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A Literature Review of Prosthodontic Concepts of Occlusion

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ABSTRACT:

Since many years ago, dentistry has extensively investigated occlusion and its relationship to the stomatognathic system's function. The papers in this series talk about occlusion with implants, fixed partial dentures, and complete dentures. The first and second parts of this article series explain the theories and principles of full denture occlusion. In terms of comfort, mastication, phonetics, and aesthetics, totally edentulous patients have yet to find an optimal tooth form or occlusal arrangement that meets their needs.Since then, the literature has presented a number of balanced and nonbalanced articulation concepts. Due to dental contacts seen during patients' non-functional activities, a balanced articulation seems to be the most suitable. This article explores the development of several occlusal schemes and occlusion principles in total denture occlusion.

Keywords: Articulation, complete denture, occlusion

INTRODUCTION:

Diet, nutritional status, and general health can all be impacted by dentate status. The ability to swallow and taste may both be impacted by a full maxillary denture. Complete denture wearers' masticatory efficiency is about 80% less than that of persons with natural teeth. Mobility of the teeth, bone resorption, a reduction in sensory perception, and motor dysfunction are additional variables that can decrease chewing ability. [1]Although the origins of the first artificial tooth are unknown, it is known that hundreds of years ago, teeth were made of materials like stone, wood, ivory, and metal. Early dentures even included human teeth. There is a resulting force every time opposing teeth make contact. Although the direction and strength of this force can change, supporting tissues must always withstand it. According to some dentists, the dynamics of the temporomandibular joint's function must be perfectly in sync with the cusps on the teeth.The teeth shouldn't have cusps, according to some dentists. Complete denture occlusion is the subject of several theories, methods, and philosophies. [2,3]

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COMPLETE DENTURE OCCLUSION CONCEPTS [2,3]:

Static concept

Centric occlusion, protrusive occlusion, and right and left lateral occlusion are examples of occlusion's static relations. When all of the teeth on both sides of the arch make their initial contact, all of these relations must be balanced. To allow the teeth to move from a more central occlusion to eccentric positions without resistance and without the application of rotational or tipping forces, the cuspal inclines should be developed.

Dynamic concept

The opening and closing motions involved in mastication are the main focus of the dynamic concept of occlusion. The teeth of one jaw travel over the teeth of the opposite jaw, causing jaw movements and tooth contacts. Free motions of the mandible are those that take place when the teeth are not in contact.

Four occlusal concepts [4] can be used to classify occlusal rehabilitation in complete dentures.

- Unbalanced articulation
- Balanced articulation
- Linear or monoplane articulation
- Lingualized articulation.

CONCEPTS PROPOSED TO ATTAIN BALANCED OCCLUSION [5]:

Gysi concept

Gysi debuted the 33° cuspal shape in 1914. To align the cuspal inclines with the condylar inclination, which is 33° to the horizontal, he gave them a 33° inclination. Cusps make bilateral contact during lateral mandibular movements to improve the stability of the dentures. The ridges are the target of the masticatory forces in centric occlusion [Figure 1a]. The occlusal contact forces are directed away from the ridges in a right lateral position. Contacts on both cusps incline in an extreme working lateral position, and the contact force is also directed away from the ridges.

French concept [5]

According to the theory, in order to improve the stability of the dentures, the occlusal surface of the mandibular posterior teeth had been lowered. The maxillary posterior teeth have slight lingual occlusal inclinations of 5° for the first premolar, 10° for the second premolar, and 15° for the first and second molars. This allows for the development of a balanced occlusion both laterally and anteriorly through the positioning of the teeth on a curved occlusal plane.

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In centric occlusion, the mandibular residual ridge is helped by the mandibular posterior teeth's half of their width helping to send the masticatory forces in a buccal direction [Figure 2a]. The occlusal contact forces are directed away from the ridges on the balancing side and toward the ridges on the working side in a right lateral posture.

Sears concept [5]

By using a curved occlusal plane anteroposteriorly and laterally or by using a second molar ramp, Sears produced a balanced occlusion in 1922 with his chewing members and in 1927 with channel teeth (both were nonanatomic teeth). Nonanatomic teeth will apply contact pressures in centric occlusion toward the ridges [Figure 3a]. Occlusal contact pressures in the right lateral position were directed toward the working side of the ridge and the buccal side of the ridge on the balancing side.

