FGTP

Facially Generated Treatment Planning

SECTION 1

Presentation Notes

SECTION 2

Decision Tree

SECTION 3

Handouts
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Facially Generated Treatment Planning

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Facially Generated Treatment Planning 2009

Mastering the Art of Treatment Planning and Treating Anterior Esthetic Dilemmas

Exam
- History
  - TMJ
- Muscles
- Dental
- Perio
- Photography

Treatment Planning
- Diagnosis
- Esthetics
  - Function
- Structure
  - Biology

THE DECISION TREE - Treatment Options and Treatment Sequence

Linear and Consistent Planning

KEY: Sequence of Treatment is NOT related to Sequence of Planning

**Dental Esthetics**
- Tooth position relative to the face
- Gingiva (free gingival margin and papillae)
- Arrangement (alignment and position)
- Contour (proportion and outline form)
- Color (shade, character, texture and luster)

The KEY to treating dental esthetics is to learn how to evaluate each of the 5 major areas.

- Know if an area needs correction
- Know how to treatment plan the correction
- Know how to technically execute the correction

KEY: When the tooth position, gingival levels and arrangement of the teeth are correct, dental esthetic treatment is focused on changing tooth shape and color.
KEY: When tooth position, gingival levels and arrangement are not acceptable, treatment is much more complicated and often involves the occlusion.

DEVELOPING THE ESTHETIC TREATMENT PLAN

Requirements for Planning

- Photographs
- Radiographs
- Charting
- Mounted models

Any of these that are left out inhibits your ability to plan and present treatment.

Diagnosis and Treatment Planning Challenging Anterior Relationships
The Most Complicated Plans Always Involve Aberrant Tooth Eruption from:

- Wear
- Tooth loss
- Excess overjet
- Inadequate overjet

Possibilities for Aberrant Eruption

- Excess eruption
- Under eruption
- Proclined
- Retroclined

How do I Know what to Do?

Establish maxillary tooth position esthetically
Establish maxillary gingival levels to correct tooth size
Alter mandibular tooth position to correct the occlusion and esthetics

Patient desiring longer incisors and has an end-to-end occlusion

What Do We Use To Evaluate Eruption:
1. Upper central incisal edge to face
2. Upper incisor inclination
3. Upper occlusal plane
4. Upper gingival levels
5. Lower incisal edge to face
6. Lower incisor inclination
7. Lower occlusal plane
8. Lower gingival levels

Always start with models mounted with condyles in a seated position!

STEPS IN THE PLANNING PROCESS

1. Evaluate the Central Incisor Incisal Edge to Face
   - Acceptable display
   - Excessive display
   - Inadequate display
2. Maxillary Incisor Inclination

- Correct
- Proclined
- Reclined

3. Evaluate the Maxillary Occlusal Plane Relative to the Ideal Maxillary Central Incisor Position

- Level
- Incisor coronal to posterior
- Incisor apical to posterior

Treatment Options to Level Plane

- Alter anteriors
- Alter posteriors
4. **Determine Ideal Gingival Levels**

- Correct tooth proportion
- Acceptable tissue display
- Symmetry

Once the fundamental parameters of tooth position and gingival levels are determined for the maxillary arch, it is now time to correct the esthetics and function of the mandibular arch.

5. **Evaluate the Mandibular Central Incisal Edge To Face**

- Acceptable display
- Excessive display
- Not visible
KEY: On the mandibular arch, the incisors can be positioned at several levels and be acceptable.

This means in the mandibular arch it is often possible to level the occlusal plane acceptably with either option.

6. Mandibular Incisor Inclination

- Correct
- Proclined
- Reclined

7. Evaluate the Mandibular Occlusal Plane

- Level
- Incisor coronal to posterior
- Incisor apical to posterior
Treatment Options

- Alter anteriors
- Alter posteriors

How Will We Decide?

- Crown length
- Which teeth need restorations

8. Evaluate Mandibular Gingival Levels

Alter Anteriors to Level Plane

- Acceptable
- Coronally positioned
- Apically positioned

Alter Posteriors to Level Plane

- Acceptable
- Coronally positioned
- Apically positioned
How will the gingival levels need to change when the different options for leveling the occlusal plane are considered:

- Alter anteriors to match posteriors
- Alter posteriors to match anteriors

Often evaluating which teeth need or do not need restoration will clarify the choice of how to level the mandibular plane, i.e. alter anterior teeth vs. posterior teeth.

**Always start with models mounted with condyles in a seated position!**

9. **Evaluate Which Teeth Need Restorations?**

- Maxillary anteriors
- Maxillary posteriors
- Mandibular anteriors
- Mandibular posteriors

Does knowing which teeth need restoration, aid in determining how to level the occlusal plane?

10. **Once the Occlusal Planes are Level, Determine How to Create an Acceptable Occlusal Relationship Between the Arches**

Our focus so far has been primarily on leveling occlusal planes and correcting crown length. Now let’s integrate all the areas of dentistry into our planning.
DEEP OVERBITE ON A PATIENT REQUIRING RESTORATION OF HIS ANTERIOR TEETH

NO OVERBITE ON A PATIENT REQUIRING RESTORATION OF HIS ANTERIOR TEETH
PHASING TREATMENT

The most common challenge to phasing is tooth position
The most common solution is to correct tooth position transitionally

SEQUENCING THE PLANNING PROCESS

Esthetics - Function - Structure - Biology

1a. Evaluate the Central Incisor Incisal Edge to Face

- Acceptable
- Excessive display
- Inadequate display

1b. Midline

- Acceptable
- Canted
2. Maxillary Inclination of the Anterior Teeth

- Acceptable
- Proclined
- Reclined

**Nasolabial Angle**

- Acceptable (85° - 105°)
- Acute
- Obtuse

3a. Evaluate the Maxillary Occlusal Plane Relative to the Ideal Maxillary Central Position:

- Level
- Incisor coronal to posterior
- Incisor apical to posterior

3b. After identification of the central incisor position, decide where to place the lateral
incisors, cuspids, premolars, and molars, buccal cusps only. The position of the laterals, cuspids, and buccal cusps of premolars and molars is an esthetic decision (Smile Line).

4a. Gingival Levels

- Acceptable
- Coronal to ideal
- Apical to ideal

Using the desired incisal edge position as a reference, evaluate the gingival margins.

**KEY:** the gingival margins are positioned to create the desired tooth size relative to the incisal edge.

**KEY:** the incisal edge is not positioned to create the correct tooth size relative to free gingival margin levels.

Using gingiva as a reference to position the incisal edges is dangerous because gingiva can move with eruption or recession.

4b. Determine Ideal Gingival Levels:

- Width/length ratio of teeth
- Desired gingival display
- Symmetry
4c. Evaluate papilla levels relative to overall crown length:

- Symmetric
- Asymmetric

4d. Evaluate Proposed Papilla Height to Contact Length:

- Acceptable
- Unacceptable

**KEY:** Ideal is approximately 50% contact 50% papilla.

4e. **Arrangement:** Evaluate if the desired arrangement is possible restoratively.

