NEUTRAL ZONE IN COMPLETE DENTURES-LITERATURE REVIEW

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ABSTRACT

Introduction. Rational goals for denture construction are basically directed at the restoration of esthetics and masticatory function and the healthy preservation of the remaining natural tissues The three dimensional volume of complete dentures optimally occupies an edentulous space that is substantial, in the light of the progressive changes that accompany edentulism and functional dynamics. The paper discusses current knowledge of neutral zone in complete denture treatment.

Key words: *complete denture, neutral zone, dentures impression*

INTRODUCTION.

Elderly patients, especially long-term denture wearers, have advanced ridge atrophy and atrophy of the cheek and lip muscles [1].

The soft tissues that form the internal and external boundaries of the denture space exert forces which greatly influence the stability of the dentures. The central thesis of the neutral-zone approach to complete dentures is to locate that area in the edentulous mouth where the teeth should be positioned so that the forces exerted by muscles will tend to stabilize the denture rather than unseat it. [2,3]

The greater the ridge loss, the smaller the denture base area and the less influence the impression surface area will have on the stability and retention of the denture. As the area of the impression surface decreases and the polished surface area increases, tooth position and contour of the polished surface become more critical [4-6].

In other words, where more of the alveolar ridge has been lost, denture stability and retention are more dependent on correct position of the teeth and contour of the external surfaces of the dentures. The forces exerted on the external surfaces of the dentures [7,8]. According to the Glossary of Prosthodontic Terms the neutral zone is "the potential space between the lips and the cheeks on one side and the tongue on the other; that area or position where the forces between the tongue and cheeks or lips are equal." [9].

LITERATURE REVIEW

Due to the availability of newer materials, the development of more sophisticated techniques and the growth of the age group, an appropriate, evidence-based treatment is desired. Therefore, the purpose of this article was to summarize the existing literature on the neutral zone and to identify possible gaps in current research to suggest areas for further investigation [10].

Residual crest resorption (RRR) is a chronic, progressive, irreversible disease and probably of multifactorial origin. It is an inevitable and natural physiological process. The technique of the neutral zone is favorable for patients with complete mandibular dentures, unstable, non-retentive [11].

Clinical trials have highlighted the benefits of using the neutral zone technique. Stromberg and Hickey in 1965 found a better adaptability of the patient to the

physiological format of the denture base compared to conventional ones[12].

A systematic review on this subject was not possible, as the related articles were few and varied. Therefore, a literature search was conducted for peer-reviewed articles published in English and limited to people for the “neutral zone”, from January 1, 1900 to June 30, 2019, in Medline (PubMed) and Google School.

PubMed results showed 1158 articles for the neutral zone, but after applying the limitations, only 32 articles remained. Of these, only 25 were relevant articles reviewed. Google also searched for any other relevant articles [13]. Most traditional prosthetic techniques consider only static assessments, such as arranging the posterior teeth directly over the edentulous ridge [14].

Neutral area detection techniques are widely used in removable dentures manufacturing protocols, to avoid neutral area violation and to improve prosthesis stability, as well as for phonation and soft tissue support accordingly. On the contrary, there is no information on the effect of techniques based on the measurement of the neutral zone on dental bridges on implants neither in terms of functional adaptation nor about the stability of the implant. [15,16].

Over time, many concepts and theories have emerged to describe where the prosthetic teeth of dentures should be located. Some of them have adopted the mechanical principle, others have used biometric guides and there is a minority that has supported mathematical formulas based on the position of natural teeth and their size. These dogmatic or arbitrary approaches have been challenged and found to be insufficient, in fact not only through rigorous research, but also through failure to restore function, aesthetics, and comfort in patients with severe atrophic mandibular ridges [17-19].

A number of techniques have been described that rely on oral functions to mandibular dentures, especially if implant treatment is not possible.

develop the shape of the neutral zone. Swallowing-based impression tehnique who located the neutral zone using swallowing as a modeling force[20].

The stability of lower dentures is well recognized as a potentially difficult treatment goal to achieve. Lack of stability and discomfort are the most common complaints reported by patients and are quite often difficult to manage by dentists. It is said about neuromuscular control that it is the key determinant of the stability of the lower dentures, since the area available for support is much smaller than the maxillary support area. The size and position of the teeth and the contours of the polished surface play a crucial role in the stability of low dentures, as they are subjected to destabilizing forces on the tongue, lips and cheeks if they are hindered by the function of these structures[20-22].

The polished surface of the dentures is the surface which is normally brought to a high level of polishing in the technical laboratory and in contact with the tongue, cheeks and lips. The shape and position of this surface largely determines whether the patient will feel "at home immediately" with dentures.The contour of the polished surface depends largely on the buccal-lingual position of the teeth in relation to the residual ridge and the shape of the denture bases in the wax denture stage. The vertical occlusion relationship and the width of the posterior teeth also affect the shape of the polished surface [23-26].

