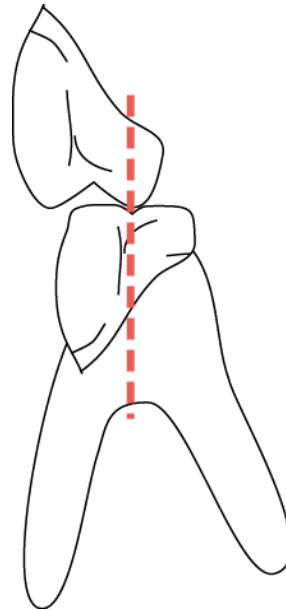

Complete Denture Manual

Robert W. Loney, DMD, MS

2019



**Robert W. Loney, DMD, MS
2019**

<http://removpros.dentistry.dal.ca>



Table of Contents

History, Examination, Diagnosis and Treatment Plan	1
Medical history.....	1
Dental History	1
Instructions to Patients	5
Limitations of Dentures	5
Adaptation to Dentures.....	5
Oral Hygiene.....	6
a. Dentures:.....	6
b. Mucosa:.....	7
Continuing Care.....	7
Preliminary Edentulous Impressions	8
Tray Selection.....	8
Irreversible Hydrocolloid Syringe Technique	8
Possible Problems with Syringe Technique:.....	11
Diagnostic Casts.....	12
Pouring a Model	12
Trimming	12
Tissue Conditioning	13
Tissue Conditioning Techniques:	13
1. Oral hygiene	13
2. Tissue Rest.....	13
3. Occlusal Correction.....	14
4. Temporary Soft Liners	14
Tissue Conditioning Treatment Protocols.....	15
Placement of Temporary Resilient Liners (Tissue Conditioners)	16
Custom Trays	19
Border Molding	21
Maxilla	22
Mandible.....	23
Final Impressions for Complete Dentures	25
Polyvinyl Siloxanes (Addition Reaction Silicone).....	25
Custom Trays:	25
Final Impressions (Seated, two mirror technique).....	25
Post-palatal Seal	26

Boxing and Pouring Final Impression.....	28
Recording Maxillo-mandibular Relationships	30
Record Bases (Baseplates) and Occlusion Rims	30
A. Arbitrary Adjustment of Occlusion Rims	31
B. Occlusal Vertical Dimension	32
C. Technique for Determining Occlusal Vertical Dimension	32
D. Transverse Horizontal Axis Location	35
Centric Relation (CR) Position	36
Reasons for NOT using positions other than CR in edentulous patients.	38
Other positions:	38
When to use CR as a treatment position:	38
How to obtain CR	38
Selection of registration media	38
Recording centric relation and mounting the mandibular cast:	39
Setting Protrusive Condylar Inclination	41
Selecting and Setting Denture Teeth.....	42
Reference Marks on the Occlusion Rims, Record Bases and Master Casts	42
A. Maxilla.....	42
B. Mandible	44
Selecting Anterior Teeth	45
Size	45
Shape	45
Shade/Hue	46
Material	46
Selecting Posterior Teeth Form (Cusp Angle).....	47
Anatomic (40°, 30°, 20°(semi-anatomic), 10°)	47
Non-anatomic (0°).....	47
Posterior Tooth Size.....	47
Refining Anterior Tooth Position:	51
Philosophies of Denture Occlusion:	53
1. Lingualized Occlusal Scheme	53
2. Monoplane Occlusal Scheme	54
3. Setting Posterior Teeth	55
4. Achieving a Balanced Lingualized Articulation.....	58
Principles for Developing & Adjusting Contacts for Lingualized Occlusion	60
The Wax Try-in.....	63
A. Initial Wax Try-in	63
1. Centric Position Contacts.....	63
2. Occlusal Vertical Dimension and Interocclusal Rest Distance.....	64

3. Tooth Position	65
4. Excursive contacts	65
5. Esthetics.....	66
6. Phonetics	66
7. Denture base contours.....	67
8. Patient Input.....	67
B. Final Wax Try-in	68
C. Completion of the Laboratory Prescription.....	68
Delivering and Adjusting Complete Dentures	69
8 Step Complete Denture Delivery	69
Rationale for Clinical Remounts for Occlusal Adjustment	72
Fabrication of Remount Casts	73
Instructions to Patients: How to Clean Dentures	74
Post Insertion Problems	76
Principles	76
1. Denture base.....	76
2. Occlusion	76
3. Retention Problems.....	76
4. Occlusal Vertical Dimension (OVD)	77
5. Allergies and Infections	77
6. Tooth Position	77
Most Common Areas Requiring Adjustments.....	77
Diagnosing Denture Pain & Looseness: Principles and Practice	78
Single Complete Dentures.....	88
Materials, Equipment & Procedures for Complete Dentures	91
Complete Denture Checklist	98

History, Examination, Diagnosis and Treatment Plan

Medical history

- Make efficient use of time, perform the exam systematically
- Follow-up significant positive findings
- Note systemic conditions that impact therapy (e.g. angina, diabetes, etc)
- Obtain physician consultations where appropriate
- If some debilitating disease - discuss with instructor – to ensure acceptability

Dental History

- How many dentures, how long patient has worn dentures
- Satisfaction/dissatisfaction with dentures
- Things patient likes - what they want changed
- Be brief

Clinical Exam – routine clinical exam

Intraoral Exam - Examine one arch at a time – inspect, then record findings

1. General tissue health

- Attached mucosa / non-attached
- Colour
- Character
- Displaceability

2. Specific anatomical considerations

- Examine systematically, e.g. posterior to anterior, palate etc.
- Note the significance that a finding has to the therapy being provided
- Visual and tactile exam.

MAXILLA

The form and anatomy of the maxillary arch can affect retention – advise the patient if any factors will affect outcome (esthetics, retention, comfort, etc.)

A. Posterior border of denture:

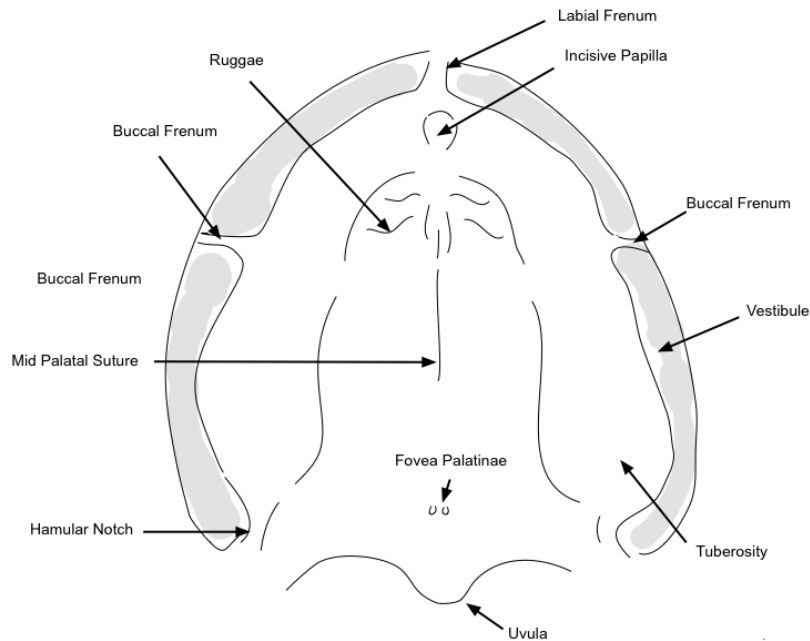
1. Hamular notches - posterior denture border

- Palpate position as can be visually deceiving
- Over extension - extreme pain, ulcers, displacement
- Under extension - non-retentive
- Must be captured in impressions

2. Vibrating line - posterior border, identified when the patient says "ah"

- At junction of the movable and non-movable portions of the soft palate
- If denture on movable soft palate - it may be displaced
- Fovea palatinae - rough guide to the position of the vibrating line

- Throat form can affect the breadth of the area where the vibrating line is located



3. Pterygomandibular raphe

- Behind hamular notches – occasionally significant
- Have patient open wide as possible
- Can displace denture – requires relief in extreme cases

B. Tuberosity

- Displaceability can decrease retention and/or stability
- Palpate for buccal undercuts – if severe, may affect ability to seat denture or extend flanges to the height of the vestibule

C. Ridge form

- Advise patient if poor shape or height, since it will affect retention and stability

D. Labial/Buccal vestibule

- denture flange in this region should be 3-5 mm thick
- when minimal - use care in accurately capturing to maximize retention
- buccal vestibule - zygomatic process - can be prominent – avoid impingement from overextension – otherwise, pain, ulceration

E. Frena - check prominence:

- Buccal frenum - usually broader

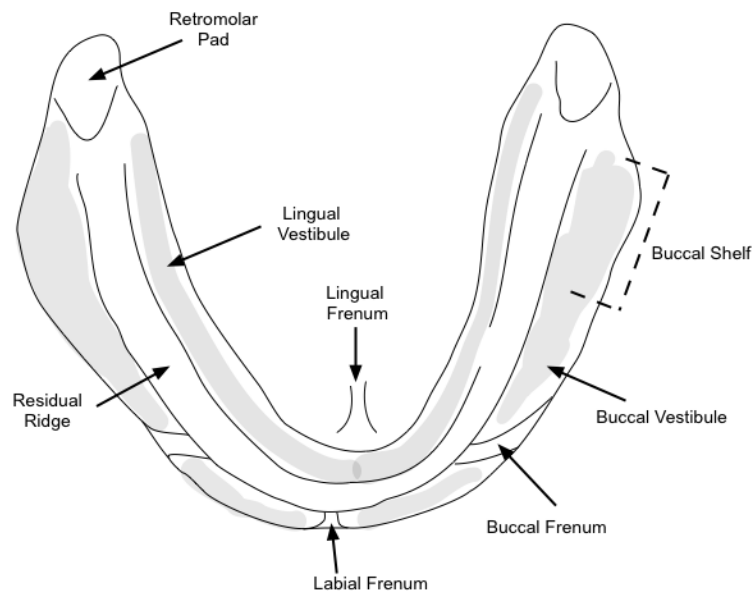
- Labial frenum – narrow, slot like; if insufficient relief patient may feel like denture flange is too long or experience discomfort

F. Mid-palatal raphe, palatal torus

- Binding or fulcruming on the midline bony structures can cause discomfort, ulceration, loss of retention & possible denture fracture

MANDIBLE

The form of the mandibular arch is even more critical than the maxilla, since there is less surface area for retention, and the moveable structures of the tongue and floor of the mouth can cause denture displacement if the denture is overextended. Inform patients of any potential retentive problems.



A. Retromolar pad

- Posterior border of the denture base should terminate on the pad
- Compressible soft tissue – affects comfort and denture peripheral seal
- Must be captured in impression – otherwise, pain, lack of retention

B. Buccal shelf

- Primary stress bearing area for mandibular complete denture
- If denture overextended to external oblique ridge, it can be painful
- Custom tray, border molding – edges should not be felt extraorally

C. Labial/Buccal vestibule

- Check for overextension with using light manipulation of lips and cheeks – denture/tray should not lift
- Masseter - if prominent in function (closing) may require concave distobuccal border of denture to prevent impingement

D. Frena

- Labial and buccal frena - narrow and wide respectively
- Lingual frenum - must allow for movement - or denture will displace easily, discomfort, ulceration

E. Retromylohyoid fossa

- Disto-lingual border of the denture
- Helpful to record - especially when there is a severely resorbed ridge
- Mylohyoid muscle - raises floor of mouth during activity – in some cases there may be large differences between position at rest and when active
- Affects the length of the flange
- Mylohyoid ridge - palpate - if prominent and/or sharp, may require relief

F. Tori

- Rarely need surgery unless large
- Most commonly located lingually in premolar region
- May require relief once dentures are delivered - advise patient

G. Genial tubercles

- Insertion for the genioglossus muscle
- May be appear above the residual ridge if there has been severe resorption
- ensure no impingement if prominent, otherwise pain, ulceration can result

Instructions to Patients

Limitations of Dentures

- Dentures are generally less efficient than natural teeth
- Some people can eat all foods easily, but these are the exception
- Generally, the better the ridge form, the less problems are encountered. Patients with minimal ridges should be advised that their dentures will likely move (especially the mandibular) and their efficiency will therefore be reduced
- Patients with minimal ridges will likely encounter more sore spots than others
- It is wise to point out these limitations to patients prior to the delivery appointment so that it is viewed as an explanation, rather than an excuse

Adaptation to Dentures

- Because new dentures have been changed in some respects to the old dentures (otherwise there would be no need for new dentures), it will take time to adapt
- Studies show that it may take 6 to 8 weeks for muscles to become optimally adapted to new prostheses (explain to patients)
- Adaptability is reduced in complete denture wearers because proprioceptors of the periodontal ligament have been lost and large areas of mucosal proprioceptors are covered with acrylic
- Adaptability is affected by:
 1. Length of time wearing dentures
 2. Amount of residual ridge remaining
 3. Degree of changes made in new dentures
 4. Individual variation (e.g. patients with more acute oral sensory perception have more difficulty adapting)

Adaptation to Chewing may be affected if:

1. CO has been changed to coincide to CR
2. Tooth positions (esp. incisors) have changed
3. Vertical dimension has changed

These patients may experience initial decreased efficiency, cheek or lip biting.

Adaptation may be improved by initially eating soft foods, increasing to firmer foods, cutting food into smaller pieces, and placing food towards the corners of the mouth. Adaptation may be accompanied by an initial, transitory increase in saliva. Patients should be advised of the need to persevere while their neuromusculature adapts to the new prostheses.

Speaking may be affected by changes in:

1. Tooth position (esp. anterior teeth)
2. Tongue space (particularly if patients have been without dentures for a while)
3. Palatal contours

Initial speaking problems are usually transitory, since the tongue is very adaptable – tooth positions must be close at delivery, however).

Appearance may be changed for some individuals, usually due to:

1. Increasing length of incisors (if previous teeth were significantly worn)
2. Changes in vertical dimension
3. Improved lip support (do not promise to eliminate wrinkles)

In most instances these changes in appearance will be beneficial and not of concern to the patient. However, it may be of concern if appearance is radically changed. Patients may require reassurance during the period of adjustment to their new appearance.

Oral Hygiene

- Affects plaque retention, inflammation, fit and potential infections
- Provide proper instructions and demonstration

a. Dentures:

- Brushing has been shown to be most effective method to remove plaque:
- Use non-abrasive cleanser (commercial pastes, dish detergents, not regular toothpaste)
- Patients often need more attention to the denture tooth/base junctions
- Use soft brush with long bristles (less wear)
- Inner and outer surfaces must be cleaned
- Brush over a filled basin or face cloth (protection against damage if dropped)
- Brush after every meal, before bed

Chemical cleaners:

- Efferdent, Polident etc. must be used overnight for optimal effectiveness (15-30 minutes is not sufficient)
- Brushing is more effective (60-80% vs 20-30% plaque removal compared to soaking alone)
- Combine brushing with soaking for more efficiency

Ultrasonic cleaners:

- True ultrasonic cleaners work well
- “Sonic” cleaners are not effective without chemical cleaner (brushing is more effective)

b. Mucosa:

- Remove dentures at night
- Brush mucosa with a soft tooth brush and warm tap water, massage all of the tissue - this will improve health for the next denture
- Alternatively use face cloth

Continuing Care

- Patients should schedule yearly denture recall appointments
- Easy to correct small problems, occlusion, pressure, reinforce hygiene, etc.
- Can do something small - improved patient health and rapport
- Denture life expectancy is 5-7 years, but if tissues change, remakes may be required sooner
- if continued care, denture might last longer than average
- It is better for dentures to wear out rather than for changes in fit and occlusion to cause resorption of the residual ridge

Preliminary Edentulous Impressions

To make accurate edentulous impressions for dentures, a custom tray is used to more accurately capture the vestibule of the patient's mouth, in order to create an effective seal for retention. Stock trays can result in distortion and shortening of the final denture flange. Custom trays are most easily made on accurate diagnostic casts made from preliminary impressions using irreversible hydrocolloid (alginate). A syringe technique can be used to ensure that alginate captures critical anatomy that is sometimes missed using a simple tray technique.

The use of border molding in conjunction with the custom tray helps prevent distortion of the movable vestibular tissues. Displacement of these tissues could lead to dislodgment of the dentures during functional movements of muscles and frenal attachments, which could cause unseating of the denture.