**KEY:** If in doubt, perform a diagnostic wax-up.

4f. **Contour:** Does the patient have any specific requests concerning tooth shape?

4g. **Shade:** Does the patient have any specific requests concerning shade?

**KEY:** Will this affect the number of teeth being treated?

**NOTE:** The key to treatment planning is to determine the ideal endpoint of treatment. Then compare it to the current condition.

Treatment is indicated when the desired endpoint and the current condition don’t match.

**KEY:** Not until the endpoint of treatment is identified can the method of treatment be chosen.
Develop the Esthetic Treatment Plan for the Mandibular Teeth

5. Evaluate Mandibular Incisors Incisal Edge Position to Face:
   - Acceptable display
   - Excessive display
   - Not visible

6. Mandibular Occlusal Plane:
   - Level
   - Incisors coronal to posteriors
   - Incisors apical to posteriors

7. Evaluate Mandibular Incisors Labiolingual Inclination:
   - Acceptable
   - Proclined
   - Reclined

**KEY:** The final mandibular incisal edge position will be determined during the functional and structural phases of planning.

8. Current Gingival Levels:
   - Acceptable
   - Coronally positioned
   - Apically positioned
How Will the Gingival Margins Need to Change when the Different Options for Leveling the Occlusal Plane are Considered?

a. Altering anteriors to level occlusal plane
   - Acceptable
   - Coronally positioned
   - Apically positioned

b. Altering posterior to level occlusal plane
   - Acceptable
   - Coronally positioned
   - Apically positioned

9. Which Teeth Need Restoration?
   - Maxillary anteriors
   - Maxillary posteriors
   - Mandibular anteriors
   - Mandibular posteriors

10. Once the Occlusal Planes are Level, Determine how to Create an Acceptable Occlusal Relationship Between the Arches
Steps to Integrating Function and Esthetics

Evaluate TMJ’s and muscles

- Make centric relation record and mount models

My definition of centric relation: The positions of the condyle when the lateral pterygoid is relaxed and the elevator muscles contract with the disk properly aligned.

**KEY:** Can the desired esthetic changes be made without altering the occlusion?

Steps in Correcting the Occlusion

Transfer the Esthetic Changes in Maxillary Tooth Position to the Upper Model.

1. Level the mandibular occlusal plane
   - Alter mandibular incisor position
   - Alter mandibular posterior position

**KEY:** Will leveling the occlusal planes create an acceptable anterior relationship?

- If the answer is yes and the leveling involved only the mandibular incisors then the existing vertical dimension can be retained.
- If the answer is no or the leveling involved mandibular posterior teeth, the existing vertical dimension may need to be altered.

**KEY QUESTION?** Does altering the vertical dimension result in an acceptable tooth form and anterior relationship?

Existing anterior relationship

Desired maxillary anterior tooth position
Open vertical

Wax lingual to contact. Unacceptable lingual tooth form

Reshape lingual

Close vertical and add to facial of lower to correct entire contact

Final corrected anterior relationship showing how much posterior teeth will need to be altered
STRUCTURE

Choose the type of restoration for restoring teeth and tooth replacement.

**Anterior Teeth**
- Bonding
- Veneers
- Bonded all ceramic crowns
- Luted all ceramic crowns
- Metal ceramic crowns

**Posterior Teeth**
- Direct
- Inlays
- Onlays
- Crowns

**Missing Teeth**
- Implants
- Fixed partial dentures
- Removable partial dentures

**Criteria to Evaluate Structurally**
- Current crown length
- Crown length after any gingival changes are performed for esthetics
- Current ferrule amount
- Does space exist for a build-up?
- How will any crown lengthening for structural purposes alter the esthetics?
Methods for Increasing the Retention of Restorations

- Build-up
- Crown lengthen
- Forced eruption
- Bond the restoration

Crown length after gingival alterations for esthetics

Space does exist for a build-up of acceptable prep length
Without a build-up it would be necessary to prepare into the attachment to gain adequate prep length or do crown lengthening.

Using a build-up would leave ideal esthetics and require no movement of the papilla.

Not using a build-up would require crown lengthening surgery and move the papilla apically, but still leave an acceptable esthetic result.

BIOLOGY

- Endodontics
- Periodontics
- Surgical

Biologic treatment planning is about establishing health with the tissue in the desired location.

**Endodontics**
- For teeth that are structurally and periodontally salvageable, complete necessary endodontics.

**Periodontics**
- Develop definitive periodontal therapy to create a healthy periodontium based upon the esthetic, functional and structural needs of the restoration.

**Elective Periodontics**
- Determine the method of correction of any esthetic periodontal concerns.

**Surgical**
- Determine the surgical treatment plan for any skeletal concerns.
SEQUENCING OF THERAPY

1. Acute problems first
2. Whichever component seems most logical and facilitates the next phase of treatment,
   provided the result can be clearly identified, communicated and achieved for the pertinent phase.
THE ESTHETIC EXAMINATION

DIGITAL PHOTOGRAPHY

Choosing and Setting Your Digital Camera

Choosing a Camera

Nikon D-100 and D-70 and D-50
- 6 megapixel
- Nikon 105 mm macro
- Nikon SB-29S

Exposure control is all manual, SB-29S doesn’t work TTL on Nikon bodies

Fuji S-2 Pro
- 6 megapixel sensor (12 megapixel interpolated resolution)
- Nikon 105 mm macro
- Nikon SB-29S

Flash does work TTL

Canon EOS-20D
- 8 megapixel
- Canon 100 mm macro
- Canon MR 14-EX
- Canon MT 24-EX

Excellent white balance control for color

Canon EOS (Digital Rebel)
- 8 megapixel
- Canon 100 mm macro
- Canon MR 14-EX
- Canon MT 24-EX

White Balance
- Auto  AWB
• Manual (Sun 5500K, Shade 7500K, Cloudy 6500K, Incandescent 2800K, Fluorescent 3800K, Flash 5500K)
• Custom (6000K)

Setting the white balance on Flash is always safe.

**Setting Exposure (Manually vs. ETTL)**

**Setting Exposures Manually**

• Adjust the histogram by adjusting the F-stop
• Point and shoot cameras are unable to shoot at F-stops that provide great depth of field

**Setting Exposure Electronically with TTL Metering**

• Adjust the histogram with exposure compensation

**Shade Selection**

• Hue
• Chroma
• Value
• Texture
• Character
The digital workspace has several problems which must be managed to correct color. First, monitors all vary in their color, and in fact change while in use. To correct this, a monitor calibration software and spider must be used, and redone every few months.

**Products:**  *GretagMacBeth – Eye-One Display*

Next, your printer’s ability to reproduce the colors on your monitor must be corrected. This is done by creating ICC profiles which are used during the printing process.
Steps for Profiling Your Printer

- Get profile for your printer and paper from printer manufacturer or have one made (Chromix at www.Chromix.com) call Rick Hatmaker at Chromix 206-985-6837 extension 7.
- Print from a color aware program such as Adobe Photoshop

Go to file – print preview – select print space and apply profile for your printer and paper – print – correct settings on your printers driver and select no color management – print.

