Principles of Occlusion for Natural and Restored Dentitions
The Nutcracker Principle
A Nut positioned near the Hinge of the Nutcracker
will be cracked easily
A Nut positioned at a Distance from the Hinge
will not be cracked easily
The Nut Cracker Principle
The Forces exerted lessen as the Distance away from the Hinge increases
Greatest Force near the Hinge
Least Force away from the Hinge
A Nut positioned near the Joint
will be cracked easily
A Nut positioned at a Distance from the Joint
will not be cracked easily
Greatest Force near the Hinge
Least Force away from the Hinge
Forces applied to Teeth during biting as related to Tooth Position
Incisors
Incisors 2-4 Kg/Sq cm
Incisors 2-4 Kg/Sq cm
Canines
Incisors 2-4 Kg/Sq cm
Canines 3- 7 Kg/Sq cm
Incisors 2-4 Kg/Sq cm
Canines 3- 7 Kg/Sq cm
Molars
Incisors 2-4 Kg/Sq cm
Canines 3-7 Kg/Sq cm
Molars 9-18 Kg/Sq cm
Incisors
Incisors  35-50 psi
Incisors  35-50 psi
Canines
Incisors  35-50 psi
Canines  47-100 psi
Incisors  35-50 psi
Canines  47-100 psi
Molars
Incisors  35-50 psi
Canines  47-100 psi
Molars  127-250 psi
In Very Muscular Men

The Forces on Molar Teeth may be

over 900 psi
over 67 Kg/ Sq cm
Molar Teeth being near the Joint
Take the Maximum Force on Closure
Anterior Teeth take the Least Force
The Forces are taken by Only Part of the Periodontal Membrane
The Resultant Direction of the Forces
When Posterior Teeth are in Good Alignment
The Forces are taken by all of the Periodontal Membrane
When Molar Teeth are in Bad Alignment
The Forces are taken by only Part of the Periodontal Membrane
Posterior Teeth in Good Alignment
are well suited to cope with the Forces of Occlusion
The Forces of Occlusion are best borne along the Long Axes of the Posterior Teeth.
Poor Alignment of Posterior Teeth
can cause Loosening of Teeth
The Principles of Occlusion
Number 1
The Forces of Occlusion
are best borne along the Long Axes of the Posterior Teeth
if the Teeth in Good Alignment using All the Fibres of the Periodontal Membrane
The Principles of Occlusion
Number 2
As many Posterior Teeth as possible should contact in Centric Relation
This spreads the Occlusal Forces over as Many Teeth as possible
Spreading the Load
The Principles of Occlusion
Number 3
No Lateral Slide should be Present when the Teeth are clenched together
(a very slight slide forward is acceptable)
When a Lateral Slide is present

The Neuromusculature adapts to avoid the Interference that causes the slide
On Opening
Both Lateral Pterygoid Muscles contract
To avoid the Interferences

- One Lateral Pterygoid Muscle also contracts on closure
- to bring the Teeth together in Maximum Intercuspidation to avoid the Interference
This Muscle is contracting on Opening and Closing which may result in Muscle Fatigue and possibly Muscle Spasm and Joint Disturbances
Muscle Fatigue and Muscle Spasm may result in Referred Pain interpreted as a Headache and Earache
Excursive Movements

All Movements of the Mandible away from Centric Relation
Posterior Contacts on Posterior Teeth in Excursive Movements
tend to be traumatic
due to the Excessive Forces that can be exerted
The Principles of Occlusion
Number 4
Excessive Contacts on Posterior Teeth in Excursive Movements should be avoided to prevent Excessive Stress on the Posterior Teeth
The Principles of Occlusion
Number 5
As a Principle

The Front Teeth should separate the Back Teeth whenever possible
A Centric Relation Appliance
Covers Interferences
Can achieve Separation of the Back Teeth
Excessive Contact on Posterior Teeth may cause

• Increased Bruxing and Clenching
• Muscle Spasm
• Headaches
Excessive Contact on Posterior Teeth may cause

- Wear of the Posterior Teeth
- Loosening of the Posterior Teeth
- Damage to the Temporomandibular Joint
Protrusive Movements
In Protrusive Movements
The Front Teeth should separate the Back Teeth wherever Possible
To avoid Excessive Forces on Back Teeth
The Greater the Overjet
The Flatter the Anterior Guidance
and the Lesser the Degree
of Separation of the Back Teeth
The Overbite
The Greater the Overbite
The Steeper the Anterior Guidance
and the Greater the Degree of Separation of the Back Teeth
The Degree of Disclusion also depends on the Arch Relationship
Class 1 Arch Relationship
When the Lower First Molars are Slightly Distal to the Upper First Molars
Guidance is on Front Teeth
Guidance is on Front Teeth
Guidance is on Front Teeth
Guidance is on Front Teeth
In Class 1 Arch Relationships

In Excursive Movements
the Front Teeth will separate the Back Teeth
almost immediately
Class II Div 1
Class II Div 1
Protrusive Movement
Class 11 Division 1 Arch Relationships
When the Lower First Molars are More Distal to the Upper First Molar Teeth
Guidance will be on Posterior Teeth to start with
Guidance will be on Posterior Teeth to start with
Guidance may possibly end up on the Front Teeth
Guidance may possibly end up on the Front Teeth
In Protrusive Movements