Irreversible Hydrocolloid Storage

1. Store bulk material in airtight containers, store in cool dry containers
2. Alginate deteriorates if stored above 54°C, or with repeated openings
3. Deterioration results in thin mixtures, reduced strength, permanent deformation

Tray Selection

1. Select a tray with 5 mm of clearance with soft tissues – alginate requires bulk for accuracy, strength and stability.
2. Maxillary trays should extend from the labial vestibule to slightly beyond the vibrating line. Mandibular trays should cover the retromolar pads.
3. Sto-K trays or edentulous trays give the best results, but dentate trays can be used (distortion, overextensions are more common with the latter).
4. Trays can be modified with compound or wax to extend the tray if desired.

Irreversible Hydrocolloid Syringe Technique

Using a syringe to make preliminary impressions helps to register critical anatomy, which can be otherwise missed. In particular, these areas are captured more easily with a syringe technique - retromylohyoid area, hamular notches, retrozygomal area. If you use a syringe routinely, it doesn't take any longer to make impressions than normal and you will become proficient in the technique. If you don't use it routinely, try it when you are having difficulty capturing the vestibular reflections. It can be used in the entire vestibule, or selective areas where anatomy cannot otherwise be registered.

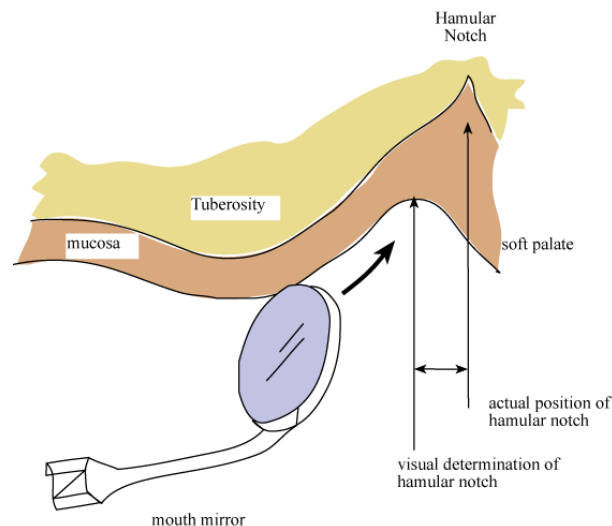
Patient preparation

1. Practice placing and removing the tray

2. Dry the mucosa with gauze – don't let patient close until the impression is made. Otherwise, dry the tissues again.
3. Mark the vibrating line prior to making preliminary and final impressions. *The fovea should not be used for arbitrarily determining the posterior border.* The technique for determining the correct posterior border is outlined below:

a. Locate and mark the hamular” notch with indelible stick

1. The posterior border of a complete denture and some partial dentures must pass through this notch, between the bony tuberosity and hamulus. Denture border must terminate on ‘soft displaceable tissue’, to provide comfort and retention. In some patients the notch is posterior to where the depression in the soft tissue appears.
2. Use the head of a mirror, to palpate the notch and mark it with an indelible marker.



b. Locate the posterior border of hard palate

Ensure the denture terminates posterior to this landmark by palpating the end of the hard palate.

c. Locate and mark the vibrating line

The denture should terminate at the vibrating line which is on the soft palate at the junction of movable and immovable portions of the soft palate. If the denture terminates posterior to this, movements of the soft palate may cause it to dislodge. If the denture terminates anterior to this, on the hard palate a poor seal may be created, and the denture may be unretentive and/or uncomfortable.

d. Make the impression

The marks will transfer to the impressions and the cast when it is poured. The clinician and technician will not have to guess the proper position. Do not allow the patient to get saliva on the indelible mark or it will smear, or not transfer to the alginate impression.

Making the Impression (Syringe Technique)

1. Select a 12cc disposable syringe, cut off the tip to provide at least a 5 mm orifice. (optional if using a syringe technique)
2. Vaseline the syringe plunger to make syringing easier.
3. Use an uncontaminated bowl and spatula, use **regular** set alginate
4. Fluff the powder by rolling a closed container, measure, tap several times and remove excess powder above the scoop with a spatula or tongue blade.
5. Use a ratio of 3 scoops powder/3 measures water for syringe impressions
6. Have an assistant mix the material for at least 45 seconds, until there is a smooth creamy homologous consistency that glistens. The material should not appear granular, lumpy or dry.
7. The assistant loads the syringe from the back until nearly full, wipes the syringe barrel clean, inserts plunger and hands it to the clinician as the assistant loads the stock tray.
8. Syringe a broad rope into the vestibule, beginning at the posterior, moving quickly toward the anterior, and filling the vestibule until the labial frenum is reached (do not cross the midline - this traps air, producing voids). Retract the cheek with a mirror rather than a finger to provide maximum visibility. In the **maxilla**, begin opposite the region of the tuberosity and inject until alginate is seen in the hamular notch area, before moving forward. In the **mandible**, start with the buccal vestibule adjacent the retromolar pad, and move forward until the labial frenum is reached. Repeat on the opposite side. For the lingual vestibule, roll the tip of syringe under the tongue, inject into retromylohyoid space until alginate is seen coming upward between the tongue and the residual ridge, then move anteriorly, filling vestibule until the lingual frenum is reached. Repeat on the opposite side. Do not scrape the mucosa during syringing – sharp edges on the trimmed syringe tip can cause discomfort.
9. If the palate is steep syringe some material into the palatal vault and smooth with a finger, to minimize voids between the syringed and tray material.

10. If the patient is partially edentulous, syringe or wipe a small amount of material on to the occlusal surfaces and push it forcefully into the occlusal surfaces to minimize occlusal voids.
11. Place the anterior portion of the tray first, then seat the posterior in order to minimize trapping air in the palate.
12. Less gagging will occur if the patient is lying down (the tongue falls to the back of the oral cavity and minimizes material going down the patient's throat, thereby minimizing gagging).
13. Mold the vestibular areas by pulling on the cheeks and lips, making circular motions and activating the muscles and frena.
14. Support the tray during setting – do not leave the patient or allow the patient to support the impression – if the tray moves during setting, distortion can occur.
15. Use a small amount of water and jiggle the tray handle until you feel the seal of the impression release, then remove quickly to avoid permanent deformation.
16. Evaluate impression and, if acceptable, pour within 12 minutes.
17. Rinse the impression thoroughly with water, gently shake to remove excess water. Spray with disinfectant to coat all surfaces, and seal in a bag for ten minutes.

Possible Problems with Syringe Technique:

1. Saliva contamination – vestibular material will not fully join the tray material.
2. Insufficient material – lack of integrity between the syringed and tray material.
3. Trapping tongue under the tray will result in under-extension of the lingual vestibule.
4. Severe gaggers – the syringe technique involves a slight increase in intraoral manipulations which may be uncomfortable for these patients.

Diagnostic Casts

Pouring a Model

1. Weigh powder for type 3 stone, measure water
2. Vacuum mix 20 seconds (less time, stronger cast)
3. Use a two-pour technique (diagnostic casts only – master casts box & single pour)
4. Modulate speed of pouring by tilting back and forth or pressing the tray more firmly onto the vibrator
5. Separate the alginate impression from the stone cast after 45 minutes

Trimming

1. Make sure the model is moist during trimming - soak in slurry water, or soak with base of cast in water.
2. Trim the base on the model trimmer parallel to the residual ridges.
3. Casts should be a minimum of 12 mm (.5 inch) in thinnest part.
4. Leave the mucous membrane reflection intact for making a custom tray. Remove extensive areas of the cheek or lip reflection which create undercuts and which will make it difficult to make or remove the custom tray.
5. All anatomical surfaces should be included – do not trim off the hamular notches, vibrating line, or retromolar pads posteriorly.

Tissue Conditioning

Definition: Non-surgical methods of improving the patients' denture-bearing tissues, including the use of tissue rest, occlusal correction, temporary soft liners and/or improvement of hygiene. Tissue conditioning is usually considered prior to performing a permanent relin and or making final impressions for complete or partial dentures.

Poor tissue health can be the result of:

1. Pathological conditions

- The result of systemic disease - nutrition, hormone imbalance, autoimmune diseases (Lupus), etc

2. Local factors

- Occlusal problems
- Tissue irritation – ill-fitting dentures, poor oral hygiene, no tissue rest.

Improvement of tissue health is normally limited to reversible tissue changes such as resolution of:

- Red inflamed, edematous tissues
- Ulcerations
- Candidiasis
- Epulis fissuratum (limited – may require surgery if extensive)
- Papillary hyperplasia (limited – may require surgery if extensive)

Tissue Conditioning Techniques:

1. Oral hygiene

- Plaque causes inflammation and edema
- Demonstrate how to brush all denture surfaces
- Have patient massage tissues with a soft tooth brush or damp face cloth twice a day - morning/night; begin with 30 seconds and increase to 2 minutes.

2. Tissue Rest

- Inflamed tissues can be treated by removing dentures for periods of 48 - 72 hours or even nightly for at least 8 hours
- Tissue inflammation will reappear if faulty dentures are replaced without correction
- Placement of a denture alters tissue shape, which recovers upon removal
- Age affects recovery time (younger tend to recover quicker, sometimes immediately vs. 10 min-4hours for elderly)
- Clinical reports suggest regular finger massage/tooth brushing of mucosa with a warmed, soft brush may be useful to improve tissue health

3. Occlusal Correction

- poor occlusion can cause to poor tissue health

****This is one of the most overlooked causes of tissue irritations****

Methods for correction:

1. Clinical remount and occlusal adjustment
2. Add to occlusal surfaces of acrylic teeth with acrylic resin, - improves vertical dimension, balances occlusion
3. Soft mouth guard over teeth – reversible procedure, inexpensive

4. Temporary Soft Liners

- Can improve comfort, retention, occlusal vertical dimension (minor changes), and extension of denture bases (minimal).
- These materials are soft and resilient and flow under pressure.
- Material becomes rigid after a week - plasticizer leeches out
- Change the soft liner as necessary (usually lasts no longer than 4-6 weeks)

The length of time required for tissue conditioning depends on the severity of irritation. A combination of treatment may be necessary.

Tissue Conditioning Treatment Protocols

All patients requiring tissue conditioning:

1. Clean denture for patient (ultrasonic and cleanser)
2. Educate the patient concerning the condition and home care
 - brushing denture
 - oral hygiene - brush, massage tissues
 - tissue rest - 8 hrs./day
 - tissue rest - 24 hours prior to final impressions

Patients should understand that inconvenience (1-3 days) now will affect their new denture over the years of use*

Patients with moderate to severe inflammation:

1. Check extensions of the denture
 - if over extended - trim as required
 - if under extended - limited increase in base with soft liner
2. Correct occlusal disharmonies, if present:
 - clinical remount
 - soft acrylic mouthguard
 - addition of acrylic to teeth
3. Soft denture liner to:
 - provide resilience, and comfort
 - provide minor alterations of the occlusal vertical dimension
 - improve the fit and stability of the denture
 - make minor extensions to the denture base

When treatment is not successful:

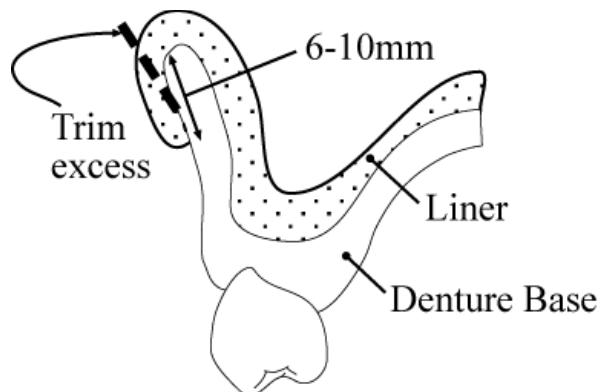
1. Refer for diagnosis/treatment of systemic disorder
2. Surgical treatment/ biopsy may be necessary

Placement of Temporary Resilient Liners (Tissue Conditioners)

Tissue conditioners provide one of the easiest means of improving the health of the mucosa. .

Technique:

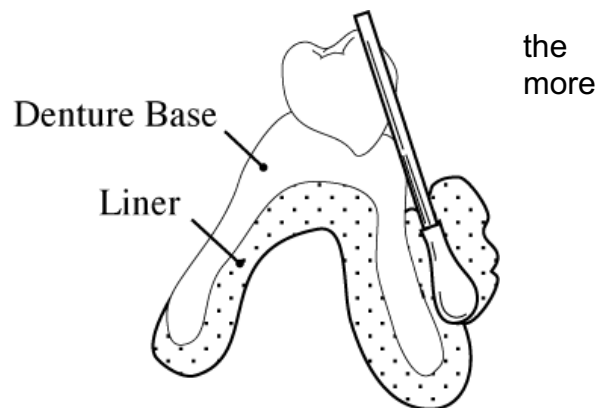
1. Clean the denture prior to application of the soft liner using scalers, pumice on a wet rag wheel, and an ultrasonic cleaner to eliminate gross debris and calculus. Disinfect the denture by immersion in sodium hypochlorite for at least 10 minutes prior to placement of the liner. This will help to minimize the presence of microbes, which might subsequently colonize the liner, thereby shortening liner lifespan. When relining opposing dentures, reline the least stable denture first so that the more stable denture can be used as reference for positioning the relined denture, using the occlusal contacts.
2. Determine if the denture base needs to be reduced prior to the placement of the liner. Flanges that are excessively long or areas that are causing severe inflammation or frank ulceration should be reduced. The entire denture bearing area should also be prepared to provide room for the liner. Most materials require a minimal thickness of approximately 2 mm in order to provide sufficient resiliency to minimize tissue trauma. If the existing occlusal vertical dimension is acceptable, and the thickness of the denture base will allow, provide uniform relief of internal surface of the denture using pilot grooves, acrylic burs and arbor bands. If there is insufficient occlusal vertical dimension (excessive interocclusal rest space or freeway space), there may be room to place the liner without reduction of the denture base. If the denture base is not reduced, the incisal display will probably be increased once the liner has been placed. The esthetic consequences of such a change should be evaluated and discussed with the patient.
3. Remove the glossy surface around denture periphery where the conditioner will terminate on the denture (at least 6 mm past the edge of the flange). This helps ensure that the conditioner will adhere to the denture to minimize separation, leakage and microbial colonization.
4. Mix the tissue conditioner according to the manufacturer's instructions. Mix with a stropping action against the mixing container. Do not use a vigorous stirring action which can lead to the incorporation of bubbles that are difficult to eliminate from the viscous mixture. In general, liners can be mixed slightly stiffer than recommended by adding



the

additional powder to the liquid component. This can be done to decrease the flow from underneath a denture during setting, when an increase in the occlusal vertical dimension is desired. Do not mix the liner thinner than suggested by the manufacturer, as this can have deleterious effects on the physical properties and longevity of the liner.

5. Apply a smooth even layer to the denture, usually starting at the posterior and teasing the material forward without incorporating air bubbles. Bring the tissue conditioner over peripheries about 6 mm, so that saliva cannot get between the denture and the conditioner in the area of the periphery. This will minimize the possibility of separation of the conditioner from the denture. Excess can be removed later.
6. Place the denture intraorally, having an assistant help retract the commissures of the mouth to avoid accidental removal of the liner during insertion. Insertion is easier if the patient relaxes the cheeks and lips rather than opening maximally. Avoid touching the material during initial placement.
7. Stabilize the denture and have the patient close lightly, until initial contact is felt or seen. If occlusal contacts are uneven, have the patient open, and tilt, tip or bodily move the denture into a position where stable even contacts can be obtained. Border mold the peripheries, when the material begins to gain viscosity (about 3 minutes for most tissue conditioners).
8. Use a cotton swab to remove any gross excess prior to initial set. This will reduce trimming needed, and make for a neater, comfortable external surface. Excess material most commonly requires removal in the area of the lingual vestibule and distobuccal flange of the mandibular denture, and the retrozygomal area and palate of the maxillary denture.
9. Remove after initial set (normally 8-10 minutes) and trim with a hot scalpel blade. Heating the blade will allow the scalpel to cut through the liner without sticking, and leave a cleaner, smoother surface, which will enhance patient comfort. Do as little modification as possible at this time, as the material will be sticky, and adjustment will often result in a rough or ragged surface that is uncomfortable and difficult to clean.
10. Clean the opposing denture and provide care instructions. Explain the temporary nature of the material to the patient. Have the patient rinse the denture with water, after eating, for the first 24-48 hours, and brush the liner with a soft tooth brush and a small amount of liquid dish detergent subsequently. Most commercial denture



cleaners should be avoided as they contain sodium hypochlorite which will reduce the lifespan and resiliency of the liner. The denture should be placed in a container with high humidity over night, but not immersed in liquid.

