Deep and cross bite
(class II and class III)

Special Edition

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This Special Edition highlights the T and K mould posterior tooth morphology for use in class II and class III bite classifications, also referred to as deep and cross bite classifications. Our desire is to assist the dental professional in successfully using these unique tooth morphologies for increased function, denture stability and overall patient satisfaction.

Designed by Dr. R Strack in the 1950’s and manufactured by Ivoclar Vivadent, it is not a new occlusal concept, but one that is not often taught in our formal educational setting.

We have used these moulds and documented many cases in our clinic with great success. The positive feedback from our patients lead us to believe that in using these moulds we are able to provide an improved functional and aesthetically pleasing removable prosthesis. In conjunction with the Ivoclar fixed set up template, these moulds are predictable and easy to set up.

Posterior tooth morphology is often measured in degrees of inclination: 33, 20, 10 or 0 degrees to name a few. In opposition to degree classification is Dr. Strack’s design of the Orthothyp morphology. His morphology recognizes the three bite classifications: class I (normal bite - N mould) class II (deep bite - T mould) and class III (cross bite - K mould).

The differences in the SR Orthotyp teeth are the cusp angulations and guiding surfaces. These unique angles and guiding surfaces allow the dental professional to achieve balanced occlusion when a strong anterior overbite/overjet (T mould) or a posterior crossbite (K mould) are present.

We have noticed an increased number of patients with a one sided posterior cross bite, due to atrophy. In these cases we use the N mould on one side and the K mould on the cross bite side with great success.

As dental professionals, we need to understand that each of our patients’ present different bite classifications. If our desire is to satisfy the patients’ need for optimum function, it is imperative that we observe which of these classifications the patient belongs. It is not always apparent during an oral examination, but rather when the models have been articulated. This is when the entire dental team needs to be aware of the importance of bite classification determination.

As equally important, is the communication that we have with our patient. Educating the patient in their different bite classification and how it may relate to anterior overbite/overjet or posterior occlusion is fundamental to our success.

We have to accept as professionals and trusted denture care providers that not all of the cases are a class I with a 1mm overbite and 1mm overjet as we may have been taught.

It is time to challenge ourselves with advanced occlusal concepts such as class II and class III, so we may be prepared for the more educated, demanding patient.
Angle's Classification of Malocclusion

Dr. Edward Angle described three (3) classes of malocclusion based on the occlusal relationship of the first molars. This classification is used in orthodontics.

Malocclusion in an edentulous person is also determined according to the Angle's classification. Whether a class I, II or III, when setting up dentures, the upper and lower first molars must have the same relationship to each other as in an Angle class I (upper mesio-buccal cusp of first molar has contact between the lower mesial buccal and buccal cusp of first molar).

**Note:** in class III, reverse cusp fossa relationship.

**Angle class I**
- Normal molar relationship

**Angle class II**
- the lower first molar is posterior to the upper first molar- anterior “overjet”

**Angle class II Division II**
- describes the anterior relationship “overbite”
- Same posterior as class II

**Angle class III**
- the lower first molar is anterior to the upper first molar “underbite”

**Class I**
- Normal bite

**Class II**
- Deep bite posterior to the upper first molar- anterior “overjet”

**Class III Cross bite**
- In an edentulous class III the posterior cross bite due to a smaller upper arch is more prevalent than an anterior underbite
Tooth lines

SR Orthotyp PE / SR Orthosit PE

3 different cusp angulations
Dr. Strack designed the Orthotyp (Orthosit) in three bite morphologies: normal bite – N mould (class I), deep bite – T mould (class II) and cross bite – K mould (class III).
The difference in these morphologies are the cusp angulations and guiding surfaces. The design of the cusps compensate the set-up for a stronger overbite (T mould) or a cross bite (K mould).