PHOTOGRAPHIC VIEWS
Views 1, 2, 4, and 4: Full face view - lips at rest and full smile, Profile view - lips at rest and full smile

- Patient is standing or sitting in office type chair.
- Head upright and level.
- Position camera at patient’s eye level.
- Place a black background four to six feet behind patient (matte black foam core poster board held by assistant).
- Hold camera horizontal.
- Adjust the focus on the patient’s eyes so the magnification shows to the top of the head and two to three inches below the chin.
- Place the patient’s nose in the center of the photograph vertically and horizontally.
- Turn patient 90 degrees for profile views.

View 5: Close-up, upper lip at rest

- Patient is seated in the dental chair, head in the headrest and chair slightly reclined. The patient’s head is not leaning left or right.
- Hold the camera perpendicular to the patients face.
- Adjust the magnification to show just beyond the corners of the lips.
- Hold the camera parallel to the floor horizontally so the midline of the upper lip is centered left to right.
- Ask the patient not to smile, but to open his mouth about one half inch.
- Center the borders of the upper lip and lower lip the same distance from the edges of the frame vertically.
- Focus on the upper lip and expose.

View 6: Close-up, smile

- Patient position is the same as view 1.
- Hold the camera in the same orientation as in View 1.
- Magnification is the same as in view 1.
- Ask the patient to smile and show as much of his teeth as possible.
- Center the central incisors vertically in the frame
- Focus on the centrals and expose.

View 7 and 8: Right and left lateral, smile

- Patient position is the same as view 1.
- Move the camera to the right or left so it is perpendicular to the lateral and canine area both horizontally and vertically.
• Adjust the magnification so that corner of the mouth to the opposite central is visible.
• Center the embrasure between the lateral and cuspid in the middle of the frame horizontally.
• Adjust the framing so the middle of the centrals is in the center of the frame vertically at one border and the corner of the mouth is in the vertical center of the frame at the other border.
• Ask the patient to smile fully
• Focus on the lateral and cuspid and expose.

**Intraoral Views With The Lips Retracted**

**KEYS:**
• Use the largest end of the wire retractors as possible.
• Gently but firmly pull retractors out laterally and forward away from the face. This pulls the cheeks away from the teeth.
• Do not pull the retractors back towards the ears, as this pulls the lips and cheeks against the teeth.
• For occlusal views with mirrors, rotate the retractor to pull the lip away from the arch being photographed.
• For lateral views with mirrors, after placing the mirror, remove the retractor on the mirror side, and relax the stretch on the remaining retractor, so the mirror can adequately retract the lip.

**Views 9 and 10: Retracted view of upper and lower teeth**

• Position dental chair and patient, with head in headrest, as in previous photos.
• Camera is perpendicular to the patient’s face and the horizontal axis is parallel to the floor.
• Magnification adjusted so the posterior teeth are visible back to the molars.
• Midline centered horizontally.
• Center the midpoint of the central incisors vertically.
• Focus on the cuspids and expose.
• For view 10, have the patient open until there is a 4 mm space between upper and lower teeth.

**View 11: Close-up view of the maxillary anterior teeth**
• Patient position is the same as previous photos.
• Have patient open mouth one half inch, or until lower teeth are out of view.
• Use retractors to lift upper lip vertically, exposing maxillary incisors and gingival.
• Adjust magnification to show just maxillary six anteriors.
• Hold camera perpendicular to face.
• Center midline horizontally.
• Focus on the centrals and expose.

View 12: Close-up view of mandibular anterior teeth

• Patient position is the same as in previous photos.
• Have patient open mouth one half inch, or until maxillary teeth are out of view.
• Use retractors to move lower lip down, exposing mandibular incisors and gingival.
• Adjust magnification to show just mandibular six anteriors.
• Center midline horizontally.
• Place the incisal edges of the mandibular anteriors just above the middle of the frame vertically.
• Focus on the centrals and expose.

View 13: Mirror view maxillary occlusal

• Patient position is the same as in previous photos.
• Place retractors.
• Warm occlusal mirror in water and dry to prevent fogging.
• Place mirror with far edge distal to second molars and hold off occlusal surfaces of second molars.
• Ask patient to open wide.
• Ideally, the mirror is at a 45 degree angle to the occlusal plane of the arch.
• Adjust the magnification to get the buccal of molars and labial of centrals, but as little of the lips or retractors as possible.
• Have the assistant roll the retractors so the upper lip is away from the anterior teeth.
• Center the arch in the frame.
• Focus on the premolars and expose.
• In some instances, the maxillary occlusal view is easier with the patient fully reclined and the photographer standing behind the patient's head shooting into the mirror.

View 14: **Mirror view mandibular occlusal**

• Position patient, head tilted back in headrest, so dental chair is reclined 45 degrees.
• Retractors placed.
• Warm mirror and dry to prevent fogging.
• Place mirror so far edge is distal to second molar and hold mirror off occlusal surface of molar.
• Ask patient to open wide.
• Ideally, adjust mirror so it is at a 45 degree angle to the occlusal plane of the mandibular arch.
• Adjust magnification to get buccal of molars and labial of anteriors, but as little of the retractors or cheeks as possible.
• Have the assistant roll the retractors to pull the lower lip away from the mandibular anteriors.
• Center the arch in the frame.
• Focus on the premolars and expose.

View 15, 16, 17 and 18: **Left and right lateral views in occlusion, teeth separated**

• Patient seated in standard photo position, with head in headrest.
• Place retractors.
• Warm and dry lateral mirrors.
• Pull retractors on side to be photographed so cheek is stretched out, while at the same time relaxing the opposite retractors.
• Insert mirror back to second molar and remove the retractor on mirror side.
• Use mirror to retract cheek. Ideally, place mirror 45 degrees to posterior teeth and hold it away from buccal of second molars.
• Adjust magnification to show from second molar to central incisor.
• Hold camera perpendicular to buccal surfaces of posterior teeth.
• Center occlusal plane of molars vertically on one edge of the frame and the center of the maxillary central incisors vertically on the other end of the frame.
• Focus on the premolars and expose.
• Have patient open 3-4 mm and re-shoot both right and left sides.
View 19: Close-up view of End-to-End and/or Crossover

- Position dental chair and patient, with head in headrest, as in previous photos.
- Camera is perpendicular to the patient’s face and the horizontal axis is parallel to the floor.
- Magnification adjusted so the posterior teeth are visible back to the molars.
- Midline centered horizontally.
- Center the midpoint of the central incisors vertically.
- Ask patient to move teeth to desired position.
- Focus on the cuspids and expose.

