The following document (formerly known as the "Grey Manual") has not been revised to reflect some changes in materials and techniques currently used in the clinic. However, the basic information is still applicable and may be of some help in the treatment of your patients.

PRECLINICAL REMOVABLE PROSTHODONTICS SUPPLIMENT

JAMES M.S. CLANCY DDS MS
ROBERT L. SCHNEIDER DDS MS

DEPARTMENT OF PROSTHODONTICS
COLLEGE OF DENTISTRY
THE UNIVERSITY OF IOWA
IOWA CITY, IA 52242

A CLINICAL GUIDE FOR

THE FABRICATION OF

COMPLETE DENTURES

Robert L. Schneider, DDS, MS
Department of Prosthodontics
The University of Iowa

August, 2001
First Edition
Modified from F.R. Scandrett

CONTENTS

EXAMINATION

REFERENCE: Boucher 11th edition, Chapters 5 & 6

INSTRUMENTS AND MATERIALS

Chart with current radiograph (OC-100)
Towel clip and patient napkin
Gauze squares
Mouth mirror
Explorer
Perio probe
Cotton pliers

STEPS

1. Review medical history, dental history and medications and record significant findings.
2. Record "chief complaint" and previous denture experience (goldenrod examination form).
3. Complete biophysical evaluation.
   a. Note clinical and radiographic pathoses. Note the condition of the mucous membrane of the mouth. IDEALLY THE PATIENT SHOULD KEEP OLD DENTURES OUT OF THE MOUTH FOR 48 HOURS PRIOR TO MAKING THE FINAL IMPRESSIONS.
   b. Trabeculation – not always a reliable finding because the degree may vary with the radiographic technique.
   c. Evaluate the edentulous ridges for resorption, size and cross sectional form.
   d. Classify arches and note tori if present.
   e. Record border and frenum attachment levels. For both arches high attachments are near the crest of the ridge. Obtain a clear mental picture of the attachments so accurate individual custom trays can be fabricated.
   f. Horizontal maxillo-mandibular jaw relation:
      Class I – Normal
      Class II – Retrognathic
      Class III – Prognathic
   g. Throat form: (Neal's Classification of retromylohyoid space) The size of the retromylohyoid space should be noted when the patient protrudes the tongue to the lip. This space is measured using the head of a mouth mirror, which is approximately ½ inch in diameter.
      Class I – Greater than ½ inch
      Class II – Approximately ½ inch
      Class III – less than ½ inch

The significance of the retromylohyoid space is the development of an optimal contour and extension of the lingual flange for stability and retention of the mandibular complete denture.

   h. Soft palate form : (House's Classification)
      Class I – Flat vault, wide posterior palatal seal area 5-12mm, vibrating line not too definite.
      Class II – Moderately steep vault, posterior palatal seal area 2-4 mm wide, vibrating line fairly definite.

Class III – Steep vault, narrow posterior palatal seal area <2mm, soft palate makes almost a right angle at vibrating line.

The significance of the soft palate form is the amount of area available to develop a proper posterior palatal seal and the anticipated amount of retention and stability of the maxillary complete denture is affected by the palate form.

i. Tongue position: (Wright's Classification) Note position of the tip of the tongue when the mouth is slightly open. A normal tongue position is with the tip against the lingual surfaces of the mandibular incisors or alveolar ridge. A retracted tongue is classified as follows:
   Class I – Tongue tip down and back
   Class II – Tongue tip straight back
   Class III – Tongue tip p and back
   Class IV – Tongue tip back in the molar region

The tongue position is of considerable importance in developing retention and stability for the mandibular complete denture.

j. Classify the patient's mental attitude as philosophical, exacting, indifferent or critical.
k. Examine the TMJ by palpation, history and ausculation.
l. Evaluate the present dentures (two, goldenrod examination form).

4. At the conclusion of the examination, discuss with the patient their expectations on receiving new complete dentures, limitation and difficulties involved in the treatment, possible improvements or changes from the old complete dentures and the prognosis of treatment. INFORM THE PATIENT AS TO THE FEE AND METHOD OF PAYMENT. ALL CLINIC FEES ARE PAYABLE IN FULL AT THE TIME OF INSERTION OF THE NEW DENTURES.

PRELIMINARY IMPRESSIONS AND CASTS

REFERENCE: Boucher 11th edition, pp 141-155, 162-174

INSTRUMENTS AND MATERIALS

Compound Preliminary Impressions
Compound heater with pan, lift and lift cloth
Bunsen burner
Alcohol torch
Stainless steel pan with ice water
Compound impression trays
Matches
Petroleum jelly
Thompson's sanitary markers
Bard Parker with new #21 blade
Alginate Preliminary Impressions
Alginate with water measurer
Mixing bowl
Spatula
Bard parker with new #21 blade
Edentulous alginate impression trays
Red or white rope wax
Thompson's sanitary markers

STEPS FOR ALGINATE IMPRESSIONS

1. Follow the steps in Boucher using edentulous trays, pp 151-55, 173-75.
2. Mark the vibrating line at the midline with the Thompson's marker. This will transfer form the impression to the preliminary cast.
3. Immediately pour the impression in plaster.
4. Trim the casts so as to preserve anatomical landmarks and to the deepest point in the vestibules.
5. The tongue area of the mandibular cast should be contoured so the lingual vestibule is not too deep.

STEPS FOR COMPOUND IMPRESSIONS

1. Do not trim the impression trays as this will destroy them for future use. ***Lightly*** coat the trays with petroleum jelly. This minimizes the compound sticking to the tray.
2. The compound (1 ½ cakes/arch) placed in a preheated water bath (135 degrees), when properly softened can be kneaded and placed in the tray. Lightly flame the compound in the tray with the alcohol torch and temper prior to placing in the patient's mouth. Only place enough compound in the water bath for 1 arch at a time.
3. It is not necessary to chill the material in the mouth if the compound is allowed to set for 30 seconds and care is exercised in removal so as not to distort it.

4. If there is insufficient surface detail, re-soften the surface with the alcohol torch and also add stick compound (green or red) to the deficient border(s). Temper the heated material in the water bath and place the impression back into the patient's mouth following the previous procedure. If the maxillary impression is acceptable, mark the vibrating line at the midline with the sanitary maker and place the impression in the patient's mouth. The line will transfer from the compound to the preliminary cast.
5. Pour and trim the casts as with the alginate impressions. Compound does not have to be poured immediately as the alginate does.
6. Separate the compound impressions by placing them in warm water. DO NOT PLACE THEM IN THE BOILOUT TANK, AS THIS WATER IS CONTAMINATED AND TOO HOT.

CRITERIA FOR EVALUATION OF ALGINATE IMPRESSION **(same as preclinical)**

1. Trays proper size
2. Adequate extension
3. No significant defects in borders or of tissue detail
4. Vibrating line marked at midline
5. Alginate not perforated by tray
6. Minimal displacement of tissue by boxing wax, if used.

CRITERIA FOR EVALUATION OF COMPOUND IMPRESSION **(same as preclinical)**

1. Trays proper size
2. Adequate extension
3. No significant defects in borders or of tissue detail
4. Vibrating line marked at the midline
5. Borders smooth and no fingerprints evident
6. Compound not perforated by tray

CRITERIA FOR EVALUATION OF PRELIMINARY CASTS **(same as preclinical)**

1. Poured in laboratory plaster
2. Bubble free
3. Anatomic landmarks preserved
4. Proper detail
5. Vestibule preserved, not over-rimmed
6. Tongue area trimmed so depth of lingual sulcus minimal
7. Proper outline for custom trays marked with red/blue pencil

FABRICATION OF CUSTOM IMPRESSION TRAYS

REFERENCE: Boucher 11th edition, pp 155-59, 175-78

INSTRUMENTS AND MATERIALS

Autopolymerizing acrylic resin (Fastray or equivalent)
Mixing cups
Tongue blade for mixing
Petroleum jelly
Triad (or equivalent) VLC material
Wax pot or baseplate wax
Green handle laboratory knife
Bard Parker with new #21 blade
Arbor band and chuck for lathe
Acrylic burs for laboratory handpiece

STEPS **(same as preclinical)**

1. Mark border outline on casts with red/blue pencil, approximately 2-3 mm *under extension* from the depth of the vestibule. On the maxillary cast the tray should extend to the vibrating line and be slightly short of the pterygo-maxillary notches. The vibrating line is usually slightly anterior to the fovea palatini by 1-2 mm. The maxillary posterior border should make a smooth concave curve anteriorly from notch to notch. The mandibular tray should be properly under extended in the vestibules but should cover the entire retromolar pad area.
2. Soak the casts in a mixing bowl with water.
3. Dip the casts in the wax pot 2-3 times to develop a uniform thickness ~1 ½-2 mm of wax or adapt one sheet of softened baseplate wax.
4. Trim the wax to the penciled outline.
5. Lightly coat your hands with petroleum jelly to minimize stick. Mix the acrylic resin and form into a patty for the maxillary tray or a horseshoe shape for the mandibular tray. Do not manipulate the resin until it is a soft dough and no longer shiny.
6. Adapt the acrylic resin to the wax spacers, making sure it is extended and adapted to the borders,
7. When the resin becomes warm, immerse the cast and tray in a mixing bowl with water to dissipate the heat and allow to set (10-15 minutes).
8. A handle may be placed on the trays if they do not interfere with the lip or border molding movements. A short vertical handle with concave sides can also be made by adding acrylic resin after the initial set of the material.
9. If a VLC type material is used it can be adapted, trimmed and placed in the polymerization unit for 6-8 minutes before final trimming.
10. When polymerization is complete remove the tray form the cast. The wax shim should adhere to the tray and is used as a guide when trimming the tray.

STEPS IN TRIMMING THE TRAY – these are important so the borders will have adequate thickness

1. Trim all borders to the wax with an arbor band. DO NOT REDUCE THE THICKNESS OF BORDERS WHILE DOING THIS
2. Reduce the wax 3-4 mm around all borders except at the vibrating line, the reduction will include the pterygo-maxillary notches.
3. Trim sharp acrylic margin on the inside of the tray
4. Reduce the border thickness form the outside to ~2mm.
5. Smooth all sharp and rough areas and remove resin trimmings from wax shims and finished tray. (would you want this tray in your mouth?)

CRITERIA FOR EVALUATION **(same as preclinical)**

1. Wax reduced from all borders except vibrating line medial to notches.
2. Borders are adequately thick, ~2mm.
3. Borders are slightly under extended except maxillary posterior.
4. All sharp edges and rough areas are smooth (not polished).
5. Acrylic resin trimmings removed form the wax shims and finished tray.

FINAL IMPRESSIONS

REFERENCE: Boucher 11th edition, pp 156-60,176-79

INSTRUMENTS AND MATERIALS

Chart
Towel clip and patient napkin
Mouth mirror
Gauze squares
Custom impression trays
Compound heater with pan, lift and lift cloth
Wax pot with Iowa Wax
#3 sable brush
Bunsen burner
Alcohol torch
Stainless steel pan with ice water
Compound (red or green) 3 sticks
Matches
Petroleum jelly
Thompson's sanitary markers
Green handle lab knife
Bard Parker with new #21 blade
Slow speed handpiece and acrylic burs
#7 wax spatula
Sharp scissors
Aquasil Monophase PVS impression material and mixing gun/tips

STEPS

1. Intraorally check the custom trays for ~2mm under extension on all boarders except the maxillary posterior. The wax spacer should not be removed from the trays at this time.
   a. The maxillary posterior border should be slightly short of the pterygo-maxillary notches.
   b. It is preferable to end the posterior border at the vibrating line rather than have it overextended. This can be done by observing the fovea on the diagnostic casts and/or using the sanitary markers. The borders can be adjusted using acrylic burs where necessary.
   c. Make sure the wax spacer has been trimmed ~3-4 mm around all borders except the vibrating line.

2. Border molding
   a. Maxillary
      (1) Pterygo-maxillary notches – open and close against pressure.
      (2) Disto-buccal – open and close against pressure.
      (3) Distal – drape cheek and move mandible side to side.
      (4) Buccal – drape cheek.

(5) Buccal frenum- drape cheek.
(6) Labial – drape lip.
(7) Labial frenum – drape lip.

b. Mandibular
(1) Distal – open and close, also note shape of retromolar pad.
(2) Disto-buccal – open and close and drape cheek.
(3) Buccal – drape cheek.
(4) Buccal frenum – drape cheek.
(5) Labial and labial frenum – drape lip.
(6) Sublingual including lingual frenum – wipe lips with the tongue and place tongue in the anterior palate.
(7) Mylohyoid – tongue in the opposite cheek.
(8) Retromylohyoid an distolingual – swallow, tongue to lip and into opposite cheek. The patient should not protrude the tongue beyond their lips as this is an exaggerated movement and will result in under extended borders.

