Occlusal schemes in complete denture patients: A review.

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Abstract

Complete denture occlusion is the rehabilitation of mastication, phonetics and aesthetics causing least or no trauma to the oral tissues. Natural teeth move under load into their sockets and return to position when load is removed. Artificial occlusion discloses even more apparent movement, since the teeth move as a group on a common base because of the nature of supporting structures. The majority of complete denture patients have significantly decreased chewing efficiency compared to dentate subjects. The main objective of the prosthodontic treatment is to attain adequate stability of denture and patient satisfaction by arranging the occlusal contacts in natural and artificial dentition. The knowledge about various occlusal schemes is of critical importance to achieve the above mentioned goals. Thus, this article discusses about the occlusal schemes used to rehabilitate a complete denture patient.

Keywords: Unbalanced occlusion, Balanced occlusion, Monoplane occlusion, Lingualized occlusion.

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Introduction

Man is the product of his evolutionary history. Normal occlusion is a product of man's evolution over the period so far. Modern theories defining normal occlusion began in the mid-1800s with Carabelli (1844) and Angle (1899) refining a classification of occlusion based on the position and interdigitation of the teeth.[1] In current dental era, dental occlusion has expanded its roots in the general dentistry.[2,3] A good clinical practice involves wide knowledge about the occlusion-related issues in all dental disciplines.[4] The voyage of occlusion in dental practice and science indeed has attained its current role as 'the medium of dentistry'.[5]

Dating back to the ancient times attempts were made to replace lost teeth to attain occlusion in complete denture patient. A variety of occlusal forms were accepted to rehabilitate complete denture designs of posterior teeth generally based on the morphology of the natural teeth and the temporomandibular joints, observation of movements of the mandible, clinical observations of wear facets on the natural teeth, chewing efficiency, and empirical and subjective values assigned by the designers based on clinical experience and judgment.[6] The requirements vary for individual concepts were the use of specific tooth moulds in specific arrangement are indicated.[7]

Brian R. categorized the different tooth form:
(1) Anatomic,
(2) Semi-anatomic,
(3) Non-anatomic, and
(4) Zero degree teeth/ flat cusp teeth.

Concepts:

Occlusion may be discussed from two viewpoints:

1. Static relation: The teeth are said to be in static relation when the occlusion attained is in maximal intercuspal position during various position. Dental relationship is characterized by a maximum of interarch contact points, during centric occlusion, protrusive occlusion, right and left lateral occlusion, and intermediate occlusion. All these tooth relations must be in conformity with the activity in the temporomandibular joint and the musculature.
2. Dynamic relation: The teeth are said to be in dynamic relation when the mandibular jaw carries out functional movement during mastication. It primarily concerns the opening and closing movement of jaw during mastication were one jaw glides over the other.

Occlusal rehabilitation schemes categorized for complete denture are:

• Unbalanced occlusion
• Balanced occlusion
• Linear or monoplane occlusion
• Lingualized occlusion

Balanced occlusion:

Spee presented the theory of balanced occlusion in 1890 with his observations on the function of the natural teeth of man.[8] He mentioned, "Since therefore, a forward and backward movement of the mandible takes place in the form of circular movements, it is possible that such movements can be carried out to a greater extent without it being necessary for the rows of the opposing teeth to move away from each other". Associated with more perfect use of the grinding movement. Balanced movement is defined as the bilateral, simultaneous occlusal contact of the anterior and posterior teeth in excursive movements.[9] Besides, this balance must be in harmony with temporomandibular joints and neuromuscular activity.

Balanced occlusion is introduced to prevent a tipping or rotating of the denture bases in connection with the supporting structures. Dentures can have balanced occlusion yet fail to have denture balance in function, it is possible to have dentures balance in function without having balanced occlusion. But it is necessary to provide stability in both condition for functional and non-functional mandibular movements.[10] Balance occlusion is a produced concept for complete dentures and does not normally occur in the natural dentition, if it occurred then it might lead to adverse changes in the natural occlusion.

Types of Balanced occlusion

Balanced occlusion can be classified as follows

• Unilateral balanced occlusion

Unilateral balanced occlusion involves the contact of the teeth together as a group simultaneously as they glide on one side uninterruptedly. This occlusion is not essential in complete denture patients but is more prevalent in fixed partial denture.

• Bilateral balanced occlusion

Bilateral balanced is the posterior contact on both sides of mandible during centric and eccentric movements of jaw. It helps maintain stability, retention and provides better masticatory function. This occlusion can be protrusive or lateral balance.