N mould (Normal) class I
(A) guiding surfaces of the buccal cusp;
(B) full body gives the correct lingual design for the tongue space

T mould (Tief-deep) class II
(A) longer guiding surface on T mould
(B) shorter body due to less interocclusal or interarch space often found in class II bites

K mould (Kreuz-cross) class III
(A) reverse guiding surfaces on K mould due to a reverse cusp-fossa relationship;
(B) longer body due to more interocclusal space in class III bites (bone resorption)
(C) the upper posterior of the K mould is narrower buccolingually. Allows patient increased tongue space
Different occlusal situation:
N mould vs. T mould

Comparing to the N mould (left of each picture) with the T mould. Note: T mould has a larger guiding area.

Contact areas of
• N mould
• K mould

Above: Larger buccal surfaces compared to the N mould.

Modified upper buccal cusp to accommodate reverse cusp-fossa relationship in class III - K mould.
Model analysis

**Class I - normal bite**
In class I the upper arch is slightly smaller in the posterior region than the lower arch.

**Class II - deep and/or overbite**
- in class II bites the upper arch is the same size or slightly larger than the lower arch
- the upper may be more anterior than the lower

**Class III - crossbite**
There are different types of cross bites:
1. unilateral cross bite
2. bilateral cross bite (due to maxillary atrophy, the lower arch is larger than the upper. Cross bite begins usually at the 2nd premolar)
3. bilateral cross bite including an anterior cross bite (rare; overdevelopment of the lower arch in comparison of the upper)

**Class III - unilateral crossbite**
Often seen when upper posterior teeth on one side are extracted long before the opposite side. A combination set-up of N- and K-moulds works very well.
Tooth selection

Anterior tooth selection according to the model analysis. Upper and lower anterior tooth selection may vary from mould guide suggestion. In a deep bite, it may be necessary in some cases to set up only 5 lower anteriors, due to the different sizes in the anterior arches.

Class II and cuspid relationships

In a normal bite (class I) the upper cuspid is positioned posterior to the lower cuspid. In a class II deep bite a reverse cuspid relationship due to a strong overjet.

1 to 2 tooth relationship. Normal upper cuspid to lower cuspid relationship.

In this case, the lower first bicuspid was dropped in order to achieve a correct posterior relationship.
Class II deep bite set up
using SR Orthotyp PE/SR Orthosit PE T-mould

Model Analysis
To determine the bite situation also use the information out of the existing dentures.

Lower Model
• retromolar pads
• crest of the ridge from 4 to 6
• position of lower cuspids
• transfer lines to the edge of model

Determining the bite relationship
• These lines on the posterior of the models are a continuous line from the crest of the ridge. They assist in determining the posterior relationship.

Upper Model
• Incisive papilla
• bisect papilla transversal for position of centrals
• bisect papilla sagittal for midline (anatomical midline)
• first large rugae for position of upper cuspids
• mark position of cuspids
• center of the ridge from 4 to 6

Check the relationship between upper and lower cuspids
• important for class II

Setting the upper anterior central

Anterior set-up according to A) average measurements or B) using the information from patients' bite blocks.
Profile of the anterior (upper and lower)

The incisal edge of the upper anteriors should point toward the lower mucolabial fold

Set-up of cuspids shorter than the centrals - important for class II division II

Check for correct positioning of the anteriors using landmarks and symmetry

Positioning of upper to lower cuspid is 1-to-2 tooth relationship
Use of the set-up template for the lower posterior teeth

Curve of Wilson

Curve of Spee

Check the correct positioning (1-to-2 tooth relationship) and aesthetics of the first bicuspid before setting all posteriors

Set-up of the posteriors using the set-up template

Contacts to template: (same as the N mould)
34/44 – buccal
35/45 – buccal and lingual
36/46 – all cusps other than distolingual
37/47 – all cusps other than distolingual
**Starting the upper posterior set-up with the first molar**

Set up the upper posteriors starting with the first molar to ensure correct occlusion. In order to achieve proper occlusal contacts and balancing movements the molars have to be in a ‘normal’ occlusal relationship to one another.

