

Comparison of two impression methods for determining the neutral zone in edentulous patients

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Abstract: Although complete dentures are not ideal replacements for natural dentition, they should not be noticeable and patients should not feel uncomfortable in the mouth. The role of the action of the surrounding facial muscles, speech, and chewing is often overlooked in the manufacture of complete removable dentures. All muscle functions that include chewing, swallowing, speaking, laughing, and sucking involve the harmonious action of the lips, cheeks, tongue, and bottom of the mouth. These actions impact the design of the prosthesis and can be recorded using functional methods. Failure to recognise these functions can affect the position of the teeth, the boundaries of expansion, the location of the occlusal plane, and the contours of the polished surface, which can lead to an unstable and unsatisfactory prosthesis. The concept of the neutral zone considers the neuromuscular function that contributes to the stabilisation of the prostheses.

Improving the effectiveness of treatment of patients with complete absence of teeth, mainly comes down to the use of dental implantation, but not all patients, for several reasons, can afford implantation. Therefore, biophysical methods of fixation continue to occupy a central position.

Toward improving these methods of fixation, recently modified methods of obtaining casts, practice volumetric modelling of the edges of the prosthesis, and the location of the edges of the structures within the neutral zone.

The neutral zone is defined as “the potential space between the lips and cheeks on 1 side, and the tongue on the other; that area or position where the forces between the tongue and cheeks or lips are equal.”¹ This zone is referred to by various names, including the dead space² and zone of minimal conflict.³ Knowledge of the neutral zone concept

may be advantageous when fabricating complete dentures. Incorrect tooth placement and arbitrary shaping of the polished surfaces may have an adverse effect on the success of the prosthesis. This is particularly true for patients with reduced mandibular residual ridges, yielding flat or concave foundations due to severe bone resorption. A number of techniques relying on function to develop the shape of the neutral zone and polished surface of mandibular dentures have been described.⁴⁻⁶ The concept considers the actions of the tongue, lips, cheeks, and floor of the mouth during a specific oral function, to push the soft material into a position where buccolingual forces are neutralised. Many materials have been suggested for shaping the neutral zone: modelling plastic impression compound,⁵ soft wax,⁷ a polymer of dimethyl siloxane filled with calcium silicate,⁸ silicone,⁹ and tissue conditioners and resilient lining materials.

Key words: muscle functions , include chewing, swallowing, speaking, laughing.

Introduction

Many techniques have been suggested using the previously described materials with movements including sucking,¹² grinning and whistling,⁷ and pursing the lips.¹³ The swallowing/modelling plastic impression compound technique¹⁴ located the neutral zone, using swallowing as the principle modelling function. Considering that a person swallows up to 2400 times per day,¹⁵ and considering also that during the entire swallowing sequence teeth come into contact for less than 1 second,¹⁶ it may be concluded that less

than 40 minutes of tooth-to-tooth contact occurs per day during function. Speech is also another important part of daily oral activities. During speaking, the mouth is moderately opened, pressures of different magnitude and direction are generated, and forces are produced with a greater horizontal than vertical component acting on the dentures. Although speaking causes upward movements of the floor of the mouth similar to swallowing, these movements are not as constant as those found in swallowing.¹⁷ Thus, the phonation/tissue conditioner technique uses phonation to develop a mandibular impression.^{8,13,14} Many studies have analysed the neutral zone^{13,18,19} and neutral zone dentures as compared with dentures made using conventional techniques in the edentulous patient.^{8,9,12,20} It has been shown that neutral zone dentures are functionally more stable than conventional dentures.^{6,8,9,12} However, the author could not identify studies comparing the swallowing and the phonetic techniques for assessing the location and shape of the neutral zone reported in the literature.

The purpose of this study was to compare the outline form of the phonetic and swallowing neutral zone impression techniques on the same subjects.

Comparison of determining the boundaries of the neutral zone during phonetic muscle activity and swallowing.

Research objectives :

- determination and registration of the neutral zone during the movements of the muscles during swallowing
- identification and registration of the neutral zone using phonetic exercises performed by the patient according to the doctor's instructions
- Comparison of the results obtained by two methods for determining the neutral zone
- Assessment of patients' satisfaction with removable dentures after rehabilitation according to three criteria: functionality, retention and stabilization of the prosthesis.

