

REVIEW ARTICLE

Canine-Guided Occlusion Simplified

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ABSTRACT

Establishing or providing occlusion that successfully permits efficient masticatory function is basic to dentistry and survival. In health, the occlusal anatomy of the teeth functions in harmony with structures controlling the movement patterns of the mandible. The structures that determine these patterns of the mandible are joints and the anterior teeth. During any given movement, the unique anatomic relationships of these structures continue to dictate a precise and repeatable pathway. To maintain the harmony of the occlusal condition, the posterior teeth must pass close to but not contact their opposing teeth during mandibular movement. It is important to examine each of these structures carefully and appreciate how the anatomic form of each can determine the occlusal morphology necessary to achieve an optimal occlusal relationship.

Keywords: Disclusion, Excursive movement, Nature's stress breakers, Non-working side, Working side.

How to cite this article: Ali SZ, Bhat JT. Canine-Guided Occlusion Simplified. *Int J Med Oral Res* 2019;4(2):11-13.

Source of support: Nil

Conflicts of interest: None

INTRODUCTION

In literal sense, occlusion means "closing off." Occlusion is defined as the static relationship between the incising or masticating surfaces of the maxillary or mandibular teeth or tooth analog.^[1] Occlusal disease is deformation or disturbance of function of any structures within the masticatory system that is in disequilibrium with a harmonious interrelationship between the temporomandibular joints (TMJs), the masticatory musculature, and the occluding surfaces of the teeth. It is of almost importance that an optimal functional occlusion is established in the patient. A dentist who does not have a working knowledge of occlusal principles must resort to guesswork and time-wasting trial-and-error attempts

to solve problems that could be confidently solved by understanding cause-and-effect responses to occlusal disharmony. Even achieving predictable function and beauty of smile design is dependent on incorporation of sound occlusal principle.

BENEFITS OF AN OPTIMAL FUNCTIONAL OCCLUSION

Patient Comfort

Occlusal disharmony may cause sensitivity of teeth to hot or cold, pain on percussion, etc. By following the guideline of occlusal stability, patient comfort can be restored.

Restoration Longevity

Cracks, fractures, and excessive wear on restorations are all signs of occlusal disharmony.

Occlusal Stability

Post-treatment shifting of teeth, opening up of contacts, or creating unesthetic misalignment are common problems of occlusal mistakes. Fremitus is almost always an early sign of a correctable occlusal disharmony.

More Accurate Treatment Planning

Following the guidelines of occlusal stability will ensure a good treatment plan. Successful treatment plan pays huge dividends.

Improved Esthetics

Following the occlusal principles can help us achieve the best possible esthetics.

Increased Productivity

The productivity of a practitioner can be good if all restorations could be placed without having to replace the restoration and do some adjustments.

PRIMARY REQUIREMENTS FOR SUCCESSFUL OCCLUSAL THERAPY

1. Comfortable and stable TMJs
2. Anterior teeth should be in harmony with the envelope of function and in proper relationship with the lips, the tongue, and the occlusal plane
3. Posterior teeth should be non-interfering.^[2]

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Canine-Guided Occlusion

Mutually protected occlusion is also known as canine protected occlusion or organic occlusion. The basic concept of canine-protected function is that on lateral excursive movements of mandible only the canine contacts and therefore protects remaining dentition from adverse occlusal torsional forces to and from centric relation and centric occlusion or as defined in Glossary of Prosthodontic Term-9, the canine-protected occlusion is a form of mutually protected occlusion, in which vertical and horizontal overlap of canines disengages posterior teeth in excursive movement of mandible.^[1]

It had its origin in the work of D'Amico,^[3] Stallard and Stuart, and Lucia and the members of the Gnathological Society. They observed that in many mouths with a healthy periodontium and minimum wear, the teeth were arranged so that the overlap of the anterior teeth prevented the posterior teeth from making any contact on either the working or the non-working sides during mandibular excursions. This separation from occlusion was termed disocclusion [Figure 1].

All posterior teeth are in contact with the forces being directed along their long axis during maximum intercuspation. The anterior teeth either contact lightly or are very slightly out of contact, relieving them of the obliquely directed forces. During excursive movement, the posterior teeth are disoccluded and only the anterior teeth stay in contact. As a result, the anterior teeth protect the posterior teeth in all mandibular excursions and the posterior teeth protect the anterior teeth at the intercuspation position, hence the name mutually protected occlusion.