3. Verify the position of the vibrating line.
   a. Remove 3-4 mm of the wax spacer along the posterior border.
   b. Add stick compound in this area and heat, temper and insert. The patient should open and close against pressure if the pterygo-maxillary notches are involved
   c. Trim the excess compound and check the vibrating line with the sanitary markers. DO NOT TRIM THE PTERYGO-MANDIBULAR NOTCHES. The posterior border should generally make a smooth concave curve from notch to notch.

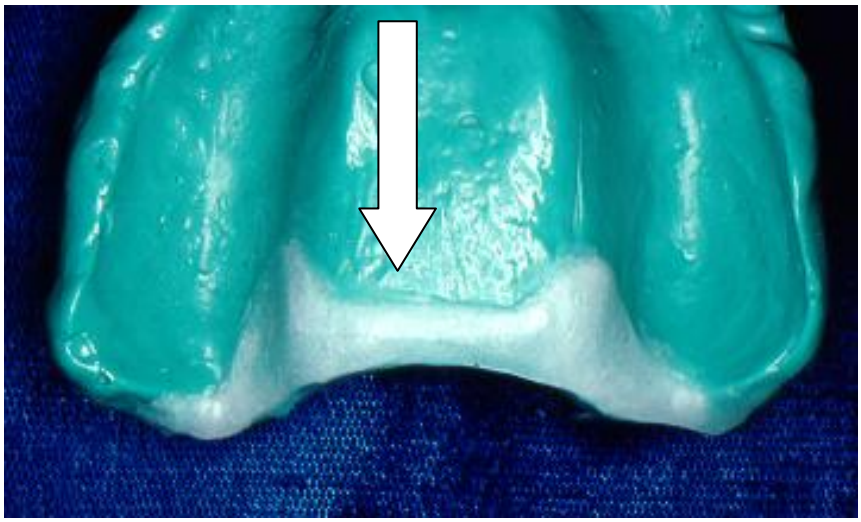
4. Prepare the custom trays for the final impressions.
   a. Reduce all compound borders ~1mm on the inside except the posterior palatal seal area. This area is not to be relieved.
   b. Gently round the borders with the edge of the #21 blade, but do not reduce appreciably in height as this will destroy your border molding.
   c. Gently remove the wax spacer
   d. Tray adhesive is generally not recommended for the edentulous impressions.

5. Making the final impression
   a. Make sure there is an adequate amount of material in the Aquasil automix cartridge, properly loaded in the dispensing gun with a new mixing tip.
   b. Dry the mouth thoroughly and leave the gauze in the mouth while loading the tray with the impression material. *Remember the tray should only need a thin ~3-4 mm uniform thickness of impression material.*
   c. Seat the maxillary tray immediately on removal of the gauze. The anterior should be seated first and then the posterior until the material starts to escape along the posterior border. Final border molding can be accomplished shortly after insertion when the material is still able to slightly flow. Then the tray should be held steady until final set ~5-7 minutes.

d. For the mandibular impression, the loaded tray should be centered and seated ***lightly*** over the mandibular ridge. Hold the tray steady with the index and middle fingers of one hand. Border mold buccal and labial with the free hand. The entire lingual is border molded by having he patient lay their tongue on the lower lip while the material is setting ~5-7 minutes.
e. Following removal of the impression(s), trim any excess material with scissors. This is especially important at the vibrating line.

Place the posterior palatal seal with Iowa Wax (see your instructor for specific instructions)

a. The seal should be shaped as illustrated below.



b. Apply the properly melted wax with a #3 sable brush and place in the patients mouth with pressure in the mid palate.
c. Wax should flow posteriorly along the entire vibrating line/notches and the surface should be flossy. Trim the excess posterior wax immediately on removal.
d. DO NOT DIP IN THE COMPOUND HEATER PRIOR TO PLACING IN THE MOUTH. This could distort the compound border molding.
e. When an appropriate seal has been obtained seal the wax along all the borders with a hot #7 wax spatula.

CRITERIA FOR EVALUATION **(same as preclinical)**

1. Border molding
   a. Adequate extension
   b. Borders blended and smooth
   c. Relief from gross undercuts
   d. Try and compound trimmed to vibrating line

2. Final impressions
   a. Borders nicely rolled and wrinkle free
   b. Good tissue detail
   c. Minimal "show through" of tray
   d. Posterior palatal seal properly placed
   e. All anatomic areas captured in detail with no distortion

BOXING IMPRESSIONS AND MASTER CASTS

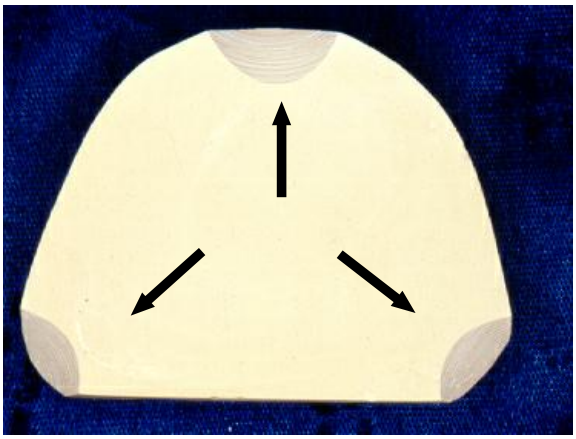
REFERENCE: Boucher 11th edition, pp 160-1, 178-9

INSTRUMENTS AND MATERIALS

#7 wax spatula
Green handle lab knife
Bard parker with new #21 blade
Bunsen burner
Rope wax
Boxing wax
Vacuum mixing bowl
Spatula
Microstone (or equivalent type III gypsum)

STEPS **(same as preclinical)**

1. Bead the impressions to preserve the border roll ~ 2mm below the borders. Rope wax is recommended for beading, however rope wax does not stick well to PVS materials unless sticky wax is applied. The beading should be 3-4 mm wide and the rope wax should be sealed to the impression on the side away from the border.
2. The tongue space should be filled so as to preserve lingual borders and extend horizontally, as illustrated below.
3. The beading should be below the maxillary posterior border, ***not*** above onto the soft tissue surface.
4. The mandibular beading should be even with the distal extension of the retromolar pads. Border thickness does not need to be preserved at the distal of the retromolar pad.
5. Boxing wax is wrapped around the beading, with the ridges horizontal, and should provide for a final cast thickness of 10-15mm thick at the thinnest area. THE TONGUE SPACE SHOULD MAKE A RIGHT ANGLE WITH THE BOXING WAX AT THE POSTERIOR JUNCTION AS ILLUSTRATED BELOW.
6. Seal the boxing wax to the rope wax on the underneath side of the impression not the tissue detail side.
7. Pour the boxed final impressions in type III vacuum mixed stone.
8. The stone should set a minimum of 45 minutes before separating. When the gypsum has properly set the impression may be placed in warm water to soften the compound and facilitate separation of the cast form the impression.
9. If the boxing was done properly there should be minimal trimming of the cast.
    a. The land area can be trimmed vertically with a knife and arbor band
    b. The base is trimmed with a model trimmer so it is 10-15 mm thick at the thinnest area when the edentulous ridge is parallel to the tabletop.
10. Place three indices on the base of the cast with an arbor band to facilitate remounting the cast if it separates from the mounting ring, etc. as illustrated below.



CRITERIA FOR EVALUATION OF CASTS

1. Poured in type III stone
2. Border thickness preserved
3. Land area sufficiently wide ~3-5 mm
4. Cast sufficiently thick 10-15 mm at thinnest area
5. Bubble free
6. Ridges parallel to base
7. Tongue area flat and parallel to base
8. Three properly placed indices on base of cast
9. Distal of mandibular cast trimmed so land starts at distal of retromolar pads.

FABRICATION OF TRIAL BASES AND OCCLUSION RIMS

REFERENCE: Boucher 11th edition, pp 183-87

INSTRUMENTS AND MATERIALS

Autopolymerizing acrylic resin (Orthodontic)
Triad (or equivalent VLC type material)
Tim foil substitute (separator)
Baseplate wax
DuraBase Soft
Mixing cups
Tongue blades for mixing
Bunsen burner
#7 wax spatula
Green handle lab knife
Hot plate to shape occlusion rims
Arbor band and mandrel
Slow speed handpiece and acrylic burs

STEPS **(same as preclinical)**

1. Casts should be relatively dry.
2. Blockout extreme undercuts with baseplate wax prior to placing separating medium.
3. Liberally apply tin foil substitute to casts, including tongue and land areas, allow to dry for 10-15 minutes.
4. If Triad is being used it can now be adapted to the cast and vestibular depth, trimmed with a lab knife and placed in the polymerizing unit for 5-8 minutes.
5. If autopolymerizing resin is to be used blockout routine undercuts with a resilient resin (DuraBase Soft) by applying it to the desired areas with a tongue blade after mixing. Do not allow this to accumulate in the vestibule.
6. Place a few drops of monomer on a small area of the cast and sprinkle the polymer on the liquid until it is completely absorbed. Repeat the procedure until one portion of the cast is built up to the desired thickness (~1-2 mm), then move to the adjacent area, until the impression area on the cast is completely covered and the borders are fully contoured. With a severely resorbed mandibular ridge, addition resin may have to be added on the anterior crest of the ridge from premolar to premolar to improve rigidity of the base.
7. Allow the autopolymerizing resin to cure in the pressure pot for ~15-20 minutes with 20 psi. Using warmer water will accelerate the set of the resin.
8. The base plates are carefully removed from the casts, which may be facilitated by immersing them in warm water for a few minutes.
9. The excess may be trimmed with an arbor band and acrylic burs. This is generally all the finishing that is needed. If the borders must be polished with pumice, keep the lathe on slow and use light pressure so as not to generate excessive heat and warp the baseplate.
10. Use the preformed occlusion rims and attach them to the baseplates so they have a slight labial flare from the labial border. If Triad is used sticky wax may have to be added in the area the rim will be attached to make sure it is secure and will not come loose.

11. Smooth and flame the occlusion rims

CRITERIA FOR EVALUATION

1. Bases stable on the casts not rocking
2. Master casts not damaged
3. Contoured the same as the final dentures will be
4. Occlusion rims parallel to base of cast and not too wide **(same dimension as preclinical)**
5. Labial flare of maxillary occlusion rim
6. Occlusion rims firmly attached to baseplates

JAW RELATION RECORDS

REFERENCES:
Boucher 11th edition, pp 189-219

WhipMix articulator/facebow manual for utilization of facebow and transfer to the articulator

INSTRUMENTS AND MATERIALS

Chart
Towel clip and patient napkin
Mouth Mirror
Casts with indices, baseplate and attached occlusion rims
Fox plate
Hot plate to shape occlusion rims
Bunsen burner
Alcohol torch
Green handle lab knife
Bard Parker with new #21 blade
#7 wax spatula
Adhesive tape
Scissors
Boley gauge
Plastic ruler
Baseplate wax
Aluwax or PVS material (and automix gun and tips) such as Regisil/Stat BR
Petroleum jelly
Bioblend IPN/Portrait IPN shade guide and mold book(s)

STEPS

1. Establish the maxillary lip contour and length of the occlusion rim. The anterior edge of the maxillary occlusion rim should contact the wet-dry line of the lower lip when the patient makes a "F" or "V" sound. In patients with atrophic facial musculature this test is not reliable without the mandibular occlusion rim in place and approximately contoured. Generally the maxillary occlusion rim will have a slight labial flare from cuspid to cuspid.
2. Mark the facial midline and cuspids. The incisive papilla or labial frenum are not reliable indicates of the midline. Vertical lines tangent to the ala of the nose will frequently pass through the middle of the cuspids. The relaxed corner of the mouth should indicate approximately the distal of the cuspid.
3. Establish the Plane of Orientation with the Fox plane. This plane is parallel to Camper's line and the pupils of the eyes. Also, this plane should be relatively parallel to the mandibular edentulous ridge. The Plane of Orientation is ***not*** the final plane where the teeth will be set. The Plane of Orientation is modified on the articulator for mechanical reasons and the Plane of Occlusion is established and is based on oral anatomy and anterior contour of the occlusion rim.