View 20 and 21: Other Views (taken as needed) – Max & Mand Marked Occlusals

- Patient seated in standard photo position, with head in headrest.
- Place retractor(s).
- Warm mirror and dry to prevent fogging.
- Place mirror so far edge is distal to second molar and hold mirror off occlusal surface of molar.
- Ask patient to open wide.
- Ideally, adjust mirror so it is at a 45 degree angle to the occlusal plane of the arch being captured.
- Adjust magnification to get buccal of molars and labial of anteriors, but as little of the retractor(s) or cheeks as possible.
- Have the assistant roll the retractor(s) to pull the lip away from the anteriors.
- Center the arch in the frame.
- Focus on the premolars and expose.

View 22: Close-up, exaggerated “E”

- Patient position is the same as view 1.
- Hold the camera in the same orientation as in View 1.
- Magnification is the same as in view 1.
- Ask the patient to say and hold the “EEEEEEEEEE” sound.
- Center the central incisors vertically in the frame.
- Focus on the centrals and expose.
Helpful Hints

• **Magnification:**
  Use the focus adjustment to set the magnification before framing and exposing each photograph.

• **Focus:**
  Once the magnification is set, adjust the actual focus by moving in and out with the camera, not by changing the camera focus. Be sure to stabilize the patient’s head in the headrest.

• **Framing:**
  Try to keep the camera perpendicular to the frontal plane of the patient’s face for all views so that the photos show the same perspective you see in a normal conversation with the patient.

• **Retraction:**
  The goal is to always keep retractors, mirrors, lips, cheeks, etc. out of the borders of the pictures. Before exposing each photo, check the borders for any extraneous items.

• **Flash Location:**

  1. For ring lights, dual flash, or fixed flash cameras, no adjustment is necessary.

  2. For single point rotating bracket cameras:
     • Full face: flash at 12 o’clock
     • Close-up smile: flash at 3 or 9 o’clock
     • Retracted frontal view: flash at 3 or 9 o’clock
     • Any retracted lateral view: flash toward anterior
     • Any mirror view: flash toward mirror
FACIAL EVALUATION

Facial Proportion

- Glabella to base of nose
- Base of nose to chin

In an ideal face Mid-face 52%, Lower face 48%

- If the lower face is shorter than the midface, the patient may benefit esthetically from the chin moving inferiorly
- If the lower face is longer than the midface, the patient may benefit esthetically from the chin moving superiorly

Lip Fullness and Symmetry

- Upper lip symmetry - an asymmetric upper lip will result in an asymmetric tooth and gingival display
- Upper lip fullness - a full upper lip makes the teeth look smaller and darker
  - a thin upper lip makes the teeth look larger and whiter

- Lower lip symmetry - an asymmetric lower lip results in an incisal plane that may look canted

- Lower lip fullness - a full lower lip makes the teeth look smaller
  - a thin lower lip makes the teeth look larger

  a. Thin lips, convex profile, high lip line, tendency toward smaller teeth:
  - 9.0 to 10.5 mm

  b. Thick lips, flat profile, long lip, tendency toward larger teeth:
  - 10.5 to 12.0 mm.

Esthetic Plane (Rickets “E” Plane) – Tip of nose to chin

- Ideal: Upper lip 4 mm behind plane, lower lip 2 mm behind plane

Useful for determining if problem is soft tissue, dental or both.

- Concave profile (nose and chin dominate) teeth can be made larger
• Convex profile (lips and teeth dominate) teeth may need to me made smaller

Facial Changes with Age

• Decreased maxillary tooth display
• Increased mandibular tooth display

TOOTH POSITION

The Five Esthetic Keys:
• Midline
• Incisal edge position
• Incisal plane/smile line
• Occlusal plane
• Gingival level

MIDLINE

• Location to face
• Philtrum = midline of face
• Papilla = midline of teeth
• Contact = most variable and visible of midline elements

Causes of midline asymmetries:
• Missing teeth
• Skeletal asymmetries

KEY: All facial embrasures parallel the facial midline
INCISAL EDGE POSITION OF CENTRALS

Evaluate Tooth Display with Lip At Rest

Average tooth display at rest of 1-3 mm is pleasing in most people.

Caucasian females

- Age 30
  - 3.37 mm maxillary incisor display at rest
  - 0.50 mm mandibular incisor
- Age 50
  - 0.95 mm maxillary incisor display at rest
  - 2.00 mm mandibular incisor
- Age 70
  - 0.00 mm maxillary incisor display at rest
  - 2.95 mm mandibular incisor

Evaluate maximum lip movement with laughing or “E” sound.

Average lip moves 6-8 mm from rest to full smile.

A 1-3 mm tooth display at rest and 6-8 mm lip movement give a range of 7-11 mm of tooth and tissue exposure on the average.

Ideal Goal: During full smile, show free gingival margin of centrals that are 9.5-11 mm.

The less the lip moves during a smile, the more tooth will have to show at rest to achieve enough tooth display when smiling.

- The greater the lip movement during a smile, the less tooth can show at rest to avoid excessive tooth and tissue display when smiling.

Tooth Position and Phonetics

- “F and V” sounds – to evaluate maxillary anterior incisal edge position to lower lip
- “S” sounds – to evaluate relationship of maxillary anterior teeth to mandibular incisors
- “Th” sounds – to evaluate cingulum contour to tongue relationship
TOOTH SHADING AND COLOR

• Desired changes?

SMILE APPEARANCE

• Reverse smile line
• Excessive

INCISAL PLANE

The line formed by the tips of the canines and the incisal edges of the anterior teeth.

Ideal Goal: A harmonious relationship should exist between the curvature of the lower lip and the line of the teeth.

Incisal Plane Evaluation:

1. Step I: Incisal plane to face: (lower lip)
   • Acceptable
   • Unacceptable

2. Step II: Incisal plane to molars
   • Level
   • Not level

3. Step III: Molars to eyes
   • Acceptable
   • Unacceptable

4. Step IV: Crown length
   • Acceptable
   • Unacceptable
If the incisal plane is incorrect and the molars are correct, treatment can be limited to the anterior teeth, consider:

1. Orthodontics
2. Periodontal surgery and restoration

If the incisal plane is incorrect and the occlusal plane is incorrect, it means the entire maxilla is canted, consider:

Causes of incisal plane problems:
1. Trauma
2. Tooth wear
3. Skeletal

**OCCLUSAL PLANE**

The line formed by the tips of the canines and the buccal cusps of the posterior teeth.

**ARCH FORM – BUCCAL CORRIDOR**

Medio-lateral position of posterior teeth (negative space, buccal corridor).

**Ideal Goal:** “U” shaped arch.
The posterior teeth play an important role in filling out the buccal corridor during a smile. However, there is not one correct look.

Evaluate arch form by using negative space from canine back during a smile and by looking at occlusal view of maxillary arch.

**GINGIVAL LEVELS**

- Gingiva to lip relationship
- Gingival symmetry

**Differential diagnosis for a gummy smile:**

1. Short upper lip
2. Hypermobile lip
3. Vertical maxillary excess (VME)
4. Anterior over-eruption
5. Wear and compensatory eruption
6. Altered active eruption
7. Altered passive eruption

- If tooth display at rest is normal and crown length is normal, but the patient has a gummy smile, patient has a hypermobile lip.
- If patient has excessive tooth display at rest, VME, short upper lip or anterior over-eruption.