**Complete upper set-up**

**Finished upper and lower set-up**
Finished wax set-up with lateral movements

Contacts on working side
- in the bicuspid / molar area

Contacts on working side
- the upper lingual cusps against inclines of lower buccal cusps

Adjustments on working side
- mesio buccal on upper bicuspids
- disto buccal on lower bicuspids

Adjustments on balancing side
- inclines of lower buccal cusps
Extreme overjet set-up

Class II, division 1

Model Analysis
defining landmarks

Severe overjet is present

Positioning of the upper centrals according to landmarks and aesthetic information (lip support, lip line ...)
Special situation: reverse cuspid relationship

Note the reverse cuspid relationship. Prior to setting the remaining lower posteriors, temporarily set the upper first bicuspid to ensure the ideal curve of Spee (no hanging bicuspid).

Use the 2D or 3D set-up template to set the posterior teeth in the ideal curves.

In order to achieve a proper first molar relationship (class I) ‘drop’ the first lower bicuspid.
Start the upper set-up with the upper first molar. This ensures the correct first molar relationship necessary for function.

Adjustments on the upper lingual cusp of the first bicuspids may be necessary.

Finished set-up (extreme overjet)

Recap
• reverse cuspid relationship
• lower first bicuspid omitted
• correct first molar relationship
Common set-up errors made to compensate for an overjet

- Lower anteriors are set-up in front of the ridge placed in muccolabial fold
- Upper anteriors are set-up too far lingual (effects speech, aesthetics and lip support)

Anterior teeth placed off ridge

Upper anteriors placed too far lingually

Above pictures combined to illustrate incorrect set-up (existing case)
Actual case presentation

Cuspid relationship

Lower first bicuspid is omitted

Lower cuspid highlighted
Partial denture set-up with overjet

Even when natural dentition is present, the correct first molar relationship should be achieved.

Note
• reverse cuspid relationship
• first bicuspid
• relationship to first molars
Class III – cross bite set-up
using SR Orthotyp PE/SR Orthosit PE K-mould

Model analysis

**Lower Model**
- retromolar pads
- crest of the ridge from 4 to 6
- position of lower cuspids
- transfer lines to the edge of model

**Determining the bite relationship**
- outline the crest of the ridge, extend lines to the edge of the model as above
- if the lines from lower to upper are wider than the width of a bicuspid, set up in a posterior cross bite

**Upper Model**
- Incisive papilla
- bisect papilla transversal for position of centrals
- bisect papilla sagittally for midline (anatomical midline)
- first large rugae, position of upper cuspids - mark position of cuspids
- center of the ridge from 4 to 6
- transfer lines to the edge of the model

**Check the relationship between upper and lower anterior arch**
- If anterior underbite is existing, set up edge to edge or a slight overbite in the anteriors if possible
Positioning of the upper anteriors

Average value: half of the intervestibular distance to determine incisal length or using bite blocks from bite

The incisal edge of the upper anteriors should point to the lower mucolabial fold with the necks of the teeth more posteriorly.
Positioning of the upper to the lower cuspid – 1-to-2 tooth relationship

The distal edge of the lower cuspid should line up with the lower crest of the ridge

Use of the template to set-up the lower posterior teeth

• adjust the set-up template as usual on the cuspid

• set-up the lower posteriors over the crest of the ridge (Pounds triangle)
• use set-up template as usual
• axis of bicuspid should be straight

Contacts to the set-up template:
• 34/44 – buccal
• 35/45 – buccal and lingual
• 36/46 – all cusps other than distobuccally
• 37/47 – all cusps
Setting-up of the upper posteriors starting with the first molar

- 1-to-2 tooth relationship
- if possible start the cross bite on the second bicuspid
- no occlusal adjustments required to achieve a functional cross bite set-up

Balancing contacts in lateral excursion are easy to achieve when the set-up template is used.
In order to avoid the typical ‘cross bite curve’, slight adjustments are necessary.

