OCCLUSION IN CLINICAL PRACTICE WORKSHOP 2009

Lecture Presentations

- Occlusion pg 2
- Models and Facebow pg 5
- Examination pg 7
- Centric Relation Bite Records pg 16
- Equilibration of Natural Teeth pg 21
- Evaluation of mounted models pg 24
- Anterior Bite Plane pg 31
Section 1

The application of occlusion in practice

<table>
<thead>
<tr>
<th>EXAM</th>
<th>DIAGNOSIS</th>
<th>TREATMENT PLANNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>Joint</td>
<td>No treatment</td>
</tr>
<tr>
<td>TMJ</td>
<td>Muscle</td>
<td>Splint therapy</td>
</tr>
<tr>
<td>Muscles</td>
<td>Dental</td>
<td>Mounted models</td>
</tr>
<tr>
<td>Dental</td>
<td></td>
<td>Equilibration</td>
</tr>
<tr>
<td>Perio</td>
<td></td>
<td>Restoration</td>
</tr>
<tr>
<td>Photography</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DECISION TREE  Treatment Options  -  Treatment Sequence

OPTIONS FOR OCCLUSAL THERAPY AFTER THE EXAM

- No occlusal therapy, only esthetics, structure and biology
- Appliance therapy to aid in diagnosis
- Mount models to evaluate potential for occlusal change

After evaluating models:
- Choose no occlusal therapy
- Perform trial equilibration
- Perform the equilibration

After trial equilibration:
- Perform the equilibration

After evaluating models:
- Diagnostic wax-up to correct the occlusion
- Prepare teeth and equilibrate remaining teeth
- Prepare teeth and equilibrate the provisionals
- Restore teeth without altering the occlusion
**Common Treatment Protocols**

4. 10. Restoration

**Our Treatment Protocol for Asymptomatic Patients**

1. Exam → 2. Mount Models → 3. Trial equilibration and wax up
2. Prep and equilibrate → 5. Complete restoration and refine equilibration

**Our Treatment Protocol for Symptomatic Patients**

1. Exam → 2. Appliance therapy until symptoms are gone and repeatable bite records can be made
2. Mount models → 4. Trial equilibration and wax up
3. Prepare teeth and equilibrate → 6. Complete restoration and refine equilibration
SYMPTOMATIC PATIENTS

Diagnose the joint condition and know which treatment options are available
Diagnose the muscle condition and know which treatment options are available
Diagnose the dental condition and know which treatment options are available

Bill

50 y/o
Grinds teeth
Inadequate anterior guidance (guidance is on the balancing side)

What determines the disclusion of the POSTERIOR teeth
On the working side - joint stability, anterior guidance, and cuspal form
On the non-working side - angle of the eminence, anterior guidance, and cuspal form

How do I know what I can do to develop disclusion
Mount models - set the articulator - find out what’s possible
Section 2

EXQUISITE IMPRESSIONS

Alginate
- Hydrophilic
- Easy
- Accurate
- Patient friendly
- Economical

Alginate Substitute
- Hydrophobic
- Technique sensitive
- Less accurate than alginate
- Patient friendly
- Stable over time
- Multiple pours possible
- Economical

VPS
- Hydrophobic
- Technique sensitive
- Long set time
- Accurate as alginate
- Stable over time
- Multiple pours
- More expensive
Polyether
- Hydrophobic
- Technique sensitive
- Long set time
- Accurate as alginate
- Stable over time
- Multiple pours
- More expensive

FACEBOW

Transfer functional and esthetic information to the articulator for use in diagnosis and treatment planning

EXQUISITE MODELS
- Plaster
- Dental Stone
  - Buff
  - Mounting
  - Snap
- Die Stone
Pouring Models
- Clean impression
- Block tongue space
- Accurate measurement
- Vacuum mixer
- Suspend poured impression
- Base as necessary

Section 3

The Clinical Exam - TMJ and Muscle Screening

HISTORY

CLINICAL EXAM
- Muscle palpation
- Joint exam
- Tooth evaluation for wear patterns
Temporalis Muscle

