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NEUTRAL ZONE – REVIEW

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Abstract: Complete dentures are primarily mechanical devices but since they function in the oral cavity, they must be fashioned so that they are in harmony with the normal neuromuscular function. All oral functions, such as speech, mastication, swallowing, smiling, and laughing, involve the synergistic actions of the tongue, lips, cheeks, and floor of the mouth which are very complex and highly individual. Failure to recognize the cardinal importance of tooth position and flange form and contour often results in dentures which are unstable and unsatisfactory, even though they were skillfully designed and expertly constructed. The loose and unstable lower complete denture is one of the most common problems faced by denture patients. One of the methods used to solve this problem is the neutral zone technique. The neutral zone is the area where the displacing forces of the lips, cheeks, and tongue are in balance. It is in this zone that the natural dentitions lie and this is where the artificial teeth should be positioned. This area of minimal conflict may be located by using the neutral zone technique. The artificial teeth can then be set up in the correct positions. The coordination of complete dentures with the neuromuscular function is the foundation of successful, stable dentures.

Keywords - Denture stability, low fusing compound, neutral zone, resorbed mandibular ridge

I. Introduction

The ultimate goal of dentistry is to keep all the teeth of an individual, healthy and in comfort throughout his life. If however teeth are lost despite all efforts to save them, the prosthesis should be fabricated in such a manner so as to function efficiently and comfortably in harmony with the muscles of the stomatognathic system and the temporomandibular joints.¹

The primary objective of complete denture prosthesis is to construct dentures that will satisfy the three basic requirements of the edentulous patient: maximum comfort, efficiency and aesthetics. These objectives can be achieved only if the dentures are both stable and retentive. Tooth position has also received considerable attention, but essentially from a purely mechanical or leverage point of view. Complete dentures are primarily mechanical appliances, but since they function in the oral cavity, they must be fashioned so that they are in harmony with the normal neuromuscular system.¹

All oral functions, such as speech, mastication, swallowing, smiling, and laughing, involve the synergistic actions of the tongue, lips, cheeks, and floor of the mouth which are very complex and highly individual. Failure to recognize the cardinal importance of tooth position and flange form and contour often results in dentures which are unstable and unsatisfactory, even though they were skillfully designed and expertly constructed. The coordination of complete dentures with neuromuscular function is the foundation of successful, stable dentures. When all of the natural teeth have been lost, there exists within the oral cavity a void which is the potential denture space.²

The neutral zone is that area in the potential denture space where the forces of the tongue pressing outward are neutralized by forces of the cheeks and lips pressing inward. Since these forces are developed through muscular contraction during the various functions of chewing, speaking, and swallowing, they vary in magnitude and direction in different individuals.²

The main objective behind neutral zone approach to complete dentures is to locate that area in edentulous mouth where the teeth should be positioned so that the forces exerted by muscle will tend to stabilize the denture rather than unseat it.³

II. Clinical procedure:

A primary impression of the upper and lower jaws is made with impression compound [Figure 1] and the model is poured. Maxillary secondary impression is made and a wax rim and a lower special tray is constructed. The special tray is a plate of acrylic adapted to the lower ridge, without a handle, with spurs or fins projecting upward toward the Upper arch [Figure 2].



Figure 1. Primary impression with impression compound



Figure 2. Lower special tray with spurs or fins projecting upward

These help with the retention of the low fusing compound.⁶⁻⁸ the lower special tray with the Softened low fusing compound is placed in the patient's Mouth; this tray is very carefully adjusted in the mouth to be sure that it is not overextended and remained stable

During opening, swallowing, and speaking. The patient is then asked to talk, swallow, drink some water, etc. After 5–10 min, the set impression is removed from the mouth and examined. The internal and external muscle groups should be brought into play, moving them through their respective action paths. In doing so, reciprocating pressures will exerted upon the compound, which will gradually mold into a state of neutral balance and become centrally inert in relation to all of the complex forces acting upon it. After a tentative vertical dimension and centric relation have been established, the final impression is made with a closed mouth procedure.⁸ Only when the final impressions get completed the occlusal vertical dimension and centric relation is finally determined.

The Plaster Index

Artificial stone is poured into the final impression. The base is then set down on a platter-shaped portion of the mix which extends at least 1 inch beyond the borders of the Acrylic resin base. Before the stone sets completely, it is notched. One notch is cut in the lingual centre section, and two notches are made on each of the buccal sides, one in the cuspid and one in the molar region [Figure 3].⁹⁻¹¹

The notches are made quickly. The stone cast, the acrylic resin base, and the compound are immersed together in cold water to avoid the effects of the chemical heat of the setting stone. The stone is coated with a separating medium when it is set hard, and the compound is covered with a 1-inch-thick layer of a plaster which is worked into the notches of the base. This is done in two sections, leaving a narrow dividing line of the compound at the occlusal and incisal edges of the pattern so that the lingual and buccal sections of the plaster index do not quite meet.¹²⁻¹³ the heat of setting is controlled by placing it in a pan of cold water. When this plaster has hardened, the index can be split at the median line on the labial side. The buccal and labial portion may be removed till two sections.¹⁴ The lingual portion may be removed as a single piece. The shape of the denture is now permanently registered in this plaster index [Figure 4].



Figure 3: Notch is cut in the lingual center section, and two notches were made on each of the buccal sides



Figure 4: Shape of the denture is permanently registered in the plaster index

The low fusing compound is now destroyed down to the bare acrylic resin [Figure 5].

