IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 11 Ser.2 (November. 2020), PP 55-61
www.iosrjournals.org

A Definitive approach to the management of resorbed ridges with a realistic mean- A Systematic Review.

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Abstract:*In the era of modern dentistry the ultimate goal of dentistry is to impart good dental health to everyone throughout their lives, despite of this if all the teeth lost after giving efforts to save teeth option left with us is rehabilitation to function efficiently and comfortably in harmony with the muscles of the stomatognathic system and the temporomandibular joints .Now a days ,implant therapy is one of the several treatment modalities available to rehabilitate severely resorbed ridge but in few cases where implant therapy is not advisable in such cases neutral zone techniques serves the best option for severely resorbed ridges. The aim of this review article is to enlighten the concept behind the neutral zone technique and illustrates the achieving of stabilization of denture with neuromuscular coordination for severely resorbed ridges.*

Keywords:*Neutral zone, Severe resorbed ridge, neuromuscular coordination...*

Date of Submission: 28-10-2020 Date of Acceptance: 08-11-2020

I. Introduction

The Definitive goal of any prosthodontic treatment is to restore the form, function, and esthetics of the patient.In Conventional complete denture cases ,the fabrication of the denture must be in harmony with all functions like speech, mastication, swallowing, smiling, and laughing as physiologically unacceptable denture will leads to poor prosthesis stability and retention , less tongue space , insufficient facial tissue support and compromised phonetics .

Whereas in the cases of resorbed atrophied ridges,denture fabricationdone by neutral zone impression technique that will insure that the muscular forces aid in the retention and stabilization of the denture rather than dislodging the denture during function with the advantages such as proper positioning of the posterior teeth which allows sufficient tongue space, reduced food lodgment as well as good esthetics due to facial support . [1]

The neutral zone can be defined as it is the potential space or dead space between the lips and cheeks on side, and the tongue on the other side or that space or area or denture position where the forces between the tongue and cheeks or lips are equal.Other names for this zone are dead space and zone of minimal conflict.[2]

Sir Wilfred Fish (1948) concluded that polished surfaces of complete denturesplays a vital role in achieving denture stability and retention. Usually polished surfaces contact cheeks, lips and tongue, eventuallydetermines the neutral zone.Concept behind neutral zone is that for each individual patient, there is a specific area where the function of the musculature will not unseat the denture and where forces generated by the tongue are neutralized by the forces generated by the lips and cheeks. The influence of tooth position and flange contour on denture stability is equal to or greater than that of any otherfactor. The artificial teeth should not be placed on the crest of the ridge or buccally or lingually to it rather they should be placed as dictated by the musculature, and this will vary for different patients. [3]

The foundation of successful stable dentures is the coordination ofneuromuscular function with the complete dentures. When there is loss of all of the natural teeth, potential denture space is created between cheeks and tongue. This potential space between the lips and 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 known as neutral zone .There are several modern approaches including dental implant therapy by means of which we can improve the denture foundation and supplement the mechanics of prosthesis support, retention, and stability. Regardless of implant availability, physiologically optimal denture contours and physiologically appropriate denture tooth arrangement should be achieved to maximize prosthesis stability,comfort, and function for patients. Based on the analysis of many studies it can be pointed that neutral zone dentures are functionally more stable thanconventional dentures. [4]

The mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support .This is the main reason behind the common complaint regarding pain and looseness of lower dentures. In such cases ,dental implants may provide stabilization of mandibular complete dentures, however there may be situations when it is not possible to provide implants on the grounds of medical, surgical or costs factors. The neutral zone technique is an alternative approach for these complex cases. The neutral zone technique is most effective for patients who have had numerous unstable, unretentive lower complete dentures. The neutral zone approach has also been used for patients who have had a partial glossectomy, mandibular resections or motor nerve damage to the tongue which have led to either atypical movement or an unfavourable denture bearing area.[3]

Still it's a challenge to provide stable mandibular dentures for patients with severely resorbed mandibular ridges but it can be overcomed by using neutral zone concept of muscle balance which helps in preventing the hindrance to stability and retention of dentures over the resorbed ridges. Based on the data acquired from several articles from 2008 to 2017, Neutral zone technique is long being used for the management of severely resorbed mandibular ridges. [5]

Technique[2]

Preliminary impressions

Primary impressions of both the maxillary and mandibular arches were made by using impression compound or if patient wearing old dentures then using patients previous denture as impression recording tray with a mixture of three parts impression compound +7 parts greenstick compound also known as **McCord's technique.** Then the impressions were poured with the dental plaster.