**E. Evaluate FACIAL HEIGHT**

- From glabella to base of nose and from base of nose to bottom of chin with face at rest and teeth in occlusion, should be equal distance.

- If excess tooth display exists at rest and lower facial height, is greater than mid facial height, probably VME and maxilla can be impacted if facial proportion of width to length will be acceptable.

- If excess tooth display at rest but mid and lower facial heights are equal, probably short upper lip or anterior over-eruption.
DEVELOPING THE OCCLUSION

1. Evaluate the TMJs
   Load Test
   Translation
   Stability

2. Evaluate the muscles
   History
   Palpation
   Test against load

3. Evaluate the teeth
   Wear
   Fractures
   Mobility
   Attrition - Erosion - Abrasion - Unknown

4. Mount models
5. Develop the occlusion

Maxillary anteriors esthetically

Maxillary posteriors esthetically

Mandibular anteriors esthetically and end-to-end protrusive and lateral

Mandibular anteriors at canine end-to-end end-to-end

Develop centric contacts

  Alter lingual of maxillary anteriors

  Alter occlusals of posterior teeth

Correct pathways of guidance to desired pattern
Patients with no attrition  \( CR = ICP \) (MIP)

Anterior guidance

No posterior contacts in excursive movements

PATTERNS OF WEAR AND OCCLUSAL DESIGN

Attrition can only occur when the mandible is moving

Your choices in occlusal design

- Design the guidance to alter mandibular movement
- Tolerate the guidance through force distribution on multiple teeth

Rationale for “Anterior Guidance”

Separate the posterior teeth during eccentric movements

“Weak link” of Anterior Guidance

All force concentrated on very few teeth
Rationale for “Group Function”

Distribution of forces over multiple teeth

“Weak link” of Group Function

Increased muscle activity due to more posterior tooth contact

Attrition Patients

Occlusion with anterior guidance will not stop bruxism - some patients will however change their pattern of behavior with a change in occlusion so test it in plastic -

If attrition continues: distribute load on multiple teeth

Trial therapy

- Appliance
- Equilibration
- Restoration (Bonding)
- Provisionals
Evaluate for

- Wear facets
- Fractures
- Tooth mobility
- Muscle symptoms

Did the patient continue to grind during trial therapy?

If the patient grinds in trial therapy identify the patterns and positions the patient grinds and design the occlusion accordingly

POSITIONS to CONSIDER

Retruded (CR) Wear  - wear on molars, less on premolars, may be minimal or non-existent on anteriors
Pathway wear (restricted) - patient doesn’t reach end-to-end positions

Look at facets on lower anteriors

Lack of horizontal facets = restricted wear

Design using custom incisal guide table

Broad shared contacts in excursions

Check mounted models in ICP - if occlusion fits without anteriors contacting wear facets it is unlikely that a CR interference is responsible for the wear

Possible etiologies

- Functional wear during chewing
- Neurologic behavior

Test the etiology with a mandibular appliance to see if a similar wear pattern is revealed
Patient reaches end-to-end but not crossover

Use group function for lateral and protrusive guidance

Protrusive only

Use distal of maxillary canines and first premolar against mesial of lower premolars in group function protrusive guidance

Lateral but not crossover

Use group function on canines and premolars in lateral excursions
Pathway but not cross-over
Cross-over - beyond canines

Maxillary centrals notched on mesial or mesial shorter than distal
End-to-End ONLY wear

NO wear on any pathways or posteriors
The Clinical Exam - TMJ and Muscle Screening

Clinical Failure

- Clinical techniques and materials
- Patient response

We can’t control the patient response, but we must try and predict it.

What Patients are at the Highest Risk for Clinical Failure?

- Bruxers
- TMJ problems
- Multiple structurally or periodontally compromised teeth
- Psychologically challenging

It is critical to the well being of your practice that you identify these patients prior to treatment and make a conscious decision as to whether you want to treat them.

After the Exam

- Treat as is
- Mount models
- Alter occlusion
- Refer

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. Anterior deprogrammer decreased tension or tenderness.

Indicated lateral pterygoid involvement

- Mount models
- Consider occlusal correction

2. Muscle palpation tenderness

May be occlusally related
Temporalsis Muscle

Trapezius

Suboccipital

SCM
Digastriks

Hyoids
PALPATE JOINTS

PALPATE CAPSULE

PALPATE CAPSULE UPON CLOSURE

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

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

The Masseter, Medial Pterygoid, and Temporalis are ELEVATOR muscles which seat the condyle when contracted.

The Lateral Pterygoid POSITIONS the condyle by pulling forward producing translation movements.
Occlusal Treatment Planning Flow

Based on joint diagnosis
Normal anatomy

**Normal Movement Patterns of the Joints**
- Rotation
- Translation
- Subluxation

**Abnormal Disk Relationships**
- Anterior disk displacement
- Anterior disk displacement with reduction (pop)
- Anterior disk displacement – without reduction (lock)

**Other Anatomical Considerations**
- The medial pole bears centric load
- The lateral pole bears eccentric load

**NOTE:** All TMJ illustrations courtesy of Dr. Sam Higdon
The key to the TMJ exam is to identify if the patient’s joints have any alterations from normal, and if so, will the alteration make them unpredictable to treat.
In addition, if the patient is experiencing any discomfort or pain, it is important to identify whether the pain is from the joint or other sources, most commonly muscle.

**Normal Joint** (Stage 1)

No joint sounds

- Medial and lateral pole of the disk are in place

Diagnosis

- No history of joint sounds
- Doppler is quiet on rotation and translation

Occlusal design

- MIP or anterior guidance

**Intermittent Click** (Stage 2)

- Lateral pole is displaced intermittently

Diagnosis

- Intermittent history of click
- Exam may or may not find click
- Doppler will be quiet on rotation but may have noise on translation

Occlusal design

- MIP or anterior guidance
**Lateral Pole Displacement with Reduction** (Stage 3a)

**Diagnosis**

- History of consistent click
- Exam will find click or pop
- Doppler will be quiet on rotation but will have noise on translation and click

**Symptoms Depend Upon Timing of Click**

- Late opening click or early closing click most likely to have symptoms

**Diagnosis if Pain with Movement**

- Pain will decrease with stabilization test

**Occlusal design**

- Appliance therapy if joint inflammation present
- Once stable - evaluate alteration produced by appliance and match

**Lateral Pole Displacement Without Reduction** (Stage 3b)

**Diagnosis**

- History of no click or click that went away
- Exam will not find click or pop
- Doppler will be quiet on rotation but will have noise on translation and no click

**Symptoms May Be Likely**

- Pain on chewing or movement
- Comfortable to loading in centric

**Diagnosis if Pain with Movement**

- Pain will decrease with stabilization test

**Occlusal design**

- Appliance therapy if joint inflammation present
- Once stable - evaluate alteration produced by appliance and match
Medial Pole Displacement with Reduction (Stage 4a)

Diagnosis

- History of click or pop
- Exam will find click or pop
- Doppler will have noise on rotation and translation and click

Symptoms Depend Upon Level of Adaptation

- Pain on loading
- Pain with movement

Diagnosis if Pain is Present

- Pain will not decrease with stabilization test
- Pain will not decrease with Lucia jig

Occlusal design

- Appliance therapy
- Once stable - evaluate alteration produced by splint and match

Medial Pole Displacement Without Reduction (Stage 4b)

Diagnosis

- History of no click or pop
- Exam will not find click or pop
- Doppler will have noise on rotation and translation and no click

Symptoms May be Likely

- Pain on chewing or movement
- Pain upon loading
- Limited opening

Occlusal design

- Appliance therapy
- Once stable - evaluate alteration produced by appliance and match
Perforation with Acute Degenerative Joint Disease (Stage 5a)

Diagnosis
Noise - There may be a rough variety of coarse crepitation. This level of crepitus can be palpated and can be heard with a stethoscope.