However, mutually protected occlusion necessitates good periodontal status of the anterior teeth. Group function is an alternative used in cases of anterior bone loss or missing canines.^[4] Other than this it cannot be used in cases of Class II or Class III malocclusion (Angle). A mutually protected occlusion cannot

be used in a situation of reverse occlusion or crossbite, in which the maxillary and mandibular buccal cusps interfere with each other in a working side excursion.^[5] Khurshid and Garg^[6] claimed that the anterior guidance that is favorable for optimal occlusion includes its ability to disclude the posterior teeth on protrusion and lateral excursions. Unfavorable anterior guidance may cause bone loss, tooth mobility and will limit the movement of the mandible at the front. In cases, where the maxillary and the mandibular canines are worn out at the incisal surface, the mandible when protruded or moves in a lateral excursion, the palatal slopes of the canine direct the mandible in a downward direction rather than moving forward. Therefore, restoration of maxillary or mandibular canine with single crowns may be done with steeper inclines so that the mandible can assume its normal position when protruded or taken into lateral excursion.

D'Amico^[3] studied the function of the canines from the anthropoid apes to modern man. He proposed that the overlapping of the canines was originally displayed in the great apes due to their non-abrasive diet. D'Amico deduced from this "the canines have been casualties of function rather than casualties of evolution."

D'Amico's also termed canines as the "nature's stress breakers" to protect the periodontium and supporting structures from lateral stress during eccentric movements.

Shock contact of the upper cuspids by the opposing mandibular teeth during eccentric excursions causes transmission of periodontal proprioceptive impulses to the mesencephalic root of the fifth cranial nerve, which in turn alters the motor impulses transmitted to the musculature. This involuntary action lessens the tension of the musculature, thus reducing the magnitude of the forces being applied.^[9]

Williamson and Lundquist^[7] investigated the effect of anterior guidance on electromyographic activity of temporal and masseter muscles and concluded that an appropriate anterior guidance that produces posterior separation can reduce the elevating activity of the temporal and masseter muscle. They found that it was the elimination of posterior contacts that decrease the activity of the elevator muscle and the contact of the canines.

The natural vertical and horizontal overlap of the upper cuspids prevents contacts that could develop horizontal vectors which could cause rapid fatigue of the periodontium or failure of restorations. It has been observed when this canine protection is taken away, muscles stay active leading to clenching, grinding of teeth, abfraction, and gum recession.



Figure 1: Canine-guided occlusion on working side and complete disocclusion on non-working side

TOOTH LOADING OF CANINE-GUIDED OCCLUSION

In this type of an occlusion, forces are directed axially by limiting the contact of the support cusps of the posterior teeth to their opposing fossae at or near their intercuspal position. All other lateral contacts are prevented by the steeper inclines of the canines. This results in the chewing stroke being more sagittal from a frontal view. In this manner, mastication occurs with a pounding motion similar to the action of a meat maul. Functional efficiency may be increased by well-formed marginal ridges, triangular ridges, grooves, and fossae so that the occluding cusps may readily penetrate fibrous food in a shredding, chopping manner. In other words, the canines are situated and inclined in such a way, while they allow full contact of all teeth in centric occlusion, they force the jaw to open as the upper and lower canine slide over each other disengaging all the cusps of teeth as person begins to grind side to side, this phenomenon is called as cuspid rise. The reason for redirecting the occlusal forces is that anterior teeth are located far away from TMJ and thereby have better leverage to offset. The horizontal force is further lessened by reducing the mediolateral cusp angle.

Guidance is created that is so inefficient for mastication that a patient would use them only for guidance and not for grinding food. The canine is best suited for this role for several reasons.

1. It does not have an occlusal table, but instead it has a lingual concavity such that it is poor with respect to the masticatory function but well suited for guidance
2. The canine has a favorable crown/root
3. It has been seen that the canines are the last teeth in the dentition to be lost

4. The root of canine is larger than the roots of the adjacent teeth and therefore offers a larger area of periodontal ligament
5. While it has been shown that the mouth does not operate purely as a lever, force magnification by leverage does occur. The canine is located at the terminal end of a Class 3 lever arm where the mechanical advantage of the muscles of mastication is negative. It is important that the canines are so inefficient in mastication that the patient does not use them for that function. Instead, the patient would find it preferable to direct their forceful chewing stroke to the posterior intercuspal positions where a state of efficiency exists
6. Canines have good proprioception.^[5]

CONCLUSION

- a. Canines are the nature's stress breakers
- b. Canine-guided occlusion is mostly predominant in younger population
- c. Longer root of canine helps dissipate the forces
- d. Mechanical advantage of muscles at canine is zero

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