Trapezius

Suboccipital
SCM

Digastrics

Hyoids
Masseter

Medial Pterygoid Muscle

Lateral Pterygoid Muscle
PALPATE JOINTS

PALPATE CAPSULE

PALPATE CAPSULE UPON CLOSED JAW

TESTING SOURCE OF PAIN

BILATERAL MANIPULATION
LOAD TEST

Leaf Gauge

If the Load Test is Positive:

- Lateral pterygoid
- Retrodiscal tissue
- Internal derangement

Cotton rolls - Lucia jig

If the patient is comfortable with load following it is most likely muscle

**If the patient is not comfortable use a bite plane**

Initial point of contact in centric relation
Functional occlusion

Anterior coupling

Contacts in excursions

Posterior clearance in protrusive
TEETH

Is the current occlusion physiologic or pathologic?

**PHYSIOLOGIC** are you going to alter it?
WHERE are you going to alter it?

**PATHOLOGIC** HOW are you going to alter it?

4 mandibular positions of tooth contact

- Maximum intercuspation (MIP, ICP .................... not CO unless coincident)
- Excursive pathways anterior and lateral to MIP
- End to End and crossover
- Retruded from MIP

Lateral pterygoid muscles are programmed by posterior teeth to permit closure into MIP

CHARTING PATTERNS OF WEAR

Anterior - Posterior

Right - Left - Forward

Flat - Cupped

Shiny - Satin

Sharp - Rounded

Areas of Occlusion - Areas NOT in Occlusion

Have teeth erupted

Has VDO changed
Occlusion Diagnosis and treatment Planning

JOINTS
Where is the disk?

MUSCLES
Are any muscles sore or tender to palpation?

TEETH
Is the current occlusion physiologic or pathologic?

PHYSIOLOGIC WHY are you going to alter it?
WHERE are you going to alter it?

PATHOLOGIC HOW are you going to alter it?

4 mandibular positions of tooth contact

- Maximum intercuspsation (MIP, ICP ...................... not CO unless coincident)
- Excursive pathways anterior and lateral to MIP
- End to End and crossover
- Retruded from MIP
Section 4

Making Centric Relation Records for Functional Analysis

Functional analysis is always done using bite records made in centric relation or adapted centric posture.

What is Centric Relation?

How Do I Find It?

- The position of the condyle when the lateral pterygoid is relaxed and the elevator muscles contract, with the disk properly aligned.

Methods of Obtaining Centric Relation

- Bilateral manipulation
- Leaf gauge
- Lucia jig
- Appliance

Factors Affecting Centric Recording

- Joint pain
- Muscle "splinting"

KEY: Obtaining centric relation is not about forcing the patient’s mandible into a seated condylar position, but simply removing the tension in the lateral pterygoid muscle which prevents the condyle from fully seating.

Use of Bilateral Manipulation
The function of loading during manipulation is to stretch the lateral pterygoid and evaluate if it is released.

If your joint exam was normal and tension or tenderness is present upon loading, it indicates the pterygoid has not released. This will require some deprogramming or the use of an appliance.

**Use of Bilateral Manipulation**

A. Advantages:
   - Efficient
   - "Feel" seating of condyle
   - Places anterior superior force
   - Reproducible

B. Disadvantages:
   - Learning curve
• Some patient's muscles cannot be managed

C. Indications:
• Manageable muscles

D. Contraindications:
• Severely splinted muscles
• Joint pain on loading

Use of a Leaf Gauge

The key to making a record using a deprogrammer is to use the patients elevator muscles for the purpose of loading. This means the patient must be asked to squeeze prior to the record for the purpose of load testing and also during the record to assure seating of the condyle.

35Simon and Nichols JPD July 1980 Centric relation as a range of positions in asymptomatic patients.

A. Advantages:
• Easy
• Adjustable
• Reproducible
• Muscles seat condyles

B. Disadvantages:
• Lack of operator "feel"
• Can distalize condyle

C. Indications:
• Joints which are pain free when loaded
• Any muscle condition

D. Contraindications:
• Joints which are painful when loaded
• When pterygoids won't release after 5 to 10 minutes as evidenced by tension increasing or not being relieved

Use of a Lucia Jig

Lucia Jig placed L-R

Lucia Jig placed A-P

marks including CR

Smooth Injecting Paste
The key to using silicone as a recording material is proper trimming. Any sponginess in the models is indicative most often of poorly trimmed records or a distorted model, not the softness of the silicone.