Material and methods

After institutional review board approval, 11 healthy edentulous subjects who wore complete dentures for at least 2 years were included in this study. Ages ranged between 73 and 83 years, with a mean of 79 years.

Requirements for selection were advanced mandibular ridge resorption (Class V, Atwood)²¹ and absence of clinical temporomandibular joint symptoms. During preliminary evaluation, none of the subjects showed signs of phonetic problems with their existing dentures. Clinical assessment showed no abnormal swallowing habits.

All procedures were performed by a single clinician. A preliminary mandibular cast was made for each subject using an irreversible hydrocolloid (Aroma Fine Dust Free; GC Europe, Leuven, Belgium) impression. Two custom impression trays were then prepared in autopolymerizing acrylic resin (Formatray; Kerr Corp, Orange, Calif), placed intraorally, and evaluated for overextensions of the borders. Borders were trimmed, and the trays were reevaluated intraorally for stability by the clinician and confirmed by the subject, after opening the mouth wide, wetting the lips with the tongue, swallowing, and speaking. One of the trays was used to shape resilient lining material (Functional Impression Tissue Toner; Kerr Corp) using phonation. Swallowing was used to shape modeling plastic impression compound (Green Impression Compound Type 1; Kerr Corp) on the second tray, constructed with wire loops to retain the modeling material. None of the subjects wore a maxillary denture during impression procedures. The resulting impressions were leveled to the same occlusal height by gently grinding the occlusal surface on sandpaper until it corresponded with landmarks noted on the cast.

The contours of both impressions were outlined on graph paper and compared. The recording of the phonetic neutral zone was always performed before that of

the swallowing neutral zone, and an impression was made for each subject using each technique.

Conclusion

Within the limitations of this study, the findings showed that the location of the neutral zone was not the same with the swallowing/modeling plastic impression compound technique and the phonation/tissue conditioner technique. However, statistical significance does not imply clinical significance, and the results yielded by these 2 techniques may be clinically acceptable. The PNZ technique resulted in impressions where the neutral zone appeared to be narrower as the buccal surface was located more lingual compared to the SNZ.

References:

1. Ibragimova F. I., Idiev G. E. The state of health of workers in the production of synthetic detergents and cleaning products. "Problems of Biology and Medicine" International Scientific Journal. - Samarkand, 2012.- №1(68).-P. 66-67.
2. Ibragimova F. I., Idiev G. E. Evaluation of the parameters of the oral cavity in workers of a chemical enterprise. "HERALD. Problems of Biology and Medicine " Ukrainian Academy of Sciences. - Ukraine, 2013. - no. 3, vol. 2 (103). - p. 315-317.
3. Ibragimova F. I., Idiev G. E., Nurov N. B. The state of immunological reactivity of the oral cavity in workers producing synthetic detergents. "Problems of Biology and Medicine" International Scientific Journal. - Samarkand, 2013.-№4.1(78).-P. 41.
4. Ibragimova F. I., Nusratov U. G., Idiev G. E., Zhumatov U. Zh. The use of low-frequency ultrasound in the complex treatment of leukoplakia of the oral mucosa. "Problems of Biology and Medicine" International Scientific Journal. - Samarkand, 2013.-№4.1(78).-Pp. 84-85.
5. Ibragimova F. I., Jumatov U.J., Idiev G.E. Influence of the harmful factors of manufacture of synthetic detergents and cleaners on the clinical-functional parameters of the oral cavities in the workers. European Science Review. Scientific journal. – Austria. Vienna, 2014.-№9-10.-P.31-32.
6. Ibragimova F. I., Prevalence and character of the oral cavity mucosa in the workers of the manufacture of the synthetic detergents. European Science Review. Scientific journal. – Austria. Vienna, 2016.-№3-4.-P.178-179.
7. Ibragimova F. I., Idiev G. E. The effect of sodium hypochlorite (an ingredient in synthetic detergents) on the activity of redox enzymes and its correction by the introduction of herbal preparations in the experiment. "Problems of Biology and Medicine" International Scientific Journal. - Samarkand, 2017.-№4.1(98).-Pp. 52-53.