

**Estudo duplo-cego para avaliação de próteses totais
feitas com duas técnicas: com e sem o uso de arco facial**

**Original em Inglês: Double-blind study for evaluation of complete dentures made
by two techniques: with and without face-bow using.**

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Daniela Fernandes Figueira Nascimento, DDS

School of Dentistry, University of Vale do Paraíba.

Renata Beatriz Luz Patto, DDS

School of Dentistry, University of Vale do Paraíba.

Leonardo Marchini, DDS, MSD

Professor (Implantology), School of Dentistry, University of Vale do Paraíba

Visitant Lecturer (Implantology), School of Dentistry, University of Taubaté

Vicente de Paula Prisco da Cunha, DDS, MSc, PhD

Professor (Prosthodontics), School of Dentistry, University of Taubaté.

Professor (Prosthodontics), School of Dentistry, University of Vale do Paraíba.

Purpose: The aim of this paper was to compare complete dentures made by two techniques: with and without face-bow. **Materials and Methods:** Five edentulous subjects were selected and each one received two pairs of complete dentures. Dentures were made from duplicated casts and each one followed different techniques. One technique used face-bow and artificial teeth were set using individualized wax ridges as guides. The other technique used an articulator which avoids face-bow using and teeth were set by a cast-analysis method. Number of occlusal contacts in centric relation and excursive movements were registered, as well as the opinion of patients regarding denture bearing during oral functions. The data were statistically analyzed. **Results:** Both groups provided balanced dentures, but the technique which avoids face-bow using presented better results regarding to esthetics, comfort and stability. **Conclusion:** Second technique provided balanced occlusion even without face-bow using and could be an alternative resource to obtain adequate complete dentures.

KEY WORDS: Complete dentures; Articulators; Occlusion.

INTRODUCTION

One of the most important requirements for successful complete dentures is a balanced occlusion. An adequate occlusal scheme allows better distribution of masticatory forces, improves denture efficiency and stability. In order to achieve this, it is necessary to reproduce centric relation and to use an adequate articulator.^{1,2,3}

Articulators reproduce patient characteristics with more accuracy as many as adjustable paths they have.⁴ However, full adjustable articulators are not practical, since they present high cost, demand wide knowledge on equipment and long chairside time.⁵ On the other hand, nonadjustable articulators are easy to handle, but do not permit to obtain a balanced occlusion and dentist spend much time on occlusal adjustments.

Considering the aforementioned statements, semi adjustable articulators seem to present the most adequate effectiveness/handling relation for complete dentures making. These articulators are easy to handle and allow to obtain a full balanced occlusion during mandibular excursions, comprising individual characteristics of each patient.⁶

Face-bow is widely used to transfer the patient occlusal plane inclination to the semi-adjustable articulators.⁷ In the same way, Paterson technique is used to get the individual compensating curves, following patient path angles for mandibular movements.⁸

However, using face-bow and Paterson technique could be troublesome in cases of elderly ill patients, because of their lack of collaboration.^{9,10}

This paper compared *in vivo* two different techniques of complete dentures construction. The first used face-bow, Paterson technique and a semi-adjustable articulator (Bio-Art, Brazil). The second used a semi-adjustable articulator (Stratos 200, Ivoclar, Liechtenstein) which avoids the use of face-bow and Paterson technique.

METHOD AND MATERIALS

Five edentulous subjects were selected from those who seek for complete denture service at dental clinic of the University of Vale do Paraíba. The sample was composed by four women and a man.

All ethical aspects were considered and respected, since it was previously approved by the Committee of Ethics in Research of the aforementioned University (Protocol Number 039/2001/CEP).

Initial examinations were done, as well as first and second impressions. Functional casts were duplicated with laboratory silicone.

Casts were then separated in two groups, which were mounted in two different arcon semi-adjustable articulators. The casts of Group A were mounted using a face-bow, in a Bio-Art articulator (Bio-Art, Brazil). Group B casts were mounted without face-bow using, in a Stratos 200 articulator (Ivoclar, Liechtenstein).

For both groups, the same type of teeth (VIPI, Brazil) was used and, after wax try-in, all dentures were processed by water bath under a temperature of 74°C, for 08 hours.¹¹

Group A technique

After mounting the upper casts by face-bow technique, compensating curves were registered and the wax ridges were fixed on centric relation position. Lower casts were then fixed in the articulator. Bennett and condylar path angles were individualized by following the individual compensating curves. Teeth were mounted following the wax ridges.