11. Have the patient return to the office 24-48 hours after placement, so that the conditioner can be trimmed with acrylic lab burs and polished with pumice on a damp rag wheel. Both the external surface and the peripheral roll should be polished, with care, to a fairly high shine. Polishing the liner will make it smoother, more comfortable and less prone to microbial colonization. In some instances polishing may improve liner longevity or hasten tissue resolution, since the liner will be easier to clean.
12. Change the soft liner as necessary. If there are no signs of tissue resolution, systemic conditions should be considered, and appropriate investigations undertaken.

Criteria for Tissue Conditioning Liner

- No significant voids
- Liner is well polished
- Adequate thickness (\approx 2mm)
- Liner has been well mixed and applied
- The peripheries are smooth, with no sharp areas, not ragged
- Excess material cleaned off external denture surface, teeth

Custom Trays

Custom trays are individualized impression trays made from a diagnostic cast that are used for making final impressions. They are most commonly made of a rigid self or light-cured acrylic resin. Trays are made short of the periphery of the diagnostic casts, to allow space for molding of the peripheries to optimize retention.

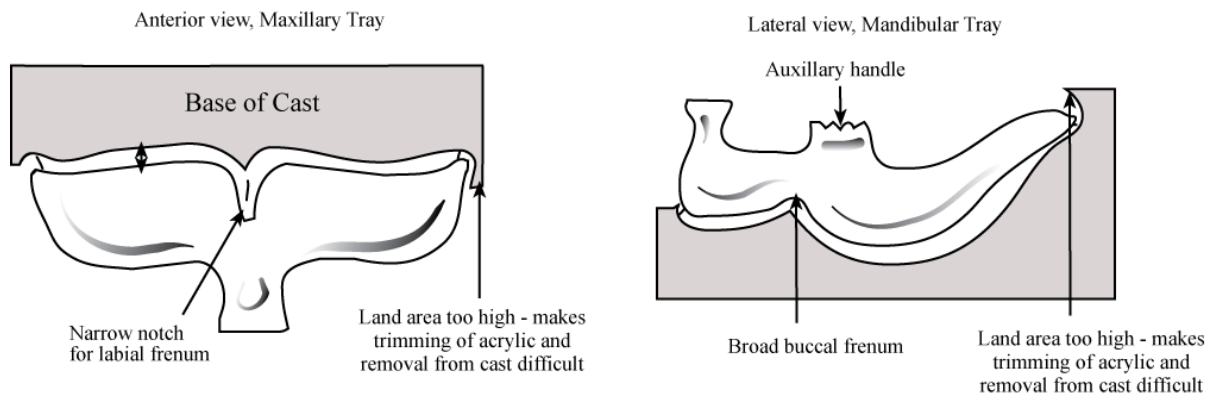
Purpose of a custom tray

1. Minimize impression material distortion (uniform thickness, rigid tray)
2. Prevent tissue distortion (less viscous material, more accurately adapted)
3. Reduce costs - less impression material (expensive) is used
4. Allow for accuracy by molding the border, resulting in improved retention

Procedure:

1. Use a pencil to outline the depth of the vestibule (where the vertical portion of the ridge begins to turn toward the horizontal portion of the vestibule) and across the vibrating line.
2. Draw a second line 3-4 mm short of the first around the vestibule, (at the posterior border).
3. Provide adequate room for frenal attachments (narrow labial, and wide buccal).
4. Block out all undercuts with baseplate wax to prevent the tray from locking onto the cast
5. Lightly lubricate the cast (petroleum jelly, Alcotex or material specific release agent).
6. Adapt one thickness of base plate wax to the cast. Trim the wax 3 mm short of the second line in the vestibule and in a "butterfly" configuration at the vibrating line from hamular notch to hamular notch (do not place relief wax over the block-out wax). Wax provides room for the impression material, but more importantly minimizes the production of hydraulic pressures that could distort the mucosa. Where block-out is placed, these pressures cannot build up because the acrylic is already away from the tissue.
7. Place a piece of unpolymerized light-curing acrylic resin (e.g. Triad, Tru-Tray) on the cast. Wear gloves to minimize exposure to material to prevent sensitivity reactions.

8. Adapt the resin to the cast (palatal area first), trim excess using a scalpel blade. Push down through the resin, rather than pulling the blade along the periphery (This will minimize sticking and tearing of the resin, and result in a better periphery).
9. Mold a small vertical handle, attach it to the anterior of maxillary tray and blend well to the tray material, ensuring it has slight undercuts to improve handling.
10. Adapt the palatal and posterior portions of the tray to ensure proper adaptation.
11. Place the cast with uncured resin under water in a clear container with a lid. The entire tray must be covered in water to prevent the formation of an air-inhibited layer on the tray. The water keeps the wax spacer from melting during curing and permits curing without the use of an air barrier coating. Ensure the container is kept water tight with a lid and that no water spills in the curing unit (to prevent an electrical accident). Polymerize in a light-curing unit as per manufacturer's recommendations.
12. Use the arbor-band and acrylic burs to trim trays make all edges round and smooth.
13. Mandibular trays should be made with two auxiliary handles for stabilization and orientation of the tongue in the area of the 1st molars. Ensure the handles do not impinge on the tongue space, or the tongue may retract and alter the resting position of the floor of the mouth.



Criteria for Acceptable Acrylic Impression Trays:

- Tray not significantly underextended
- Stable, does not rock on cast or in mouth
- Tray not significantly overextended
- Uniform thickness (2-3mm; wax /cast not showing through tray)
- Tray flange adapted as closely to residual ridge as possible
- Wax relief over mobile tissue, undercuts, incisive papilla, other critical anatomy
- Labial and buccal notches properly placed
- Borders rounded, not sharp
- Small handles, properly positioned

Border Molding

Border molding is the shaping of the border areas of an impression tray by functional or manual manipulation of the tissues to duplicate the contour and size of the vestibule. Border molding can be performed with thermoplastic modeling compounds, waxes or impression materials. **The custom tray wax spacer should be removed prior border molding procedures.** Do not place holes in the tray until border molding is completed, so that the retentive seal of the borders can be tested.

Procedure for border molding with modeling compound

1. Try the custom tray in the mouth - it should be comfortable and provide 2-3 mm of space to the height of the vestibule - trim with an acrylic bur if indicated
2. Dry the periphery of tray (otherwise compound will not stick to the tray)
3. Heat the modeling compound using a Bunsen burner or torch until it starts to droop. Keep it moving in the flame, rotating it so it does not overheat – if the compound catches fire or bubbles, it will not mold as easily, and may have to be removed to complete the border molding procedure
4. Apply compound over the periphery of the tray, in a thickness just slightly narrower than the compound stick
5. Flame with a hand torch until all seams or sharp contours have disappeared
6. While heating, it may help to hold the tray upside down so that the softened compound droops toward, rather than away from, the depth of the vestibule
7. Temper the compound in a water bath (135-140°F) for several seconds to prevent burning the patient. The water bath is set at a temperature that will keep the compound soft for an extended period - it will not harden in the water bath
8. The patient should be seated with head against the headrest, with mouth open and relaxed prior to removal from the hot water bath. When the patient ‘opens wide’, the commissures constrict, limiting access to the oral cavity and making it more difficult to place the tray. Use a mouth mirror to slightly retract one side of the mouth for easier placement of the tray with softened compound
9. Place the tray intraorally by rotating it into place and mold the material by pulling on the cheeks and lips and having the patient make functional movements

10. Chill in cold water
11. Trim excess compound that has overlapped the internal surface of the tray or external material that is thicker than 4-5 mm before moving to another area of the tray. Clean debris from the tray
12. If the border is sharp after trimming or has seams, re-flame with a torch, temper and readapt intraorally
13. Repeat until the periphery is completed. Dry the tray and compound prior to each application so the compound will stick to the tray and previously molded compound
14. When complete the tray should have sufficient peripheral seal to resist removal from the seated position. If it does not, add compound to deficient areas
15. Some textbooks suggest reducing the border molding material by 1-2 mm prior to making a final impression. This is optional if any of the modern, low-viscosity impression materials are used. Only a thin layer of impression material (0.5-1 mm) is desired over the surface of the border molding in the final impression.

Maxilla

1. Seat the tray firmly in the mid-palatal area during border molding procedures
2. Border mold the posterior buccal areas by pulling the cheek down and forward with slight circular movement. Have the patient move the mandible side to side and open wide. This will mold the retrozygomal area to allow movement of the coronoid process and relief for the pterygomandibular raphe, to prevent impingement
3. Border mold the anterior labial frenum by pulling the lip outward and straight downward in an exaggerated fashion (do not pull the frenum to one side)
4. The labial frenum should be narrow and distinct, while the buccal frena are usually broader and somewhat "V-shaped"

Post palatal area:

1. Add compound from hamular notch to hamular notch across the top of the tray (not at the edge) of the posterior border of the tray
2. Check that the posterior extension of the denture terminates at the vibrating line and hamular notches by using an indelible stick. Insert the tray and check visually that the compound terminates at the indelible line

Mandible

Border molding in the mandible is generally more challenging due to the changing position of the floor of the mouth - the position of the lingual periphery can differ greatly between positions at rest and activity

Posterior buccal areas:

1. Pull the cheek upward while holding tray in place. Have patient pucker their lips or suck their cheeks inward while holding tray in place.
2. The retromolar pad should be covered (at least partially) to provide a seal and comfort.
3. Border molding should not normally extend beyond the external oblique ridge. Palpate the cheek at the angle of the mandible to feel for a smooth transition between the mandible and the border molding. Palpation of a prominent ledge of compound indicates overextension of the compound lateral to the retromolar pads and posterior ridge
4. The distal buccal extension of denture often needs to converge medially to allow movement of the masseter muscle. This portion can be molded by having the patient try to close firmly against resistance of the operator pushing downwards slightly on the mandibular tray. This activates the masseter, which will displace the compound on the distobuccal area of the flange, if the tray itself is not over extended.
5. The labial frenum is narrow and distinct; the buccal frena are broad and "V-shaped". To mold the labial frenum, pull the lip straight up, in an exaggerated manner.

Posterior lingual areas

1. Have the patient touch their tongue to the corners of the mouth, to the palate and lick their top lip
2. An "S" shaped lingual flange commonly results in the posterior lingual area
3. Compound should extend into the retromylohyoid space. The disto-lingual border can present a squarish rolled border, extending straight down from the retromolar pads, or it may curve anteriorly to varying degrees, depending on the lateral throat form. The disto-lingual border almost never angles posteriorly from the retromolar pads.

4. The lower border should be at or slightly below the mylohyoid ridge but not deeply into the undercut below the ridge, particularly if it is sharp. (This minimizes, abrasion and discomfort around the mylohyoid ridge)
5. The denture should not lift with normal tongue movements

Anterior lingual

1. Have patient lift tongue to palate, to corners of mouth and stick tongue out while holding tray in place – denture should not lift by normal tongue movements

Criteria for Border Molding-Maxillary

- Tray stays in place at rest and during slight manipulation of tissues
- Tray exhibits firm suction when an attempt is made to remove it
- Labial and buccal flanges extend into height of vestibule
- No tray is showing through border molding
- Flange thickness generally no greater than 4-5 mm (unless severely resorbed)
- Patient feels no areas of discomfort
- Posterior palatal seal is properly covered
- Frenal areas properly contoured
- Flanges smooth, continuous; rolled and not sharp
- Flanges relatively symmetrical on contralateral sides

Criteria for Border Molding – Mandibular

- Tray stays in place at rest and during slight manipulation of tissues
- Tray is relatively stable when a vertical force is applied (within constraints of anatomy)
- No tray is showing through border molding
- Flange thickness generally no greater than 4-5 mm
- Patient feels no areas of discomfort
- Labial and buccal flanges extend into depth of vestibule
- Frenular areas properly contoured
- Flanges smooth, continuous; rolled and not sharp
- Flanges relatively symmetrical on contralateral sides
- Covers retro-molar pads
- Does not extend past buccal shelf
- Lingual flanges at or slightly below mylohyoid ridges
- Posterior extensions of lingual flanges extends into retromylohyoid spaces
- Palpation over masseter reveals no over-extension

Final Impressions for Complete Dentures

Polyvinyl Siloxanes (Addition Reaction Silicone)

- Inherently hydrophobic but newer materials more hydrophilic
- preferably use light-bodied material to minimize possible soft tissue distortion (some medium-bodied materials flow well and can be used as well)
- Flow - many are thixotropic, requiring slight pressure to flow
- Good dimensional stability
- Excellent elastic recovery
- Excellent dimensional accuracy

Custom Trays:

- After completion of border molding, smooth the edges of the compound blending any sharp internal and external surfaces of the border molding or tray to provide a smooth transition that will not distort the tissue
- Place holes in tray to allow release of hydraulic pressure
- Apply thin coat of adhesive to the inside of tray and any exposed compound - allow to dry for a minimum of 5 minutes

Final Impressions (Seated, two mirror technique)

- Ask the patient to leave their dentures out for 24 hours prior to the final impressions to permit tissue rest & recovery if possible
- Make the impression with the dentist seated and the patient in a supine position. This improves both ergonomics and visibility for the dentist. In the supine position, the patient's tongue naturally falls to the back of the throat, closing off access for excess material at the back of the tray and minimizes the possibility of gagging. Do not place the patient in a semi-supine position as the tongue will not fall back sufficiently for patient comfort. Impressions should be made with the patient either fully supine or upright.
- Place two mirrors, one at each commissure and move them forward to approximately the position of the canines until both the anterior and posterior vestibules can be fully seen at the same time. If one or the other vestibule cannot be seen, shift the position of the mirrors until the entire buccal vestibule is visible. This will allow impression material to be flow to the full extension of the vestibule without capturing air pockets that can produce peripheral voids.

- Dry tissues with 2x2 gauze folded in cotton pliers; in the mandible, gauze can be left in place until removal just prior to the impression
- Place enough impression material to cover the tray in an even layer. Do not over fill the tray fully to the top of the peripheries. Doing so will result in so much excess being expressed into the vestibules that it will over-extend the peripheries and in many cases cause the patient to gag
- Try not to incorporate air when loading the custom tray. Use a light vibration when loading to make the material flow into a smooth layer
- Cover all border molding including the external surface of the compound
- Insert the loaded tray keeping the two mirrors in the positions that permit visibility of the entire buccal vestibule. Slightly rotate the impression tray into place trying not to contact the lips, cheeks or mirrors. Ask the patient to keep their lips and cheeks loose. Use the labial frenum as a guide for positioning the tray at insertion. Seat the tray front to back to allow air in the palatal vault to exit posteriorly to minimize palatal voids. Keep the mirrors in position until the operator can see impression material expressed around all borders of the impression, to the full height of the vestibule and along the entire posterior border. Once no gaps are seen around the periphery, remove the mirrors, and use a cotton tip applicator to sweep excess material at the posterior border to the side of the oral cavity for removal.
- Ensure the tray is centered and properly oriented – move the tray if required
- Border mold tissues similarly that done with the compound
- Support the impression throughout the duration it's setting to ensure no movement during polymerization that could introduce stresses that might potentially result in distortion of the set impression
- Material should not be more than 1 mm thick over border molding (otherwise it was likely not fully or correctly seated)

Post-palatal Seal

- Mark the area of the post-palatal seal on the soft palate intraorally with indelible stick – outline the glandular area and vibrating line
- Replace the impression intraorally and the line will transfer to the impression
- Disinfect, refresh the line with the indelible stick
- Prescribe a mechanical posterior palatal seal
- Pour impression in type III stone (e.g. Microstone)

Criteria for Final Impression - Maxillary

- Post-palatal seal area recorded (vibrating line & displaceable tissue outlined)
- Peripheries covered by a thin layer of impression material (.5-1 mm)
- Tray properly vented and compound relieved
- No significant voids
- Impression is stable and retentive when moderate pressure is applied to the canine region No significant areas of "burn through"
- Accurately records available supporting structures

Criteria for Final Impression - Mandibular

- Peripheries covered by a thin layer of impression material (.5-1 mm)
- Tray compound properly relieved
- No significant voids
- Impression is stable with tongue at rest when moderate unseating pressure is applied
- No significant areas of "burn through" (distortion of the contours of the surrounding tissue)
- Mandibular retention evident - when tongue at rest and moderate vertical force applied
- Accurately records available supporting structures

Boxing and Pouring Final Impression

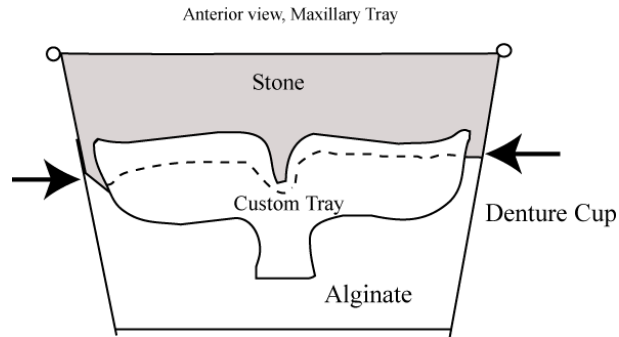
ALL REMOVABLE PROSTHODONTIC FINAL IMPRESSIONS should be boxed in order to:

1. produce a cast of maximum strength
2. preserve vestibular roll contours
3. produce a flat land area around the borders for use in denture processing
4. minimize the need for trimming

Alginate in Denture Cup Boxing Technique:

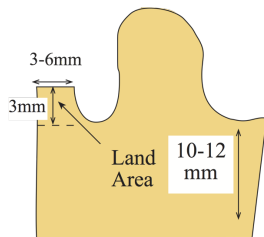
This method is quicker and easier than wax or plaster/pumice techniques:

1. Mix 5-6 scoops of alginate to slightly fewer measures of water to produce a thick mix. The actual ratio is not important. The mix should be thick enough to support the impression without it sinking into the alginate under its own weight
2. Neatly fill a denture cup with the mix
3. Jiggle the impression into the alginate – keeping the impression relatively horizontal and centered in the cup, with alginate around all borders. Pay particular attention to ensure the posterior borders of the impression are at least 4-5 mm the sides of the cup
4. Attempt keep the peripheral roll 3-4 mm above the surface of the alginate. If not possible, this can be corrected by trimming later. Try to keep the highest portion of the impression at least 12mm from the top of the denture cup
5. Try to smooth the alginate surface prior to setting around the borders and in the tongues space in the mandible
6. When set poke a couple of holes in the bottom of the cup, flex the borders and floor of the cup and remove the alginate with the imbedded impression. Trim any alginate that is rough or covering the impression borders to produce a uniform 3mm of the impression periphery above the alginate. Trim the outer most alginate horizontal. Ensure the retromolar pads or hamular notch areas of the impression are exposed and not covered by alginate. In the maxilla trim the alginate at the posterior border so the impression is approximately 1mm above the alginate, so the posterior border of the impression is easy to discern.

