The journal of
PROSTHETIC AND IMPLANT DENTISTRY
Official Publication of Indian Prosthodontic Society
Kerala State Branch

OCCLUSAL SCHEMES IN COMPLETE DENTURE CONCERNING AGE, GENDER, AND MANDIBULAR RESORPTION - A NARRATIVE REVIEW.

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https://doi.org/10.55231/jpid.2024.v07.i03.08

Abstract

This review aims to evaluate various occlusal schemes in complete dentures concerning age, gender, and mandibular resorption to determine their relative effectiveness and suitability. This narrative review was performed through scientific articles published between 1998 and 2020, indexed in MEDLINE and PubMed databases. Various occlusal schemes are employed to enhance masticatory ability and ensure patient satisfaction. Despite the availability of multiple occlusal schemes, determining the optimal one linked explicitly to the highest level of patient acceptance remains inconclusive. This review presents scientific data from selected sources, elucidating various occlusal scheme patterns and summarizing the most suitable based on age, gender, and mandibular resorption.

Key words: Occlusal schemes, complete denture, mandibular resorption, balanced occlusion, lingualised occlusion.

Introduction

Complete dentures represent one of the prevailing treatment modalities frequently employed in rehabilitating individuals with total tooth loss. The need to treat older individuals who are edentulous is increasing as a result of the demographic shift toward older patients. According to Steel et al., 13% of the population in the age group of 75 years and above, were edentulous.[1] Even though implant restorations are becoming more common, the implant needs enough bone to provide support. Complete dentures are still the restorative option for individuals who cannot afford implants or where implant placement is impossible. The occlusal scheme is a major aspect that must be considered while fabricating complete dentures to give the patient a satisfactory fit and function.[2] Occlusal scheme decides the form of occlusal contacts and arrangement in natural and artificial dentition. Occlusion in complete dentures can be classified into two broad categories: non-balanced occlusion and balanced occlusion. Balanced occlusion can be defined as the bilateral, simultaneous, anterior, and posterior occlusal contact of teeth in centric and eccentric positions.[3] Prominent characteristics of the bilateral balanced occlusion are uniform load distribution on the denture-bearing area, reduced rates of resorption, and a greater level of positional stability, leading to reduced

occurrences of food entrapment between the denture and its soft tissue base.[4,5,6]The arrangement of teeth according to the spherical theory, organic occlusion, and transographics may be classified as non-balanced occlusion. Devan's concept of neutrocentric occlusion and canine guided occlusion are also kinds of non-balanced occlusion. A non-balanced occlusion fails to meet the criteria of contact between the upper and lower teeth simultaneously in eccentric positions. Numerous studies have compared occlusal schemes related to age, gender, masticatory performance, mandibular resorption etc.

Discussion

Bilateral balanced occlusion is the most widely accepted occlusal scheme worldwide. The concept of balanced occlusion has been suggested to improve the stability of complete dentures and the health of oral tissues. Apart from bilateral balanced occlusion, it has been reported that canine guided occlusion has a greater level of patient acceptance and biological benefits among conventional complete denture wearers. A significant benefit of this occlusal scheme is the reduced time required for the technician during the setup process and the clinician during chairside modifications.[7] In lingualized occlusion, the maxillary lingual cusps articulate with the mandibular occlusal surfaces in centric occlusion, working and nonworking mandibular positions. Buccalized occlusion is "articulation of the mandibular buccal cusps with the opposing maxillary occlusal surfaces while mandibular lingual cusps did not contact the maxillary teeth in centric or eccentric movements".[8,9]