Fig.1. Resorbed mandible
(Courtesy: International Journal of Advanced Health Sciences • Vol1 Issue8 • December 2014)

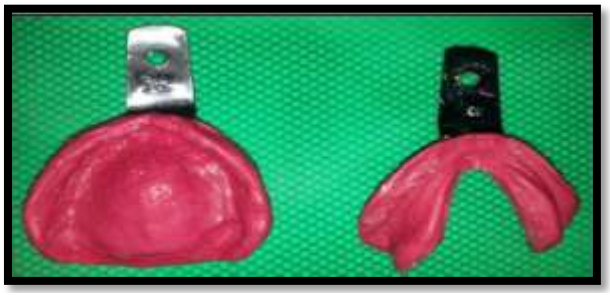

Fig .2. Preliminary Impressions
(Courtesy: Int J Dent Med Res | NOV - DEC 2014 | VOL 1 | ISSUE 4)

Custom tray Fabrication

The casts were retrieved and prepared for the fabrication of the custom trays. Two custom trays has to be made one for tentative jaw relation and second one for recording the neutral zone or potential space by tongue movement. Using first tray, a tentative vertical dimension is recorded, and centric relation have been established On the second Custom tray of acrylic resin adapted to the lower ridge with the acrylic stop to maintain vertical dimension at occlusion, without a handle, with spurs or fins projecting upward toward the upper arch as retentive loops.

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Fig.3. Custom tray with retentive loops
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

Fig.4. Custom tray with retentive loops and acrylic stops
(Courtesy: J Indian Prosthodont Soc (Apr-June 2010) 10(2):102–104)

Adaptation of tube compound

Greenstick compound i.e., softened low fusing compound will be adapted over the retentive loops then placed in the patient's mouth; this tray was very carefully adjusted in the mouth to be sure that it was not overextended and remained stable during opening, swallowing, and speaking. The patient was then asked to talk, swallow, drink some water, etc. After 5-10 min, the set impression was removed from the mouth and examined

Fig.5. Mandibular occlusal rim in neutral zone
(Courtesy:INTERNATIONAL JOURNAL OF DENTAL CLINICS 2010: 2 (3):53-57)

Putty index, Conversion of green stick compound to wax & Teeth arrangement

Then, the putty index is made in which final master cast is notched. One notch is made in the lingual Side at the center, and two notches are cut on each of the buccal sides, one in the cuspid and one in the molar region. Putty is mixed and is placed on notches around the impression recorded in neutral zone then modeling wax was poured in the putty index after removal of greenstick impression compoundTeeth arrangement was done as conventional protocols but following the putty index.

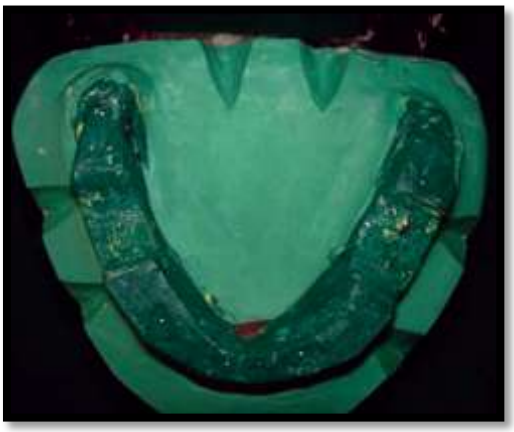

Fig.6. Notch is cut in the lingual center section, and two notches were made on each of the buccal sides
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

Fig.7. Shape of the denture is permanently registered in the plaster index
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

Fig.8. Bare acrylic resin denture base with the index
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

Try In

Then the wax trial dentures are tried in the oral cavity to see the appearance, stability, and occlusion. The upper denture is finished in the usual manner. While in lower denture light body impression material is placed on polished surface and same neutral zone impression is recorded.

Fig.9. Lower teeth arrangement in the neutral zone
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

Fig.10. Wax trial dentures
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

Denture Insertion

Denture is delivered with post-delivery instructions. And the patient is recalled for follow-up.