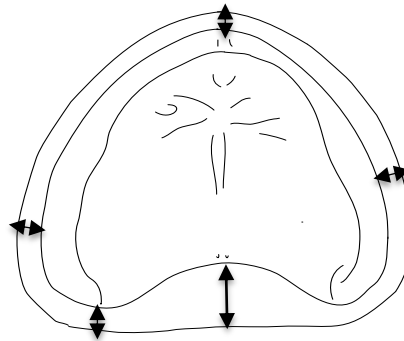


Trim the alginate horizontally. The right side at the arrow is prepared correctly, with a 3-6 mm land area and approximately 3mm of the periphery exposed. The left side at the arrow is prepared incorrectly, trimmed at an angle exposing too much of the border so that stone will flow around and lock onto the rigid tray. This will make the impression difficult to remove without fracturing the cast.

7. Make sure there is no debris on impression. Reseat the trimmed mass into the denture cup.
8. Vacuum-mix type III dental stone (e.g. Microstone) & vibrate into impression
9. When set, remove the entire contents from the denture cup, discard the alginate, carefully remove the impression from the cast and trim to produce a 3-6 mm land area around the outer edge of the entire cast



Cross Section of Cast Through Ridge



Trim outer border to 3-6 mm except in the midline of the posterior border to ensure the hamular notch areas are not over-trimmed

Criteria for Master Casts

- No significant bubbles or flaws in stone
- Includes all anatomical surfaces of final impressions
- Posterior border of maxillary cast clearly demarcated
- Includes 3-6 mm land area
- Base approximately parallel to ridge and a minimum of 12mm at thinnest point
- Evidence of a dense stone surface
- Clean and well trimmed (no dried slurry on casts)

Recording Maxillo-mandibular Relationships

In order to fabricate complete dentures, certain anatomical positions and relationships need to be transferred to an articulator, which will be used to set the teeth and arrange the denture occlusion. These relationships include:

Occlusal vertical dimension - amount of the distance between two selected anatomic or marked points when the patient is in maximal intercuspal position with denture teeth or wax rims in contact.

Transverse Horizontal Axis - an imaginary line around which the mandible may rotate (without translation) within the sagittal plane.

Centric relation – a maxillomandibular relationship, independent of tooth contact, in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminences; in this position, the mandible is restricted to a purely rotary movement. It is a clinically useful, repeatable reference position.

Protrusive condylar inclination: the angle formed by the path of the moving condyles within the sagittal plane compared with the horizontal plane. It is used to program the articulator to simulate the relationship of the maxilla and mandible in excursive movements so that the denture teeth can be set in a harmonious relationship.

Record Bases (Baseplates) and Occlusion Rims

The maxillary and mandibular casts can be accurately related on an articulator using record bases and wax occlusion rims. Record bases should NOT be referred to as 'stabilized bases' unless they have been lined with an elastomeric material to improve fit and adaptation to the cast and supporting tissues.

The record bases simulate the finished denture base and the wax occlusion rims simulate the position of the teeth for the purposes of making these records. To make the recording of jaw relationships easier, the occlusion rims are made slightly bulkier than the denture teeth to provide additional stability during record making. After the maxillary and mandibular casts are related on the articulator, the bulk of the wax rim is replaced by denture teeth, so that the contours of the denture and position, size and other aspects of the dentures can be evaluated prior to processing.

The maxillary record base should be retentive. A non-retentive record base usually results from failure to adapt the resin (particularly from the posterior border and palate) during polymerization. Alternatively, looseness may be caused by over- or under-extension, or by the use of too much block-out on undercut portions of a cast. In cases of minimal looseness, a denture adhesive may be used to keep the record base in place. If pronounced looseness exists, time will be saved by remaking the record base prior to jaw relation records.

Make the rims slightly higher than required (23 mm average height from the flange of the record base to the rim), so you can reduce the height as necessary.

A. Arbitrary Adjustment of Occlusion Rims

Prior to determining the occlusal vertical dimension of occlusion, the occlusion rims should be adjusted separately to using average dimension and guidelines. This arbitrary adjustment provides a 'starting point' for adjustments and should be fairly rapid. *It should normally not take longer than 15 minutes per arch.*

1. Maxillary Occlusion Rim Adjustment

- The maxillary wax rim should be slightly facial to the ridge to compensate esthetically for facial resorption of the bone. It should procline slightly with an angle approximately 80° to the occlusal plane
- Anterior height should provide rim display of 1-2 mm below the lip at rest or when the patient slightly smiles
- Longer upper lips (columella to edge of lip) over 30mm normally are associated with no display and shorter lips of 10-25mm are associated with 2-4mm of rim/incisal display
- Older individuals and males tend to have less rim/incisal display
- The rim should touch the wet line of the lower lip, when the "F" or "V" sounds are spoken (have the patient count from 50 to 60)
- Externally the nasolabial angle should be approximately 90°, and the lips should be unstrained, with the vermilion border visible
- The anterior-posterior orientation of the occlusal plane should be parallel to the ala-tragus line (a Fox plane can be used to visualize this plane)
- The mediolateral orientation of the occlusal plane should be parallel to the pupils

2. Mandibular Occlusion Rim Adjustment:

- The mandibular wax rim should be centered over the middle of the ridge to maximize stability, which is usually compromised in the mandible

- The rim should be slightly proclined, similar to the maxilla
- The posterior height of the wax rim should intersect with a point 1/2 - 2/3 up the retromolar pad
- The anterior height of the wax rim should be even with the corners of the mouth when the lip is relaxed
- The maxillary wax rim should have 1-2 mm horizontal overjet anteriorly and posteriorly when the patient is in a centric position
- The patient should demonstrate unstrained lips, with the vermilion border showing in both arches

B. Occlusal Vertical Dimension

Physiologic Rest Position – PRP (Rest Vertical Dimension) - the postural position of the mandible when an individual is resting comfortably in an upright position. Normally the lips are barely touching, the occlusion rims/denture teeth should are not

Interocclusal Rest Distance (IRD) is the space between opposing occlusal surfaces or wax rims while a person is in the physiologic rest position - **usually 2-4 mm.**

Occlusal Vertical Dimension (OVD) is the distance between the maxilla and mandible when the teeth or wax rims are in contact in centric position

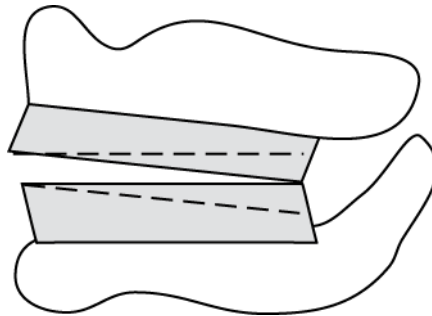
$$\text{PRP} = \text{IRD} + \text{OVD}$$

C. Technique for Determining Occlusal Vertical Dimension

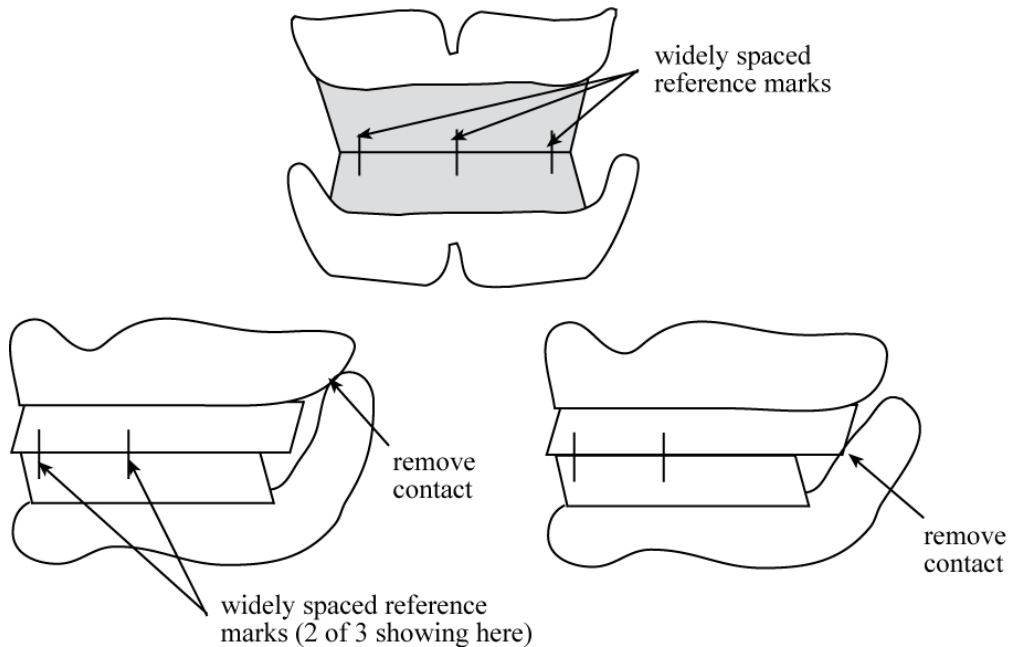
1. Use an indelible stick to make one dot on the philtrum, just below the columella of the nose and another on the chin.
2. Measure the distance between the dots with a Boley gauge at both the physiologic rest position and also at the occlusal vertical dimension. The patient should be **sitting upright** without head support since jaw position is affected by posture. The difference between the measurements is the interocclusal rest distance which should normally be 2-4mm.
3. The patient should open and close until lips barely touch - **physiologic rest position**. Ask the patient to stop jaw movement as soon as their lips touch when closing and ask them to maintain the position. Place a finger below the patient's

chin, look away, then have patient close until wax rims touch - you should feel movement of the mandible through the rest distance as a double check on the measurements you made. Do not look at the patient during this test lest soft tissue movement be mistaken for jaw movement.

4. If insufficient interocclusal distance is present- remove wax from one or both of the rims
5. Use 'closest speaking space' to confirm the occlusal vertical dimension – when speaking sibilant sounds ("s", "z", "sh", "ch"), the rims should be at least 1 mm apart at all times
6. Use large metal spatulas, #7 and Cottrell wax spatulas and a red-handled knife (scalpel) with Bunsen burner and torch to adjust rims.
7. Rims should make flat contact evenly along the entire length of the occlusal surface when the patient closes in the hinge or centric relation position. **This is extremely critical.** If the rims touch in one area first, the patient can slide into an eccentric or potentially strained position.
8. If the patient does not contact evenly over the entire occlusal surface, scribe lines parallel to the opposing occlusal surface on the facial sides of the maxillary and mandibular rims. These guides should be used to parallel the rims during reduction.



9. Ensure the record bases are not in contact by scribing lines between the maxillary and mandibular dentures on three widely separated areas. Remove the record bases, superimpose the lines and check the posterior regions for areas of record base contact - eliminate contacts between the record bases, or between the record base and the occlusion rims (these will cause tilting movements of the record bases). There will be only one position where all three lines will line up.



10. Continue to adjust the rims until the interocclusal rest distance is 2-4 mm and there is even contact between the rims in the centric relation position.

A patient with **excessive occlusal vertical dimension** may have symptoms:

- Sore muscles
- Sore spots on the tissue bearing surfaces
- Rapid bone resorption
- Clicking of denture tooth contact during speech

A patient with **inadequate occlusal vertical dimension** may have symptoms:

- Face looks collapsed - chin too close to the nose or protruding
- Fatigue when chewing
- Sore muscles or joints

D. Transverse Horizontal Axis Location

A face-bow or ear-bow is a device used to record the relationship of the maxilla to the transverse horizontal axis of the mandible, which is then transferred to the articulator. Location of the transverse horizontal hinge axis is important to prevent occlusal errors, particularly when cusped teeth are used in dentures.

Making a Facebow/Earbow Transfer:

1. Mark the facial midline on maxillary wax rim
2. Heat the edentulous bite fork, center and insert it into the facial surface of the maxillary occlusion rim on the fork, about 2 mm below the occlusal surface. Make sure all prongs insert into the wax and attach firmly. If you overheat the fork, it will melt the wax and make attachment difficult
3. Place the bitefork with the attached record base in the patient's mouth, have the patient close against the opposing rim to stabilize the bite fork
4. Slide the facebow/earbow onto bite fork handle with the earbow pointing vertically at the beginning
5. Rotate the facebow until the earpieces are centered over the external auditory meatus on both sides, then center the assembly
6. Establish the third point of reference - Whip Mix uses Nasion; Hanau should contact cheek at infraorbital foramen
7. Tighten the assembly on the bite fork, ensuring the record base is fully seated
8. Loosen the earpieces and remove carefully
9. Attach to articulator in a centered position
10. Zero the incisal pin and incisal guidance table, lock the condylar elements in the hinge position and then attach a mounting ring to upper member of the articulator

Indirect Mount: (Whip Mix) attach the indirect mounting platform, remove the transfer rod/bitefork assembly intact from the facebow and attach to the mounting platform

OR

Direct Mount: if using an H2 Hanau articulator/**earbow** combination - set horizontal condylar elements to 70° and Bennett adjustment to 0° - ear piece slides on pin which is on the movable element. If using a **facebow**, this does not apply. Lower the bite fork handle to the lower mark on incisal pin or match the third point of reference attachments.

11. Adjust a cast support under the bite fork
12. Mix **fast set** or **mounting plaster** to a creamy consistency - apply to ring and wet cast surface
13. Close the articulator. Once set, remove the ring and cast and add mounting stone to make the mounting smooth and neat.

Centric Relation (CR) Position

Most normal, healthy, fully dentate individuals have a maximum intercuspation that is close to, but not necessarily coincident with a relatively centered horizontal transverse axis. Because they have stable contacts and no pathology, dentists can restore their teeth without altering the position, thereby maintaining a non-pathologic position.

Once patients have lost all (or occasionally most) of their teeth, it becomes difficult for patients to determine their proper position for function, because they have lost the fine proprioception of the periodontal ligaments of the teeth that help them determine where their mandible is in three dimensions. Patients cannot normally determine what height their bite should be (occlusal vertical dimension) or even determine where antero-posteriorly and medio-laterally their jaw should be. Dentures could potentially be made at a random position by having patients just bite together, hoping the random position causes no pathology. A more predictable approach is to select a repeatable, measurable **treatment position** where dentists can be assured the patient will be able to comfortably function. The most accepted position for maximum intercuspation of dentures is Centric Relation, defined in the most recent *Glossary of Prosthodontic Terms* as:

A maxillomandibular relationship, independent of tooth contact, in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminences; in this position, the mandible is restricted to a purely rotary movement. It is a clinically useful, repeatable reference position."