In 2012, Abdul Razzaq Ahmed et al., in their study of Masticatory capability between balanced and lingualised occlusion in complete denture wearers, concluded that lingualized occlusion has better masticatory effectiveness.[10] In 2013, Deniz and Ozcan et al. stated that lingualized occlusion was the most favourable occlusal scheme because of improved comfort.[11] Shirani et al. mentioned in their study that bilateral balanced occlusion using anatomic 30-degree teeth exhibited a notably higher level of discomfort during mastication compared to lingualized occlusion.[8] Faten S Abbas et al. in 2016 reported that there was no statistical difference in clinical significance between canine guided occlusion and bilateral balanced occlusion.[12] In 2017, Kawai et al., compared both bilateral balanced occlusion and lingualized occlusion, and no dissimilarities were detected between lingualized occlusion and bilateral balanced occlusion at 3 and 6 months post-delivery.[13] Hedaiat Moradpoor et al., in 2018 conducted a randomized control trial where they compared four occlusal schemes, fully bilateral balanced occlusion(FBBO), buccalized occlusion(BO), lingualized occlusion(LO) and partial group function occlusion (PGFO). The authors concluded that the patients with BO presented higher satisfaction scores for comfort, stability, and retention at the 1-year follow-up. Both PGFO and FBBO groups had higher physical pain scores compared with BO and LO. The psychological discomfort scores of the FBBO group were significantly higher than those in the LO group. Pairwise comparisons revealed no significant differences in general patient satisfaction.[9] Ana Carolina Pero, in 2019, compared bilateral balanced occlusion with canine-guided occlusion (33-degree anatomic teeth) and concluded that canine-guided represents a viable alternative to bilateral balanced occlusion, showing better results in perception of chewing and occlusal force.[14] The neutrocentric concept that is based on monoplane occlusion was introduced to increase the surface area of occlusion so that more distributed force is transferred to the resorbed ridges. Many comparative studies have been conducted in the past, and they concluded that monoplane occlusion is the least followed occlusion concept.[15,16] However, most of these studies depicted variations in their conclusion regarding the occlusal schemes for com-

plete dentures.

Variations in tooth morphology about gender and age

The occlusal surfaces play a significant role in the masticatory ability of the individual. The cusps of both bicuspids and molars display diverse angulations in both bucco-lingual and medio-lateral dimensions.[17,1] Okeson reported that there is a high correlation between condylar guidance and incisal guidance in terms of cuspal inclination. In 2011, H.S. Shashidara et al., conducted a study on natural dentition and concluded that in natural dentition, the cuspal inclination for premolars in males is more pronounced or more angulated as compared to females, whereas, in the case of females, molars have a steeper inclination compared to premolars.[17]

Alteration in tooth structure arises from the cumulative impacts of wear, disease, and aging. Occlusal wear is also a result of the aging process. Various studies have reported that as age progresses the crown length decreases and there is an increased percentage of occlusal tooth wear.[18-22] Farzin et al. reported that in the maxillary first premolar, the crown length is reduced more in the palatal surface than the labial surface as age progresses.[18] Masotti et al. in 2017, concluded that there were notable age-related differences in incisal and occlusal wear on incisors, canine, and premolars and were significantly high in the older age group.[23] In 2014, Sarig et al. reported that the cause of the reduction of the mesiodistal and buccolingual dimension of teeth with age was due to environmental factors rather than genetic factors.[24] Farzin et al.. found that, in older individuals, in the second molar region, there is a decrease in mesiodistal width of the tooth structure.[18] Barlett et al.. observed that with an increase in age, there is an average rise in tooth wear in the buccolingual dimension.[18, 25] Therefore, as age advances there are alterations in the occlusal anatomy of the natural dentition. Consequently, when fabricating complete dentures and determining optimal occlusal schemes, it is essential to take these parameter into consideration.