4. When the maxillary rim is contoured a facebow recording can be made and the maxillary cast mounted. Make sure the maxillary rim has two V-shaped, non-parallel notches on each side for orientation on the facebow plate. Place a thin coat of petroleum jelly on the occlusal surface of the rim.
5. A facebow record can be made using softened baseplate wax adapted to the bite plate or a PVS recording media such as Regisil may be used. Center the bite plate on the rim so that it will extend straight out of the patient's mouth. The midline should line up with the mark on the bite plate and the Plane of Orientation should be parallel to the bite plate.
6. Orient and adjust the facebow on the patient to the maxillary occlusion rim. Make sure all adjustments of the facebow are tight before removal from the patient.
7. Attach the facebow transfer components to your articulator and mount the maxillary cast with plaster, don't forget to place a light coat of petroleum jelly in the index areas.
8. Determine the physiologic rest position and vertical dimension of occlusion with the maxillary occlusion rim in place.
    a. Place triangular pieces of adhesive tape on the nose and chin. All measurements should be made from the tip of one triangle to the other with a Boley gauge or millimeter ruler.
    b. Measure physiologic rest dimension using observation, the "M" test, and the end of swallowing.
    c. Measure vertical dimension of occlusion with the old dentures for reference. If it is satisfactory you may duplicate that dimension with your new rims.
9. Adjust the height of the mandibular rim so the vertical dimension is equal to the occluding vertical dimension (for most patients' 2-3 mm less than physiologic rest dimension). REMEMBER A PATIENT CAN ACCOMMODATE EASIER TO AN INSUFFICIENT VERTICAL DIMENSION BUT NOT AN EXCESSIVE VERTICAL DIMENSION.
10. Check the vertical dimension with phonetics and esthetics. The patient must have 1-2 mm anterior space between the occlusion rims with rapid pronunciation of "S" sounds. Have the patient count from 50-60 and note the space on 56 and 60.
11. Adjust the labial contour of the mandibular occlusion rim so there is approximately 1 mm of horizontal overlap with the "S" sounds. This is done simultaneously with step #10. Phonetics are not totally reliable at this stage with bulky occlusion rims, so attempt to contour the rims as accurately as possible to reduce the bulk.
12. Check the "F" position and facial contours in general as it is often necessary to modify the labial contour of the maxillary occlusion rim again.
13. Record centric relation at the proper vertical dimension of occlusion.
    a. Reduce the height of the mandibular occlusion rim an additional ½ mm in the anterior and ~2 mm in the posterior.
    b. Make sure the heels of the mandibular rims do not contact the maxillary occlusion rim at the vertical dimension of occlusion. This is done by clinical observation.
    c. Use a light coat of petroleum jelly on the maxillary indices and attach softened Aluwax (2 thicknesses) over the posterior of the mandibular occlusion rim and guide the patient into a centric relation closure until the occlusion rims are ½ mm from contacting in the anterior area. When the Aluwax is firm remove the rims and cool the wax.
    d. If a PVS material is being used the same procedure is followed only placing the PVS material on the mandibular posterior instead of the Aluwax.

e. The mandibular baseplate should be stabilized during this procedure with your index fingers on the lower buccal flanges and your thumbs under the inferior border of the mandible.
f. The patient may be able to assist with centric relation recording by placing the tip of the tongue at the posterior border of the maxillary baseplate.
g. When the recording is complete check the fit of the Aluwax/Regisil record in the indices. The mandibular heels must not contact the maxillary baseplate or the record should be retaken.
h. Verify this record again in the mouth before mounting the mandibular cast.

14. Mount the mandibular cast with plaster. The incisal pin may be lowered 2-3 index marks to compensate for the thickness of the interocclusal record. ***The cast can be mounted as illustrated in your articulator manual***.
15. Check with your instructor to see if a protrusive record is need and what articulator settings should be used for your patient.
16. DON'T' FORGET TO SELECT THE PROSTHETIC TEETH BEFORE DISMISSING THE PATIENT. THIS IS DISCUSSED IN THE NEXT SECTION.

CRITERIA FOR EVALUATION

1. Lip contour and support adequate – Cupids Bow well formed
2. Tooth display adequate on "F" position
3. Adequate interocclusal distance ~2-3 mm for the average patient
4. Adequate speaking space on "S" position
5. Plane of Orientation established
6. Occlusion rims contoured to simulate the replacement teeth
7. Adequate buccal corridors
8. Midline acceptable
9. Centric relation record satisfactory
   a. Adequate indices
   b. No anterior contact
   c. No heel interference
10. Stable baseplates – required for accurate JRR
11. Casts properly trimmed to centric relation records can be related
12. Tooth selection completed
    a. Mold
    b. Shade
    c. Posterior tooth form
    d. Impression of previous denture for mold reference, if necessary

PROSTHETIC TOOTH SELECTION

REFERENCES:

Boucher 11th edition, pp 231-261

Trubyte handout for arrangement and articulation of anterior/posterior teeth

INSTRUMENTS AND MATERIALS

Plastic ruler
Bioblend/Portrait mold book
Bioblend/Portrait shade guide
Trubyte arrangement book

STEPS

1. Determine the patient's facial form; squire, tapering, ovoid, or combination.
2. Determine the width of the maxillary six anterior teeth by measuring the distance between the cuspid lines. If the cuspid lines represent their centers, add 6 mm for the average size arch. A width of 50 mm is average.
3. Examine the teeth on the old denture and discuss their size with the patient.
4. Select a maxillary anterior mold from the above information using the mold guide.
5. Select a shade that harmonizes with the patient's hair, complexion, and age. Always examine the shade of the old denture. Narrow your choices down to 2-3 shades and let the patient participate in the shade selection.
6. Select a posterior tooth form. Discuss this with your instructor. Generally monoplane teeth are indicated with severely resorbed ridges, cross-bite situations, some class II and class III patients, and where considerable difficulty was experienced in recording centric relation due to poor neuromuscular coordination. Cusped teeth are more frequent indicated in a patient with well-formed ridges in a class I relationship, and exhibits adequate neuromuscular coordination.
7. We predominately utilize acrylic resin teeth in the clinic. You will need to indicate on the laboratory work authorization the material (acrylic resin), mold and shade you would like to use for your patient. Check with your instructor for specific direction in using the mold guides for tooth selection. Each mold guide presents suggested combinations of maxillary/mandibular anterior and posterior molds.
    a. Portrait IPN acrylic resin teeth
        (1) shades from the Vita type guide in the A, B, C & D range
        (2) posteriors molds available in zero, 10 and 40 degrees.
    b. Bioform IPN acrylic resin teeth
        (1) shades from the Bioform guide B59-81
        (2) posterior molds available in zero, 10, 20, 30, 33 and 40 degrees.

ARRANGING PROSTHETIC TEETH/DENTURE OCCLUSION

REFERENCES

Boucher 11th edition, pp 262-78

Trubyte handout for arrangement and articulation of anterior/posterior teeth

INSTRUMENTS AND MATERIALS

Bunsen burner
Green handle lab knife
Bard Parker with new # 21 blade
#7 wax spatula
Flat Trubyte occlusal plane
Pencil
Plastic ruler
Baseplate wax
Alcohol torch
Casts and rims mounted on articulator

STEPS **(same as preclinical)**

1. There are many different ways to successfully arrange artificial teeth. We recommend the following sequence, regardless of the desired occlusal scheme:
   a. maxillary anterior
   b. mandibular anterior
   c. maxillary posterior beginning with 1st premolar
   d. mandibular posterior beginning with 1st molar for cusp teeth and 1st premolar for monoplane teeth

2. Follow the steps in the Trubyte handout for arranging the anterior and posterior molds you have selected. There are many variations in tooth arrangement such as eliminating the 1st premolars if there is inadequate mesial-distal room etc., check with your instructor as how they would like you to handle each individual situation.

ESTHETIC TRY-IN AND VERIFICATION OF JAW RELATION RECORDS (JRR)

REFERENCE: Boucher 11th edition, pp 279-331

INSTRUMENTS AND MATERIALS

Chart
Towel clip and patient napkin
Mouth mirror
Articulator with completed tooth arrangement
Gauze square
Thompson sanitary markers
Hand mirror
Aluwax or PVS material (and automix gun and tips) such as Regisil/Stat BR
#7 wax spatula
Bunsen burner
Alcohol torch
Green handle lab knife

STEPS

1. Check arrangement and try-in by utilizing evaluation criteria.
2. Verify centric relation by making a new Aluwax or PVS record on the mandibular posterior teeth and checking to see if the articulator will accept it. ASK YOUR INSTRUCTOR FOR A DEMONSTRATION ON VERIFICATION OF THE CENTRIC RELATION RECORD. The condylar elements must remain against their stops when the centric lock is released and the maxillary cast is carefully seated into the record. If not, the record should be repeated. If after the second effort the record is not acceptable, then the mandibular cast should be remounted to the new record. It is generally not necessary to remove the posterior teeth if the record is kept sufficiently thin, no greater than 1 mm thick. When remounting, remember to compensate for the thickness of the interocclusal record by dropping the incisal guide pin approximately 1mm. Centric relation interocclusal records are not acceptable if there are tooth perforations in the recording media in any one spot.
3. If during the try-in, it is decided to decrease the vertical dimension of occlusion, the following steps should be followed:
    a. Remove the mandibular posterior teeth.
    b. Decrease the vertical dimension of occlusion o the articulator approximately the amount you have decided to on the patient.
    c. Reset the mandibular anterior teeth chairside to improve phonetics and "S" sounds.
    d. Make a new centric relation record using the anterior teeth as a guide to the amount of closure desired and remount the mandibular cast.
4. DO NOT ALLOW THE PATIENT TO VIEW THE TRIAL ARRANGEMENT IN THEIR MOUTH UNTIL YOU AND YOUR INSTRUCTOR ARE SATISFIED WITH THE ESTHETICS AND JAW RELATION RECORDS.

5. When the patient gives their final OK then the arrangement can be readied for processing and delivery.

CRITERIA FOR EVALUATION

1. Casts and mountings clean and properly attached to the articulator
2. Articulator clean and properly set
3. Teeth neatly waxed to finished denture contours
4. Baseplates stable
5. Wax removed from the casts
6. Occlusal plane established
7. Monoplane teeth
    a. All posterior teeth and canines on occlusal plane
    b. Mandibular posterior teeth over the crest of the ridge
    c. Adequate posterior horizontal overlap
    d. Smile line developed
    e. Mandibular anteriors set to eliminate vertical overlap
    f. Maxillary first premolars in harmony with canines
    g. Bilateral posterior contact in CR with no heavy anterior interferences in protrusive movement
8. Cusp teeth
    a. Centric occlusion stops adequate. Check by releasing incisal guide pin.
    b. Mandibular posterior teeth over the crest of the ridge
    c. Smile line developed
    d. Maxillary first premolars in harmony with canines
    e. Working occlusion satisfactory
    f. Non-working occlusion satisfactory
    g. Protrusive occlusion satisfactory
    h. Adequate anterior horizontal overlap
    i. Minimal anterior vertical overlap
9. Midline acceptable
10. Smile line acceptable
11. Buccal corridors satisfactory
12. Facial contours/support acceptable
13. Occlusal plane satisfactory
14. Adequate interocclusal distance
15. Acceptable speaking space
16. Horizontal overlap “S” sound satisfactory
17. “F” position satisfactory
18. Centric relation satisfactory

CORRECTION OF PROCESSING ERROR, PREPARING THE REMOUNT INDEX AND FABRICATION OF REMOUNT CASTS

REFERENCE: Boucher 11th edition, pp 342-346

INSTRUMENTS AND MATERIALS

Plaster bowl/spatula
Articulating paper/Accufilm
Laboratory handpiece
Acrylic burs, mounted stones/burs
Green handle lab knife
Boxing wax

STEPS

1. After removing the denture and casts from the flasks, attach the cast to their plaster mountings with compound or sticky wax. The cast and mountings must fit accurately or the correction of processing error must be postponed until new records can be made from the patient. Following processing of the complete denture there is almost always a pin opening of ~1mm or more.
2. Check the amount of pin opening and look for heel interferences.
3. Use the criteria and rules given in the previous section ARRANGING PROSTHETIC TEETH/DENTURE OCCLUSION for correcting the processing error (pp 36-38).
4. When removing and finished the processed dentures from the master casts the facebow record will be lost. A remount index should be fabricated after the occlusal correction and prior to removal of the dentures from the casts. The use of a remount index makes repetition of the facebow transfer unnecessary when the dentures are remounted at the insertion appointment.
   a. A new mounting ring is placed on the lower member of the articulator and boxed with a strip of boxing wax to the level of the maxillary teeth when the articulator is closed. Plaster is mixed and the wax is filled to the level of the maxillary teeth. The index should just have shallow incisal edge and cusp tip imprints. This record facilitates remounting the maxillary denture when it is removed from the master cast and the patient remount is completed.
   b. The dentures can now be removed from the master cast(s), finished and polished.
5. Preparation of remount casts after the dentures are polished
   a. All undercuts inside the dentures must be blocked out. Materials that can be used are wax, wet pumice or wet tissue paper.
   b. Fill the tissue side of the dentures with plaster, including the borders. Do not submerge the dentures in plaster. No separating medium is required between the denture and plaster.
   c. When the plaster has fully set, 30-40 minutes, remove the dentures from the casts and neatly trim them with the model trimmer, remember to preserve the borders.

d. Reseat the dentures on the casts and check for a definite seat with no rocking or movement of the denture on the cast. The master casts on which the dentures were processed should not be used for remount casts as the denture will not generally reseat satisfactorily on them.
e. Attach the maxillary remount cast to the upper member of the articulator by seating the denture/remount cast in the remount index and mount to the articulator with plaster.