It is thought that the anterior-superior position of the condyle against the posterior slopes of the articular eminence is considered desirable is because:

1. In joints there is usually thickening (buttressing) of the bone over the area of an articular surfaces – the thickest part of the bone of the articular eminence is in the anterior-superior portion of the glenoid fossae
2. The articular disk is in a superior-anterior position
3. The neurovascular supply of the retro-discal pad is posterior to the articular disk - if the condyles articulated in a most posterior position, these tissues would probably be impinged upon
4. Cartilage usually covers articular surfaces - fibrocartilage covers the anterior portion of the glenoid fossae, not the posterior, and articular cartilage covers the superior and anterior surfaces of the head of the condyles, not the posterior surfaces
5. Posterior most positions usually require operator force to obtain, and it is possible that this pressure may force the condyles down posterior slope of fossa, or cause flexing of the mandible

Clinically a dentist cannot determine the actual position of the condyles at the time jaw relations records are made, and so that the actual condylar position cannot be assured, even if we agree on a definition of centric relation

Centric relation can be thought of as a **treatment position**, which is not necessarily ideal or normal in the natural dentition. Centric relation position is used as our acceptable reference or treatment position for complete dentures because it is:

1. Conducive to health - not pathogenic
2. Relatively repeatable - the patient can find stable occlusal contacts easily
3. A hinge position - allows change in the vertical dimension easily and so the patient can find stable occlusal contacts easily
4. A relatively symmetrical position - avoids muscle strain which might occur in excursive positions

“Centric Occlusion” (CO) is usually defined as occlusion of opposing teeth when the mandible is in centric relation; this may or may not coincide with the maximal intercuspal position. One problem with both of these terms (CR and CO) is that they have been defined differently by various investigators, and differently over different time periods.

Reasons for NOT using positions other than CR in edentulous patients.

Other positions:

- a. may be dysfunctional (must palpate muscles, TMJ to ensure no dysfunction)
- b. can be more difficult to verify - studies have shown it is not as reproducible.
Patients cannot tell where centric occlusion or a habitual position is with bulky wax rims in position. Basically, there is no habitual position with new wax rims
- c. may lead to dysfunction – there is no way to determine this prior to fabricating and delivering the dentures to a patient – an expensive proposition if it turns out to be dysfunctional

When to use CR as a treatment position:

- a. When the **entire occlusion being restored** (i.e. no remaining posterior centric stops)
- b. When complete, fixed, or removable partial dentures involve the either the entire or almost the entire occlusion

If a stable, **nonpathological** natural occlusion exists (posterior centric stops present), and there is no valid reason to change it, then restorations should be made in maximum intercuspation.

How to obtain CR

Bimanual manipulation produces reasonably good results:

1. The patient should be placed in a slightly supine, position
2. Place notches in the occlusion rim to aid in stabilizing the record bases with index fingers on the rim, and thumbs under symphysis
3. Jiggle the lower jaw – the mandible should freely arc
4. Allow the patient to close the last portion
5. **DO NOT PUSH THE MANDIBLE or dislodge the record base**
6. **The registration media must be dead soft**, when the patient close into it

Selection of registration media


1. Avoid wax if possible! Waxes produce the least accurate interocclusal records. Numerous studies with dentate patients have even shown that the most accurate mountings are achieved when NO MATERIAL is used with DENTATE casts where the patient has stable contacts (i.e. no rocking of casts when placed together - you

need to remove all positive bubbles to check for this). Alternatively, for dentitions that do NOT have stable contacts, elastomeric materials produce more accurate interocclusal records than wax. For best records for complete or removable partial dentures:

- a. Use no material for tooth borne RPD's with stable occlusal contacts.
- b. Use elastomeric bite registration material (e.g. Memoreg) with record bases and wax rims for CD's & most RPD's. Record the entire occlusal surface for stability. Use small 'V' shaped notches on the occlusal rim surface.

Recording centric relation and mounting the mandibular cast:

1. Place 3 widely separated marks between the maxillary and mandibular wax rims as you did previously and check that the record base heels do not touch
2. Place two sharp 'V'-shaped notches in the wax in the premolar and molar areas of the maxillary and mandibular rims (1-2mm deep) on both sides of the arch. Make sure there are no undercuts in the rims or the 'V'-shaped notches
3. Place the record bases and occlusion rims intraorally and rehearse making the centric position record without recording media.
4. Place a thin layer of elastomeric registration material **over the entire arch** of the mandibular rim.
5. Stabilize the mandibular record base using index fingers on the flange (or in a recess in the occlusion rim) and the thumbs under the symphysis.
6. Ask the patient to open, relax, and slowly close
7. Gently arc the mandible in a hinge like motion - without translation of the mandible, without much splinting
8. The patient slowly closes, and the operator uses tactile input to ensure the mandible does not move suddenly forwards or to either side
9. The patient should close until the occlusion rims are almost touching (1mm apart). Ask the patient to stop as soon as this position has been reached, or as soon as they feel they are just barely touching the rims together. If contact is seen between rims ask the patient to stop closing, so they do not contact the rims and possibly translate from hinge position.
10. Never instruct the patient to bite firmly - this can cause translation/ inaccuracy.

11. Stabilize the patient's mandible while the material sets (never make a record without keeping your hands in place - if movement is felt during setting, re-make the record).
 12. Hold this position for approximately 1 minute (or recommended set time of the media). Have the patient open and remove both rims together. Separate carefully.
 13. Reseat the record bases intraorally with the bite registration and ensure the patient can close without deviation into the record again (repeatable). Make sure the record does not capture the sides of the occlusion rims. If it does, it will be difficult to confirm whether the record was taken at the hinge position, because the portion of the registration capturing the sides of the rim will guide the patient into the same closure whenever they close – it will look repeatable only because the patient cannot close in any other position.
- 

Don't capture the side of the ridge in the record
14. Remove the records and rims and seat the casts into the record bases extraorally. Ensure the record bases fit together with no space between the rims and the records. If there are spaces, look for interfering contacts between casts and or rims that may be preventing full seating into the records. Do NOT mount the casts unless you can get full seating into the registration. As a last resort, make a new record to ensure the first record is not inaccurate.
 15. Increase the height of the incisal pin ~1mm and invert the articulator.
 16. Place wax rims together, and lute them together with sticky wax - 4 spots between the wax rims or use tongue blade sticks and sticky wax to immobilize your casts during mounting. **If you mount your casts without immobilizing them, you may introduce a mean occlusal discrepancy of ~ 1.6mm** (vs. 0.25 mm with sticks & sticky wax) (Gunderson & Siegel, J Prosthodont 2002).
 17. Mix mounting plaster to creamy consistency - place on cast and ring - close articulator - smooth the mounting plaster. Return the incisal pin to its original height after the record has been removed. The occlusal rims should be touching evenly, over the entire occlusal surface with no contact of the maxillary and mandibular casts or record bases. **Only the wax occlusions rims should be contacting each other** – casts and record bases should not be in contact with anything.

Setting Protrusive Condylar Inclination

Prior to setting teeth, a protrusive record should be made, in order to set the condylar guidance on the articulator and help select appropriate cusp angle for the planned denture occlusion.

1. The patient should protrude a minimum of 5-6 mm (for ease of determination) but less than 12 mm (maximum travel of the condylar element on the most articulators). If they deviate sideways, help them protrude straight forward.
2. Elastomeric registration material is placed over the entire mandibular rim and the patient closes in an anterior position, normally edge to edge or slightly anterior, unless there is a severe Angles malocclusion (Class II or III).
3. The registration media must interdigitate with the opposing "V-shaped" notches placed previously.
4. The record is taken at a height slightly greater than the established vertical dimension.
5. The record bases and registration are removed, placed on the articulator.
6. The condylar elements are released from the hinge position, the instrument protruded, and the records approximated. Firm pressure is placed over the mounting screw of the maxillary cast. The condylar elements are rotated until there is maximum interdigitation of the registration and opposing occlusal rims. Clockwise or counter-clockwise rotation of the condylar element will result in opening posteriorly or anteriorly between the record and either wax rim from this position.
7. ONLY the wax rims and registration should contact. If there is contact of casts and/or bases, normally the rotation of the condylar element will have no effect on the seating into the record on that side.
8. If the casts and/or record bases contact, eliminate the contacts and reseat into the record. The lateral component of condylar guidance (Bennett Angle) can be set arbitrarily at 15°.
9. When a monoplane occlusion is selected, the protrusive record is still important to determine the degree of separation of the cusplless posterior teeth in excursions, in case steep condylar guidance requires modification to the denture setup in order to improve denture stability. This cannot be assessed if the condylar guidance has not been set on the articulator. Setting a condylar guidance of 0° in these cases will look fine on the articulator but will not be accurate intraorally.

Selecting and Setting Denture Teeth

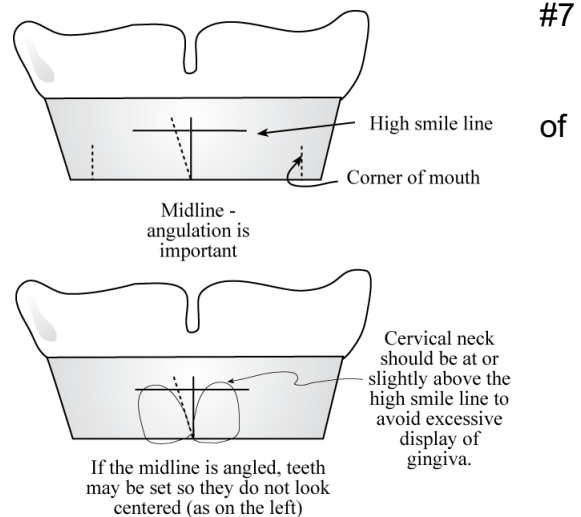
Reference Marks on the Occlusion Rims, Record Bases and Master Casts

When a dental laboratory technician will be setting the denture teeth, it is critical that the occlusal vertical dimension, the lip support, the angulation and overjet of the wax occlusion rims be determined correctly, for the technician will not have the benefit of patient contact to help them set the teeth in proper position and angulation. After accurately adjusting these aspects of the occlusal rims, the dentist should place some additional reference marks on the occlusion rims to aid in tooth selection and placement.

A. Maxilla

In the maxilla, reference marks should include:

Midline of the maxillary rim - Use a wax spatula to score a line demarcating the position of the midline philtrum of the lip. This is one of the most critical references to record. Ensure the mark is a line, not just a dot, which parallels the patients overall facial midline. Otherwise the incisors can be set at an angle, making the set up look off center. The mandibular midline can be marked at the same time.

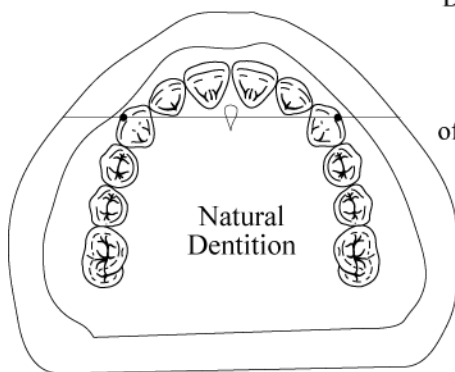


Corners of the mouth - Use a #7 wax spatula to mark the corners of the patient's mouth, when closed, at rest. This approximates where the distal of the canine teeth should terminate. Use the flexible Trubyte Auto-Rule to measure around the circumference of the rim between contralateral marks - tooth size of the six anterior teeth can be read off the ruler in mm or by the Dentsply letter code (A, B, C, etc.)

High Lip line - Use a #7 wax spatula to mark the highest point the upper lip reaches when the patient smiles. The maxillary anterior teeth should be selected so the cervical necks lie at or above this line. If shorter teeth are selected, the esthetic result will be compromised.

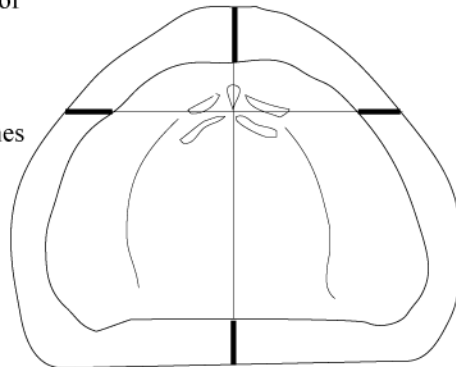
Palatal Midline - With a pencil (NOT an indelible stick) and the straight edge, of a clear Trubyte Millimeter Ruler, draw a line through the middle of the incisive papilla and the mid-palatal raphe, extending it onto the land area of the cast. Check your occlusal rim for symmetry about this important midline. If it is not symmetrical, adjust the rim prior to sending it to the lab for placement of teeth.

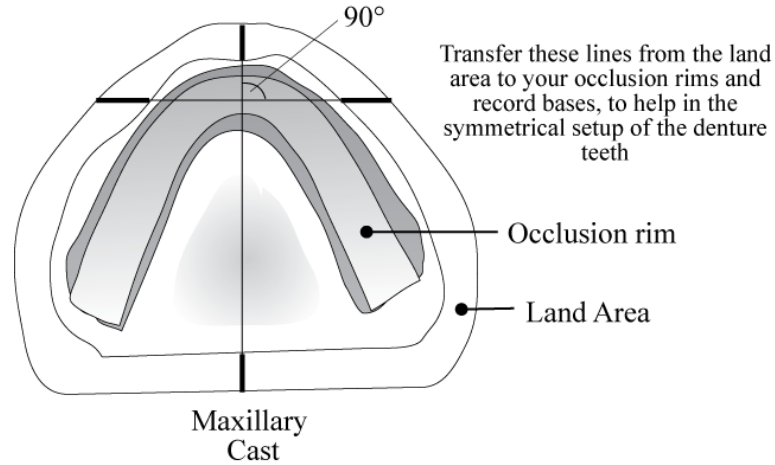
Distal aspect of the incisive papilla - In the edentulous maxilla, a line drawn perpendicular to the palatal midline, passing through the distal aspect of the incisive papilla should normally intersect with the cusp tips of the canines. Draw this line with pencil and a straight edge, on the cast, extending out to the land area. It will provide verification that your tooth size selection was correct. Additionally, it will provide another line to verify the symmetry of the wax rim and denture tooth setup. On average, the facial surface of the **central incisors should be approximately 8-10 mm anterior** to this line.



Draw a line at the back of the incisal papilla, perpendicular to the midline- this defines where the cusp tips of the replacement canines should be. Note the papilla changes position after extractions, due to ridge resorption and tissue changes

Line through the incisal papilla and the midline raphe define the midline for the denture teeth setup, and should be scribed on the cast and record base





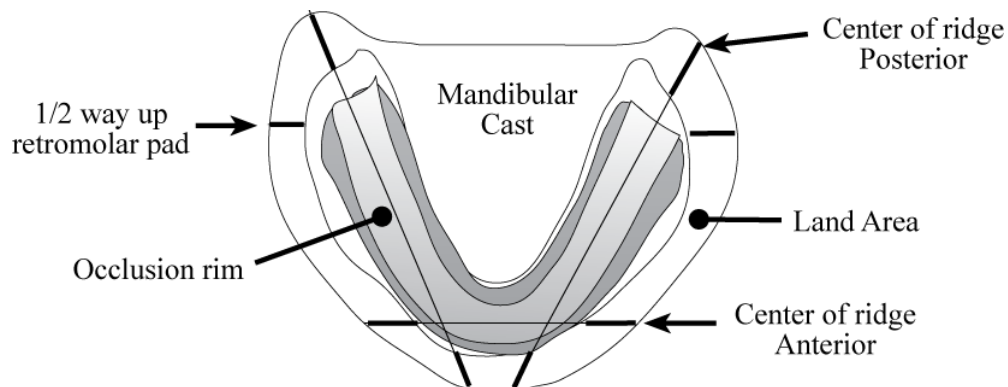
B. Mandible

In the mandible, reference marks should include:

Half way up the retromolar pad - the posterior aspect of the occlusal plane should intersect the midpoint of the pear-shaped pad, to ensure the occlusal plane is not set too low (can cause tongue biting) or too high (can cause strain as tongue struggles to place the food bolus back on occlusal table)

Center of the posterior mandibular ridge - Draw this line with a pencil and a straight edge, on the cast, extending out to the land area. The lingual cusp of the maxillary posterior teeth should be centered over this line to ensure denture stability, by reducing fulcruming forces during function

Center of the anterior mandibular ridge - Draw this line with a pencil and a straight edge, on the cast, extending out to the land area. If the anterior teeth are set too far anterior to this line, heavy fulcruming forces can cause tilting and dislodging of the mandibular denture, particularly when the mandibular ridge is severely resorbed.