Occlusal schemes concerning age, gender, and mandibular resorption

Understanding and adapting to these age-related occlusal scheme patterns are vital in the fabrication of complete dentures to ensure ideal function and comfort for individuals across different age groups. Heydecke et al. conducted a study to ascertain whether the perception of chewing ability are influenced by the method of the complete denture fabrication process.[26] He reported that among the study group, patients who received canine and premolar guided prostheses rated their overall satisfaction, stability, and aesthetic appearance as higher. Comfort and chewing abilities did not significantly differ between the lingualized balanced occlusal pattern and canine and premolar guided prostheses approaches.[26] Farias Neto et al.. in 2010, compared bilateral balanced occlusion with canine guided occlusion with a mean age of 59.7 years. There was an absence of any substantial variation between these two occlusal patterns.[27] Paleari et al..,with a mean age of 65.5 years, concluded that the patient`s satisfaction is not affected by any of the occlusal schemes as long as the resilience and volume of the residual ridge is normal.[28] However, patients perception of the vertical intrusion of the maxillary complete denture during chewing, was lower with canine guided occlusal scheme.[28] In 2013, Ahmed et al., conducted a study on 60 edentulous patients with a mean age group of 53.63 and concluded that lingualized occlusion is better than bilateral balanced occlusion.[10] Faten S. Abbas in 2016 conducted a cross-over study, in which bilateral balanced occlusion was compared with canine guided occlusion in patients with a mean age of 47 years. This study concluded that the mean values of satisfaction were higher for ca-

nine-guided occlusion.[12] In 2017, Maxwell et al. reported that canine guided occlusion has better masticatory efficiency than bilateral balanced occlusion with a mean age of 60 years.[29] In a prospective clinical trial conducted by Silvia Brandt and colleagues in 2019, it was documented that patients with a mean age group of 64.3 years accepted canine guided occlusion more than bilateral balanced occlusion whereas patients with a mean age group of 66.9 years preferred bilateral balanced occlusion.[4]

Hedaiat Moradpour et al., conducted a study comparing bilateral balanced occlusion, lingualized occlusion, and buccalized occlusion. Their result showed that females accepted buccalized occlusion more, while male participants mostly accepted lingualized occlusion. Bilateral balanced occlusion was one of the least preferred occlusion schemes.[9] Ana Carolina et al. in 2019, conducted a study comparing canine-guided occlusion and bilateral balanced occlusion, exclusively selecting female participants. The findings revealed that canine-guided occlusion demonstrated superior masticatory ability, characterized by a higher bite force.[14] According to Pinto Alves et al. and Demers et al., findings indicate that females exhibit diminished masticatory ability.[30] Bilateral balanced occlusion yields reduced levels of patient satisfaction in both male and female populations.

As age increases, bone resorption tends to increase due to various physiological factors. Various occlusal schemes have been proposed to preserve and prevent the degeneration of the residual alveolar ridge. Matsumaru et al. in 2010, compared bilateral balanced occlusion with lingualized occlusion in the mandibular resorbed region in terms of masticatory efficiency and concluded that lingualized occlusion is the most accepted occlusal pattern in severely resorbed cases.[31] As per existing literature, lingualized occlusion is predominantly favored owing to its tendency to reduce denture instability, consequently leading to an improvement in chewing efficiency compared to the alternative. In a separate investigation conducted by Kawai et al., it was documented that patients exhibit a higher preference for the lingualized occlusal scheme in cases of mandibular resorption.[13] These investigations provide a comprehensive insight into the impact of alveolar bone resorption on both chewing efficiency and patient acceptance in the context of complete dentures. Lingualized occlusion surpasses several occlusal schemes in cases of resorbed ridges, as the forces exerted on the mandibular alveolar ridge are centrally positioned at the apex. This leads to enhanced denture stability, subsequently elevating masticatory efficiency and fostering higher patient acceptance.[25,32,33]

Conclusion

This narrative review delves into the current understanding of diverse occlusal scheme patterns in complete dentures, seeking to consolidate this knowledge and emphasize the most relevant inquiries within this domain. Many studies proved that bilateral balanced occlusion, in particular, demonstrated lower acceptance levels regarding masticatory efficiency. Conversely, lingualized occlusion and canine-guided occlusion emerged as the more favoured options, with the latter being especially preferred for the mastication of hard foods. Concerning gender, a few studies favour canine-guided or buccalized occlusion for females and lingualized occlusion for males. Regarding age, the literature depicted wide variation. However, it was noticed that as age advances, there is a preference for balanced occlusion, though the younger groups prefer caning-guided and lingualised occlusion. When the resorption status of the mandible is concerned, lingualized occlusion surpasses several occlusal schemes in cases of resorbed ridges. However, further research has to be done to arrive at a definitive conclusion.

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