6. If a commercial laboratory finished your dentures, you should ask them to return your finished dentures with remount casts and the maxillary cast remounted using a facebow preservation record.

CRITERIA FOR EVALUATION

1. Minimal pin opening
2. No heel interference
3. Casts related to mounting indices accurately
4. No gross tooth movement during processing
5. Dentures properly finished and polished
6. Occlusion properly adjusted while maintaining appropriate occlusal scheme and vertical dimension of occlusion.

DELIVERY OF THE DENTURES AND OCCLUSAL REFINEMENT

REFERENCE: Boucher 11th edition pp 358-80

INSTRUMENTS AND MATERIALS

Chart
Towel clip and patient napkin
Mouth mirror
Articulator with remount casts and maxillary cast mounted
Aluwax/Regisil
#7 wax spatula
Alcohol torch
Bunsen burner
Green handle lab knife
Pressure Indicator Paste (PIP) and applicator brush
Mizzy spray
Slow speed handpiece
Acrylic burs

STEPS

1. Check the polish of the dentures by drying them with air. They should be smooth and void free so as to accumulate a minimum amount of plaque and food debris.
2. Check the borders for sharp areas. All borders should be rounded, teardrop in cross sectional dimension. If the maser casts have not been destroyed during the processing procedure, the denture can be checked on these to make sure the borders have not been excessively polished. The finished denture borders should have the same thickness and extension as the final impressions. Reduction of the border thickness or height should only be done by the dentist, not by the technician.
3. Check the tissue surfaces for sharp ridges and bubbles. Round the ridges and eliminate any small positive bubbles.
4. Check the tissue surface and border extensions of the maxillary denture with PIP for undercuts and pressure areas. Place sufficient paste on a gauze square with a tongue blade for your procedure. Adjust these areas with a slow speed handpiece and appropriate acrylic bur.
5. Check the mandibular tissue surface and border extensions with PIP and adjust accordingly.
6. Check the occlusion. The importance of occlusal harmony can be summarized as follows,

   "Occlusal harmony in complete dentures is necessary if the dentures are to be comfortable, to function efficiently, and to preserve the supporting structures. It is difficult to see occlusal discrepancies intraorally with complete dentures. The resilience of the supporting soft tissues and the displaceability of the tissues in varying degrees tend to disguise premature occlusal contacts. The tissues permit the dentures to shift; as a result, after the first interceptive

occlusal contact the remaining teeth appear to make satisfactory contacts. Patients are seldom aware of faculty occlusion in complete denture; yet they always seem to notice an improvement after the fault has been corrected. The eye cannot be relied upon to observe occlusal discrepancies, and the patient cannot be depended upon to diagnose occlusal faults. It is the responsibility of the dentist to find and correct these occlusal discrepancies and permit the patient to depart free of occlusal disharmonies."

"One must assume that there are occlusal faults in all complete dentures until proven otherwise. Occlusal faults can be determined by obtaining an interocclusal record from the patient and remounting the dentures on an articulator. These faults can be corrected by careful selective grinding procedures. Remounting the dentures on the articulator and selective grinding procedures should be carried out at the time of placement of the dentures. Postponing this important step will lead to (1) a deformation of the underlying soft tissue, (2) discomfort, and (3) destruction of the supporting bone. At a later date the occlusal errors may be concealed and impossible to locate an correct because of distorted and swollen tissues."

Dr. Charles M. Heartwell

7. Refine the occlusion by a patient remount and selective grinding procedures
   a. The advantages of this procedure are:
      (1) It reduces patient participation
      (2) It permits the dentist to see better what he is doing
      (3) It provides a stable working foundation; bases are not shifting on resilient tissues
      (4) The absence of saliva makes possible more accurate markings with the articulating paper or Accufilm
      (5) Corrections can be made away from the patient, thus preventing occasional objections when patients see their dentures being adjusted
   b. Make a centric relation record by placing two thicknesses of softened Aluwax over the mandibular posterior teeth. There must not be any tooth perforations of the wax. Only slight cusp indentations are acceptable.
   c. Mount the mandibular denture with this record.
   d. Repeat this record to verify the original centric relation record as was done at try-in. Two repeatable records are sufficient
   e. Refine the occlusion by selective grinding as described previously at the end of the occlusion section (36-38).
8. Check the maxillary posterior palatal seal, vertical dimension, and phonetics.
9. Give the patient the necessary post insertion instructions. These should be both written (school handout) and oral.
10. Appoint the patient for a 24-hour recall check.

CRITERIA FOR EVALUATION

1. Positive bubbles removed from the bases
2. Sharp areas on tissue side smoothed
3. PIP used to relieve pressure areas – contact in primary stress bearing areas
4. Border extension adjusted adequately including labial frenum

5. Polish adequate
    a. Border thickness and extension preserved
    b. Rounded gingival margins and interdental areas
    c. No unpolished areas
    d. Teeth not polished excessively so as to lose anatomy
    e. Adequate lingual tongue contour
    f. Minimal stippling
    g. Adequate gingival anatomy
6. Occlusion satisfactory – remount casts must be made and mounted
    a. Centric relation
    b. Protrusive
    c. Right lateral
    d. Left lateral
    e. Heel interference
    f. Coronoid process interference
    g. Horizontal overlap adequate in posterior
7. Occlusal plane satisfactory
8. Buccal corridors satisfactory
9. Smile line satisfactory
10. Midline satisfactory
11. Retention of maxillary denture adequate
12. Mandibular denture stable
13. Facial contours acceptable
14. Adequate interocclusal distance
15. Acceptable speaking space
16. Horizontal overlap satisfactory “S” sounds
17. Vertical overlap satisfactory
18. “F” position satisfactory
19. Adequate oral and written post insertion instructions
20. 24 hour post insertion appointment

FIVE IMPORTANT RULES FOR THE CORRECT INSERTION OF COMPLETE DENTURES

by Robert L. Schneider, DDS, MS

Rule # 1:

Begin assessing and addressing patient expectations at the initial consultation appointment. A problem anticipated pre-prosthesis delivery is a ***diagnosis*** and a problem addressed at delivery that hasn't been previously discussed is an ***excuse***. The patient will appreciate your diagnostic ability and knowledge if they are fully informed of potential concerns and problems well before the delivery of the prosthesis. This information may include problems with soft tissue irritations due to severe residual ridge resorption or unusual ridge morphology, xerostomia, parafunctional habits, concerns with altering the vertical dimension of occlusion or the occlusal scheme of previously successful complete dentures, etc. Your patients should be given written brochures, pamphlets and any other necessary information at this appointment to begin the education process, even if the patient has worn complete dentures for many years.

Rule # 2:

Evaluate the adequacy of the finish and polish of the dentures ***before*** the patient's appointment. The borders should not have any sharp angles and should be rounded and teardrop shaped in cross section. The finished denture borders should have the same thickness and extensions as the final impressions, providing the impressions were accurate. The tissue surfaces should be checked for sharp ridges and bubbles, which should be removed. The polish is checked when the denture is dry. The denture should have the appropriate finish and contours completed before the patient's appointment, including high shine. Also check the contours around the teeth to make sure there are no irregularities or bubbles in the sulcular areas. The dentures should be thoroughly cleaned following polishing in cleaning solution and the ultrasonic cleaner. If the denture isn't clean enough to have in YOUR mouth don't even consider placing it in your patient's mouth until it is in the proper state of cleanliness.

Rule # 3:

Check the tissue adaptation with pressure indicating paste [PIP] (Mizzy™). The PIP should be applied evenly over the entire basal seating area, in a thin layer up to and including the peripheries. The paste is applied with the supplied brush so that even brush marks are visible in one direction, usually in an anterior-posterior direction. One arch should be evaluated and adjusted at a time. Never have the patient occlude with both complete dentures in at the same time to check the tissue contact, UNTIL the occlusion has been corrected. Until the occlusion has been corrected interceptive occlusal contacts will give you false pressure location readings. In the mandibular arch use both hands to place pressure on the prosthesis. Use the index finger on the occlusal surface of the first molar area and the thumb on the inferior mandibular border just below the first molar area to stabilize the complete denture. Try to refrain from forcing the denture distal, and sliding it up the ramus, as this will also give you a false reading. The

maxillary denture is stabilized with moderate pressure placed by the index finger in the mid palatal area. After each has been separately adjusted both may be checked with the patient biting on a cotton roll in the first molar area with no tooth contact. The cotton roll will equalize the pressure distribution and give you a more accurate reading. The bases should be adjusted so that there is even pressure on the primary stress bearing areas and the posterior palatal seal area with no excessive rubbing in undercut areas. The peripheries are checked with PIP. Kerr's Disclosing Wax™ may also be used to check for border overextensions. The wax is placed along the periphery in 1 - 2 mm uniform thickness and the denture is placed in the patients mouth. Border molding movements are then performed on the patient and when the denture is removed any overextension will show through to the denture base and can be relieved.

Disclosing Wax is easily removed by using a gauze square. PIP is more difficult to remove and clean up. Begin by wiping as much as possible out of the denture using a tissue or gauze squares. The remaining amount can be easily removed using wax solvent (available in the laboratory) or orange solvent (available in the dispensary) and a laboratory tooth brush or in a plastic bag with the denture in the ultrasonic cleaner.

Remember to repolish any areas that were adjusted on the peripheries and smooth any internal adjustments that were left too rough.

Rule # 4:

Occlusal correction can now be done. Unless you have used processed bases, centric occlusion will rarely be in harmony with centric relation. Interceptive occlusal contacts are a very common cause of denture sore spots, loose-feeling dentures and patient dissatisfaction. There are many methods to accomplish refining the occlusion for your patient. The occlusal adjustment will vary depending on the occlusal scheme selected for your patient. The Department of Prosthodontics requires a clinical remount be performed at the delivery of the prosthesis because:

1. It gives the dentist an improved field of vision in the correction by eliminating the tongue, cheeks, saliva, etc.
2. It provides a stable foundation because the bases are mounted on a working cast and not on resilient mucosa.
3. The patient's participation is reduced, as they are most often unsure as to what you are trying to accomplish, and inaccurate input may be detrimental to the final outcome.
4. Working with a dry field on the articulator provides more accurate markings with occlusal marking media.
5. The corrections are made away from the patient, which may prevent occasional objections when you are grinding on the denture teeth.

When the dentures have been mounted on the articulator for the clinical remount, do not begin grinding on the denture teeth until another centric relation record is made and verified on the articulator. Two repeatable records are sufficient to begin the selective grinding process.

The modification of the occlusal or incisal forms of artificial teeth by grinding according to a plan at selected places marked by spots made by a suitable marking material is the definition of selective grinding. Changes will always occur in the occlusal relationship of artificial teeth during the time dentures are being processed with our current technology. Some processing procedures claim to eliminate these changes, however with our current clinical procedures these changes are most often desirable. After the dentures have been flasked, packed and processed, never remove the dentures from the master casts before they are remounted on the articulator and the occlusion adjusted to the predetermined vertical dimension of occlusion. The laboratory remount procedure is a critical step in perfecting the occlusion you are attempting to develop for the patient. The dentures are remounted for the purpose of correcting the errors in occlusion that have occurred during the processing procedure. The laboratory remount procedure is only the beginning of occlusal refinement for complete dentures.

At least one patient remount is required to develop an acceptable occlusal scheme. The patient remount is required because with the well fitting, adjusted, processed denture base a more accurate centric relation record can now be made. The previous trial bases probably did not fit the tissue bearing area as accurately as the processed bases. Dentists are often confused in regard to the selective grinding process for complete dentures. This is very understandable because most procedures that are described are lengthy and seem to become rather involved. Listed below are basic procedures for MONOPLANE OCCLUSION and BALANCED OCCLUSION.

MONOPLANE OCCLUSIONS

If you have chosen a monoplane occlusal concept with a flat compensating curve the occlusal correction is completed on the mandibular arch after the maxillary arch has been gently flattened with wet/dry very fine sandpaper on a smooth, flat surface (glass mixing slab). When you are sure the maxillary occlusal plane is flat, the remaining corrections are performed on the mandibular teeth to maintain the predetermined vertical dimension of occlusion and desired occlusal contacts. When the corrections are complete gently repolish the adjusted occlusal/incisal surfaces with pumice and high shine. Re-clean the denture(s) in cleaning solution in the ultrasonic cleaner before delivery to the patient.