Once drawn on the land area, replace the mandibular record base and using a clear ruler and a scalpel blade, scribe lines on the wax rim surface connecting the marks for the center of the ridge anteriorly and posterior. Do the same for the center of the anterior ridge.

Selecting Anterior Teeth

Selection of anterior teeth requires a combination of science and artistic ability based on observation. Measurement, formulas etc. are only a starting point – use your eyes and common sense.

Size

- Use existing teeth as a guide:
 - Too big or small? If so, use other means of establishing size
 - Does patient like the existing teeth? Do you?
 - If acceptably close, use a Boley gauge to measure width and length of central incisors and check with the paper **Trubyte Mould Guide chart** (measurements for central are given; pictures are ~life size).
- **High Lip Line** gives indication of inciso-gingival length (normally provide minimal gingival display with the neck of the tooth tucked just under the upper lip when smiling)
- Mark **the position of the commissures** of mouth on the maxillary rim with the patient relaxed, mouth closed (position of distal of canines - use the Auto-Rule to pick a corresponding mould e.g. C, D, E, F etc.)
- **Bizygomatic width measured** by facebow divided by 16 = width of the central incisor; divided by 3.3 = width of 6 anteriors
- Pre-extraction casts or photographs can be useful, if available

Shape

- Although the Trubyte system is based on facial shape, tooth shape does not actually correspond to facial shape. Nonetheless, the Trubyte system can be a good starting point for selecting denture teeth; Similarly, there are proven no male/female characteristics of teeth that other tooth selection systems are based on.
- Use existing teeth or denture teeth as a guide — do they look good to the patient and the operator?
- **USE COMMON SENSE AND OBSERVATION**

Shade/Hue

- Tooth shade/hue darkens with age, but the suggestion that there is any correlation with skin and hair colour is suspect
- Dentsply Trubyte Portrait IPN acrylic shade guide is used at Dalhousie
- Don't show a patient all shades in the shade guide outside of the mouth – patients will almost always pick the whitest shade
- Instead show patient 2 or 3 shades under lip and ask their opinion (colour perception is affected by background) – disinfect the tabs afterward
- Use the Portrait Shade number and not the Vita shade code when prescribing denture teeth from the Portrait shade guide. (Portrait numbers begin with a "P" and are listed as the bottom-most shade code on the shade tabs)
- Anterior and posterior tooth shades are the same (e.g. anterior shade P22 corresponds with posterior shade P22)
- Shade selection for porcelain restorations should be made with the Vita shade guides. If you need to match a porcelain restoration to denture teeth, select the Vita shade for porcelain and pick the corresponding Portrait shade (P1-P34) for the Vita shade (the Vita shades are listed on the top of the Portrait shade tabs and list by letter A, B, C, D)
- The patient should choose the shade guided by the dentist – if they want the whitest teeth possible, offer your opinion, but don't persuade
- Use the squint test for value (brightness) - squinting reduces the influence of hue - if the teeth look too bright while squinting, suggest something less bright

Material

- Porcelain teeth are becoming less prevalent. Not used at Dalhousie
- Acrylic much easier to set and adjust; they will last life of denture (5-7 years)

Porcelain	Acrylic
- wear less	- new materials wear well
- more translucent	- better teeth have layers to improve transluc.
- brittle - fracture easily if dropped	- resilient - acts as shock absorber
- don't bond to base (stain, fall out)	- chemically bonds to base
- difficult to adjust/set	- quieter; gum sticks

Selecting Posterior Teeth Form (Cusp Angle)

Anatomic (40°, 30°, 20°(semi-anatomic), 10°)

- More esthetically pleasing (especially in the premolar region) – use for patients with esthetic concerns, if there are no contraindications (severe ridge resorption, jaw malrelationships, uncoordinated jaw movement)
- Use when a balanced occlusion is desired or for maxillary teeth when a lingualized occlusion is used. Use a tooth cusp angle similar to the condylar inclination
- Use when coordinated jaw movements are present
- Use when setting teeth for a single denture opposing a natural dentition (easier to interdigitate)

Non-anatomic (0°)

- Jaw size discrepancies (such as cross-bite situations, severe Angles Class II or III malocclusions)
- Reduction in horizontal forces is desired (severe ridge resorption)
- Uncoordinated jaw movements or unrepeatability of centric registrations
- Poorer esthetics, due to lack of cuspal inclines
- Set with no incisal guidance (no overbite) for monoplane occlusal schemes
- Selection of tooth form also depends on:
 - Condylar and incisal guidance inclinations - easier to maintain posterior contacts using a cusp angle similar to the condylar inclination
 - Curve of Spee - determined by the dentist
 - Angulation of occlusal plane - determined by the dentist

No tooth form has been proven most efficient – many patients can't discern a difference

Posterior Tooth Size

- The Trubyte mould chart has a list of corresponding sizes to match the anterior teeth already selected
- Select by determining distance of distal of canine to position of beginning of ascending ramus (29, 30 mm. etc), also look at mould guide chart
- The posterior teeth should at least approximately match the cervico-incisal height of anteriors (no large discrepancies)

- Selection may be affected by the interocclusal distance available for setting teeth (amount of space for 'S', 'M', or 'L' teeth) - if limited space, choose a shorter mould
- Buccolingual size of teeth can affect the tongue space – choose smaller teeth if tongue space is limited

Prescribing Denture Teeth

The teeth in Trubyte denture tooth mould guide are printed life size. For most cases at Dalhousie University we will prescribe **acrylic** denture teeth, of the **Portrait** type. **IPN** is a proprietary type of acrylic that has improved wear resistance. The chart below shows how to complete the prescription for denture tooth selection.

	Shade	Mould	Tooth Form
Max. Ant.	P22	22E	
Mand. Ant.	P22	H	
Max. Post.	P22	30L	33°
Mand. Post.	P22	630	0°

Step 1
Select a shade using the shade guide

Step 2
Select a maxillary anterior mould and the corresponding mandibular mould from the chart in the mould guide

Step 3
Decide on an occlusal scheme and select posterior molds based on the table of moulds corresponding to the anterior mold already selected

Trubyte Portrait Recommended Combinations for Lingualized Occlusion:

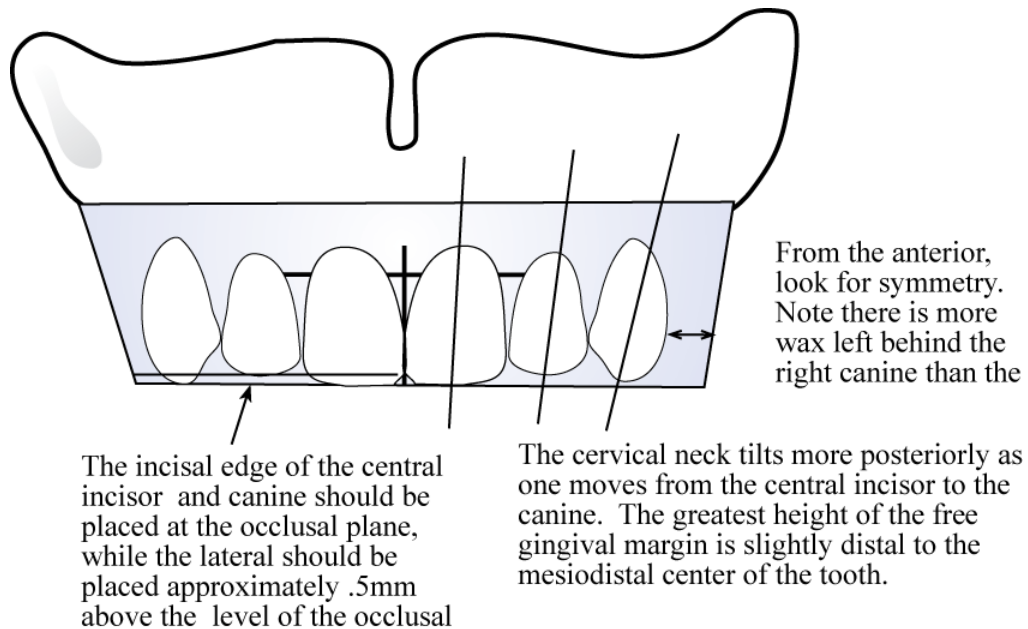
Recommended Set-up Combinations		Maxillary 33°		
		30L	32L	34L
Mandibular	22°	530		
			532	
	0°	630		
			632	
			634	

Other tooth series and other companies also offer a range of denture teeth that also differ in cost and quality - the dentist should select the proper tooth quality, not the laboratory.

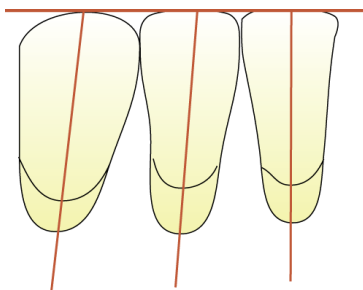
Setting Anterior Teeth

Additional Reading:

1. Watt DM, MacGregor AR. **Designing Complete Dentures**. 2nd ed. 1986. Bristol, Wright. Ch. 2 Biometric guides to the design of complete dentures, pp 3-31.
2. Landa, LS. Anterior tooth selection and guidelines for complete denture esthetics. *In* Winkler S, ed. **Essentials of Complete Denture Prosthodontics**. 2nd ed. 1988. Littleton, Mass., PSG Publishing Co. pp 202-16.

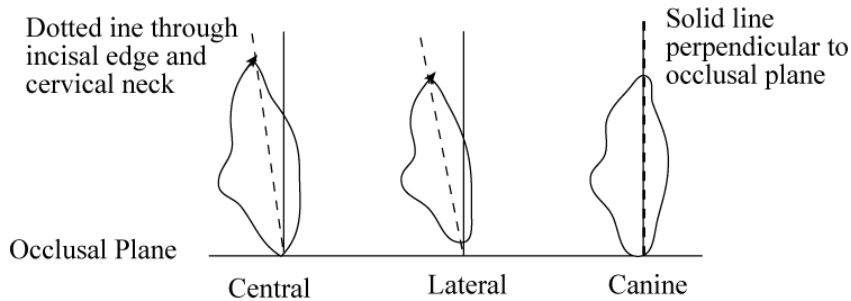


The anterior teeth are set mainly (but not exclusively) for phonetics and esthetics. In denture occlusion, unlike the natural dentition, anterior contacts are avoided in centric position to minimize the forces over the anterior residual ridge which resorbs more quickly under external pressure compare to the posterior ridge. In excursions, anterior teeth contact to permit incising of food.

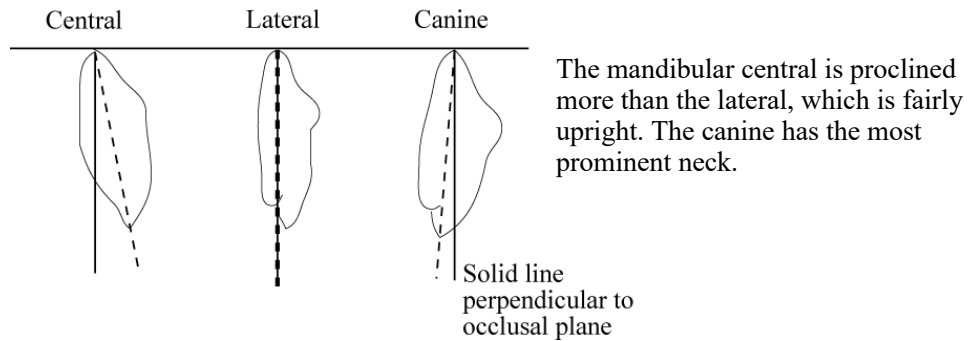


The mandibular anterior teeth are set even with the occlusal plane (no overbite) for monoplane and lingualized occlusal schemes.

Canines should be tilted more posteriorly at their CEJ than other anterior teeth, and should have a more prominent cervical neck

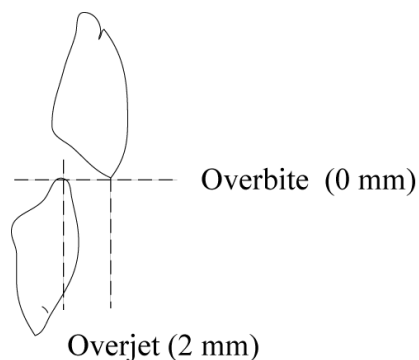


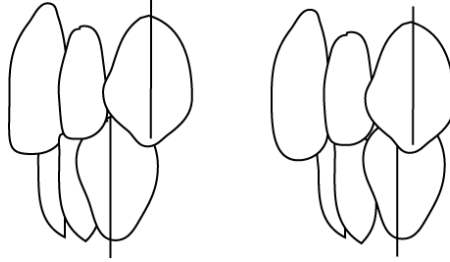
The facial surface of the central incisor is approximately perpendicular the occlusal plane, while the neck of the lateral incisor is slightly depressed. The neck of the canine is more prominent



The mandibular central is proclined more than the lateral, which is fairly upright. The canine has the most prominent neck.

- check symmetry against land area and land area reference lines
- 1-2 mm horizontal overlap (overjet), 0.5 mm vertical overlap (overbite) – anterior teeth don't contact in centric position
- for monoplane occlusions, NO OVERBITE is set - one needs to determine the type of posterior occlusion to be set before the anterior teeth are set





From the lateral aspect, there should be one half tooth offset (left) between the maxillary and mandibular teeth to ensure the posterior teeth can have a normal cusp to fossa relationship.

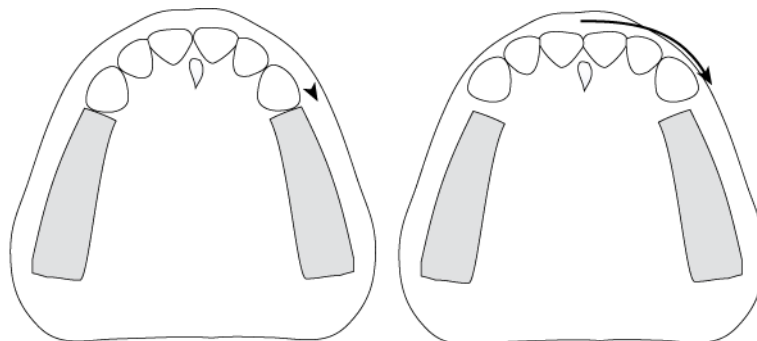
Refining Anterior Tooth Position:

- Maxillary central incisors should lightly touch inside of vermillion border of lower lip for 'F', 'V' & 'S' sounds – incisal edges should approximate each other
 - Incisal edges of maxillary incisors should follow line of lower lip when smiling ('smile line')
 - Crown removing forceps can be used to bodily move and angle teeth
 - Do not hesitate to grind the record base and/or tooth to modify position if teeth do not appear properly positioned – don't let the record base dictate position
 - The nasolabial angle should be approximately 90°; if there is insufficient support, the lip will thin, lengthen and the vermillion border will be reduced
 - The junction of glossy oral mucosa should just be barely visible when the lips are slightly separated. If it is not visible, then the lip is probably insufficiently supported; lips should meet at the junction of the oral & transitional epithelium
 - Excessive block-out of the record base in the anterior will tend to push the lip out at the height of the vestibule, shortening and distorting the lip and nasolabial angle – the teeth will look short when denture is finished, and the flange is properly contoured
- Lipping:
 - too much horizontal overlap
 - palatal contour too constricted
 - anterior teeth too far labially
 - broaden & thicken contour for tongue contact
 - arch form too broad

Remember that anterior teeth are not set exactly where their precursors were - stability is important and modifies positioning

AVOID THE DENTURE SMILE: TEETH TOO SMALL, NOT SHOWING, TOO STRAIGHT ACROSS; "CHICLETS"

In setting the maxillary teeth, make sure the central and lateral incisors are placed so they begin to turn along the curvature of the arch. Note the parallelism with the



A common mistake is to set the anterior teeth too straight across the front, so that the canine is not placed sufficiently posteriorly or palatally to be in harmony with the posterior teeth (right). Note the difference in visible land area in the incisal and canine areas.