Group B technique

Before mounting teeth at Group A, wax ridges were first used to mount Group B casts

at Stratos 200, using a technique based upon average values. This technique was developed to avoid the use of face-bow and is specific for this articulator.

Lower casts were fixed first and it was necessary to set out the retromolar pad and labial frenula. Upper and lower wax ridges fixed together were positioned in patients mouth at centric relation position and vertical dimension of occlusion. So, the distance between upper and lower labial fornix was measured with assistance of a ruler. Half of this measurement was transferred to the mobile front shaft of an horizontal guide, specific from this equipment. The horizontal guide was positioned over labial frenula and, its posterior part, over retromolar pad of the cast. Then this whole was mounted over a fix board united to the upper part of articulator.

This procedure is useful for positioning the lower cast, because it permits to describe an arbitrary occlusal plane. Then, lower cast was fixed to the inferior part of articulator with plaster.

At the final stage, the wax ridges in centric relation obtained for Group A (before mounting teeth) were placed over the lower cast, positioning the upper cast, which was also fixed with plaster. Articulator was then adjusted arbitrarily in 15° for Bennett angle and 30° for condylar guide, permitting excursive movements. After that, the wax ridges were repositioned in Bio-Art articulator (Group A), in which they were used for teeth mounting.

Teeth mounting in Group B followed the technique of the Biofunctional Prosthetic System (Ivoclar, Liechtenstein), did not using the wax ridges as guides. The technique described by the manufacturer uses casts analysis, as well as the relation between dental archs and anatomic criteria, like palatal and retromolar pad, wrinkles and maxillary tuber. These procedures were done observing adequate overbite, according to Angle classification of the patient, and balanced occlusion.

Results assessments

At denture delivery appointment, only one of the two pairs were given to the patient (nor patients or operator knew from which group was the first pair entrusted to the patient – only the technician knew it). Occlusal contacts were registered with carbon, counted and signed. To minimize errors, contacts were realized twice in each person, in a total of 10 samples. Patients were instructed to return after 10 days and then answered the Group A part of the following questionnaire.

QUESTIONNAIRE ABOUT COMPLETE DENTURES BEARING

Patient ID number: _____

Evaluation of Group A dentures:

Date: ___/___/___

1. 1. Comfort during wearing period:

Bad Satisfactory Very good

2. 2. Stability and safety:

Bad Satisfactory Very good

3. 3. Bearing during speaking:

Bad Satisfactory Very good

4. 4. Bearing during chewing:

Bad Satisfactory Very good

Evaluation of Group B dentures:

Date: ___/___/___

1. 1. Comfort during wearing period:

Bad Satisfactory Very good

2. 2. Stability and safety:

Bad Satisfactory Very good

3. 3. Bearing during speaking:

Bad Satisfactory Very good

4. 4. Bearing during chewing:

Bad Satisfactory Very good

Preference: Denture A Denture B

Second pair of dentures were then delivered and procedures were repeated. After wearing period, patients were asked to choose one of those pairs, what was also signed. Results concerning about questionnaire and number of contacts of groups A and B were statistically analyzed. To access differences between the groups about these criteria, Wilcoxon test (p-value of 6%) was used to verify occlusal contacts and test of Proportion Analysis was made for questionnaire answers.

RESULTS

Occlusal contacts presented a significant statistically difference between the averages of Groups A and B for centric relation ($p=0.005$) and left lateral movement ($p=0.010$), in which group B presented the great number of contacts. At right lateral movement there was a tendency of group B to present higher number of contacts ($p=0.065$), due to the proximity of p-value established of 6%. There was no significant difference between groups of dentures ($p=0.331$) for protrusive movements (Table 1).

Lateral movements were subdivided in work and non-work sides, whereas protrusive movements were separated in anterior and posterior contacts. Concerning work side at lateral movements, dentures A presented worse results than dentures B, at right movements ($p=0,007$), but at left lateral movement, there was no significant difference ($p=0,102$) like shown at Table 2.

Opposite situation was found for non-work side, in which Group A obtained worse results at left lateral movement ($p=0,023$), and presented no significant difference at right movement ($p=0,233$) in relation to group B (Table 3).

Regarding to protrusive movement (Table 4), there was no significant difference between denture groups both for anterior ($p=0,725$) and posterior contacts ($p=0,373$).