BALANCED OCCLUSION

Here, in most simple terms, is a suggested procedure that may be used to develop a balanced occlusal scheme using cusp teeth:

FOR CENTRIC RELATION: Grind fossa if premature contact of cusp in centric but ***not*** in lateral. Grind cusp if premature contact of cusp in centric ***and*** also lateral.

FOR LATERAL: Premature contact on working side - grind inclines of buccal cusps of maxillary ***or*** inclines of lingual cusps of mandibular. Premature contact on non-working side - grind inclines of lingual cusps of maxillary ***and*** inclines of buccal cusps of mandibular.

FOR PROTRUSIVE: Grind interfering slopes of cusps of posteriors. Bevel incisal edge of

mandibular anteriors at the expense of the labial. Bevel incisal edge of maxillary anteriors at expense of the lingual, if necessary relief isn't achieved with adjustment of the mandibular incisal edge.

Remember to repolish the adjusted occlusal/incisal surfaces after the adjustment with pumice and high shine. The denture(s) can then be re-cleaned using a cleaning solution in the ultrasonic cleaner before delivery to the patient.

Reminder: Selective grinding does not end after the laboratory processing. It should be accomplished on delivery and possibly several times after that. Many soft tissue irritations the denture patient experiences can be traced to occlusal discrepancies that cannot be seen by the clinician. The most predictable and reliable way to develop a stable occlusal scheme is with remounting and selective grinding procedures. The selective grinding procedures will vary with the occlusal scheme desired. Communication with the laboratory is of utmost importance!

Rule # 5:

The patient is now given review of instructions for hygiene of the oral mucosa and the prostheses, maintenance of the prostheses, and what to expect during the "break-in" period of complete dentures. Also review for the patient any expected problems you have described during the treatment such as potential areas of soreness, the feeling of fullness with new dentures, any changes in the occlusion or vertical dimension of occlusion, etc. The patient should also be given the clinic sheet with instructions for cleaning their new dentures.

Make the patient an appointment for a 24-hour recall evaluation. This appointment is to evaluate and treat the patients concerns after having worn the prostheses for 24 hours. Most often this consists of address any soft tissue irritations which are corrected with the use of PIP and adjusted accordingly. Occasionally another remount is necessary, so ***don't throw out your casts from the delivery remount!*** Most of the time these visits are not very long and should end after a reasonable period if the dentures are adequate and the patient has reasonable expectations.

Following a reasonable number of post insertion adjustments and when the patient is comfortable, the patient is placed on annual recall for evaluation of the prosthesis for problem areas and for oral examination of the soft and hard tissues. The recall is important and should be emphasized to the patient. A periodic small occlusal adjustment may prolong the patient's ability to wear the prostheses comfortably for a longer period of time and help prevent the more frequent need for remake of the prostheses.

POST-DELIVERY TROUBLE SHOOTING

I. Retention Problems

A. Problem: Maxillary Denture Lacks Retention at Time of Insertion.

Possible Cause	Diagnostic Procedure	Treatment
1. Tissue contours or fluid balance changed since time of impression.	Patient closes firmly on cotton rolls for 5 min. to determine if retention improves.	Patient reassurance if retention improves.
2. Incorrect posterior palatal seal.	Place pressure on lingual of incisors and canines while supporting denture. Denture dropping indicates incorrect seal.	Treatment depends upon type of error. (See Below)
a. Seal placed on non-displaceable tissue. (Denture too short posteriorly)	Check posterior extension by placing transfer ink on posterior border. Dry tissues and insert denture to transfer ink line to palatal tissues. Relate line to vibrating line.	Relieve original palatal seal. Extend denture with wax or compound. Add seal with impression wax or beading wax until retention is improved. Replace wax/compound with autopolymerizing resin as a lab procedure.
b. Seal on movable tissue (Denture too long posteriorly)	Use transfer ink to relate posterior border to vibrating line.	Shorten denture to vibrating line. Add seal with autopolymerizing resin/or/ create seal with wax until retention improves. Replace wax with resin (Lab Procedure)
c. Inadequate depth and seal does not extend into hamular notch.	Add wax seal along posterior border and check for improvement in retention.	Replace wax with autopolymerizing resin (lab Procedure)
d. Posterior border and seal does not extend into hamular notch.	Transfer ink line to palate with denture. Slide blunt instrument along distal slope of tuberosity until instrument ‘falls’ into notch. Relate to ink line.	Extend posterior border into hamular notch with wax or compound. If retention improves replace wax with resin as a lab procedure.

Possible Cause	Diagnostic Procedure	Treatment
2. Incorrect posterior palatal seal.	Place pressure on lingual of incisors and canines while supporting denture. Denture dropping indicates incorrect seal.	Treatment depends upon type of error. (See Below)
a. Seal placed on non-displaceable tissue. (Denture too short posteriorly)	Check posterior extension by placing transfer ink on posterior border. Dry tissues and insert denture to transfer ink line to palatal tissues. Relate line to vibrating line.	Relieve original palatal seal. Extend denture with wax or compound. Add seal with impression wax or beading wax until retention is improved. Replace wax/compound with autopolymerizing resin as a lab procedure.
b. Seal on movable tissue (Denture too long posteriorly)	Use transfer ink to relate posterior border to vibrating line.	Shorten denture to vibrating line. Add seal with autopolymerizing resin/or/ create seal with wax until retention improves. Replace wax with resin (Lab Procedure)
c. Inadequate depth and seal does not extend into hamular notch.	Add wax seal along posterior border and check for improvement in retention.	Replace wax with autopolymerizing resin (lab Procedure)
d. Posterior border and seal does not extend into hamular notch.	Transfer ink line to palate with denture. Slide blunt instrument along distal slope of tuberosity until instrument 'falls' into notch. Relate to ink line.	Extend posterior border into hamular notch with wax or compound. If retention improves replace wax with resin as a lab procedure.
3. Inadequate clearance for labial or buccal frenum.	Pull lip or cheek down firmly in area of frenum while supporting denture to check for dislodgement.	Use P.I.P. or disclosing wax to determine area for adjustment.
4. Posterior palatal seal causing tissue rebound and denture displacement.	Use P.I.P. to check. Complete displacement of P.I.P. Indicates excessive depth. Patient will usually complain of pain or pressure.	Relieve seal, checking with P.I.P. until retention improved and discomfort corrected.

Possible Cause	Diagnostic Procedure	Treatment
5. Thin tissue covering over prominent mid-palatal suture or tours.	Displacement of P.I.P. when alternating pressure placed on posterior teeth.	Relieve area of P.I.P. displacement.
6. Dry mouth because of alcoholism, radiation medication or disease.	Place saliva substitute to check if retention is improved.	Prescribe saliva substitute as rinse and for placement in denture.
7. Inaccurate denture base because if inaccurate impression or war of finished denture.	Place thin mix of alginate impression material in denture and seat firmly in mouth. Thick areas of alginate indicate poor tissue adaptation.	Reline or remake the denture.
8. Posterior border too short or too thin to fill buccal vestibule.	Retract check and visually check.	Extend border with compound or impression wax and border mold. Replace impression material with resin as a lab procedure.
9. Short labial flange or excessive notch for labial frenum.	Retract lip horizontally and visually check. Denture drops when patient smiles widely.	Extend border with compound or impression wax. Replace impression material with resin as a lab procedure.

B. Problem: Maxillary denture loosens when patient opens widely.

Possible Cause	Diagnostic Procedure	Treatment
1. Posterior borders too thick or too long.	Pull cheek out and down over border to check for dislodgement of denture.	P.I.P. or disclosing wax on border. Overextension or excessive thickness may be indicated by only a thin line of displacement of indicating material. Adjust area of show through.
2. Interference with coronoid process if mandible by distobuccal flange.	Place finger in anterior teeth and have patient protrude mandible and move it from side to side. Feel for movement of denture.	Use P.I.P. or disclosing wax to indicate area for adjustment. Adjust show-through.

C. Problem: Maxillary denture loosens while patient is speaking.

Possible Cause	Diagnostic Procedure	Treatment
1. Inadequate posterior palatal seal.	Place pressure on lingual of incisors and canines while supporting denture. Denture dropping indicates incorrect seal.	Treatment depends upon type of error. (See section I A-3)
2. Interference with coronoid process of mandible.	Place finger on anterior teeth and have patient protrude mandible and move from side to side. Feel for movement or dislodgement of denture.	Same as I B-2
3. Posterior border too long or too thick.	Pull check out and down over border to check for dislodgement of denture.	Same as I B-1
4. Short labial flange or excessive notch for labial frenum.	Retract lip horizontally and visually check. Denture drops when patient smiles widely.	Extend border with compound or impression wax. Replace impression material with resin as a lab procedure.
5. Notch for buccal frenum too thick or of insufficient size.	Grasp cheek and pull down and out in buccal frenum area. Move cheek anteriorly and posteriorly and check for dislodgement.	Use P.I.P. or disclosing wax and repeat movements. Adjust show through areas.

D. Problem: Mandibular denture lacks retention at time of insertion.

Possible Cause	Diagnostic Procedure	Treatment
1. Change in tissue contours or fluid balance since impression.	Cotton rolls placed between posterior teeth and patient closes firmly for 5min. Check for improvement.	Reassurance if retention improves.
2. Borders too wide to too long in labial or buccal flange areas.	Patient places tip of tongue on the mandibular incisors and opens. Lips and cheeks are lifted up and around borders to check for lifting of denture.	Place P.I.P. or disclosing wax and repeat lifting of lip and cheek while holding denture in position. Adjust show-through areas.
3. Buccal flanges under extended.	Pull cheek outward and upward at a 45degree angle and move cheek forward and back. Space between border and cheek indicates unerextension.	Extend and border mold with compound or impression wax. Replace with resin as a lab procedure.

Possible Cause	Diagnostic Procedure	Treatment
4. Labial flange under extended.	Pull lip out in horizontal direction and move it from side to side. Space between border and mucobuccal fold indicates under extension.	Same as I D-3
5. Inadequate notch for lingual frenum.	Patient forcibly places tongue to touch posterior palate. Check for lifting of denture.	P.I.P. to indicate area for adjustment.
6. Overextension or excessive thickness of lingual border in molar area.	Patient lightly places tip of tongue into right and left buccal vestibules. Note forceful lifting of denture.	Place disclosing wax on border on side of forceful lifting. Repeat tongue movement while holding denture firmly in place. Adjust show-through areas.
7. Overextension or excessive thickness in distolingual area.	Patient protrudes tongue from mouth. Forceful lifting indicates need for adjustment of denture.	Disclosing wax is placed around border on distolingual one third of denture. While holding denture in place, patient forcefully protrudes tongue to indicate area for adjustment. Thin distolingual border to 2mm.
8. Under extension of lingual border in molar/and/or/ distolingual area.	Apply impression wax on border. Patient lightly protrudes tongue from mouth, into each cheek and opens widely. Wax remaining with dull surface appearance indicates lack of contact and under extension.	Add additional wax or use compound to extend border and border mold. When retention is improved, replace with resin as a lab procedure.
9. Inadequate lingual seal.	Lengthen and widen lingual border from premolar to premolar with impression wax. Patient licks lips, clears buccal vestibules and retrudes tongue to touch posterior palate. Improved retention indicates inadequate seal.	Replace wax with resin as a lab procedure.
10. Retracted tongue position (tongue doesn't lie comfortably with lip touching lingual incisors and lateral borders not contacting teeth.)	Place dentures firmly in mouth. Ask patient to open slightly. Observe relationship of tongue to denture.	Tongue exercises twice daily. Place resin nodule on lingual of mandibular incisors to serve as reference point for tip of tongue.
11. Lack of adequate neuromuscular control. (elderly stroke, disease.)	Patient observation. Evaluate patients' ability to manipulate lips and tongue on command. Observe facial musculature for hypotonicity.	Use of denture adhesives for a few weeks until control of denture improves. Improve contours of polished surfaces if they are not ideal.

Possible Cause	Diagnostic Procedure	Treatment
12. Posterior teeth set too lingual crowding tongue.	Lingual cusps should lie within triangle formed by lines connection the lingual and buccal aspects of the retromolar pad with the mesial contact point of the properly positioned canine.	Reposition teeth on denture base and process with resin. Minor errors may be corrected by grinding lingual surfaces.
13. Poorly contoured polished surfaces. (Should be contoured so that lower fibers of buccinator and tongue will add in retention.)	Polished surfaces too convex with denture base wider than borders.	Reshape denture base to acceptable contours.
14. Dry mouth because of alcoholism, medication or disease.	Place saliva substitute in denture to check if retention improves.	Prescribe saliva substitute as rinse and for placement in denture.