Range - May be normal or reduced.
Manipulation - May or may not be painful manipulation.

Doppler - There will be a rough degree of coarse crepitation with possible ronchi in the articular space.

- History of crepitus
- Exam will find crepitus
- Doppler will be noisy at all times
- Imaging shows lack of cortical plate

Symptoms Depend Upon Rate of Degeneration

- Joint pain likely as changes occur
- Bite changes common

Occlusal Design

- Appliance therapy
- Once stable - evaluate alteration produced by appliance and match

Perforation with Chronic Degenerative Joint Disease (Stage 5b)

Diagnosis

- History of crepitus
- Exam will find crepitus

Symptoms Depend Upon Rate of Degeneration

- Joints may be comfortable or sporadically painful
- Bite changes may be present or adapted

Occlusal Design

- Appliance therapy
- Once stable - evaluate alteration produced by appliance and match
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Tooth Position

**Midline**

Orthodontics Vs. Restorative

Midline is Incorrect

Are The Teeth Restored or Will They Need Restoration?

Yes

Consider a restorative solution

Restorative won’t adequately correct the problem

No

Consider Orthodontics

Patient won’t do Orthodontics

Yes

No
Incisal Edge Position

Excess Tooth Display

Evaluate Occlusal Plane

Occlusal plane and incisal plane are level

Evaluate for maxillary impaction

Incisors are coronal to posteriors

Evaluate if teeth need restoration

Yes

Consider crown lengthening and restoration

Patient has short roots

No

Consider Ortho intrusion

Patient won’t do ortho
Inadequate Tooth Display

Evaluate Occlusal Plane

- Occlusal plane and incisal plane are level
  - Evaluate teeth for wear
    - Teeth are unworn
      - Ortho and Orthognathic consult
    - Teeth are worn
      - Restoration and increase vertical dimension
  - Teeth are worn
    - Ortho to level arch
    - Restoration to level arch

- Incisors are apical to posteriors
  - Evaluate teeth for wear
    - Teeth are unworn
    - Teeth are worn

Plastic consult for lip shortening

Incisal Plane - Treatment Options
Incisal Plane is Incorrect

Evaluate incisal plane to occlusal plane

Incisal plane and occlusal plane are continuous

- Consider orthognathic surgery

Incisal plane and occlusal plane aren’t continuous

Evaluate level of posteriors to face

- Evaluate if anteriors need restoration

  Yes
  - Consider restoration

  No
  - Ortho

Posteriors aren’t correct

Posteriors are correct
Labiolingual Inclination Treatment Options

Teeth are Reclined

Evaluate if teeth need restoration

Yes
Evaluate teeth for lingual wear

Yes
Consider orthodontics

No
Consider restoration

Patient won’t do orthodontics

Consider ortho

Patient won’t do ortho

Restore and open vertical dimension
Teeth are Proclined

Evaluate if teeth need restoration

Yes

Can inclination be corrected without endo?

Yes

Restore

No

Orthodontics

No

Patient won’t do orthodontics
Malalignment of Teeth

General Malalignment

Teeth are Malaligned

Do Teeth Need Restoration?

Yes

Can occlusion be managed without ortho?

Yes

Are the existing papilla levels acceptable?

Yes

Is the most apical gingival margin acceptable?

Yes

Can an acceptable contour and arrangement be created without ortho?

Yes

Can the teeth be restored without ortho and without structural or biologic compromise?

Yes

Restorative

No

No

No

Orthodontics

Patient won’t do Ortho

Treat with patients understanding of compromises

Ortho

Graft

No

No

Ortho

Yes
Anterior Open Bites

Treatment Planning Anterior Open Bites, Treatment Options (Class II Malocclusions)

Posture Forward, Build in CR with Open Bite, Dual Bite, Orthognathic, Orthodontics

Evaluate Current Habitual Occlusion for Anterior Contact

- Open bite
  - Evaluate posterior teeth for wear, fracture or mobility
    - None
      - Posterior breakdown
        - Dual bite or orthodontics or Orthognathic
  - Anterior contact
    - Evaluate posterior teeth for wear, fractures or mobility
      - None
        - Posterior breakdown
Mediolateral Arch Form Treatment Options

Arch is Narrow Posteriorly

Evaluate inclination of posterior teeth

Teeth are inclined toward palate

- Do teeth need restoration?
  - Yes
    - Can restoration accomplish goals?
      - Yes
        - Restore
      - No
        - Orthognathic surgery if ortho can’t accomplish goals
  - No

Teeth are labially inclined

- Ortho if ortho can accomplish goals

Muscle and Joint Evaluation

Muscle and Joint Evaluation (part A)

Palpate Temporalis → Pain → Will require treatment

Palpate Masseter → Pain → Will require treatment

Palpate Medial Pterygoid → Pain → Will require treatment

Palpate Lateral Pole of Joint → Pain → Will require treatment

Palpate Retrodiscal Tissue → Pain → Will require treatment

Palpate Joint during opening and closing → Click or pop → Internal derangement is present is present

Crepitus is present

Is bite changing? Yes → Unstable joint
No → Potentially stable joint

Press forward in ear canal while opening and closing → Click occurs where there wasn’t one before → Patient has lax ligament may be disposed to future clicking or popping

Evaluate range of motion → Limited → Muscle or joint may be limiting factor
Muscle and Joint Evaluation (part B)

Patient has pain with movement → Stabilize mandible and ask them to move

No pain means a joint problem is likely

Pain means Lateral Pterygoid is likely involved

Manipulation → Easy → Proceed to treat

Difficult → May need deprogramming or appliance therapy to get correct bite

Load test for tension or tenderness → None → Proceed

Present

Place deprogrammer on anterior teeth → Tension eliminated → Lateral Pterygoid was involved

Tension remains

Doppler → Noise on translation → Lateral pole may be displaced

Noise on rotation → Medial pole may be displaced

Appliance therapy
Appliance Therapy

Appliance Therapy Treatment Options

Anterior Bite Plane  Posterior Pivot  Full Coverage  Repositioning

Place Lucia Jig and Deprogram

Patient has no discomfort

Patient has tension

Patient has acute pain

Evaluate joint and joint history

Place short term posterior pivot (equalizer)