The plaster index is soaked in hot water and the excess is blown off. The index is then coated with a light mineral oil and assembled with the acrylic resin base in position [Figure 6].



Figure 5: Bare acrylic resin denture base



Figure 6: Bare acrylic resin denture base with the index

The pink baseplate wax is slowly melted in a ladle and poured into the index through the space between the labial and lingual indices on the occlusal surface [Figure 7].

Then the entire assembly is immersed in cold water. When the index is opened, a hard wax duplicate of the low fusing compound has been formed.¹⁵ This is easily handled, and being attached to the acrylic resin base, it becomes the lower occlusion rim [Figure 8].

Arrangement of Teeth

All of the lower teeth are set first [Figure 9]. This is done by removing just enough wax to set one tooth at a time, constantly checking its position with the index. When all of the lower teeth have been set, the upper teeth are arranged.

Completion of the Dentures

The wax trial dentures [Figure 10] are tried in the mouth to check the appearance and occlusion. The upper denture is finished in the usual manner. A stone cast is poured carefully into the impression surface of the acrylic resin base of the lower trial denture. This is then flaked in the usual way.

After the flask has been separated and the wax removed, the acrylic resin base is softened by directing a Bunsen flame against it. The resin base is then removed from the flask and the mold is packed with the all new denture base material. This will avoid warpage of the original base during processing. The finished lower denture must be polished very lightly, and with extreme care finally the denture insertion and post insertion instructions are given.¹⁶⁻¹⁷



Figure 7: Labial and lingual indices on the occlusal surface



Figure 8: Lower occlusion rim



Figure 9: Lower teeth arrangement in the neutral zone



Figure 10: Wax trial dentures

III. Discussion

Various theories have been advanced to improve the stability of mandibular restorations. Most of the literature suggests that dentures should be positioned to occupy the position of their natural anterior teeth [8] or that posterior dentures should be positioned directly atop the non-dental cusps. Pound [18] It is recommended that the lingual surface of the posterior teeth of the mandibular restoration occupy a limited area. By two lines starting from the mesodermal surface of the mandibular canines and extending posteriorly to the linguistic and jaw aspects of the acoustic cushion. Lammie suggested that the mandibular posterior dental prosthesis be placed on the maxillary plateau to provide increased language spaces and facilitate the development of the polished vertical surfaces, thereby making it possible to achieve and maintain an effective filling. Wright et al. believe that the teeth of the posterior restoration should be placed directly in the centre of the stress zone of the restoration. This location may not correlate with toothless crests, especially with being severe apical atrophy. [20] Campbell states that the teeth of the mandibular restoration should be aligned slightly forward with respect to the apex of the maxillary, while the posterior teeth of the mandibular restoration should be arranged slightly vestibular relative to the apex of the border teeth.

Neutral zone is defined as the latent space between lips and cheeks on one side and tongue on the other; Area or position where force between tongue and cheek or lip is equal [21] It is also known as dead zone [21], stable zone [22], zone of minimum conflict [22], balance zone [23], zone of least interference [2], biometric prosthetic study space [25], prosthetic space [26] and prosthetic potential space [27] The neutral zone is the area of the mouth in which is active, external pressure forces are neutralized effected by the inward pressure of the cheeks and lips. Since these forces are developed by contraction of the muscles during the different functions of chewing, swallowing and speaking, they differ in amplitude and direction between individuals and at different stages of life. [28] The more ridge loss, the less area of the denture base and the less influence impression surface area will have on the stability and retention of the denture. As the surface area of the impression surface decreases and the external surface area increases, the development and contour of the external surface become more critical. The polished surfaces of the denture must exhibit a series of inclined planes in relation to the muscles of the tongue and cheeks. The palatal surface of the upper denture looks inward and downward, while the lingual surface of the lower denture looks inward and upward. [29] The forces on the external surface are constantly changing in magnitude and direction during swallowing, speaking and mastication. It is only when the mouth is completely at rest that the forces are constant. If a person's teeth were in contact all the time, the external surface would be relatively unimportant in denture stability. [30] Conversely, if a person never brought his teeth into contact, the occlusal surface would be relatively unimportant and the stability would be dependent on the forces on the external surface as transmitted to the impression surface. The only time the two teeth come into contact is during chewing and swallowing. This means that the patient will only make tooth contacts during normal functioning. But the lips, cheeks and tongue still do not stop using. This emphasizes the importance of the transverse forces exerted by the lips, cheeks and tongue. It seems reasonable that when making dentures, the artificial teeth should be placed in the same mechanical position relative to natural teeth.

IV. CONCLUSION

The neutral zone philosophy is based on the concept that for each individual patient there exists within, the denture space, a specific area where the function of the musculature will not unseat the denture and, at the same time, where the forces generated by the tongue are neutralized by the forces generated by the lips and cheeks. In other words, we should not be dogmatic and insist that the teeth should always be placed over the crest of the ridge, or lingual to the ridge or buccal to the ridge. Placement of the teeth should be dictated by the musculature and will vary for different patients. The neutral zone has not been given enough importance, in the literature but as a determinant of occlusion, it cannot be ignored. Complete and partial denture failures are often related to noncompliance with neutral zone factors. Regardless of the method of treatment, any part of the dentition out of harmony with the neutral zone will result in instability, interference with function or some degree of discomfort to the patient.

Thus, the neutral zone must be considered as an important factor while rehabilitating the edentulous patients. The operator should try to neutralize forces acting on complete dentures, which will make the prostheses more functionally physiologically and psychologically acceptable to the patient.

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