E. Problem: Maxillary denture loosens at different times of day.

Possible Cause	Diagnostic Procedure	Treatment
1. Heavy secretion of mucinous saliva from palatal salivary glands.	Tissue surface of maxillary denture covered with ropy saliva. Usually affects a first time denture wearer. Heavy carbohydrate diet may contribute to problem.	Remove and clean denture several times daily; use of astringent mouth rinses; reassurance that palatal glands tend to atrophy when covered.
2. Periods of excessive dry mouth because of alcoholism, radiation medication or disease.	Place saliva substitute to check if retention is improved.	Prescribe saliva substitute as rinse and for placement in denture.

F. Problem: One or both dentures loosen while eating.

Possible Cause	Diagnostic Procedure	Treatment
1. Teeth set too far buccal to crest of ridge.	Lingual cusps should fall within triangle formed by buccal and lingual aspects of retromolar pad and the mesial contact of the canine.	Reposition teeth on denture base.
2. Occlusal plane higher than retromolar pad.	Check relation of occlusal plane to anatomic landmarks.	Reposition teeth of both dentures.
3. Interceptive contact in occlusion.	Carefully check relationship of teeth throughout the chewing process.	Remount and correct posterior occlusion. Hollow grind lingual of maxillary anterior teeth if necessary to eliminate anterior interferences in function range of movement.
4. Inadequate neuromuscular control with new dentures.	Rule out all possible errors of dentures.	Reassurance that it will take time for oral structures to accommodate to new contours of new dentures. Adhesives may be used for 1-2 weeks until control of denture improves.

II. PATIENT DISCOMFORT PROBLEMS

A. Problem: Excessive salivation.

Possible Cause	Diagnostic Procedure	Treatment
1. Strangeness of new denture.	Usually occurs first 72 hours of wearing new dentures.	Reassurance. Patient should be counseled about problem prior to denture insertion. Probably caused by reflex parasympathetic simulation of the salivary glands.

B. Problem: Sore mouth at 24 hours or subsequent post insertion appointment. (during first 2 weeks)

Possible Cause	Diagnostic Procedure	Treatment
1. Pressure areas from impression or war of denture. Lack of relief in non-yielding areas such as tori, lingual tuberosities, exostoses or sharp bony areas.	Examine bearing area for reddened areas or red areas with central ulceration. Swelling of inflamed area helps to identify pressure area with P.I.P.	P.I.P. to indicate area for adjustment. May encircle area requiring adjustment with transfer ink.
2. Borders too long, too wide, or border left sharp.	Examine border areas for red line, long slit or cut in tissue; or a well-circumscribed reddened area or, a grayish white area that appears to be sloughing.	Use P.I.P. or disclosing wax and manipulate borders to determine area of overextension. Area may be encircled with transfer ink to help identify overextension. Borders must be rounded.
3. Errors in occlusion causing movement of denture.	Carefully check occlusion. Irritated areas are on ridge slopes.	Remount and correct occlusion.
4. Overextension in masseter area of mandibular denture.	Disto-buccal contour of mandibular denture does not assume 45degree angle from top of pad, and soreness is on lingual of mandible. Place disclosing wax on disto-buccal borders and have patient close very firmly on cotton rolls to activate masseter muscle.	Adjust areas where wax is displaced.
5. Insufficient relief over undercuts.	Use combination of P.I.P. and transfer ink to locate exact area on denture. Area may be reddened and/or ulcerated.	Adjust denture until patient feels improvement. Do not over relieve denture.

C. Problem: Non-specific pain with a new denture.

Possible Cause	Diagnostic Procedure	Treatment
1. Pressure over zygomatic process.	Palpate and apply pressure over zygomatic area to check for pain.	Locate pressure area with P.I.P. and adjust.
2. Disto-buccal border of maxillary denture base too wide.	Place finger on maxillary anterior teeth and have patient protrude mandible and move from side to side. Feel for movement or dislodgement of denture.	Use P.I.P. or disclosing wax to indicate area for adjustment.

D. Problem: Generalized soreness after repeated adjustments.

Possible Cause	Diagnostic Procedure	Treatment
1. Clenching and bruxing.	Shiny wear facets on teeth, observation and questioning of patient.	Patient awareness, stretch and relaxation procedures. Keep denture out at night or wear a soft mouth guard over denture.
2. Inadequate Interocclusal distance. (freeway space)	Utilize rest position and phonetics to determine if rest position has been encroached by vertical dimension of occlusion.	Remount and reposition or equilibrate teeth restoring adequate Interocclusal distance (freeway space.)
3. Errors in occlusion. (Soreness on crest or slopes of residual ridge)	Carefully remount and analyze occlusion. Check for interferences at position of habitual closure if it differs from centric relation. (retrognathic patients)	Correct occlusion. May have to remount to help in eliminating interferences.
4. Post menopausal endocrine changes or endocrine therapy.	Careful history – relationship of soreness to initiation of drug therapy or a change of medication.	Consult with physician for possible interruption of drug therapy or change in medication.
5. Low tissue tolerance due to nutritional deficiencies.	Thorough dietary analysis.	Dietary counseling; with knowledgeable physician if problem persists.
6. Low tissue tolerance due to disease such as uncontrolled diabetes, pemphigus vulgaris.	Thorough history. Rule out all possible local causes.	Referral to physician for diagnosis and treatment.

E. Problem: Cheek biting.

Possible Cause	Diagnostic Procedure	Treatment
1. Insufficient horizontal overlap of posterior teeth.	Observe relationship of posterior teeth. Should be approx. 2mm. Of horizontal overlap.	Normal relationship: round in buccal cusps of mandibular molars; crossbite: round in buccal cusps of maxillary molars.
2. Insufficient clearance between denture bases and distal to last tooth.	Check for clearance of 3-4mm.	Thin denture bases to allow space for tissues of check.
3. Sharp buccal cusps.	Run finger over buccal surface of posterior teeth.	Round over sharp edges and polish.
4. Replacement teeth extend too far posteriorly.	Teeth set over retromolar pad or tuberosity.	Remove most posterior tooth and grind it off denture base.

F. Problem: Tingling and/or pain of lower lip.

Possible Cause	Diagnostic Procedure	Treatment
1. Pressure over mental foramen.	Only ridges with extensive Resorption. Palpate firmly in area of mental foramen to reproduce symptoms.	Use transfer ink to encircle area. Relieve area liberally.

G. Problem: Burning sensation of upper lip and side of nose.

Possible Cause	Diagnostic Procedure	Treatment
1. Impingement of nasopalatine nerves exiting incisive foramen.	P.I.P. to verify pressure over incisive foramen. Area may be reddened.	P.I.P. or place transfer ink on papilla to locate area of denture for liberal relief.

H. Problem: Patient complains of sore throat.

Possible Cause	Diagnostic Procedure	Treatment
1. Overextension and ulceration on soft palate.	Use transfer ink to determine overextension onto movable tissue.	Shorten and reestablish a posterior palatal seal.
2. Overextension beyond hamular notch, disto- buccal of maxillary denture, disto-lingual of mandibular denture or onto pterygo-mandibular raphe above retromolar pad.	Inspection for inflamed or ulcerated tissues in these areas,	P.I.P. or disclosing wax and transfer ink to locate area of denture for adjustment. Adjust and polish denture.

III. GAGGING WITH DENTURES

A. Problem: Gagging at time of insertion.

Possible Cause	Diagnostic Procedure	Treatment
1. Nervousness at receiving first denture.	Rule out other possible causes.	A Piece of hard sweet-sour candy to occupy tongue when symptoms appear – first day or two only.
2. Posterior border too long.	Apply transfer ink to posterior border of denture and insert after drying tissues. Relate ink line to vibrating line.	Adjust denture if it extends beyond vibrating line. Reestablish a posterior palatal seal.
3. Posterior border thick.	Inspect posterior border for thickness over mm.	Reduce thickness from overextended and thin distolingual border to 2mm.
4. Disto-lingual flange of mandibular denture too long or too thick.	Check to determine that disto-lingual borders are not over 2mm. thick. Use disclosing wax or P.I.P. to check for overextension.	Shorten borders if overextended and thin distolingual border to 2mm.
5. Maxillary occlusal plane too low triggering tongue gagging.	Simulate contact on tongue with mouth mirror to check for gagging response.	Reposition teeth on denture base or remake denture.

B. Problem: Delayed gagging – begins subsequent to day of insertion.

Possible Cause	Diagnostic Procedure	Treatment
1. Heavy mucinous saliva form palatal salivary glands escaping from posterior border.	Remove denture and observe thick ropy saliva.	Remove and clean denture frequently. Use of astringent mouthwash. Reassurance that secretion will eventually decrease
2. Mandibular teeth set too far lingual triggering tongue gagging.	Verify correct buccal-lingual position and lingual aspects of retromolar pad and the incisal contact of the cuspid.	Grind lingual surfaces of mandibular posterior teeth or reposition teeth on denture.
3. Vertical dimension of occlusion increased beyond physiologic limits.	Use rest position and phonetics to verify adequate Interocclusal distance. (freeway space)	Reposition or equilibrate teeth to increase the Interocclusal distance.

IV. SPEECH PROBLEMS

A. Problem: Patient has difficulty speaking with first or new denture.

Possible Cause	Diagnostic Procedure	Treatment
1. Unfamiliarity with new denture contours	Generalized awkwardness in speaking – no specific consonants.	Reassurance. Suggest reading aloud for practice. Suggest use of tape recorder to help build confidence.
2. Vertical dimension of occlusion increased beyond physiologic limits.	Posterior teeth as well as anterior strike while speaking, particularly in the "s", "ch" and "j" sounds.	Reposition teeth or equilibrate after remount to establish adequate "speaking space".
3. Anterior teeth set with too much vertical overlap and/or tooth little horizontal overlap. (Common problem when teeth set in normal relationship for patients with retrognathic jaw relationship	Watch relationship of anterior teeth when patient says words with "s", "ch" and "j". Rule out increased vertical dimension of occlusion and loose dentures.	Recontour anterior teeth by creating incisal wear and/or by hollow grinding lingual surfaces of maxillary teeth. Reposition teeth if necessary.

B. Problem: Prolonged difficulty in speaking clearly.

Possible Cause	Diagnostic Procedure	Treatment
1. History of corrected speech problems as a child.	All denture causes of problem ruled out. Take a detailed history. Patients often forget early lisps or other problems that were corrected by time or therapy.	Enlist the aid of speech therapist.

C. Problem: Whistle on 's' sounds.

NOTE: Normal 's' sound is created by hiss of air as it escapes from median groove of tongue when tip of tongue is just behind maxillary incisor teeth. Lateral borders of tongue in contact with posterior teeth and tissue.

Possible Cause	Diagnostic Procedure	Treatment
1. Median groove of tongue too deep. Maxillary anterior teeth set too far labial or insufficient denture base material on lingual of maxillary anterior teeth.	Add wax to anterior palate to create normal "s" curve of palate and have patient speak words with "s" sound.	Replace wax with resin if whistle is corrected.
2. Posterior teeth set too far lingual or denture base material too prominent causing median groove to deepen.	Combination of relieving posterior denture base and add wax to anterior palate.	Replace wax with resin if whistle is corrected.

D. Problem: "S" sound sounds as "SH" or "TH".

Possible Cause	Diagnostic Procedure	Treatment
1. Median tongue groove too shallow and air escaping at lateral borders of tongue: Excessive base material lingual to anterior teeth or anterior teeth set too far lingual.	Problem with "S" sound not pronounced.	Relieve anterior palatal denture base.
2. Air escaping at lateral borders of tongue because of lack of denture base material restoring tissue.	"S" sounds as slushy "sh" or a lisping "th". Build up lingual tissue roll with wax until problem is corrected.	Replace wax with resin.

PROTOCOL FOR RELINING COMPLETE DENTURES

1) Examination of patient and existing prostheses.
2) Decide if a reline versus a remake is indicated.
   Indications for a reline:
   1) Minimal to moderate loss of retention and/or stability
   2) The vertical dimension of occlusion is satisfactory.
   3) The esthetics are satisfactory.
   4) The prosthetic teeth are not severely worn.
   5) The borders are not grossly over or under-extended
   6) The occlusion is satisfactory.

   If any of these indications are not met, **the denture should be remade.**

   * *(It is the policy of the Department of Prosthodontics that students should only reline dentures made at the College of Dentistry)*

3) Proceed with reline technique.

Clinical Procedures for Functional Reline Technique:

First Appointment:

1) Make only one reline impression at a time. Treat the less stable denture first.
2) Remove existing undercuts in denture.
3) Reduce any overextended borders and slightly relive tissue surface. Place relief hole(s) if indicated. (under extended borders will require border molding: the standard technique is preferable in this situation)
4) Place tissue conditioner in denture and allow it to thicken for several minutes.
5) Place denture in patient's mouth and verify proper orientation. Have the patient close lightly into maximum intercuspation with the mandible in centric relation at the appropriate VDO.
6) Remove denture after ten minutes and trim excess material with a sharp lab knife. Replace denture and proceed with opposing denture reline impression if one feels it is appropriate. Otherwise reline opposing denture at separate appointment.
7) Either have patient wait one hour, or dismiss patient with instructions to wear dentures until they return. The patient should return within 48 hours. (Note: if patient has a bruxing habit, do not have them leave the dentures in overnight.)