A. Advantages:
- Reproducible
- Can verify bite at time it is made
- Does not distalize condyle
- Muscles seat condyles
- Can use with any patient

B. Disadvantages:
- Lack of operator "feel"
- Not adjustable

How Do I Decide Which To Use?
- Bilateral manipulation
Section 5

Equilibration of the Natural Dentition

Critical Questions: When Do We Choose to Alter an Occlusion?

To treat occlusal pathology
To provide predictable restorative dentistry
When the dentistry will destabilize the existing occlusion
When the tooth that is the CR point of initial contact is being altered
When enough teeth are being altered that intercuspal position doesn’t exist

Goals of equilibration

Even stable posterior contacts in CR
Harmonious anterior guidance in lateral and protrusive excursions where possible
Lack of posterior tooth contacts in lateral and protrusive excursions
Lack of fremitus or mobility on guiding teeth

Trial Equilibration on Mounted Models

To verify the feasibility of the planned equilibration

Which cases benefit the most from a trial equilibration?

Anterior open bites
Lateral shifts from CR - MIP
Greater than 1 mm anterior shifts from CR-MIP
Whenever it is questionable that the anteriors can be coupled without restoration
Whenever you are in doubt about your ability to perform the equilibration

KAREN

37 y/o - doesn't like her smile
Kicked in the face at 19 and fractured right condyle
Must wear bite splint or has frequent severe headaches
Section 6

Evaluation of Mounted Models

Mounting and Evaluating Models

Step 1. Evaluate and clean up models

Step 2. Trim bite records
Step 3.  Mount upper model using facebow
Step 4.  Mount lower model using centric record

EVALUATION OF MOUNTED CASTS
How Do I Know My Mounting is Correct?

Verification

- Compare point of initial contact in CR in the mouth and on the models.

If They Match, Mounting is Likely Correct.

If They Don’t Match, Possible Causes:

- Distorted models; did bite record fit models?
- Laboratory error in mounting: check with split cast
- Incorrect point of initial contact in the mouth
- Incorrect bite record

Check Laboratory Mounting

- Remove magnet from upper plate
- Replace bite record **USED TO MOUNT** between models
- Close articulator while holding upper model in bite record. If split cast fits, mounting was done correctly. If it doesn’t fit, mounting was done incorrectly. Break off lower model and remount.
Use of magnetic plates and split cast to compare bite records.

- After verifying laboratory mounting
- Remove bite record used for mounting, and replace with other records
- Close upper member of articulator. If split casts line up, records match. If split casts don’t line up, records are different.

Compare other bite records using split cast to verify repeatability of position.

If records don’t match, patient may require appliance therapy for managing a muscle problem.

**NOTE:** if the points of initial contact don’t match the mouth but the records match, the laboratory mounting was done correctly.
NOTE: If the models aren’t distorted, the laboratory mounting was correct and both bite records are identical.

If the Marks on the Model are Anterior to the Mouth

- The mounting is wrong
- Redo the bite

If the Marks on the Model are Posterior to the Mouth or on Additional Teeth

- Trust the mounting

NAME: __________________________________________

Bite Records and Mounting Exercise

COLLECT 2 BITE RECORDS ON EACH OF YOUR PARTNERS
- Bilateral manipulation
- Lucia jig
- Leaf Gauge

COLLECT 1 PROTRUSIVE BITE RECORD FOR EACH PARTICIPANT

Each participant will have 6 "OR" bite records and 1 protrusive record

If you are in a group of 2 rather than 3 doctors - ask your faculty mentor to gather a set of slides from each of you so that there are 6 total slides per participant

<table>
<thead>
<tr>
<th>BILATERAL MANIPULATION</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUCIA JIG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEAF GAUGE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

M = Match
N = NO Match
U = Used to mount
Other Areas to Evaluate on the Models

- How close are all the teeth to contacting in CR?
- What is the posterior anatomy like? Flat or Steep?
- How do the midline and canines line up in CR?