• The Molar Teeth will contact
• then the Premolar Teeth will take over the Guidance
In Class II Division 1 Arch Relationships

In Protrusive Movements
the Front Teeth will NOT separate the Back Teeth immediately
if at All
In Protrusive Movements

- Eventually the Anterior Teeth may take over the Guidance
- depending on the Degree of the Overjet
- The Anterior Teeth may never take over the Guidance
Guidance on Posterior Teeth is usually inevitable in:

- Class II Division I Jaw Relationships
- where the Upper Front Teeth are far in Front of the Lower Front Teeth
- and may never contact
In Class 11 division 1 Arch Relationships
Guidance on Posterior Teeth is Necessary
Class 11 Division 2 Arch Relationships
When the Lower First Molars are More Distal to the Upper First Molar Teeth
and the Upper Incisors are inclined Backwards
Guidance is Immediately on the Front Teeth
Separating the Back Teeth Immediately
In Class II Division 2 Arch Relationships

In Protrusive Movements the Front Teeth will separate the Back Teeth immediately
In Class II Division 2 Arch Relationships
There tends to be More Temporomandibular Joint Problems
In Class II Division 2 Arch Relationships
Relieving the Occlusal Contacts Anteriorly may relieve the Problems
Protrusive Movement
Class 111 Arch Relationships
When the Lower First Molars are Mesial to the Upper First Molar Teeth
and the Lower Front Teeth are in Front of the Upper Front Teeth
Guidance may Never be on the Front Teeth
Guidance is always on Posterior Teeth
Guidance is always on Posterior Teeth
Guidance is always on Posterior Teeth
Guidance on Posterior Teeth is usually inevitable in:

• Class III Jaw Relationships
• where the Lower Front Teeth are in Front of the Upper Front Teeth
• and are unlikely to contact
In Class 111 Arch Relationships

Guidance on Posterior Teeth is Necessary and Unavoidable
Eccentric Contacts
Any Contacts of the Teeth
during Eccentric Movement
of the Mandible
(Movements away from Centric Relation)
The Principles of Occlusion
Number 6
In Eccentric Movements

Posterior Tooth Contacts should decrease
as the Front Teeth take over Guidance
Excursive Movements

Left
Functional Side.
Functional Side
(Working Side)
The Side towards which
the Mandible moves
Right Molar Teeth

Centric
Jaw moving to the Right
The Same Side
This is a Functional or Working Movement
This is a Functional or Working Contact
Functional Movements without Posterior Tooth Contact
Due to Disclusion caused by Guidance on Front Teeth
The Right Molar Teeth
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
The Right Molar Teeth

Moving to the Same Side
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
Functional Movement with Tooth Contact
Due to No Disclusion
by Front Teeth
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
The Right Molar Teeth

Moving to the Same Side
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
Moving to the Same Side

The Right Molar Teeth

Moving to the Same Side
Functional Movement with Tooth Contacts in Crossbite
Due to No Disclusion by Front Teeth
The Right Molar Teeth in Crossbite
Moving to the Same Side

The Right Molar Teeth
The Right Molar Teeth Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
The Right Molar Teeth Moving to the Same Side
Principles of Guidance

• wherever possible the Guidance should be as far forward as possible
• as far away from the Joint (the Hinge) as possible
To Minimize the Stresses on Teeth

• In Eccentric Movements
• The Posterior Tooth Contacts should decrease
• as the Front Teeth take over Guidance
Guidance on Posterior Teeth

is necessary if the Front Teeth are not in a Position to separate the Back Teeth
Guidance on Posterior Teeth is usually inevitable in

• Class III Jaw Relationships
• where the Lower Front Teeth are in Front of the Upper Front Teeth
• and are unlikely to contact
The Principles of Occlusion
Number 7
To Minimize the Stresses on Teeth
In Eccentric Movements
The Posterior Tooth Contacts
should decrease
as the Front Teeth take over
Guidance
Non-functional.
Non-working.
Balancing.

Right ➔ Left
Non-functional Side
(Balancing Side, or Non-Working Side)

The Side away from which the Mandible moves
Case History

- Patient aged 40
- Headaches since age of 10
- Frequent dull Headache all Day
- Occasional Acute Headache commencing when doing Intense Work
Two Sets of Study Models
were Mounted in Centric Relation
In Right Lateral Movement

Non-functional Contacts were Present
Right Lateral Movement
Non-Functional Contact
Non-Functional Contact
Unopposed Third Molar
Causing the Non-Functional Contact
Left Lateral Movement
Non-Functional Contact
Unopposed Third Molar
causing the Non-Functional Contact
Equilibration involved

- Removal of Lower Third Molars
- Removal of Interferences in Centric Relation
- Removal of any Remaining Non-functional Contacts
- Refinement of the Anterior Guidance
After removal Non-Functional Contact
After removal Non-Functional Contact
Treatment Outcome
The patient had immediate relief of Symptoms
Three months later the Patient experienced One Episode of a Dull Headache
The Principles of Occlusion
Number 8
There should be No Non-functional Contacts

Right

Left
As a Principle
There should be no Non-Functional Contacts
Non-Functional Contacts on Posterior Teeth may be Unavoidable in Class III Cases
If Loose Teeth are present on the Functional Side and the Teeth are firm on the Non-functional Side, Contacts on the Non-Functional Side are Necessary to protect the Loose Teeth.
The End