Inspection of Reline Impression: (at least one hour later, but not over 48 hours)

1) Inspect tissue conditioner in the denture. If there are areas of acrylic showing through the material, relieve them and place a thin layer of new tissue conditioner in the denture. Replace denture in patient's mouth and re-evaluate after twenty minutes. Once the material appears uniform and accurate, box and pour immediately in Type III stone and send denture(s) to the laboratory for placement of posterior palatal seal and processing. (It is important to instruct the laboratory on the proper posterior palatal seal design for each individual patient.)

Delivery Appointment:

1) Inspect processed dentures.
2) Deliver dentures to patient and check adaptation with PIP.
3) Evaluate occlusion. Perform clinical remount.
4) Review home care and recall with patient.

Clinical Procedures for Standard Technique:
(preferred technique when border molding is necessary)

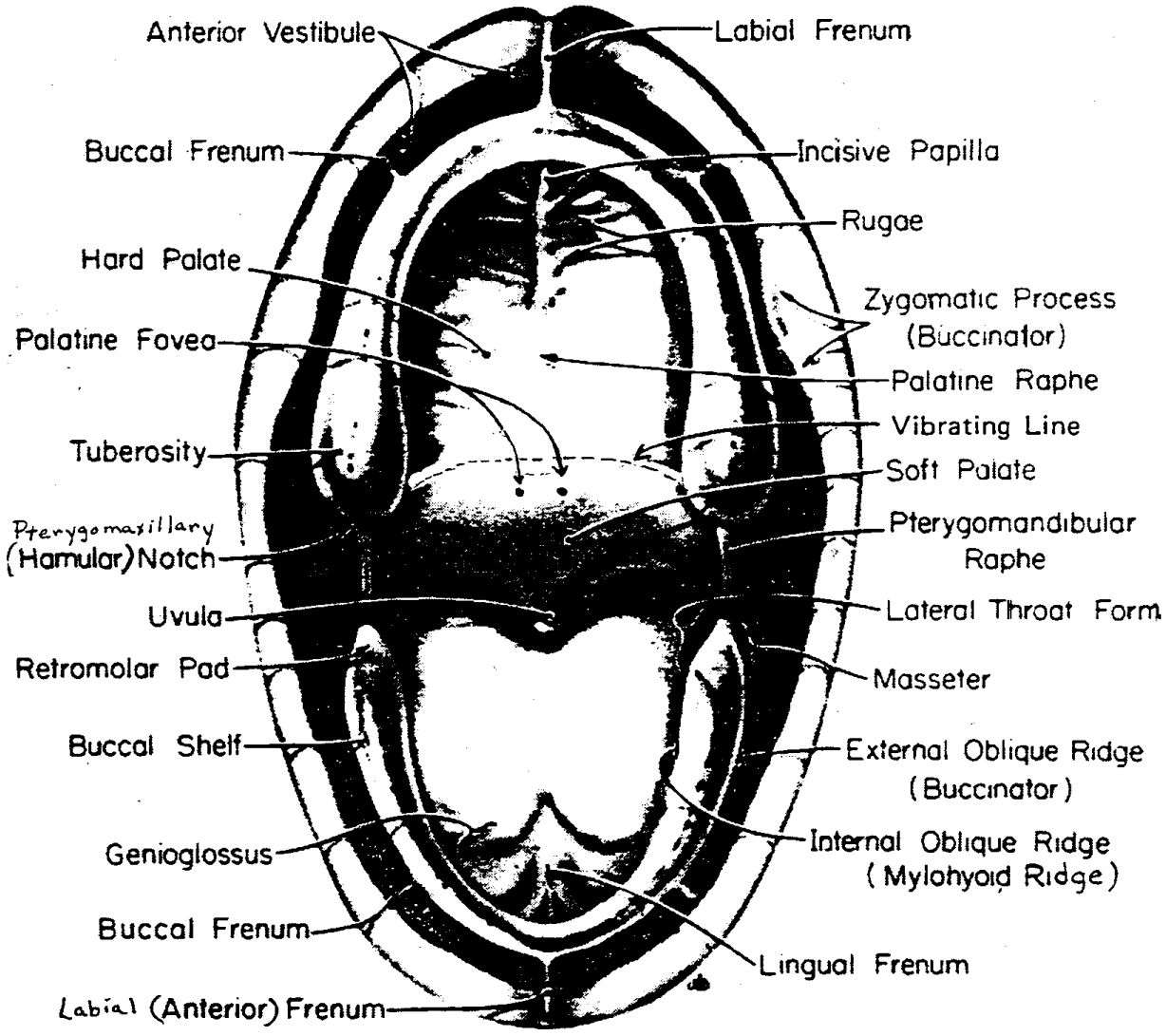
First Appointment:

1) Make only one reline impression at a time. Treat the less stable denture first.
2) Remove existing undercuts in denture.
3) Reduce any overextended borders. Border mold if necessary.
4) Relieve tissue surface by 1-2mm. Place relief holes if necessary.
5) Place polyvinylsiloxane impression material in denture.
6) Place denture in patient’s mouth and verify proper orientation. Have the patient close lightly into maximum intercuspation with the mandible in centric relation at the appropriate VDO.
7) Remove denture after 5 minutes and trim excess material.
8) Place functional posterior palatal seal in maxillary denture with Iowa Wax, or give the lab appropriate instructions for designing the patient’s posterior palatal seal**.**
9) Replace denture and proceed with opposing denture reline impression if one feels it is appropriate. Otherwise reline opposing denture at separate appointment.
10) Dismiss patient. Send dentures to lab for processing.

Delivery Appointment:

1) Inspect processed dentures.
2) Deliver dentures to patient and check adaptation with PIP.
3) Perform clinical remount.
4) Review home care and recall with patient.

SCHEMATIC APPEARANCE EDENTULOUS MAXILLA AND MANDIBLE.
(TONGUE NOT SHOWN)



Clinical Steps in Removable Partial Denture Fabricaction

Dr. Robert Schneider

Appendix I

CLINICAL STEPS IN THE CONSTRUCTION OF REMOVABLE PARTIAL DENTURES

FIRST APPOINTMENT - Examination and diagnostic records

Evaluate the patient's health history, dental history, extra and intra-oral exam, radiographic exam (including periapicals and panoramic for partially edentulous patients). Diagnostic impressions and casts, facebow transfer, centric jaw relation records (when necessary) will be completed at this appointment.

For this appointment have ready: hot water bath, cold water bath, patient's chart and current radiographs, alginate impression trays, alginate with mixing bowl and spatula, rope wax, Aluwax™, compound, alginate tray adhesive, Bunsen burner, Hanau torch, complete facebow apparatus, wax spatula, mouth mirror, perio probe, explorer, etc.

1. Initial clinical, and radiographic evaluation.
2. Accurate, properly extended alginate impressions made in a stock tray.
3. In the laboratory: double pour the impressions, first pour with vacuum mixed dental (yellow) stone and support the impression by the handle holders in the laboratory. Allow the stone to set a minimum of 10 - 15 minutes. The second pour is vacuum mixed dental stone placed on plastic or tile. The first pour can be inverted on the new mix of stone to form the base. DO NOT SEPARATE FIRST POUR FROM THE IMPRESSION BEFORE INVERTING ON THE SECOND POUR AND ALLOWING THE SECOND POUR TO SET. Separate the cast from the impression after the second pour has set 45 - 60 minutes.
4. Facebow transfer: mark arbitrary hinge axis location 12 mm anterior to the tragus on the ala-tragus line. If you use the ear bow set it appropriately. When the patient has a totally or partially dentate maxillary arch, use the bite plane with compound or aluwax to record the cusp tips. The brass rivet should be placed between the maxillary central incisors pointing superiorly. Warm the wax and wrap it firmly around the bite plane (red compound). Temper the wax at 140^{o} F in the water bath and place the plane in the patient's maxillary arch to record the indentations of the cusp tips. After the wax has cooled, gently remove the plane from the patient's mouth without rocking, to avoid any distortion in the material. Check the wax indentations for perforations to the metal plane. Any perforations are unacceptable and a new record will be made. Chill the acceptable

wax record in cool water. Assemble the facebow on the patient. The patient may assist in this procedure by supporting the bite plane with their index finger or thumb. Following proper alignment, tighten the adjustments and infraorbital pointer and gently remove the facebow from the patient.

5. If enough contacting natural teeth remain, a wax or Regisil™ centric relation interocclusal record may be fabricated. If not, an autopolymerizing acrylic resin sprinkle on, or light cured record base and occlusion rim will have to be fabricated on the diagnostic casts for use at the next appointment to facilitate articulating the diagnostic casts. *Check with your instructor for the desired method for your patient.*
6. Mount the indexed diagnostic casts if a wax or Regisil™ centric relation record was made. If you must fabricate an autopolymerizing acrylic record the centric relation records will be made at the following appointment.
7. If the RPD to be fabricated is in the maxillary arch, a custom impression tray, covering the palate to the vibrating line should be made on a duplicate cast for use at the next appointment. Be sure to include natural tooth stops on the teeth not involved in the RPD design for the tray to be accurately re-oriented in the patient's mouth.

If a mandibular removable partial denture is to be fabricated and the maxillary arch is edentulous, and no fixed restorations are planned, mounted diagnostic casts are usually not necessary

Before the patient's second appointment the student should schedule time with their prosthodontic instructor to discuss the patient's treatment plan. Bring the patient's chart, radiographs, mounted diagnostic casts, surveyor with analyzing rod, carbon marker and sheath, and undercut gauges, and a red/blue pencil with you. An RPD design will be drawn on the diagnostic casts by the student with instructor assistance. A written treatment plan, including perio, endo, operative, surgery and fixed prosthodontic procedures necessary in the patient's treatment will be listed. All anticipated mouth modifications will be listed on the goldenrod treatment plan sheet, such as, rest seats, guide planes, changes in height of contour, extractions, fixed restorations, etc. Mouth preparations will be completed on the diagnostic casts with your instructors approval before the master cast impression appointment. All fixed restorations to be completed on a combination patient will be completed only after a definitive RPD design is approved by your instructor.

SECOND APPOINTMENT - Mouth preparation and master cast impressions

For this appointment have ready: high and slow speed handpieces with burs, diamonds and stones, hot water bath, cold water bath, appropriate impression trays - perforated stock or custom acrylic resin - rope wax, cake and stick compound, alginate with water measurer, mixing bowl and spatula, or light and heavy body polyvinyl siloxane such as Reprosil™ or Express™ with the proper tray adhesive, and syringe, Bunsen burner, Hanau torch, mouth mirror, perio probe, explorer, etc.

1. Mouth preparations will be completed as previously listed on the goldenrod treatment plan, providing all other restorative, perio, surgery, etc. for the patient are satisfactorily completed. *Check with your instructor before beginning*. To prepare the teeth to receive an RPD, high and slow speed handpieces with an assortment of carbide burs and diamonds will be used. After the rest preparations are completed and polished, and the instructors approval is obtained, impressions for the master cast can be made.
2. Master cast impressions for the mandibular arch can usually be made with a modified stock tray using alginate. The master cast impression should accurately record all soft and hard tissues, rests, guide planes, including retromolar pads, retromylohyoid fossa, etc. The perforated metal impression tray usually has to be modified with rope wax or compound to achieve the proper extension. Occasionally your instructor will require a custom acrylic resin impression tray for a mandibular RPD, *check with your instructor*. If alginate is used for the impression **TWO** alginate impressions are required for master casts. *Before or after making the impression, record the depth of the floor of the mouth. This is done using a perio probe and recording the distance from the crest of the marginal gingiva of the natural teeth to the activated floor of the mouth on the treatment plan sheet and diagnostic cast. These measurements will be your guide for the placement of the mandibular major connector and is very important*. Double pour the mandibular master cast impressions. If a custom tray was used it will have to be boxed before being poured. Use vacuum mixed **die stone** for the first pour placing small retentive blebs on the surface to retain the second pour base. Allow the die stone to set a minimum of 20 - 30, then use vacuum mixed yellow stone for the second pour. DO NOT SEPARATE THE FIRST POUR FROM THE IMPRESSION BEFORE THE SECOND POUR IS MADE AND SET. Separate the master cast from the impression after the second pour has set 45 - 60 minutes. Use the model trimmer after the master cast has set 24 hours to prevent erosion of the unset stone surface.