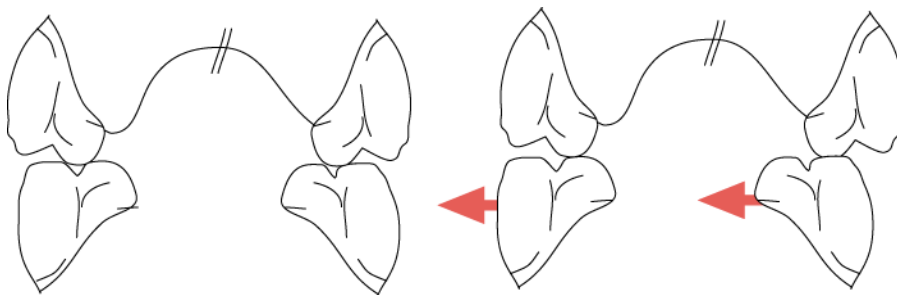
Philosophies of Denture Occlusion:

There are many philosophies of arranging the denture occlusion, but no definitive scientific studies have proven one type of occlusion to be clearly superior to another. Clinicians have developed some principals, based on experience, to make it easier to determine which type of occlusal scheme to use. We will learn two occlusal schemes (there are others):

1. Lingualized Occlusal Scheme

Lingualized occlusion can be set as a type of a balanced articulation scheme. The philosophy of a balanced scheme is to improve denture stability by maintaining contacts on both sides of the denture in excursions during function. Patients feel more confident and have less discomfort when dentures are more stable. There is indirect evidence that a balanced articulation may reduce ridge resorption and allow for increased functional forces in excursions. Lingualized occlusion differs from traditional fully balanced schemes by having only the lingual cusp of the maxillary tooth contacting the mandibular teeth to maintain this contact.

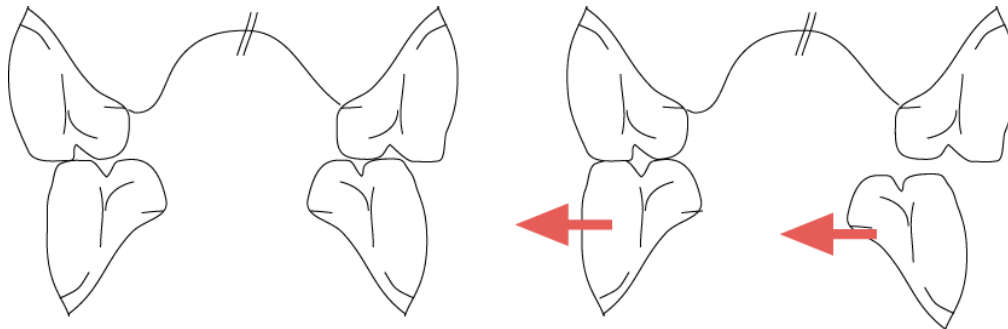
- a) Centric position contacts are set maxillary lingual cusp to fossae of the mandibular posterior teeth. No anterior contacts should be present in the centric position.
- b) Anatomic teeth are used in the maxilla opposing a flat-cusped, or shallow cusped mandibular tooth.
- c) Overbite is incorporated into the anterior setup to improve esthetics, and eccentric contacts.
- d) In eccentric movements there are contacts on both the working and non-working sides of the denture, whether excursions are protrusive or lateral in nature. Anterior teeth make grazing contact in excursions.



- e) The condylar guidance, incisal guidance, angle of the occlusal plane, cusp angle of the denture teeth, and compensating curves placed during the posterior tooth setup all affect the ability to achieve these contacts.
- f) Technically more challenging than monoplane scheme, no definitive studies to prove improved stability;
- g) **Contraindications:** Extreme cases of the following: difficulty in obtaining repeatable centric record (incoordination, jaw malrelationships, severe ridge resorption (lateral forces displace the denture) may more easily be handled with a monoplane scheme.

2. Monoplane Occlusal Scheme

- a) Cuspless teeth are set on a flat plane with 1.5- 2 mm overjet – there is no cusp to fossa relationship. No anterior contacts are present in the centric position

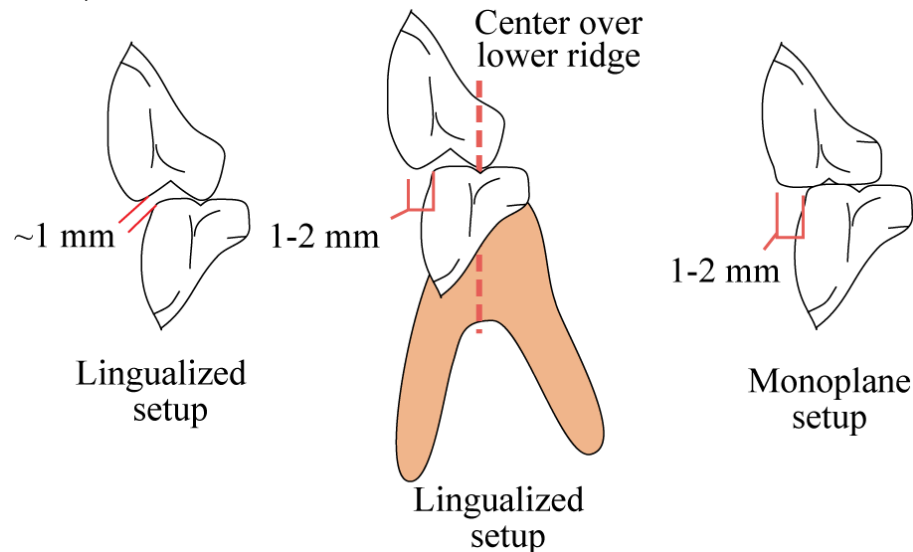


- b) No overbite is incorporated into the anterior setup. An overjet of 2 mm is used to create an illusion of overbite.
- c) **In eccentric movements there are usually no contacts on the non-working sides** of the denture, depending on the condylar inclination and other aspects of the denture setup. Anterior teeth make contact in excursions. Modifications have been made to the monoplane scheme, so that non-working ramps or compensating curves can be added in an attempt to improve stability.
- d) The philosophy is based on the idea that by eliminating cusps, lateral forces on the dentures will be reduced, thereby improving denture stability. This scheme was proposed as a means to simplify the arrangement of denture teeth.
- e) Technically easier to achieve, especially if there is difficulty in obtaining repeatable centric records (muscle incoordination), or if there is a skeletal malocclusion, or severe residual ridge resorption.

- f) Poorer appearance (non-anatomic teeth); can be unstable if the condylar guidance is steep (posterior teeth separate, leaving only the anteriors in contact)
- g) **Contraindications:** The patient has high expectations for improved appearance, very steep condylar guidance may make a monoplane scheme less stable, unless modifying ramps or compensating curves are used.

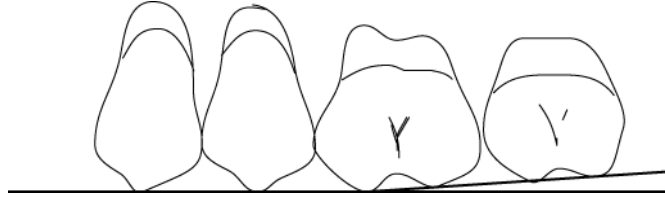
3. Setting Posterior Teeth

- Posterior teeth are set for function, while the anterior teeth are set mainly for esthetics and phonetics (although placement can affect incising ability and fulcruming potential of the denture)
- Stability is increased when centric contacts are on flat surfaces, rather than on inclines
- The most important cusp in the posterior setup is the maxillary lingual cusp which is set over the middle of the mandibular ridge (mandibular central fossae will be placed here)

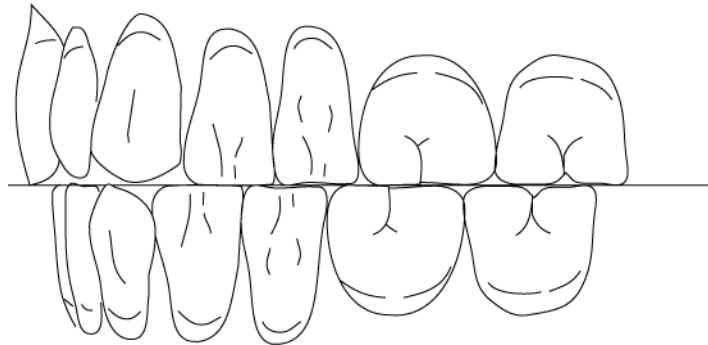


- Ensure 1-2 mm of overjet in order to prevent cheek or lip biting
- Mandibular buccal cusps are lateral to the residual ridge and have more tipping potential for the lower denture
- For a lingualized setup, there should be 1mm separation of the maxillary and mandibular BUCCAL cusps

Lingualized Maxillary Tooth Setup: Maxillary teeth are set with the distal cusp of the first molar and the cusps of the second molar raised slightly above the occlusal plane. This provides a curve of Spee to aid in maintaining posterior contacts.

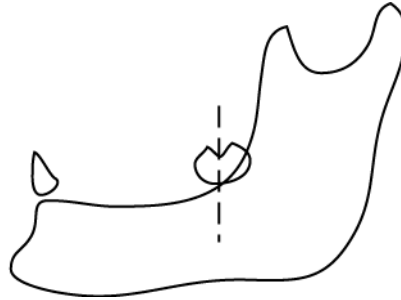


Monoplane Denture Tooth Setup: All denture teeth are set flush with the occlusal plane, in maximum contact with the opposing teeth. No overbite is present.



- Posterior teeth should not be placed over a sharply ascending ridge. If there is not enough room, set three, rather than four posterior teeth. When doing so, eliminate the 2nd premolars, since the first premolar usually has a longer neck (important for esthetics) and it has a lingual contour that smooths the transition from the anterior teeth to the posterior teeth (in some moulds). Avoid eliminating molars as they provide a greater surface area and number of centric and excursive contacts. It is wise to advise the patient of the fact that teeth will be removed from the setup prior to the wax try-in along with the reason for removal, so that they are not surprised by this change.

Do not place the posterior teeth over the ascending portion of the ramus (posterior to dotted line). Functional forces will cause the denture to tilt or shift, causing looseness and/or discomfort. Instead, eliminate the 2nd premolars from the setup, if necessary.

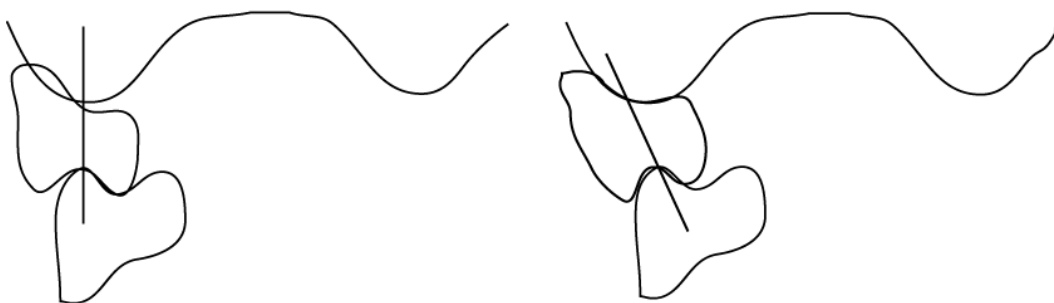


There are a number of ways to set denture teeth and the sequence of set-up is relatively unimportant. Some set the maxillary posterior teeth first because their placement has more impact on esthetics, especially the first premolar. Others set the mandibular teeth first to ensure they are set over the ridge for maximum stability. Some set one maxillary posterior tooth, then the mandibular antagonist, alternating posteriorly. Others set all the teeth in one arch first, then the antagonists. As long as basic mechanical and esthetic requirements are met, one technique is not inherently superior than the other.

The posterior teeth should be set to follow the occlusal plane of the record base - the teeth should not be set on a plane higher than that intersecting a point 1/2-2/3 up the retromolar pads

In cases where there is a jaw-size discrepancy or skeletal malocclusion, the tooth positions may have to be modified into cross bite positions. Often in these situations it is easier to set cusplless teeth in a monoplane scheme, because it is not necessary for cusps and fossae to interdigitate

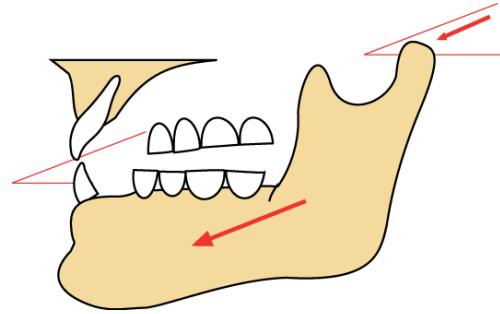
Don't let the record base dictate the buccolingual inclination of teeth:



If the cervical neck of the tooth hits the record base(left), the correct axial alignment may not be possible, causing tipping of the tooth (right), which will reduce the overjet, making balancing difficult and adversely affecting appearance.

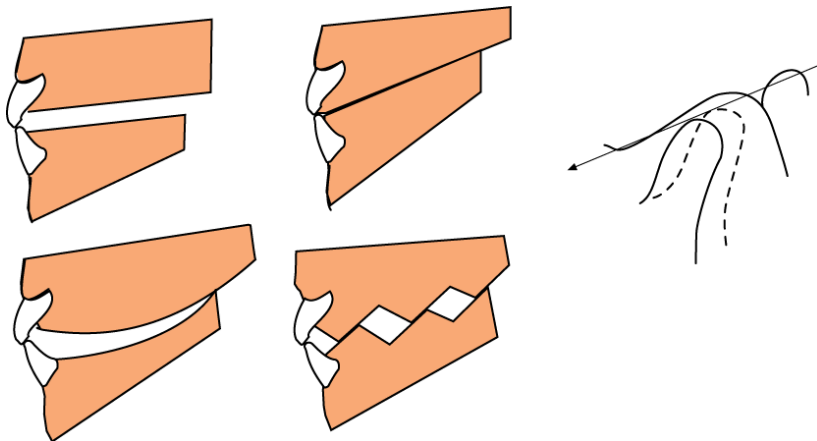
4. Achieving a Balanced Lingualized Articulation

Normally, when the mandible moves in lateral or protrusive directions, the condyles move down the slope of the glenoid fossae, causing the whole mandible to move downwards and the posterior teeth to separate. This



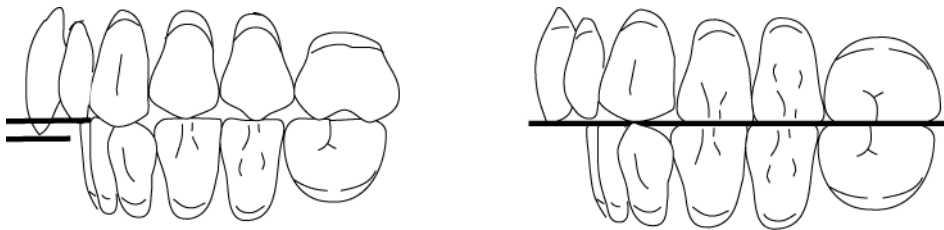
separation, called Christensen's phenomenon, makes any balanced occlusion (such as lingualized occlusion) more difficult. **When condylar inclination is steep, using a shallow cusped tooth (e.g. Anatoline – 10°), rather than a non-cusped mandibular tooth (0°) for will make balancing easier to achieve.**

- the separation of posterior teeth, is affected by several factors (Hanau's quint):
 - a) Condylar angulation (recorded by the protrusive record)
 - b) Incisal guidance (set by the dentist when making dentures)
 - c) Cusp angle and fossae depth (selected by the dentist)
 - d) Occlusal plane (determined by the dentist in forming the wax rims)
 - e) Curve of Spee & Curve of Wilson (depends on inclination that teeth are set)

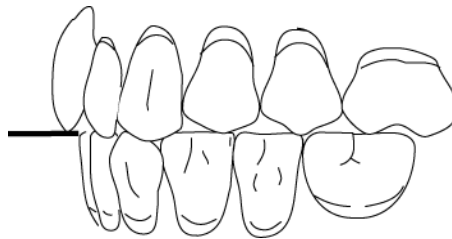


As the condyle moves down the fossa, posterior teeth separate (upper left). Contacts can be maintained by tilting the occlusal plane to more closely approximate the angles of the condylar and incisal guidances (upper right), introducing more of a curve to the occlusal plane (lower left), or adding teeth with higher cusp angles (lower right).