• Protrusive balanced occlusion

Protrusive balanced occlusion is present when mandible moves in a forward direction with simultaneous and smooth occlusal contacts anteriorly and posteriorly. It is a three point contact, two posterior and one anterior.

• Lateral balanced occlusion

Lateral balanced occlusion is absent in normal dentition. It presents minimal

simultaneous three point contact during lateral moment of the mandible.

Many authors proposed different concepts for obtaining balanced occlusion.[11-14]

1. Gysi's concept
2. French's concept
3. Sears's concept
4. Pleasure's concept
5. Frush's concept
6. Hanau's quint
7. Trapozzano's concept
8. Boucher's concept
9. Lott's concept
10. Levin's concept

Sheppard stated that "Enter bolus, exit balance". By this statement it is clear that balancing contact is absent when food enters the oral cavity. Although this occlusion was introduced to enhance retention in complete denture but the above statement makes us think that balanced occlusion has no function during mastication hence it is not essential in complete denture. But this is not true. A normal individual on an average undergoes tooth contact during masticatory only for 10 minutes in one complete day compared to 4 hours of total tooth contact during other functions. During this period of 4 hours of tooth contact, balanced occlusion is essential in maintaining the stability of the denture.[15]
Balance counts to be the requisite in various movements performed whole day by the jaw be it swallowing, closing mouth to reseat dentures, and parafunctional habits such as bruxism performed by patients in between meals. Absence of which may lead to shifting of bases, detrimental forces acting on their foundations during the eccentric movements and inflammation leading to accelerated bone resorption.

Lingualized occlusion:

Gysi in the year 1927 designed and stated the biomechanical advantage of lingualized tooth form.[16,17] He observed that 60% of the edentulous patients at the University of Zurich Clinic, during the early 20th century, had posterior cross-bites, primarily due to normal resorption of their edentulous jaws.[17]
In Gysi's cross bite posterior teeth, maxillary teeth cusps were designed linear that fit into a shallow mandibular depression.
Payne in 1941 reported a more potent form lingualized occlusion. He stated the mortar-and-pestle arrangement of the teeth in his article and its advantages. According to Payne, maxillary lingual cusps contacted with mandibular teeth in both the centric and eccentric positions, while maxillary buccal cusps never contacted opposing surfaces in any maxillomandibular relationship.[18]
According to glossary of prosthodontic terms lingualized occlusion is defined as "a form of denture occlusion that articulates the maxillary lingual cusps with the mandibular occlusal surfaces in centric, working, and nonworking mandibular positions."[9]
Lingualized occlusion represents a functional and aesthetic complete denture articulation.

This type of occlusion involves:

1.The use of a large upper palatal cusp against wide lower central fossa,

2.The buccal cups of the upper and lower teeth do not contact each other.

The advantages of lingualized contact occlusion[19, 20] are:

1. Good aesthetics
2. Good bolus penetration
3. Simple technique
4. Additional stability in parafunction
5. Lateral forces directed towards alveolar bone are reduced
6. Ease of adjustment
7. Better accommodates basal seat changes
8. Can be used in Class II, Class III, and cross-bite situations
9. Compatible with the tenets of neutrocentric occlusion.

However the disadvantages in association with the lingualised occlusion are:
Due to constant wearing of maxillary lingual cusp or mandibular fossa rapidly results in buccal and lingual contact of equal intensity results in depletion of centralization of forces on the mandibular posterior teeth and increase the potential lateral displacement.[21]

Monoplane occlusion:
Jones in 1972 advocated monoplane articulation. Jones stated that "Because a tooth might be no anatomical or even cuspless, but also might possess inclined planes on the occlusal surface, I prefer to use the term zero degree teeth. Zero degree teeth may be used to produce a monoplane occlusion, that is, on one plane only." Nevertheless, the zero degree teeth use does not necessarily result in a monoplane occlusion as they may be set to a curve or may be set with balancing units, resulting in one or more additional planes.[22]
Monoplane occlusion concept utilize a nonanatomic occlusal scheme with flat occlusal surfaces set to a flat occlusal plane. The concept includes arrangement of maxillary posterior teeth first following the determination of the occlusal plane. A plane can be considered a line drawn to connect two points in space. The anterior point represented by the incisal edges of the canines. And the determination of the posterior point, as the articulator is viewed from the side, is made.
Three factors determine the location of the point are:

1. Result in occlusal plane evenly divides the space between the upper and lower ridges.
2. Provide an occlusal plane that parallels the mean foundation plane.
3. Occlusal plane should fall at the junction of the upper and middle thirds of the retromolar pads.