Pleasure concept [5]

A reverse curve is used in the bicuspid area for lever balance, a flat occlusal scheme is set in the first molar area, and a spherical scheme is set in the second molar area by raising the buccal incline to provide for a balancing contact in lateral position. This occlusal scheme, known as the "pleasure curve," was introduced by Dr. Max Pleasure in 1937. A compensating curve for protrusive balance can also be created by elevating the second molar's distal.

Pleasure explained that the bottom denture's instability called for a specific occlusion design. The forces that result should be directed either vertically or lingually. Contact forces in centric occlusion are directed toward the ridges [Figure 4b], and in the right lateral working position, depending on the angle of the second molar ramp, occlusal forces are directed toward the lingual side of the lower ridge on the working side and toward the buccal side of the lower ridge on the balancing side.

Frush concept [5]

Frush presented the "Linear occlusal idea" in 1967. It made use of an arbitrary articulator balance and intraoral modifications to achieve balance. The upper posterior teeth's flat occlusal surface made contact with one mesiodistal ridge on the lower posterior teeth, which were positioned at an angle to the horizontal. The goal was to increase stability and get rid of deflective occlusal contacts. According to the linear occlusal concept, contact forces in centric occlusion are directed toward the ridges [Figure 5a]. At a given inclination of 6°, the contact pressures in a right lateral position are slightly toward the buccal side of the lower ridge on the balancing side and slightly toward the ridge on the working side.

Hanau's quint [2,3,6]

A discussion paper titled "Articulation: Defined, analysed, and formulated" was delivered by Rudolph L. Hanau in 1925.

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He believed articulation of artificial teeth was related to nine factors:

- Horizontal condylar inclination
- Compensating curve
- Protrusive incisal guidance
- Plane of orientation
- Buccolingual inclination of tooth axes
- Sagittal condylar pathway
- Sagittal incisal guidance
- Tooth alignment
- Relative cusp height.

In a sequence of 44 sentences, he listed the principles of balanced articulation and numerically calculated the nine elements. Hanau merged the initial nine variables to arrive at the final five.

Thielemann subsequently simplified Hanau's factors in a formula for balanced articulation.

[K × I]/[OP × C × OK]

Where,K=Condyleguidance.I=Incisalguidance.

C=Cuspheightinclinations.

OP = Inclination of the occlusal plane.OK=Curvatureoftheocclusalsurfaces.

Trapozzano concept[6]

After reviewing Hanau's five parameters, Trapozzano came to the conclusion that just three of them were crucial to achieving balanced occlusion. Since the placement of the plane of orientation within the accessible inner ridge space is highly changeable, he deleted it. In order to favour a weaker ridge, he also proposed that the occlusal plane can be positioned at different heights [Figure 7]. According to Trapozzano, there is no need for a compensatory curve because the cuspal angulation will result in a balanced occlusion, making it unnecessary.

Boucher concept[2,3,6,7]

There are three fixed factors:

- The condylar guidance, incisal guidance, and occlusal plane orientation

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- The angle of the cusp is more significant than its height.
- The compensatory curve makes it possible to enhance the cusps' effective height without altering the shape of the teeth.

The lott concept [2,3,6,7]

He stated the laws as follows:

- The angle of the overbite (vertical overlap), regardless of the angle of the condylar path, increases the separation in the anterior and posterior regions. • The angle of the condyle path decreases as the overbite increases.
- The compensating curve must be bigger or higher the farther the posterior teeth are spaced apart.
- The inclusion of the plane of orientation is necessary for the posterior separation compensation curve to balance the occlusion [Figure 8].
- The posterior teeth must be larger the further apart the teeth are.

Bernard levin's concept [2,3,6,7]

Lott's laws of articulation were largely adopted by Bernard Levin, however he did away with the plane of orientation.He has named the four factors as Quad. The essentials are as follows:

- The patient's condylar guidance is established and recorded. The working condyle Bennett movement is part of the balancing condylar guidance and may or may not have an impact on lateral balance.
- The patient's phonetic and aesthetic needs are typically used to determine the incisal guiding. However, it can be altered to meet specific needs. For instance, incisal guiding might be reduced when the remaining ridges are flat.
- The most crucial element in achieving balance is the compensatory curve. To compensate for monoplane or low cusp teeth, utilise a compensating curve.
- Although cusp teeth have the inclinations required to achieve a balanced occlusion, they are almost often utilised in conjunction with a compensatory curve.
- The Quad is really simple to use and comprehend. For a denture occlusion to be bilaterally balanced, limiting posterior separation is a key objective.