The surfaces of the denture must eliminate a series of inclined planes in relation to the muscles of the tongue and cheeks. The palatal surface of the upper denture faces inward, and the lingual surface of the lower dentures points inward and upward [27].

The concept of neutral zone is considered exceptionally important when considering treatment options for patients who complain of instability of total

Tench et al were the first in this field and have proposed modeling plastic impression compound as the material to be

used for recording the neutral zone experiments, the shearing of different microbial strains from MPC-coated surfaces by the deliberate passage of an air–liquid interface should be investigated in more detail. A tissue-conditioning material was

Light-polymerized acrylic resin provides sufficient working time and polishes to a high luster; however, irritation due to the monomer may be a problem [32].

Whichever materials are used for recording the neutral zone, it seems that 2 factors cannot be ignored: the neutral zone should be recorded at an established occlusal vertical dimension, and the material used for recording should be reasonably slow setting so that oral musculature shapes it into proper contour and dimension. [33].

Until now, the number of additions and the volume of impression materials required for recording the neutral zone have not been clarified. Heath demonstrated that recordings of denture space morphology vary according to the volume of the material used.

To address this volumetric variable, a nonsetting gel - a polymer of dimethyl silicate filled with 12% calcium silicate - was used on a trial basis to estimate the optimal volume of material required to record the denture space. Ikebe et all examined the effect of incremental injections of impression material on the resultant denture space [34,35].

Studying the reproducibility of the neutral zone, Karlsson and Hedegard compared the results of 2 operators using 1 impression material and a spatula for application and concluded that there was no operator effect when making neutral zone impressions. They also compared the results obtained by 1 operator with 2 impression materials and 2 methods of application (spatula versus injection) and reported significant differences among impressions when different materials and different application methods of the material were used. The results confirm the variability of the neutral zone techniques [36].

preferred by many authors because of the ease of mixing, elective initial viscosity, and slow-setting properties that enabled capture of the movable tissue morphology in the functional state [28-31].

Different thoughts are mentioned in literature for the facio-lingual positioning of artificial teeth. Weinberg stated that buccal cusps and fosse of the posterior teeth should be directly over the crest of the ridge. This position was said to result in more stability and less lateral force since the occlusal pressure on the tooth fell close to the fulcrum and created little or no torque

The neutrocentric concept requires that posterior mandibular denture teeth should be arranged to occupy as central a location as possible, relative to the denture foundation, without disturbing adequate tongue function [37,38].

ElGheriani recommended that posterior maxillary denture teeth should be arranged to satisfy specific mathematical formulas based on natural intercanine width.

Lammi argued that in aging patients, mandibular posterior denture teeth should be arranged over the buccal shelf to provide increased tongue space and to facilitate the development of vertical facial denture polished surfaces against which, an effective facial seal may be achieved and maintained[39].

The neutral zone method typically locates posterior denture teeth slightly facially, when compared to teeth arranged over the crest of the residual ridge from complete denture made by conventional waxing methods. Hand waxed denture base contours typically incorporate concavities along facial prosthetic surfaces [40].

More frequently, however, contours resulting from physiologically molded external impressions yield generalized convexities along the facial surfaces of both maxillary and mandibular dentures, especially in the molar region.

DISCUSSIONS

Several studies have compared dentures fabricated by using neutral zone (myodynamic) and conventional techniques, and it has been observed that neutral zone dentures are functionally more stable than conventional dentures, increase patient comfort and function, and experience minimum postinsertion problems.

However, according to Fahmy and Kharat, comfort and speech performance were better with the neutral zone dentures than with conventional dentures, which showed better mastication results. Raja et al63 showed that in those with longer periods of edentulism, neutral zone dentures had better assessment results and success.

These dentures have the advantages of improved stability and retention, sufficient tongue space, reduced food trapping adjacent to the molar teeth, and good esthetics due to facial support.

Critically, Stromberg et al compared similar dentures whose external surfaces had been formed by manual and physiologic procedures and found that all patients preferred the manually formed dentures. The reason could be that although both types of denture were properly placed, the exaggerated contours of the functionally formed denture base caused a slight decrease in retention because of the different degrees of mouth opening used during the study.

It has been suggested that long periods of edentulism modify the position of the neutral zone and that the duration of edentulism influences residual ridge resorption.

Fahmy in 1992 concluded that the longer the period of edentulism, the more buccally or labially located was the neutral zone. Lammie3 reported that the direction of mandibular ridge resorption allows the mentalis muscle attachments to fold over the alveolar ridge, which results in the posterior positioning of the neutral zone. Fahmy proposed that Lammie's findings were true only for patients who were edentulous for less than 2 years.

Limitations to this review may have influenced the outcome. Although the electronic searches were supplemented with manual searches with an attempt made to include all the articles related to the neutral zone, some articles might have been omitted either because they did not focus directly on the topic or because of the filters applied.

In future studies, different materials and quantity, application methods and techniques, number of operators, and varied edentulous periods could be compared.

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