No negative joint findings or history

Patient has abnormal joint findings

Convert to full coverage

Anterior bite plane

Full coverage appliance
Equilibration

Treatment Planning Equilibration

Evaluate Current Occlusion
TMJ, Muscle and Joints

Asymptomatic
- Evaluate teeth to be restored
  - More than 4 posteriors, all anteriors, altering point of initial contact
    - Equilibration
  - Less than 4 posteriors and not altering point of initial contact
    - Use habitual position

Symptomatic
- Appliance if necessary and equilibration
Worn Dentition

Evaluate Non Occluding Areas for Evidence of Erosion

Wear in non occluding areas

Evaluate location of wear

Determine most likely source of acid

Evaluate restorations for evidence of attrition (facets)

Facets present

Attrition is present

Trial therapy to correct occlusion

Evaluate muscle activity with corrected occlusion

Normal, no grinding

Patient is still grinding

Assess envelopes of function

Create treatment plan to incorporate envelope of grinding

Treat patient

Correct occlusion

None present

Equilibration
Refer Back to PAGE 15
Gingival Levels

**Apically Positioned**

Gingiva is Apically Positioned

Evaluate Root Exposure

- None
  - Evaluate tooth inclination
    - Tooth is upright
      - Ortho extrusion
    - Tooth is proclined
      - Ortho to upright, followed by extrusion
- Root is exposed
  - Surgical root coverage
Coronally Positioned

Gingiva is Coronally Positioned

Evaluate CEJ to Bone

CEJ not probeable

Osseous surgery

CEJ normal

Probe sulcus

Normal sulcus

Evaluate root length

Normal root

Ortho intrusion

Deep sulcus

Gingivectomy

Gingivectomy

Short root
Excessive Gingival Display
(Gummy Smile)

Excess Gingival Display (Part A)

Evaluate Crown Length

Normal

Evaluate if excess gingiva is visible anterior or posterior

Anterior only
Evaluate incisal plane to occlusal plane
Incisors coronal to posteriors
Do teeth need restoration?
Yes
Ortho intrusion of anteriors and restore
No
Ortho intrusion of anteriors
Perio surgery and restore

Anterior and posterior
Evaluate incisal plane to occlusal plane
Incisors level with posteriors
Evaluate tooth display at rest
Normal
Ortho intrusion of anteriors
Excessive
Evaluate facial proportions
Normal
Long
No tx
Maxillary impaction

No tx
Excessive Gingival Display (Part B)

Evaluate Crown Length

- Short
  - Evaluate Teeth for Wear
    - Yes
      - Evaluate root length
        - Short roots
          - Ortho intrusion and restore
        - Normal roots
          - Perio surgery and restore
    - No
      - Evaluate active eruption
        - CEJ is in normal location
          - Probe sulcus
            - Deep sulcus
              - Gingivectomy
            - Normal sulcus
              - No treatment
        - CEJ can’t be probed
          - Radiograph
            - CEJ and bone at the same level
              - Osseous surgery
            - No treatment
              - Osseous surgery
Black Triangle

A Black Space Exists

Evaluate problem area papillary height to adjacent papilla levels

Papilla in question is apical to adjacent papilla

Radiograph area and compare bone in problem area to bone in other areas

Bone is apical to other areas

Erupt teeth

Bone at same level as other areas

Embrasure is too large

Problem is inadequate contact length

All papilla are at same level

Evaluate root angulation

Divergent

Ortho to upright roots

Parallel

Crown form is too tapered

Alter crown forms
Ridge Augmentation

Treatment Planning  The Need for Eruption or Ridge Augmentation

Treatment Options

Orthodontic Eruption  Surgical Ridge Augmentation

Evaluate the Facial Bone and Interproximal Bone on the Tooth to be Extracted

Interproximal bone adequate

Facial inadequate

Adequate

Evaluate interproximal bone on adjacent teeth

Extract and augment

Erupt tooth to be extracted

No eruption or augmentation required

Inadequate

Adequate

Erupt adjacent teeth

Extract without eruption
Missing Teeth

Single Anterior Tooth Replacement

Treatment Options
Bonded Bridge, Cantilevered Bridge, Fixed Bridge, Implant

Biologic Treatment Planning

Evaluate Age of Patient
- Growth is complete
  - Evaluate bone
    - Bone is adequate
      - Evaluate space for implant
        - Adequate
          - Orthodontics
        - Inadequate
          - Fixed bridge
          - Consider implant
    - Inadequate for implants
      - Augmentation

- Growth is incomplete
  - Temporary restoration
Esthetically Unacceptable Single Tooth Implants

Treatment options

Trephine out, Single Tooth Osteotomy, Erupt Adjacent Teeth, Graft

Evaluate Implant Position

Acceptable position

Severely malpositioned

Evaluate facial and interproximal tissue

Inadequate facial tissue

Evaluate bone on adjacent teeth

Unacceptable

Erupt adjacent teeth

Inadequate interproximal tissue

Evaluate bone on adjacent teeth

Acceptable level

Healing time to regenerate papilla

Inadequate interproximal tissue

Trephine out

Single tooth osteotomy
**Multiple Missing Anterior Teeth**

**Fixed Prosthesis, Removable Prosthesis**

Evaluate High Lip Line

- Ridge is visible
  - Evaluate if surgery can produce acceptable ridge height and form
    - No
      - Removable appliance with prosthetic tissue replacement
    - Yes
      - Fixed appliance
- Ridge is not visible
  - Evaluate if a labial flange is necessary
    - Yes
      - Removable appliance with prosthetic tissue replacement
    - No
      - Fixed appliance with prosthetic tissue replacement

**Implant/ Pontic**

Adjacent Implant

- Separated by a Pontic

Evaluate which Teeth are Missing

- All incisors
  - Central implants
- 2 centrals and laterals
  - Lateral implants
- 2 centrals
  - Central implants
  - Central implant
  - Adjacent
Structural Treatment Planning with Missing Teeth

Evaluate Adjacent Teeth to Edentulous Site

- Restorations necessary
  - Present implant and bridge option
- No restorations necessary
  - Implant

Functional Treatment Planning

Evaluate Overbite and Overjet

- Minimal overbite, Adequate overjet
  - Present implant or bonded bridge options
- Deep overbite, minimal overjet
  - Implant

Evaluate Mobilities of Potential Abutments

- Non mobile
  - Present implant, bonded bridge or cantilevered bridge
- Mobile
  - Present implant or conventional bridge
Evaluate Occlusal Habits

- Parafuction or bruxism
  - Present implants or conventional bridge
- No parafuction or bruxism
  - Present all acceptable options

Esthetic Treatment Planning

Evaluate Edentulous Ridge

- Augmentation necessary
  - Evaluate bone vertically
    - Unacceptable vertically
      - Soft tissue augmentation and pontics
    - Acceptable
      - Augment and implant if appropriate
- No augmentation necessary
  - All options