1. Rotate lower first molar slightly more buccal
2. Move lower second bicuspid slightly more lingual
3. Move upper first molar slightly buccal
4. Move upper second bicuspid slightly more lingual

**Occlusal adjustments**: lower central fossa and upper lingual cusp of first molar.
Change distolingual cusp of lower second bicuspid into fossa.

The upper 5, 6 and 7 lingual cusps should be in contact to the lower lingual cusps to achieve the necessary occlusal contacts and to avoid that the cusps are ‘hanging’.
Final set-up

Lateral movements and balancing contacts in a cross bite set-up

Working
- bicuspid against bicuspid
- upper buccal cusps over lower lingual cusps

Balancing
- upper buccal cusp of molars against lower buccal cusps
Common set-up mistakes in a cross bite

Common errors made when setting up class III cases. Teeth set up too far off ridge resulting in:
• Unstable denture
• Cheek biting
• Middle fractures
• No buccal corridor (poor esthetics)

Upper posterior teeth placed off ridge

Posterior teeth are set-up well outside the ridge. Even with the mesh palate, the denture still fractures.

Set-up of upper denture against lower natural dentition

Existing denture was set up in a normal bite, class I.
Placing the molar in a normal bite occlusion where it appears to belong, shows how much the posterior teeth would be off the ridge. This could compromise function, fit, stability and integrity of the denture. A posterior cross bite set-up is indicated, using the K-mould.

Completed set-up of K mould set-up against natural dentition.
One-side posterior cross bite using the K mould and N mould

One-side cross bite with natural dentiton
Sandra Goergen

Sandra Goergen was born and educated in Germany. In 1990, she graduated from the school of dental technology and dental technical training in Hamburg. Sandra worked in different laboratories specializing in removables, hybrid dentures, implants, crown and bridge, attachments and the double crown technique.

In 1999 Sandra moved to Liechtenstein to work for Ivoclar Vivadent. There Sandra worked as a BPS Master technical consultant, field technical specialist and the primary instructor for the denture programs.

As part of her responsibilities for Ivoclar Vivadent, she travelled extensively through Europe, Asia and North America to conduct field educational programs to denturists, dentists, and technicians. In April 2004 Sandra moved to Canada and began working with Nancy Tomkins, denturist. Sandra and Nancy own CanDEC (Canadian Denture Education Centre). Sandra is the Education Manager - Technical for CanDEC. She continues to lecture in Japan, Korea and other countries for Ivoclar Vivadent.

Nancy Tomkins

Nancy Tomkins is a dental technician and licensed denturist trained at George Brown College, Toronto, Canada. As a dental technician, she has worked in commercial laboratories as a gold, ceramic, and denture technician.

Since graduating, with honours, from the Denturism program, (1988) she has been in private practice. Her denture clinic offers the services of a dentist, dental hygienist and associate denturist.

Nancy is an international lecturer, instructor and dental consultant for two of the world’s leading dental companies Ivoclar Vivadent and Straumann Implants. She is an ITI member, the International Team of Implantology.

Nancy is a certified Master BPS clinic and a certified BPS instructor for Ivoclar Vivadent. She has traveled to Australia, New Zealand several times to instruct BPS and Implant Overdentures. She lectures and trains across Canada to dental professionals on the clinical and technical aspects of denture fabrication.

In 2002 Nancy opened her own continuing education facility - CanDEC (Canadian Denture Education Centre) in her Brantford clinic. Through CanDEC, Nancy instructs denturists and their staff in many aspects of precision denture fabrication from the clinical to technical procedures. Her services include taking CanDEC ‘on the road’ traveling to denture clinics and laboratories training staff (e-mail: briggin@rogers.com).

Nancy instructs introductory, advanced and master level hands on overdenture courses for Straumann.