Considering all movements analyzed, it was observed that dentures from group B, on average, obtained greater number of occlusal contacts than dentures from group A (Figure 1).

According to questionnaire, it was observed that denture B had better acceptance by patients, because for answers “Bad” ($p=0,017$) and “Very good” ($p=0,057$) there was a statistically significant difference between groups A and B (Table 5).

DISCUSSION

It was observed that group B, made at Stratos 200 without face-bow and Paterson technique, presented higher number of occlusal contacts in centric relation than Group A for all mandibular positions. It might be due to Paterson technique, which shows an inherent difficulty: the resin bases have no enough retention at time of obtaining individual compensating curves. Doing so, the occlusal planes could be inadequately related to alveolar ridges.

Inversely, Group B was made using the teeth mounting guide of Stratos 200, which allows to obtain an arbitrary occlusal plane at the moment of teeth mounting. This procedure avoids the errors due to Paterson technique as previously described.

Both groups presented similar results in excursive jaw movements, establishing a balanced occlusion. Slight better results could be seen for Group B, probably referred to the same inaccuracy related to the application of Paterson technique added to the use of standard guides for teeth mounting.

Regarding to esthetic of complete dentures, Group B presented better esthetic than Group A for all patients. It could be due to the technique used to mount teeth. Group A mounting depends on dentist and technician ability to achieve all esthetic requirements

during wax ridges individualization. Group B mounting respects cast analysis, which reproduces individual characteristics, despite dental staff aesthetic abilities.

Regarding to the questionnaire applied, Group B received more favorable answers than Group A for chewing and speaking functions. This result confirms that comfort, stability and less stress to the supporting tissues come from an adequate balanced occlusion.¹² Thus, since group B presented greater esthetics and comfort, all patients preferred dentures from this group like their pair of choice.

As a rule, Group B presented better results than Group A, what showed that even without face-bow, Stratos 200 articulator presented an unexpected performance and could be used as a resource to obtain balanced occlusion during complete denture making.

CONCLUSION

Considering the methodology applied and the sample analyzed, one can conclude that:

1. 1. Dentures from groups A and B presented occlusal contacts in all mandibular excursions and both obtained balanced occlusion;
2. 2. Occlusal contacts at left lateral movement and at centric relation, from group B, presented a statistically significant difference to group A, due to greater number of contacts verified in B;
3. 3. According to patient, Group B provided more comfort and better esthetic than Group A, and received all preference from patients;
4. 4. Stratos 200 articulator provided making dentures with balanced occlusion even without face-bow use.

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Table 1. Number of occlusal contacts in groups A and B.

Contacts	Centric relation		Left lateral movement		Right lateral movement		Protrusive movement	
	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B
Average	11,90	19,10	12,40	15,30	12,60	15,50	15,70	17,40
Variance	6,77	10,10	25,38	27,34	18,93	20,06	17,34	24,93
n	10	10	10	10	10	10	10	10
p-value	0,005		0,010		0,065		0,331	

n = sample size.

Table 2. Number of occlusal contacts at work side in groups A and B.

Work side	Left lateral movement		Right lateral movement	
	Group A	Group B	Group A	Group B
Average	6,50	7,70	6,40	8,40
Variance	6,06	8,90	6,71	7,82
n	10	10	10	10
p-value	0,102		0,007	

n = sample size

Table 3. Number of contacts at non-work side in groups A and B.

Balance side	Left lateral movement		Right lateral movement	
	Group A	Group B	Group A	Group B
Average	5,90	7,60	6,20	7,10
Variance	6,99	6,93	3,96	3,88
n	10	10	10	10
p-value	0,023		0,233	

n = sample size.

Table 4. Number of contacts at protrusive movements between groups A and B.

Protrusive movement	Anterior		Posterior	
	Group A	Group B	Group A	Group B
Average	4,60	4,70	11,10	12,70
Variance	3,82	4,90	7,66	14,23
n	10	10	10	10
p-value	0,725		0,373	

n = sample size.

Table 5. Patients answers regarding dentures bearing.

Answer	Group A	Group B	p-value
Bad	25%	0%	0,017
Satisfactory	35%	30%	0,736
Very good	40%	70%	0,057

Figure 1

Legends

Figure 1. Average number of occlusal contacts in centric relation, left and right side (lateral movements) and protrusive.