Two Concepts in Denture Occlusion

Lingualized Occlusion vs. Linear Occlusion – What's the Difference?

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Denture wearers have three things they desire most from their prostheses: aesthetics (a natural look), comfort and function. Comfort and function are directly linked with the occlusal scheme incorporated into the prostheses. But what is the best scheme?

Occlusal schemes are divided into two classes – anatomic and non-anatomic. Depending on where an individual received his or her pre-doctoral training will play a significant role in the occlusal scheme a doctor selects. There is far too much material that needs to be taught and far too little didactic time available to permit an in-depth study of all aspects of denture occlusion in a pre-doctoral curriculum. Each school might by necessity emphasize one particular type of occlusal scheme depending on the philosophy and background of the school and department head. It is the responsibility of the dental school to prepare its students, first and foremost, to successfully pass their dental board examination. To that end, the student must be proficient in one occlusal concept, not all.

In these two categories, linear and lingualized occlusal forms (Condyloform and AutoCentric Posteriors, Candulor USA, Inc.) have a history of being the most functionally efficient. In the Glossary of Prosthodontic Terms both are defined.[1] For lingualized occlusion, "this form of occlusion articulates the maxillary lingual cusps with the mandibular occlusal surfaces in centric working and non-working position." More recently, the term has changed to "lingual contact occlusion" to dispel the misconception that the mandibular teeth have been moved lingually. The mandibular occlusal surface might be flat or poses a shallow central fossa into which the opposing lingual cusp articulates (Figs. 1a & 1b). For linear occlusion, "the occlusal arrangement of artificial teeth, as viewed in the horizontal plane, wherein the masticatory surfaces of the mandibular posterior artificial teeth have a straight, long, narrow occlusal form resembling that of a line, usually articulating with opposing monoplane teeth (Figs. 2a & 2b)." In the arrangement of both, the point of occlusal contact is over the crest of the residual ridge for mechanical stability. Lingualized occlusion has been likened to a mortar and pestle, whereas linear occlusion resembles a knife on a chopping block. From a personal perspective, a sharp knife on a chopping block is functionally more efficient than a grinding, crushing type of occlusion.

Stability of the mandibular prosthesis is directly associated with the lack of cusp/fossa interference in arriving at or exiting from centric occlusion position and the lack of interference in eccentric movements. This is much harder to attain with lingualized occlusion since there is a specific cusp to fossa intercuspation, whereas linear occlusion has no inclines with which the blade might contact when the patient closes into centric or eccentric articulation. With linear occlusion, articulating forces are in a vertical, stabilizing direction whereas tipping forces might occur in lingualized occlusion if there are any premature contacts prior to achieving centric articulation. Instability of the prosthesis leads to discomfort from tissue irritation and loss of residual ridge over time.

In addition to differences in occlusal form, there are differences in the principles of articulation. With linear


Fig. 1a

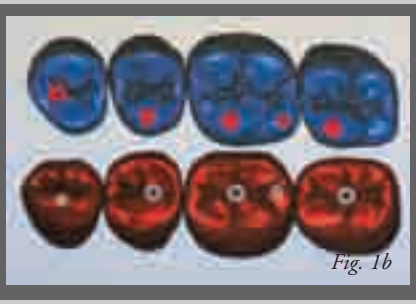
Fig. 1b

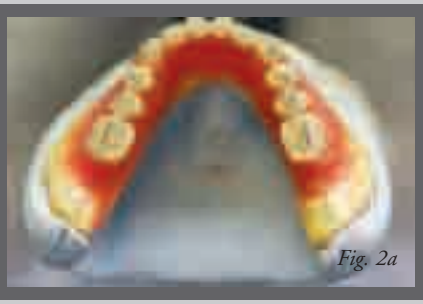
Fig. 2a

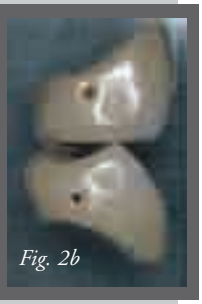
Fig. 2b

occlusion success is directly linked with noninterference between opposing tooth surfaces. That applies to the anterior component as well as the posterior component. To facilitate this, the mandibular anterior teeth are arranged in centric position a half millimeter below the occlusal plane, which is determined by the incisal edges of the maxillary central incisors in the anterior and halfway up the retromolar pad on either side in the posterior (Fig. 3). To prevent anterior contact in protrusive position, the mesial one-third of the maxillary first premolar is beveled at a 45-degree angle toward the distal contact area of the canine. This creates a straight edge against which the blade of the mandibular first premolar will make contact as the mandible moves forward and upward, preventing anterior contact. This creates a posterior, vertical force in the premolar area which seats rather than rotating the maxillary prosthesis on the anterior residual ridge (Fig. 4).