Evaluate Adjacent Tooth Thickness and Translucency

- Thin and translucent
  - Implant
- Thick and opaque
  - All options
Changes Planned for the Adjacent Teeth Esthetically

- Veneers or crowns
  - Present implant or bridge
- None
  - Implant
Inflammation Around Restoration
Treatment Options

Oral Hygiene  Replace Restoration  Correct Biologic Width

Evaluate Gingiva on Adjacent Natural Teeth

Not inflamed

Evaluate margin

Good fit

Evaluate contour

Poor contour

Good contour

Allergic history

Allergy possible

Allergy unlikely

Evaluate distance from margin to bone

Adequate

Inadequate

Evaluate location of inadequacy

Facial

Osseous surgery

Interproximal

Ortho extrusion

Inflamed  Oral hygiene
Anterior Restorations

Evaluate Condition of Existing Teeth

Structurally healthy but unesthetic

- Evaluate tooth color
  - Acceptable
    - Enamel replacement veneer using homogenous material
  - Discolored
    - Enamel and dentin replacement using homogenous and heterogenous materials

Structurally poor and unesthetic

- Evaluate tooth color
  - Acceptable
    - Full crown using translucent materials
  - Discolored
    - Full crown using opaque materials
Posterior Restorations

Direct  Inlays  Onlays  Crowns

Evaluate Existing Tooth

Gingival Margins in Proximal Box are in Enamel

Direct Yes No Indirect

Isthmus < ½ intercuspal width

Yes No

Evaluate cusps and support

Occlusion is tooth supported

Yes No

No cracks and cusps are supported by dentin

Weak cusps

Inlays

Heavy function

No Yes

Onlay or crown
Restoration of Endodontically Treated Teeth

Evaluate Existing Tooth Condition

Structurally sound
- Evaluate color
  - Discolored
    - Bleach
  - Acceptable
    - No treatment

Breaking down
- Evaluate internal access size
  - Conservative
    - Prep for crown or veneer
      - Evaluate prep length
        - 2mm or less
          - Evaluate ferrule
            - Less than 1mm
              - Create ferrule
            - 1mm or more
              - Place post build-up and finish
        - 3mm or more
          - Restore with veneer or conservative crown
    - Evaluate color
      - Acceptable
        - Complete w/o post
        - Bleach
  - Large
    - Bleach

Discolored
- Bleach
- No treatment
- Prep for crown or veneer
  - Restore with veneer or conservative crown
- Evaluate color
  - Acceptable
    - Complete w/o post
    - Bleach
  - Discolored
    - Place tooth colored post core and conservative translucent crown
The Restorative Connection:  
Facially Generated Treatment Planning

Esthetics

a. Tooth position
   Changes desired________________________________________

b. Gingival levels
   Changes desired________________________________________

c. Arrangement
   Changes desired________________________________________

d. Contour
   Changes desired________________________________________

e. Shade
   Changes desired________________________________________

Function

a. Is the occlusion pathologic?
   Joint______ Muscle_____ Teeth_____   

b. If yes, what treatment will be necessary to create a more ideal occlusal relationship? __________________________________________________________

   __________________________________________________________

c. Are you planning any treatment that may destabilize the occlusion?

d. If yes, what treatment will be necessary to correct the occlusion as part treatment? __________________________________________________________

   __________________________________________________________

Structure
e. Which teeth will be restored and with what kind of restoration?
____________________________________________________________
____________________________________________________________
f. Which teeth will be replaced and how will they be replaced?
____________________________________________________________
____________________________________________________________

Biology

g. What perio, endo, or oral surgery will need to be done as part of the treatment?
____________________________________________________________
____________________________________________________________

Consultations

h. Are any specialty consultations necessary, and if so, for what specific problems?

Ortho__________________________________________________________

Perio___________________________________________________________

Endo___________________________________________________________

Oral surgery____________________________________________________

i. How will the decisions of the specialist most likely effect your treatment plan?
______________________________________________________________
______________________________________________________________

j. What treatment options exist if the specialist can’t perform the treatment or the patient declines the specialty treatment?

How will you sequence treatment?
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
Facially Generated Treatment Planning

Photographic Views

Full views

1) Teeth apart / lips at rest
2) Smile
3) Lateral profile teeth apart / lips at rest
4) Lateral profile smile

Close-up views

5) Teeth apart / lips at rest
6) Smile
7) R lateral smile
8) L lateral smiles

Retracted views

9) Teeth together
10) Teeth slightly parted
11) Upper anterior teeth
12) Lower anterior teeth

Mirror views

13) Upper occlusal
14) Lower occlusal
15) R lateral – teeth together
16) R lateral – teeth slightly parted
17) L lateral – teeth together
18) L lateral – teeth slightly parted

Other views

19) Retracted view - End to end and/or cross-over
20) Mirror view - Marked Upper Occlusal
21) Mirror view - Marked lower occlusal
22) *Close-up view - Exaggerated “E”*

1) **Upper Incisor to Face**
   
   *Images 1, 3, 5, 6, & 16*

2) **Upper Incisor Inclination**
   
   *Images 13, 16 & 18*

3) **Upper Occlusal Plane**
   
   *Images 5, 10, 16 & 18*

4) **Upper Gingival Levels**
   
   *Images 2, 6, 7, 8, 9 & 11*

5) **Lower Incisor to Face**
   
   *Images 2, 6, 10 & 12*

6) **Lower Incisor Inclination**
   
   *Images 14, 16 & 18*

7) **Lower Occlusal Plane**
   
   *Images 5, 10, 16 & 18*

8) **Lower Incisor Gingival Levels**
   
   *Images 6, 9, 10, & 12*
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

Jaw Joint Pain  R  L  Jaw Joint Noise  R  L  Jaw Joint Locking  R  L

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>Left (L)</th>
<th>Right (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporalis Anterior</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Temporalis Posterior</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Trapezius</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Suboccipital</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Sternocleidomastoid</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Digastrics</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Hyoids</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Masseter</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Medial Pterygoid</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Lateral Pterygoid*</td>
<td>L___</td>
<td>R___</td>
</tr>
<tr>
<td>Other</td>
<td>L___</td>
<td>R___</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

MANIPULATION    Easy    Difficult    Impossible

AUSCULTATION  (manual / stethoscope / Doppler)
Noise with Rotation  ____R  ____L  ____R  ____L
Noise with Translation  ____R  ____L  ____R  ____L
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 _________
DIAGNOSTIC SUMMARY

JOINTS

RIGHT
- Comfortable
- NOT comfortable
  - disk __ in place
  - ligament laxity on lateral pole
  - disk off lateral pole
  - disk off medial pole

LEFT
- Comfortable
- NOT comfortable
  - disk __ in place
  - ligament laxity on lateral pole
  - disk off lateral pole
  - disk off medial pole

☑ Unable to verify CR

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
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
  - Mount models
  - Consider occlusal correction