The benefit of the monoplane occlusion concept included the lesser resorption of the residual ridges, increase adaptability to Class II and Class III situations, reduced horizontal forces impact, improve patient comfort due to no locking of the inclines. Disadvantages were less aesthetic flat premolars, reported as less efficient in chewing tests, anterior aesthetics needs more over jet and no overbite.[22, 23]

Unbalanced articulation:
Pound stressed on the positions of the anterior teeth. He stated their importance in phonetics and also increase denture stability and efficiency with the chewing cycle. Were as the maxillary posterior teeth should have sharp palatal cusps which should occlude with opposing widened central fossae of the mandibular posterior teeth to eliminate the deflective occlusal contacts. Retention of the denture bases is the main goal of this concept.[24]
Another concept introduced the use of 33 degree cusp form. The anterior teeth are set as per the need of phonetic values and the posterior teeth disocclusion away from centric occlusion when accompanied with extreme vertical overlaps producing cuspid guidance. Main features of this concept is the use of pantographic tracings and transfer of these recordings to an instrument to eliminate all potential deflective contacts in the arrangement of the posterior teeth.
Hardy utilized nonanatomic teeth in a straight occlusal plane, usually horizontal, when the casts were mounted horizontally in an instrument. All-porcelain or all-plastic posterior teeth were used, or combinations of posterior teeth of porcelain upper and plastic lower teeth, or metal shearing blades may be incorporated in a block of the upper posterior teeth occluding against lower porcelain teeth.[25]
Occlusal pivots were favoured by Sear. The main feature are that the mandible be placed

in equilibrium by maintaining the load in the molar regions. This protected the temporomandibular joints against injury, and reduced stresses in the anterior regions of the ridges in anticipation of tissue maintenance.[26]

Kurth advice the occlusal pattern consisting of posterior tooth blocks in series of four teeth which were arranged on a flat anteroposterior occlusal plane with a reverse lateral curve (reverse of Wilson curve).[27]

Discussion:

As a whole, all conventional complete denture occlusions have certain related factors. The occlusion require that the teeth in the maxillary and mandibular dentures contacts in centric occlusion when the mandible is in centric jaw relation to the maxilla. Tooth contacts are established to distribute stresses over the entire denture base supporting area evenly to preserve the supporting structure that must carry the load during function.

Woelfel, Mickey, and Allison, in the year 1962 studied and examined anatomic (33°), modified anatomic (20°), and nonanatomic (0°) teeth to determine the influence of occlusal form on the jaw movements during chewing and the denture movement on its foundation.[11]

Ohguri examined which occlusion scheme shows preferred conditions of pressure distribution on supporting structures in a complete denture prosthesis. The study concluded that lingualized occlusion and fully balanced occlusion excessive occlusal force was not required for grinding hard food, and the stress to the supporting tissues is smaller than with monoplane occlusion.[28]

In a study by Heydecke et al, they observed comprehensive methods used for fabrication of complete dentures. This included semi-anatomical lingualized teeth and a full registration which did not solely influence patient's perceived chewing ability, when compared with others simple procedures. Anatomical teeth proved to show better patient satisfaction with chewing ability for hard foods.[29]

Therefore, selection of an occlusal scheme for a complete denture patient should consider the correlation of features of the patient with these provided occlusal scheme. The characteristics to be evaluated should include age of patient, residual ridge resorption, social status and demand of the patient aesthetic and function, neuromuscular control, maxillary and mandibular jaw relation and if present then parafunctional activities. Lastly it is the skills and philosophy of the dentist in occlusion concept, the dentist must really on clinical skill and experience when selecting an occlusal scheme for the patient

Conclusion:

There is not a single occlusal scheme that can be adjusted in all patients who require complete denture rehabilitation in fact, there may be more than one occlusal scheme be used in a case. The controversy about occlusion cannot be unfolded due to three reasons: knowledge is based upon empirical rather than scientific information, the tolerance of the oral organ or the upper and lower physiologic limits are so vast that, because a certain concept failed in one specific mouth, it does not mean it would fail in all mouths, and the tremendous variable factor of the individual dentist and the standards by which he evaluates his completed restorations.[30] Hence there is no one answer to occlusal problems, the dentist should stick to the philosophy that works best and at the same time does the most good or, better yet, the less harm to the patient.

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