Fig. 3

Fig. 4

One reason for the popularity of lingualized occlusion can be attributed to the fact that its technical aspects are basically the same as conventional anatomic occlusion. That said, the inherent anterior vertical overlap is a given. Even if the anterior teeth are arranged out of contact in centric articulation, with occlusal wear (porcelain prosthetic teeth are rarely used) and posterior ridge resorption, the mandible will move forward and upward with resulting anterior tooth contact. When this occurs, a rocking or rotational movement of the prosthesis occurs with its associated anterior hyperfunction and in one of every four patients, loss of the premaxilla.[2,3]

Arranging posterior lingualized teeth is much more difficult than linear prosthetic teeth due to the required cusp/fossa relation. If the maxillary anterior teeth are

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positioned for aesthetics and phonetics, followed by the mandibular anterior and posterior teeth, the articulation of the maxillary first premolar to the mandibular first premolar is usually problematic. If the maxillary posterior teeth are arranged followed by the mandibular posterior teeth, the mandibular anterior teeth might have problems filling the remaining space (Fig. 5). This problem does not exist with linear posterior teeth since the blade in one arch articulates anywhere on the flat surface in the opposing arch (Fig. 6).

Fig. 5

Fig. 6

The final difference to consider is occlusal adjustment or refinement. With lingualized occlusion, the first point of a premature contact will be hidden within the occlusal fossa. Because of this, one must rely entirely on marking the spot with articulating paper. In the mouth, if the first contact is on an inclined plane, the prostheses could shift as tissue is displaced under occlusal loading. The most accurate method would be an intraoral needle point tracing and lab remount. Some advocate using the intraoral tracing device with gradually closing the marking screw until contact is made, marked and relieved. This is repeated until bilateral uniform contact on all articulating surfaces is achieved. If the contacting force is too great, tissue displacement could still be a source of error.

As defined earlier, with linear occlusion, one arch contains a bladed occlusal form and articulates with flat monoplane teeth. The posterior linear occlusal teeth are manufactured in porcelain only. This allows the blades to be sharpened and resist wear. The arch with the flat occlusal surfaces is milled on a plate glass slab with 220-grit wet and dry sandpaper until all posterior teeth are in contact on the horizontal plane. Once this is achieved, these flat surfaces are never altered with a rotary instrument. Only the blades are adjusted vertically until bilateral, uniform contact is established.

To make an intraoral adjustment, the operator will first listen, then look and finally mark with articulating paper and reduce the offending blade vertically. After bilateral simultaneous contact is established, the blades are sharpened by grinding on the buccal and lingual of the blades. When rapidly tapping together in centric relation, a distinctive click or ringing sound is heard. If by chance the occlusion is off, a dull or double-click will be heard. The operator then parts the lips and has the patient close slowly into a retruded position. With no incline planes to obstruct the view, the first point of contact can be observed. Knowing this, the blades are marked and more accurately relieved. This is repeated until bilateral, simultaneous contact is achieved. With only vertical occluding forces, the possibility of lateral shifting of the prosthesis during refinement is eliminated. The patient is then instructed to bring the mandible forward into an end-to-end relationship and checked for contact. The bilateral fulcrum should prevent contact, but if present, either the maxillary or mandibular offenders are reduced until only light, kissing contact remains. The decision as to which teeth to reduce depends primarily on aesthetics.

Conclusion

The occlusal scheme chosen by the clinician will always be a personal decision based on knowledge and experience. This is basically the conclusion drawn by attendees at The International Prosthodontic Workshop on Complete Denture Occlusion[4] in 1972 when they stated, "At present, the choice of a posterior tooth form or arrangement for complete dentures is an empirical procedure. The available research fails to identify a superior tooth form or arrangement; therefore, it appears logical to use the least complicated approach that fulfills the requirements of the patient." Personally, I will always choose the one which will be functionally efficient and create the least amount of post-insertion problems, for me as well as for the patient. Over the years, I have found that linear occlusion satisfies that criteria for the majority of patients, both completely edentulous,[5] as well as combination cases.[6] To choose a scheme primarily because they merely look more like "teeth" is, in my opinion, a disservice to the patient. Granted, the desires of the patient must be taken into consideration, but we as the professional have an obligation to educate the patient about the need to preserve that which remains, not merely replace that which is missing. For the doctor wishing to use linear occlusion, two challenges must be

overcome, neither of which is insurmountable. The first is the need for training in the technique, which differs in many aspects from conventional procedures in denture fabrication. This can be accomplished by attending a hands-on course. There is no substitute for actually doing the procedures under supervision. The second challenge is the area of laboratory support. Shortcuts and modification of the required procedures will only lead to frustration and disillusionment with a return to the old ways. Over the years, this has proven to be the greatest hindrance in expanding the use of linear occlusion. Simply put, you need to find a laboratory trained in the technique in order to get the required support to achieve the desired successful outcome. ■

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Author's Bio

Dr. William Jameson graduated with honors from the University of Tennessee in 1954. He completed postgraduate training in prosthodontics at Tufts University in 1962 and was certified as a Diplomate for the American Board of Prosthodontics in 1967. He retired from the Air Force in 1976 to become a core faculty member at Oral Roberts University, School of Dentistry tasked with developing the removable prosthodontics curriculum. In 1980 he established a practice limited to prosthodontics in Tucson, Arizona. Since retirement in 1992, he has been a consultant and lecturer while maintaining a part-time practice limited to removable prosthodontics using linear non-interceptive occlusion. His presentations have covered complete dentures, removable partial dentures and implant reconstruction. He can be contacted at bbjameson@dakotacom.net.