Following Evaluation

- Appliance therapy
- Trial equilibration
- Diagnostic wax up
Section 7

Anterior Bite Plane

Decreased elevator muscle activity
Release of lateral pterygoid
Seat condyle

Common Names

- Hawley appliance
- Sved appliance
- NTI
- Best bite discluder

Indications

- Any muscle condition
- Immediate protection of porcelain
- Clenchers with healthy joints

Contraindications

- Joint pain on loading
- Any patient whose symptoms get worse
Risks

Anterior migration or posterior extrusion with excessive use
Mandibular repositioning
Clinical and Functional Examination

Evaluation of Joints, Muscles, and Occlusion for Spear Education Workshops.

*NOT a complete exam form - significant information has been omitted from this evaluation*

Data for ________________________  Collected by ______________________________

**HISTORY**  P = Past  N = Now

PERTINENT CONTRIBUTORY MEDICAL HISTORY and MEDICATIONS

- Headaches  ____ per week  Location ________________________________

- Clenching  ❑ DAY  ❑ NIGHT  ❑ Grinding  ❑ DAY  ❑ NIGHT

- Had/Have Ortho  ❑ Wear Splint  ❑ Been Equilibrated ____________________

- Trauma  ❑ External Signs of Trauma ________________________________

- Sleep  Time to fall asleep _____ min  Awaken ___ times  Fall back asleep in _____ min
  Hrs per Night _____  Awaken Rested  Y  N


- Facial Pain  __________  ❑ Limitations ________________________________

Notes:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
CLINICAL FUNCTIONAL EXAMINATION

MUSCLE ASSESSMENT

Score Muscle as 0 = NO PAIN  10 = WORST PAIN IMAGINABLE

<table>
<thead>
<tr>
<th>Muscle</th>
<th>L</th>
<th>R</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporalis Anterior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporalis Posterior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trapezius</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suboccipital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sternocleidomastoid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digastrics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyoids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masseter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medial Pterygoid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral Pterygoid*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TMJ EXAMINATION

Palpation
- Lateral pole
- Retrodiscal tissue

MANDIBULAR RANGE OF MOTION

- Mandibular deviation with opening
- Mandibular deviation in protrusion
- Overbite: ___ mm
- Overjet: ___ mm
- Maximum opening: _____ mm
- Movement measurement: to R: _____mm to L: _____mm
- Protrusive: ___ mm

- PAIN with movement: Location: ________________________________

- PAIN present with mandibular stabilization: YES  NO

MANIPULATION

- Easy  Difficult  Impossible

AUSCULTATION (manual / stethoscope / Doppler)

- Noise with Rotation: ___R  ___L  ___R  ___L
- Noise with Translation: ___R  ___L  ___R  ___L

PAIN
LOAD TEST

Leaf Gauge  R - +  L - +  □ Load Test NOT appropriate

☐ Cotton Rolls Placed  After Cotton Rolls  R - +  L - +

☐ Lucia Jig Placed  After Lucia Jig  R - +  L - +

CENTRIC RELATION

☐ Unable to Verify CR with Load Test

First Tooth Contact  ☐ ALL Teeth Contact  ☐ Right  ☐ Left  Teeth ___/___/___  ___/___

Degree and Direction of slide  Right ___  Left ___  Anterior ___  Posterior___  Vertical ___

FUNCTIONAL OCCLUSION

Anterior Coupling  ☐ YES  ☐ NO … most ANT teeth in contact ________________

Posterior Interferences in Excursions __________________________________________

Posterior Clearance in Protrusive End-to-End  L ___  R ___  (Condylar Inclination Setting)

