Comparing Two Techniques of Artificial Posterior Teeth Arrangement by Pronouncing Some Arabic Consonant Sound

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Introduction

Successful treatment of patients with complete dentures depends upon the proper positioning of artificial teeth. Continuous resorption of the residual alveolar ridge and the forces from the peri-oral musculature imposes challenges in determining the tooth position. (1)

It was stated that buccal cusps and fossae of the upper posterior teeth should be directly over the crest of the ridge. This position is set to result in more stability and less lateral forces since the occlusal pressure on the tooth falls close to the fulcrum and creates little or no torque. Therefore, it was indicated that the posterior teeth should be positioned bucco-lingually on the residual alveolar ridge.(2)

It was stated that invariably arranging the teeth over the crest of the residual ridge condemned patients by accentuating facial deformity provoking phonetic problems, making food manipulation difficult during deglutition and because of the instability of the mandibular denture.(3)

Artificial teeth should be positioned where the natural teeth grew. Forces are developed as a result of the contraction of muscles during function. These forces are directed against the denture and will either help stabilize it or tend to displace it. (4)

Denture teeth should be arranged in the neutral zone where during function the forces of the tongue pressing outwards are neutralized by the forces of cheeks and lips pressing inward. The proper position of the teeth is not necessary on the ridge inside or outside the ridge but at a point where the tongue and cheek pressure balance. Positioning of the artificial teeth according to the neutral zone record shows minimal speech defects. The upper teeth should be placed in a position so that they are in harmony with the force of both the lips and the tongue. The neutral zone concepts are based and followed the biological needs for the complete denture wearers more than the mechanical rules. (5)

The Neutral Zone

Definition and Nomenclature of the Neutral Zone

The Neutral Zone is defined as the potential space between the lips and cheeks on one side and the tongue on the other. Natural or artificial teeth are subjected to equal and opposite forces in this zone from the surrounding musculature. It is also referred to as the dead space, the stable zone and the zone of minimal conflict. [6,-11]

During function, forces are generated due to muscular contraction. It was believed that the way theses forces are directed against the denture will either help to stabilize or tend to dislodge it. Cinefluorographic studies have shown that the muscles tend to re-seat complete dentures during function. [12-17]

I. Importance of the Neutral Zone

1. Arrangement of Artificial Teeth

   The concept of the neutral zone is known as an important factor in complete denture fabrication.

   Different studies investigated the relationship between the position of the neutral zone and the crest of the ridge in a bucco-lingual direction. It is aimed at supplying information to facilitate positioning the teeth in a region of minimum conflict, so that the stability of the denture is enhanced. [18, 19]

   Prosthodontists used the moulded shape of the neutral zone to the construct lingual and buccal registers to help in setting up the artificial teeth. [20-23]

2. Determination of the Occlusal Plane
   A technique was suggested to identify the occlusal plane through the recording of the neutral zone by specially made acrylic resin trays for upper and lower jaws mounted on the articulator after recording the centric occluding relation. [24,25]

3. Contouring the Polished Surfaces
   Zinc oxide and eugenol paste was used to contour the polished surfaces of the waxed dentures guided by muscle influence on the neutral zone. [26, 27]

***Materials and Techniques Used For Recording The Neutral Zone:**

Several materials have been advocated by many authors for recording the neutral zone. Alginate impression material was advocated by some authors. Alginate was applied on a specially prepared tray and functional movements were made under closed mouth conditions.[28,29]

The use of soft wax was recommended for making impressions of the cheeks, tongue and lips to functionally develop the polished surface for the mandibular and maxillary complete dentures. [30-32]

After the trial dentures were tried in the patients' mouths the hard set up wax was removed from all the surfaces of the trial dentures except the lingual surfaces of the maxillary denture and around the necks of the teeth and replaced by flame-softened narrow strips of soft wax. The patient was instructed to pronounce pho-whee, to suck and swallow twice and to open and close into occlusion twice until a desirable shape of all the external surfaces of the dentures was formed. Some prosthodontists used extra soft wax that softens at mouth temperature for setting of the teeth. The trial dentures were left in the mouth for several minutes and the patient was asked to make functional movements as speech and swallowing to give a chance for the muscles of the tongue, lips and cheeks to push the set up teeth into the neutral zone. The soft wax then reinforced with sticky wax. The use of special wax was advocated to build up on a rim of mandibular heat cured acrylic denture base by adding wax gradually in increments. [33, 34]

Each time wax was moulded by asking the patient to do some functional movements such as blowing, sucking, swallowing, and protrusion of the tongue into the buccal vestibule on each side. Then

the waxed up denture was then coated with Zinc Oxide and Eugenol impression paste. After placing it in the patient's mouth, the patient was instructed to do the same functional movements. Modelling compound was advocated by some prosthodontists and modified by others for recording the neutral zone. The compound was used first for recording the neutral zone of the lower arch by instructing the patient to swallow and purse the lips as in sucking. Then the occlusal plane was adjusted in the patient's mouth following the oral commissures and the height of the lower lip at rest and continued posteriorly to a point one-half to two-thirds the height of the retro-molar pad. [35, 36]

