressure sensor for 2 seconds and then opened slowly to allow time and for easy detection of occlusal load distribution. Three records were taken for each patient to validate the reproducibility of the occlusal contact.[12]

Electromyographic recordings were performed with the patient seated in a relaxed upright position to avoid the effect of the posture on the reading ***(Ceneviz et al., 2006).***[13]

Surface electrodes were preferred over needle electrodes to eliminate fear and pain which in turn would affect the EMG ***(Quach, 2007).***[6]

Standard 1 cm cubes of two different foods (carrots and banana) were given to each test subject, while the patient was chewing measurements of efficiency was recorded as number of chewing stroke until the patient swallowed ***(van Kampen, 2012).***[14]

There was statistically significant difference between both groups during chewing soft and hard food diet for masseter and temporal is muscles.

The highest mean differences muscle activity were recorded for patients received conventional denture while the lowest values recorded for patients received denture in muscle activity of group II can be correlated to the improvement in occlusal distribution and less occlusal discrepancies ***(Kohyama et al., 2013).***[15]

T-scan III was found to be a reliable tool to detect early contacts and could be effectively used to check occlusal balance.

It could detect the amount of fulsce as well as location of the highest intensity contacts of a single tooth which is very specific.[16,17]

In this study using T-scan III for both groups revealed that there was a statistically significant difference between both groups at insertion and insignificant difference within twelve months follow-up period.

There results can be explained that at insertion there is some occlusal discrepancies in the first group more than that in the second group.

While after 6 and 12 months these discrepancies become less due to the effect of wearing the occlusal premature contact of the teeth.

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