3. Impressions for the maxillary master cast are made, most often, with a custom impression tray, with a wax spacer and polyvinyl siloxane impression material. The FULL PALATAL COVERAGE impression tray is made on a duplicate diagnostic cast. The tray should be extended 2 - 3 mm short of the mucobuccal fold, through the ptyergomaxillary notches and to the fovea palatini. Three stops should be placed on the natural teeth as far apart as possible. The distal extension edentulous areas will be border molded using red or green stick compound. Following border molding the wax spacer is removed from the impression tray and polyvinyl siloxane tray adhesive is painted on the interior and borders of the impression tray. Light body polyvinyl siloxane material (Reprosil™ or Express™) can be applied to the abutment teeth using a syringe. Heavy body polyvinyl siloxane material can be loaded in the tray and the tray placed in the mouth. The final impression will be double poured after boxing, using vacuum mixed die stone for the first pour and vacuum mixed yellow stone for the second pour as previous described for the mandibular impression. When the double poured cast is separated from the impression, and if the impression is still intact, repour in the same manner for a second master cast. The second cast will be used as a back-up or for a remount cast. Use the model trimmer after the casts have set for 24 hours to avoid erosion of the unset stone surface.

The student should schedule time with their prosthodontic instructor to survey and tripod the master casts. Bring trimmed master cast(s), complete surveyor, red/blue pencil, blank removable prosthodontic laboratory work authorization, patients record, and diagnostic casts. The design of the removable partial denture should be drawn on the work authorization, and diagnostic cast(s) EXACTLY as it is to be fabricated by the laboratory. The second master cast is used as a back-up or for use as a remount cast. The written laboratory work authorization is also to be filled out at this time. Most dental laboratories require at least 5 - 7 working days for the fabrication of a removable partial denture framework. Some instructors require students to observe and critique the blockout and wax-up of one RPD framework during their prosthodontic block rotation. *Check with your instructor as this may require more laboratory working time*. Give the master cast and laboratory work authorization, after your instructor has OK'ed and signed them, to the Prosthodontic secretary, Mrs. Mary Ann Sevcik.

THIRD APPOINTMENT - Framework try-in, altered (corrected) cast impression

For this appointment have ready: hot water bath, cold water bath, Bunsen burner, Hanau torch, Bard Parker with a new blade, wax spatula, red or green stick compound, Kerr's Disclosing Wax™, polyvinyl siloxane impression material (Reprosil™ or Express™) occasionally Denture Base Elasticon™ is used, wax pot with Kerr's Iowa Wax™, sable brush, high speed handpiece with burs and diamonds, slow speed handpiece with denture adjusting burs, mouth mirror, explorer, perio probe, shade guides (Bioblend or Trublend for anteriors and Bioform or Trublend for posteriors), and the appropriate mould guide booklet available in the dispensary.

Evaluate the finished RPD casting on the master cast when it is returned from the laboratory. Check the design and fit of the metal to the cast. Rests, clasps and appropriate major and minor connectors should not exhibit any gap between the metal and the stone model. *As your instructor for an evaluation before the patient's appointment.*

1. The fit of the framework can now be evaluated in the patient's mouth. Areas of potential interference (guide planes, lingual plates, rests, etc.) are checked using Kerr's Disclosing Wax™ or spray Occlude™. *Check with your instructor as to the desired material.* Areas that are found to be binding are adjusted with a highspeed handpiece using stones and burs. The adjusted areas can be smoothed with a slow speed handpiece and the appropriate metal polishing burs and stones. The properly adjusted RPD framework should not bind or exert excessive forces on the hard or soft tissues on insertion or removal. The RPD framework should be passive when fully seated as described in a previous chapter.
2. Following proper fitting of a tooth supported RPD framework, and if there are enough teeth in the opposing arch, a wax interocclusal record should be made to facilitate mounting the casts. *Check with your instructor.* If enough natural teeth are not available to provide at least three points of contact, widely spaced in the arch, then a stable wax rim should be added to the edentulous areas of the RPD framework to facilitate jaw relation records. If the maxillary RPD is tooth supported, a facebow transfer can be completed at this appointment. With tooth supported RPD's, prosthetic tooth mould and shade selection can be completed at this appointment.
3. When the RPD is a mandibular Kennedy Class I or II an autopolymerizing acrylic resin impression, or light cured impression tray should be added to the distal extension

edentulous area(s) at this time. Before the tray material is added to the framework, lightly Vaseline™ the edentulous ridge on the master model. Filly seat the framework on the master cast and add one thickness of baseplate wax over the edentulous ridge an adapt the wax with your fingers. Trim the excess wax 2 - 3 mm short of the depth of the vestibule. With the framework on the master cast, remove the wax from the retentive holes of the mesh or the tray material will not firmly attach to the framework. The wax will serve as a spacer for the impression material. The soft tissue undercuts should also be blocked out with baseplate wax. The tray material can be placed and adapted to the posterior edentulous ridge, making sure it flows into the retentive mesh or lattice holes. DO NOT place tray material on the abutment teeth or in deep undercuts. Following processing of the tray material, gently remove the framework with the tray(s) from the master cast and trim the periphery of tray(s) the same as a complete denture impression tray (length then width). Trim the tray 2 - 3 mm short of the depth of the vestibule. DO NOT RIM THE TRAYS SHORT OF THE RETROMOLAR PAD. The finish tray should have a uniform wax layer, 2 mm short of the acrylic resin border, have smooth borders, AND BE FIRMLY ATTACHED TO THE RPD FRAMEWORK.

4. Return the framework with the tray(s) to the patient's mouth, and with your instructor evaluate the extension of the trays for proper coverage and re-evaluate the fit of the framework to make sure it is fully seated. Border mold with red or green stick compound and have your instructor evaluate the extensions. Trim the compound appropriately and add the proper tray adhesive. When the tray adhesive has dried make the altered cast impression using the material your instructor suggests. *Do not place impression material in the tray so that it will get under rests or major connectors.* If the impression material gets under an occlusal/incisal rest, the framework may not fully go to place, resulting in a seriously inaccurate impression. WHEN PLACING THE ALTERED CAST IMPRESSION IN THE MOUTH, ONLY PUT PRESSURE ON THE RESTS, NOT THE EDENTULOUS RIDGE, AS DESCRIBED IN CHAPTER 19. Do not remove your fingers from the occlusal/incisal rests until the impression material has fully polymerized. The student should remove the impression from the patients mouth, when it has fully polymerized, and trim excess material to the internal finish lines, guide planes and rests. The impression will be tried in the mouth again to make sure the rests were seated when the impression was made. Also, stability (anterior-posterior) is evaluated. Excess A-P rocking or lifting of the indirect retainer would indicate remake of the impression. When the impression is acceptable the patient can be dismissed. Boxing and pouring of the altered cast impression will be done in the laboratory. *Ask your instructor or the laboratory technician in the Junior Laboratory for help in this procedure.*

FOURTH APPOINTMENT - Jaw relation records or wax try-in

For this appointment have ready: hot water bath, cold water bath, Bunsen burner, Hanau torch, slow speed handpiece, and denture adjustment burs, baseplate wax, Aluwax™, red or green stick compound, hot plate for adjusting the occlusion rims, mixing spatula, wax spatula, adhesive tape, Thompson™ markers, Boley gauge, mouth mirror, perio probe, explorer, etc.

If the RPD is tooth supported this appointment is for the wax try-in, when anterior teeth are being replaced.

When the RPD is a distal extension this appointment is necessary for centric jaw relation records. The jaw relation records will be completed as follows:

1. Coat the distal extension area(s) of the master cast with two thin coats of tin foil substitute and allow them to dry. Use baseplate wax to blockout the tissue side of the retentive mesh of the framework, make sure the framework is fully seated on the master cast. With the framework fully seated on the cast, gently remove most of the wax from the holes in the mesh. Dam the cast as described by your instructor or laboratory technician and as described in Chapter 20. Durabase Soft™ can be used to blockout soft tissue undercuts in the retromylohyoid fossa and vestibular areas. DO NOT USE DURABASE SOFT™ UNDER THE RPD FRAMEWORK. Sprinkle clear orthodontic autopolymerizing acrylic resin over the previously dammed edentulous areas until a thickness of 2 - 3 mm is achieved. Place the cast into a warm pressure pot for 15 - 20 minutes at 20 psi. Proper blockout and damming will insure no acrylic resin gets locked into the undercuts. Gently remove the framework without fracturing the abutment teeth. Trim the flash on the acrylic resin bases on the lathe or with a laboratory handpiece using acrylic resin trimming burs and wheels. Polish the borders with a rag wheel and pumice on the lathe. Add a wax rim from the distal of the last abutment tooth to a height approximately half way up the retromolar pad(s) on the mandibular arch RPD or approximating the occlusal plane in the maxillary arch RPD.
2. The framework with the base(s) and wax rim(s) are now tried in the mouth and evaluated. The framework and wax rim should not interfere with the patient's occlusion, *i.e.*, the patient should occlude the same way with or without the framework and wax rim in place. At the proper vertical dimension of occlusion and in centric relation, there should be 2 - 3 mm of space between the wax rim and the opposing occlusion. There

should be natural tooth contact with the opposing artificial or natural dentition. Aluwax™ or Regisil™ is added to the occlusal surface of the wax rim. Insert the RPD with the wax rim and recording material in the patient's mouth and guide the mandible into centric relation. Instruct the patient to close into the recording media just shy of any tooth contact.

3. If the distal extension RPD is restoring the maxillary arch, make a facebow transfer after the plane of orientation has been established, with the wax rim, before recording the centric jaw relation position. Index the wax rim with two non-parallel "V" grooves 2 - 3 mm deep. Use softened red cake compound or Regisil™ on the bite plane for the occlusal registration and mount the indexed maxillary cast BEFORE making the centric jaw relation record.

Mould and shade of the prosthetic teeth can also be selected at this appointment if not previously done.

FIFTH APPOINTMENT - Wax try-in or insertion

At the wax try-in appointment have ready: baseplate wax, Bunsen burner, Hanau torch, wax spatula, green handled knife, slow speed handpiece and denture adjusting burs, articulating paper, mouth mirror, perio probe, explorer, etc.

This appointment is usually for the clinical evaluation of the completed wax-up. If (1) anterior teeth are to be replaced, (2) if the RPD is a bilateral distal extension, or (3) if there are distal extension bases opposing each other, a wax try-in is required. Occasionally a tooth supported RPD not involving anterior teeth, or a unilateral distal extension RPD need not be tried-in. *Check with your instructor*.

If the try-in is to be done at this appointment the waxing should be complete, smooth, festooned and clean. The student should evaluate the RPD in the patient's mouth for esthetics, phonetics, vertical dimension of occlusion and verify the patient's centric relation position. Following the patient's acceptance of esthetics and signing the chart to verify this, the patient can be dismissed. Flasking and processing of the RPD will be completed in the laboratory. The shade of the denture base acrylic resin should be selected at this appointment. Denture base shade tabs are available from your instructor or in the laboratory.

SIXTH APPOINTMENT - Delivery

At the delivery appointment have ready: hot water bath, cold water bath, Bunsen burner, Hanau torch, slow speed handpiece with denture adjusting burs, articulating ribbon, Aluwax™, Kerr's Disclosing Wax, green handled knife, wax spatula, pressure indicating paste with brush applicator, remount casts with the maxillary cast mounted on the articulator, clinic handout for RPD cleaning and maintenance for the patient, mouth mirror, perio probe, explorer, etc.

If a try-in is not necessary, the RPD is waxed and processed to be delivered at this appointment. The proper adaptation of the denture base to the patient's soft tissues is evaluated with pressure indicating paste. The framework should seat completely. On tooth supported RPD's opposing natural dentition or another tooth supported RPD, the occlusion may be adjusted intraorally. Distal extension RPD's must have the occlusion adjusted by the means of a remount procedure, therefore, a remount cast, which the RPD will accurately fit is required, as described in Chapter 24.

Following the remount and occlusal adjustment to correct the processing distortion, the patient's natural tooth occlusion should be identical with or without the RPD in place, unless an onlay RPD or modification in the patients vertical dimension of occlusion was intended. Also at the delivery appointment the patient should be given instructions on the insertion, removal and maintenance of the prosthesis. Make sure the patient can properly insert and remove the RPD. Reinforce the home care procedures verbally and with the written clinic handout. Also, recall appointments should be established at this time. A minimum of 24 hour and one week recall examinations are required in the Junior Prosthodontic Clerkship. *Check with your instructor when recall appointments should be scheduled.*

SEVENTH APPOINTMENT - Recall examination

Have ready for this appointment: pressure indicating paste and brush applicator, articulating ribbon, slow speed handpiece and denture adjusting burs, mouth mirror, perio probe, explorer, etc.

Refer to Chapter 24, Trouble Shooting Chart for post insertion problems and adjustments to RPD's.