WEAR

☐ Anterior teeth  ☐ Posterior teeth  ☐ Left side  ☐ Right side

☐ Worn areas flat  ☐ Worn areas cupped

☐ Worn surfaces shiny  ☐ Worn surfaces satiny

☐ Worn areas sharp  ☐ Worn areas rounded

☐ Worn areas in occl  ☐ Worn areas NOT in occl

☐ Teeth have erupted in areas of wear

☐ Teeth have NOT erupted in areas of wear  ☐ Vertical dimension appears closed

OCCLUSAL SIGNS

Thermal  ☐ WNL _________  Fracture  ☐ WNL _________  Mobility  ☐ WNL _________

Fremitus  ☐ WNL _________  NCCL  ☐ WNL _________  Crazing  ☐ WNL _________

Cracks  ☐ WNL _________  Percuss  ☐ WNL _________
## JOINTS

<table>
<thead>
<tr>
<th>RIGHT</th>
<th>LEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Comfortable</td>
<td>[ ] Comfortable</td>
</tr>
<tr>
<td>[ ] NOT comfortable</td>
<td>[ ] NOT comfortable</td>
</tr>
<tr>
<td>disk __ in place</td>
<td>disk __ in place</td>
</tr>
<tr>
<td>___ ligament laxity on lateral pole</td>
<td>___ ligament laxity on lateral pole</td>
</tr>
<tr>
<td>___ disk off lateral pole</td>
<td>___ disk off lateral pole</td>
</tr>
<tr>
<td>___ disk off medial pole</td>
<td>___ disk off medial pole</td>
</tr>
<tr>
<td>[ ] Unable to verify CR</td>
<td></td>
</tr>
</tbody>
</table>

## MUSCLES

- [ ] Comfortable
- [ ] NOT comfortable
  - Elevator [ ] +  
  - Positional [ ] +  
  - Cervical [ ] +

## OCCL

- [ ] Inadequate anterior guidance
- [ ] VDO closed
- [ ] Significant signs
  - [ ] Wear from attrition (occlusal)
    - [ ] MIP
    - [ ] Excursive
    - [ ] End to End / X-over
    - [ ] Retruded
  - [ ] Wear from erosion (chemical)
    - [ ] GERD
    - [ ] Other ____________________________

## OCCLUSAL DIAGNOSIS

- [ ] Physiologic Occlusion
  - [ ] NO treatment required
  - [ ] Treatment required - occlusion not effected
  - [ ] Treatment required - occlusion effected
  - [ ] Pathologic Occlusion
Bite Records and Mounting Exercise

COLLECT 3 BITE RECORDS ON EACH OF YOUR PARTNERS

- Bilateral manipulation
- Lucia jig
- Leaf Gauge

COLLECT 1 PROTRUSIVE BITE RECORD FOR EACH PARTICIPANT

Each participant will have 6 "CR" bite records and 1 protrusive record

*If you are in a group of 2 rather than 3 doctors - ask your faculty mentor to gather a set of bites from each of you so that there are 6 total bites per participant*

<table>
<thead>
<tr>
<th>BILATERAL MANIPULATION</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUCIA JIG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEAF GAUGE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

M = Match
N = NO Match
U = Used to mount
Exam Findings which Indicate a Need to Mount Models or Alter the Occlusion

Assuming the exam findings of the TMJ’s to be acceptable. i.e.) if any pain on loading was present, it was decreased with an anterior deprogrammer.

1. Pain upon loading that was decreased with the anterior deprogrammer.

   Indicated lateral pterygoid involvement
   
   Mount models
   Consider occlusal correction

2. Muscle palpation tenderness

   May be occlusally related
   
   Mount models
   Consider occlusal correction

3. Dental findings

   □ Pathologic wear
   □ Fractures
   □ Mobility

   Mount models
   Consider occlusal correction

4. Evaluate initial point of contact in centric relation

   • Tooth #’s ______________________
   • Evaluate how close other teeth are to contact in CR

   □ Several other teeth within .1 to .2 mm from contact
   □ No teeth within .5 to 1 mm of contact in centric relation except initial point of contact

   □ If you are planning to restore the point of initial contact and no other teeth are within .5 mm of contact in CR

   Mount models
   Consider occlusal correction
5. Evaluate slide from CR – CO

• Lateral shift measured at midline from CR – CO _____mm  R or L
• Anterior shift measured as overjet change between maxillary and mandibular incisors from CR – CO _________mm
• Vertical change measure in overbite change from CR – CO _____mm

☐ If a lateral shift greater than .5 mm exists
☐ If an anterior shift greater than 1 mm exists
☐ If a vertical shift greater than 1.5 mm exists

• Mount models
• Consider occlusal alteration

6. Evaluate teeth to be restored

☐ Initial point of contact in CR is being restored
☐ More than 3 – 4 posterior teeth are being restored
☐ All anteriors are being restored
  o Mount models
  o Consider occlusal correction