There are four different types of tooth moulds, according to Brien R. Lang [3,4,7].

- Anatomic
- Nonanatomic

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- Zero degree
- Cuspless teeth.

DISCUSSION:

The bilateral, simultaneous, anterior, and posterior occlusal contact of teeth in centric and eccentric positions is referred to as balanced occlusion. Complete dentures' balanced occlusion is special because it doesn't happen with real teeth. If it happens in a normal tooth, it is regarded as a pathologic early contact on the nonworking side. In order to align teeth in a balanced occlusion, anatomic teeth are typically employed [Figure 10a–c]. It is possible to employ balancing ramps with nonanatomical teeth. [2,3]

Importance

The idea was initially proposed to improve complete dentures' retention during chewing. The equilibrium on the non-working side is destroyed by even a single grain of food on the working side, it was discovered. Sheppard succinctly put it this way: "Enter bolus, exit balance." [8]

Complete denture teeth do occasionally make contact when chewing, according to research by Allen A. Brewer and Donald C. Hudson. It will, however, only endure for 17 minutes each day. [9] Many excursive actions, including swallowing saliva, closing to reseat dentures, and bruxism undertaken by patients between meals, are now thought to require balance. Therefore, without balance, the bases may shift, tip, or torque on their foundations during the eccentric movements, resulting in inflammation and increased bone resorption.Many patients only feel comfortable when the eccentric balance is present, despite some writers' claims that these connections other than mastication are unlikely to be made with much force. For the mucosa to remain healthy, all posterior teeth must make equal contact with one another (called centric occlusion). [10-12]

Studies that tested the force required to masticate food with natural teeth found that it can range from 5 to 175 pounds. This vast range of force is caused by a person's diet, the health of the teeth's supporting structures, the crown's integrity, and the subject's muscle growth. [2]

The results of a study on patients with dentures' mastication force are important. The average force in the molar and bicuspid area during mastication in a study of 100 denture wearers whose ages ranged from 26 to 83 years was 22 to 24 pounds. In the incisor region, there was a reduction in force to nine pounds. According to research by Gibbs et al., people wearing complete dentures experience an average closing force of 11.7 pounds during mastication, which is much less than the weakest closure force experienced by subjects wearing natural teeth.Complete denture users can only generate 10% to 15% of the force of a patient with healthy natural teeth, according to a study comparing the force of natural and artificial teeth.

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Therefore, it would seem that the typical total denture wearer hardly has enough force to do the task necessary during mastication. [2,13,14]

In order to establish incisal guidance for each individual patient, modified anatomic teeth are arranged in a semi-adjustable articulator that can accept facial bow transfer and horizontal and lateral condylar guidance records. According to the interocclusal records, selective grinding is carried out to lessen occlusal interferences and prevent the transmission of deflective stresses to the supporting components. The supporting structures' health will then be preserved for a longer period of time by thorough patient education, incentive, and frequent recall.

Attrition of synthetic acrylic teeth and loss of occlusion are effects of having the same complete dentures for a long time. These abnormalities lead to uneven force distribution and pathological alterations in the underlying oral tissues, which in turn causes discomfort for the patient, occlusion instability, ineffective masticatory function, and aesthetic issues. In the end, the patient might not be able to wear dentures and will be labelled as having prosthetics that are maladaptive.

To maintain an appropriate fit and stable occlusion, patients with complete dentures should adhere to a regular control plan at intervals of one year. The patient should be encouraged to adopt good denture-wearing practises, such as removing them at night.

CONCLUSION:

Complete tooth loss impacts the patient's mental health as well as their ability to chew and maintain aesthetics. There has been a lot of debate over various ideas and hypotheses put forth to achieve occlusion. However, it has been overlooked to apply these rules based on each case's unique merits. Each case needs to be carefully examined in light of the patient's compliance, the neuromuscular control, the hard and soft tissue structure, and the resorption pattern.

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Conflict of interest

There are no conflict of interest.

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