Fig.11. Denture insertion
(Courtesy: Contemporary Clinical Dentistry | Jan-Mar 2010 | Vol 1| Issue 1)

II. Discussion

Long term denture wearers often pose a problem due to lack of stability of their mandibular complete dentures because of high resorption of lower edentulous ridge. It is the duty of a prosthodontist to rehabilitate those patients to near normal function, irrespective of the clinical picture.Many concepts and theories emerged to describe where prosthetic teeth of complete denture should be positioned. Some of them adopted mechanical principles, others used biometric guides and a minority advocated mathematical formulas based on natural teeth position and dimensions (Lammie, 1956; Pound, 1951; El-Gheriani, 1992). These arbitrary approaches have been challenged and found insufficient, infact not only by rigorous research, but also by failure to restore function, aesthetics and comfort in patients with severely atrophic mandibular ridges, patients with enlarged tongue and cases of marginal or segmental mandibulectomy.The key determinant of stability of lower complete denture is the neuromuscular control of the patient. Size and position of prosthetic teeth and the contours of polished surface have a crucial role in lower complete denture stability as they are subjected to destabilizing forces from the tongue, lips and cheeks if they are placed in hindrance with function of this structures (Ahmad and Nixon, 2011)Dental implants placed with neutral zone technique stabilize the denture fabricated over atrophic mandibular ridge .However, there may be certain medical, surgical or economical conditions when it is not possible to provide implants .In such complex cases the neutral zone impression technique is the only option left for the stabilization of the complete denture. Indications: Severely atrophic mandibular ridge. Patients with prominent and highly attached mentalis muscle, lateral spreading of tongue as a result of poor transition from dentate to edentulous state and severe resorption.Fish pointed that out of the three surfaces ofthe denture the polished surface is bounded by the tongue and the cheeks (Fish, 1947).[6]

Masticatory function requires a unique coordination with muscles and oral structures. If the denture is placed in a zone where the displacing forces of tongue, lips, cheeks and modulus are balanced, then the denture will be retained more effectively during function. This zone is known as neutral zone. If the denture strays outside / inside the neutral zone it will be unstable during the activities such as talking, swallowing and mastication. The neutral zone technique is used to minimize the displacing forces of the surrounding structures. It is not only a treatment of choice in atrophic mandible but also in patients with partial glossectomy, mandibular resections or motor nerve damage to the tongue which have led to either atypical movement or an unfavourable denture bearing area. Neutral Zone Technique is advocated as an alternative method of complete denture construction in poorly resorbed ridge .[7]

Weinberg designated that the buccal cusp and fossae of the posterior teeth should be directly over the crest of the ridge Hickey and Zarb stated that the posterior part of the arch form will be determined to a greater extent by the "neutral zone." Watt suggested that the artificial teeth should be placed in the approximate position occupied by the natural teeth .[8]

Arranging artificial teeth within the neutral zone achieves two important objective: (1) prosthetic teeth do not interfere with normal muscle function; and (2) normal oral and perioral muscle activity imparts force against the complete dentures that serves to stabilize and retain the prosthesis rather than cause denture displacement. The neutral zone technique typically locates posterior denture teeth slightly facially, when compared to teeth arranged over the crest of the residual alveolar ridge .[9]

Neutral zone impression technique will insure that the muscular forces aid in the retention and stabilization of the denture rather than dislodging the denture during function .The dentures will also have other advantages such as reduced food lodgement, good aesthetics' due to facial support, proper positioning of the posterior teeth which allows sufficient tongue space.[10]

Clinicians must identify and record the neuromuscular dynamics of the oral tissues and this should be applied in the construction of the definitive prosthesis that will exist within the stabilizing boundary conditions of the neutral zone area. This will improve stability and retention as well as prognosis of complete dentures in resorbed ridges cases.

III. Summary And Conclusion

Severely resorbed ridges are best managed by neutral zone concept, it is simpler and very effective noninvasive method for enhancing the stability and retention in resorbed ridges complete denture cases. Alsofrom economic point of view, itcan be affored by everyone .No special equipment's were needed .Done easily by adding one step of recording neuromuscular balance to the conventional complete denture procedures. This procedure should be performed for all the complete denture resorbed ridge patients either solely or in conjugation with other procedures to improve the denture stability.

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Gulshan KumarTomar, et. al. "A Definitive approach to the management of resorbed ridges with a realistic mean- A Systematic Review." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(11), 2020,