The neutral zone of the upper arch was recorded separately by asking the patient to make the functional movements of sucking and swallowing. The excess compound was then trimmed to a length of 2mm below the upper anteriorly and parallel to the residual alveolar ridge posteriorly. The use of soft roll of red impression compound on auto-polymerizing acrylic resin recording bases was recommended. The upper and lower compound rims were moulded separately. Then at the try-in stage, zinc-oxide eugenol impression paste was applied to the external surfaces of the denture flanges to record the impression of the contacting tongue, lips and cheeks in function. Viscoelsatic gel was suggested for recording the neutral zone. [37]

The viscoelastic gel was moulded once during rest and once more during function. During rest, the patient was asked not to speak or swallow but only to let the tongue and lips fall against the gel. During function, the patient was asked to swallow five mm of water every thirty seconds to a total of twenty times. The shape of the gel during rest and function was composed and cheeks to fall against the rubber base and let his tongue touch the inner surface of the rubber base.[38,39]

Tissue conditioning material was advocated by some authors for recording the neutral zone. Occlusal vertical dimension was registered using wax occlusion rims. Windows were cut in the wax at the areas of the maxillary and mandibular right and left premolars and first and second molars leaving three centric stops which were related

with V-shaped notches. The rims were then flasked, processed and finished. Tissue conditioning material was applied to fill in the windows and placed in the patient's mouth and the patient was instructed to close in centric occlusion. After three minutes, the rims were removed and minor deficiencies were corrected. The rims were returned to the mouth for two hours period during which the patient was instructed to swallow and move his cheeks, lips and tongue to mould the material. [40]

When providing complete dentures, the base should always be optimally extended, the polished surface correctly shaped and the teeth placed in the most favourable position. The patient and the dentist may have conflicting agendas: the dentist will consider factors promoting denture stability and retention, and which provide good aesthetics and phonetics without compromising function; the patient may be more concerned with aesthetics and phonetics (at the expense of function) or may prefer a modified copy of their previous denture rather than radically different dentures with significant improvements. Most edentulous patients have existing complete dentures, which can be used as a template. However, if there is no existing denture, or if a patient has expressed dissatisfaction with previous dentures, the dentist may need to use biometric principles. These use anatomical landmarks to guide in the optimal placement of teeth on the denture. Using biometric principles, the upper artificial teeth can best support the lips and cheeks if they are placed in the position previously occupied by the natural teeth. In addition, a peripheral seal is formed between the denture flange and cheeks and lips, which enhance denture retention and stability. Pre-extraction photographs and models can be invaluable guides but, if they are not available the dentist must rely on biological guides to assist in the optimal placement of the artificial anterior teeth for function and aesthetics. [41]

2. Guides to the Position of the Occlusal Plane

Some dentists consider the occlusal plane to be parallel to the inter-pupillary line and the alar-tragal line, but they differ as to where the points are located on the relevant cartilages. [42]

The alar - tragal line lies between the lower border of the ala of the nose and the upper border of the tragus of the ear. The angulation relative to horizontal provided by the ala-tragal line allows the denture teeth to articulate in a harmonious manner. Other allowances are built into the set-up by the technician to provide optimal balanced articulation – cusp angles, compensating curves and incisal guidance. The condylar guidance can be programmed into an adjustable articulator to allow optimal arrangement of the teeth. (43)

It was found that positioning the occlusal plane at the level of the upper third of the retro-molar pad brings it close to the level of the pre-extraction natural dentition. (44)

The lower wax rim, used in the jaw registration, should be constructed in laboratory to the height of the upper part of the retro-molar pad. This position of the plane allows satisfactory function, as it usually lies mid-way between the two residual ridges. (45)

Placing the occlusal plane parallel to the crest of the lower ridge was suggested for maximum denture stability. Although this advice has been repeated in the textbooks, it has not been thoroughly investigated experimentally. There is reluctance amongst dentists to raise the occlusal plane level because it will cause denture instability if the tongue is unable to place food comfortably on the occlusal platform. At rest, the dorsum of the tongue should lie at least at the level of the occlusal plane or overlying the lingual cusps to provide denture stability. This position can be difficult to assess clinically as the tongue's position will vary according to the denture-wearing experience of the patient. In addition, patients who tend to retch with dentures will often retract their tongue on opening their mouth to guard the pharynx unconsciously. (46)

Residual ridge resorption is about four times greater in the mandible than in the maxilla and in the patient who has been edentulous for a long time. This can result in the lower denture appearing large and bulky. Fortunately, the height of the lower denture can be reduced slightly because the rest vertical dimension is diminished following extraction of the teeth. The pattern of resorption varies in the two