Because setting of anterior teeth affects the incisal angle, which can also cause separation of the posterior teeth, the clinician should stipulate how anterior teeth are set. In general, for a monoplane occlusion, no overbite is set. For lingualized occlusion, an overbite may be set to improve appearance if the posterior teeth can balance in excursions 2-3mm from centric. If the incisors prevent the posterior teeth from balancing by discluding them (usually this occurs when very little horizontal overlap or overjet is present), then the incisal angle can be set to zero (i.e. no overbite).



When 1.5-2.0mm of overjet can be set, a lingualized occlusion (left) can have overbite set. Monoplane occlusion (right) should normally have no overbite set.



When very little overjet can be set (usually due to ridge position and jaw relation problems), a lingualized occlusion (left) should be set to have less, or in some cases, no overbite. This will prevent incisor contact causing immediate separation of the posterior teeth in excursive movements.

Occlusal adjustment

Occlusal adjustment is almost always required to optimum occlusion.

Principles for Developing & Adjusting Contacts for Lingualized Occlusion

A. ADJUSTING **ALL** CONTACTS

- Incisal pin should be just barely out of contact with the incisal table
- Don't lose occlusal vertical dimension (note pin setting)
- Mark with articulating paper on both sides of the arch simultaneously
- Don't tap too hard – teeth could move, loss of occlusal vertical dimension
- Heaviest contacts will have a 'target' or bulls-eye appearance (dark ring with empty center); heavy contacts are darker and wider. Adjust these to establish similar size and darkness as other contacts
- Use fresh articulating paper – change frequently
- Remove marks with dry gauze – no water or toothbrush

B. ADJUSTING **CENTRIC** CONTACTS FOR LINGUALIZED OCCLUSION

- **Adjust Centric stops before adjusting excursions:**
- Deepen/reshape mandibular centric contact area first
- Reshape maxillary cusps if on inclines, or need greater amount of adjustment
- Ensure no buccal cusp contacts, adequate overjet
- When done, note a solid sound (sharp rap, woodpecker knocking on a tree)
- Contacts should not feel bouncy or sound dull on the articulator
-

Goals in CENTRIC: Even distribution on all posterior teeth

- No anterior contacts
- **NO posterior buccal centric contacts** :1mm of space between buccal cusps
 - 1-2mm of buccal overjet
- **NO heavy contacts** - even weight/darkness of markings on posterior teeth
- **NO contacts on inclines** – desire Mx lingual cusp tips to FLAT Md contact area (e.g. marginal ridge, fossae)
- There is no contact on 1st PM marginal ridge as the maxillary canine opposes

Rules for whether to move teeth in wax or adjust with a bur:

Adjust with bur if:

- All contacts showing close to proper position
- All contacts present but not even in weight
- Contact(s) not in proper position, but minor reshaping will move them
- Contacts not all showing, but appear close to contacting
- Contact(s) is/are on an incline, and can be adjusted to flat area

Move teeth in wax if:

- Lack of contact **or** position of contact will take a lot of time to correct
- Lots of adjustment is required to correct
- Tooth is rotated/tilted so contacts/relationships/appearance is/are poor

C. ADJUSTING **ECCENTRIC** CONTACTS FOR LINGUALIZED OCCLUSION

Rule: Develop acceptable centric stops before adjusting excursive contacts. Ensure you don't remove centric stop contacts during adjustments in excursions

Mark excursive contacts in one colour, then re-mark centric stops with a different colour prior to adjusting, so centric stops can be identified, and not eliminated

Goals for **ECCENTRIC** Contacts:

- Even distribution of bilateral contacts on all teeth in excursions
- Anterior contacts in excursions should not disclude posterior teeth
- NO MAXILLARY POSTERIOR BUCCAL cusp contacts in excursions
- At least one working and one non-working contact on each mandibular posterior tooth
- Non-working contacts should never be heavier than working contacts
- Excursive contacts should appear as lines, not dots, on mandibular teeth
- Eliminate heavy contacts, working contacts buccal to the ridge and contacts on inclines
- Adjusted occlusion should feel very smooth in excursions on the articulator, and intraorally. No jumps or bumps should exist.

Rules for moving teeth in wax versus adjusting with a bur are the same as for centric contacts

Principles for Adjusting **EXCURSIVE** Contacts

- If there are inadequate excursive contacts (uneven weight, missing) then lighten existing excursive contacts by making cuspal inclines shallower, removing heavy contacts, reshaping cusps
- **IIF** – non-working contacts will be on Inner Inclines of Functional Cusps
- Reshape mandibular teeth first. Only adjust the maxillary lingual cusp if there are heavy contacts on inclines, or if a greater amount of adjustment is needed
- Eliminate any posterior contacts between teeth and denture bases

D. ADJUSTING CONTACTS FOR A **MONOPLANE** OCCLUSION:

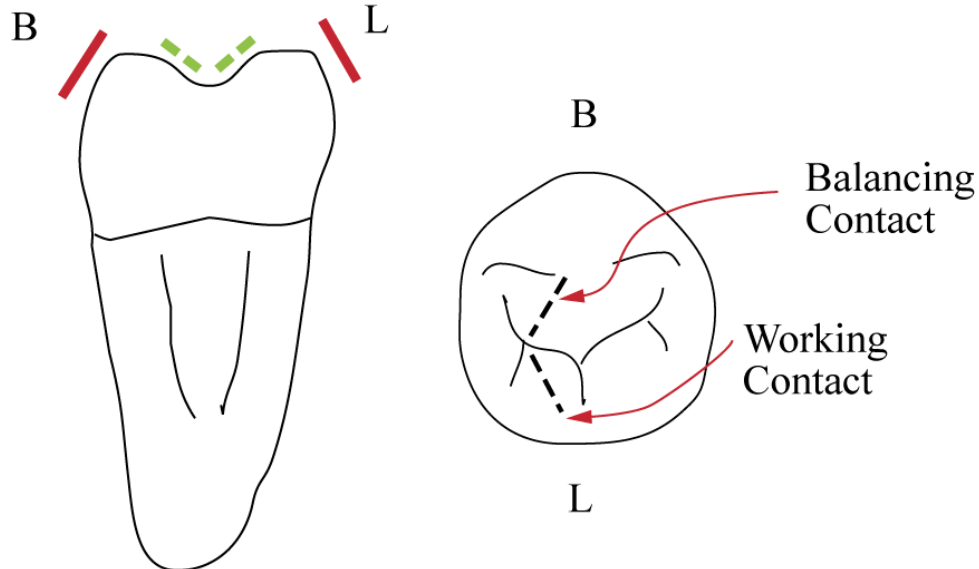
For adjusting centric stops or excursions in a monoplane occlusion, use a large, flat sided bur and reduce the occlusal surface of premature contacts with side of the bur flat to the occlusal plane until the surrounding and contralateral contacts become even in weight and distribution.

Balanced Articulation in a Nutshell:

IIF

=

Non-Working Contacts



--- Inner Inclines (inside of cusp)

— Outer Inclines(outside of cusp)

(Inner Inclines of Functional cusps)

Non-working contacts should be lines, not points

Non-working contacts should never be heavier than working contacts

The Wax Try-in

The purpose of the wax try-in appointment is to verify all aspects of the denture tooth setup – the appearance, phonetics, vertical dimension, occlusal relationships and patient comfort. Normally two try-in appointments are required, an initial wax try-in and a final wax try-in. Never overlook problems you find in the wax try-in stages. If you or the patient find problems, the problems may be more difficult or impossible to change after processing. Failure to make changes at this stage might require removal, resetting and/or reprocessing of the teeth on the finished denture – procedures that are more costly and time consuming.

A. Initial Wax Try-in

The main purpose of the initial try-in is to verify the appearance of the anterior teeth and the accuracy of the centric record. Changes will almost always need to be made at this appointment. At the initial try-in appointment, the dentist should make any changes which would be difficult for the technician to make without the presence of the patient (e.g. many esthetic problems with the anterior teeth). Other changes can be prescribed for the technician to make.

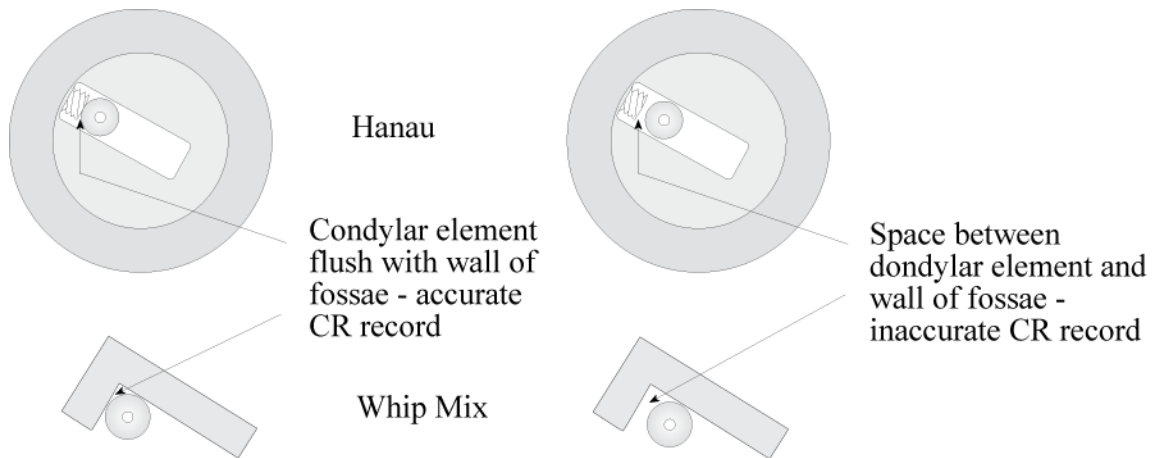
1. Centric Position Contacts

Check the centric position first as it affects everything else. Mark the centric contacts with articulating paper while stabilizing the mandibular denture and placing patient into centric relation (you will need an assistant to hold the articulating paper). Place a thin line of elastomeric bite registration material over the occlusal table and make a new centric relation record. Using a small amount of registration material will improve the accuracy of the record by providing less resistance during patient closure. The opposing cusps should not penetrate the registration, but you may be able to see the articulator markings through the thin areas of the material. This is a preliminary means of confirming the record was acceptable.

To confirm the accuracy of the articulator mounting, loosen the centric locking mechanism of the articulator, so the condylar elements are free to translate. Seat both record bases and interdigitate the teeth into the centric record, pulling the upper articulator member forward. **If the mounting is accurate, the condylar elements should be firmly seated in the hinge position** (no space between the condylar ball and the wall of the fossae) **and the teeth should perfectly interdigitate with the recording medium** (no space around the cusps). If either of these criteria are

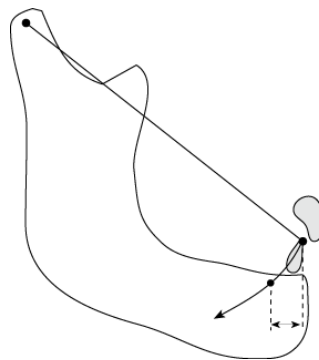
not met, the record should be remade. If a second record shows the mounting to be inaccurate, the mandibular cast should be removed from the mounting ring, half of the mounting plaster ground from inferior aspect and the cast should be remounted, using the new record.

Lateral view of condylar element of Hanau and Whip Mix articulators with accurate and inaccurate CR records:



2. Occlusal Vertical Dimension and Interocclusal Rest Distance

The occlusal vertical dimension should be verified using the same techniques that were used previously. At this point it is critical that 2-4 mm of interocclusal rest distance can be both measured and felt, and that the posterior denture teeth do not contact during assessment of the closest speaking space. If the vertical dimension is incorrect, it should be changed before altering other aspects of the denture setup, since it can affect the relationship of the maxillary and mandibular teeth and the facial esthetics.



As the mandible opens (ie. by increasing the occlusal vertical dimension) the incisal edge moves downward and backward. By increasing the vertical dimension, more overjet is obtained and there is a tendency toward moving to a skeletal Class II situation.

If the vertical dimension is too great, assess whether one or both arches will require reduction in height. Changes can be done in the laboratory, since a change will necessitate the resetting of all the teeth in at least one of the arches. Remember, that the height of both the anterior and posterior teeth must be changed. If only the posterior teeth are changed, there will be an undesired effect on overbite relationships, esthetics, and non-working contacts. Assess how these changes will affect the overall appearance of the patient, before sending the dentures to the laboratory

3. Tooth Position

a. Canine Relationship The most critical tooth position relationship for the initial try-in appointment is the half tooth offset between the maxillary and mandibular canine teeth. If this relationship is not present for a setup of anatomic teeth, a space between the anterior and posterior teeth will be required in order to produce correct interdigitation of the posterior teeth. Technicians will encounter problems setting the correct canine relationship when there are jaw size discrepancies, malocclusions, or improper contouring of occlusal rims at the jaw relation record appointment. *Prior to sending the setup back to the laboratory for final setup, the dentist should determine how to eliminate a canine relationship discrepancy.* It could involve one or more of the following:

1. Reducing or increasing overjet
2. Reducing or increasing facial arch circumference of one or both occlusion rims
3. Altering vertical dimension
4. Bodily moving teeth more facially or more lingually within esthetic limits
5. Changing axial inclination (tilting teeth) of one or more teeth

b. Verify overjet relationships - to help prevent cheek or lip biting. If there is inadequate overjet, the teeth may require bodily movement or tilting to 1-2 mm.

c. Verify patient comfort with the tongue space (denture teeth not set too far lingually) by asking the patient to comment on the comfort of the dentures or their ability to speak with the dentures

4. Excursive contacts

If the canine relationship is not acceptable, and will be changed, excursive contacts will change as well. Nonetheless, the presence of working and non-working contacts

should be evaluated both visually and with articulating paper intraorally, and then compared to the contacts on the articulator, to verify the accuracy of the articulator settings. If the contacts appear noticeably different (check the amount of space between posterior teeth in excursions) or the markings are different between the intraoral and articulator situations, the protrusive record should be remade, and the condylar inclination reset.

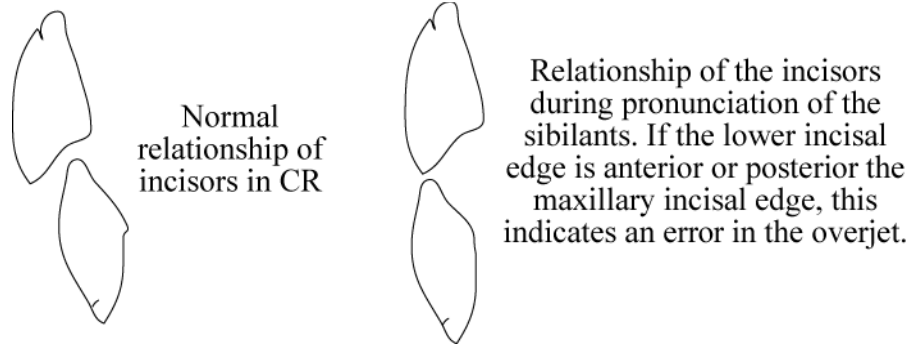
5. Esthetics

Check the amount of the incisal display, the harmony of the maxillary teeth with the smile line, the accuracy of the midline, and the cant of the occlusal plane. Check for proper soft tissue profile, contours, lip support, display of the vermilion border, and correct nasolabial angle. Ask the patient for their opinion of the appearance, prior to voicing your opinion so that you avoid biasing the patient. It can be helpful to have a family member or friend attend the wax try-in to provide a third opinion on appearance. If the clinician or the patient have reservations about the appearance, the problem should be clearly resolved prior to final processing. Never attempt to persuade a patient out of a concern they may have – the problem will be yours later if the patient still does not like the appearance. It is helpful to the technician if the dentist can make changes, but major changes can be delegated to the lab, if necessary.

6. Phonetics

Phonetics can be assessed more readily at the try-in stage since denture teeth have replaced the relatively bulky occlusion rims. Patients will normally find speaking more comfortable at this appointment. Watch for lisping. It can be caused by non-uniform overjet of the anterior teeth, diastemas between teeth or faulty palatal contours. Sometimes a crowded tongue space can adversely affect phonetics. If the initial wax try-in has a diastema between anterior and posterior teeth due to canine malrelationship, this can allow for the escape of air, and produce altered phonetics. In most instances phonetics cannot be corrected until the final wax try-in, when the diastemas should be eliminated. If patients have not worn dentures for an extended period, or if the new denture will have dramatic changes in contour, tooth position and/or vertical dimension, the patient should be allowed to read a passage from a magazine out loud for 5 minutes to allow them time to adapt to and assess phonetics and comfort.

Sibilant sounds ('S', 'Z', 'T', 'CH', 'SH', 'sixty-six', 'Mississippi') - upper and lower incisors should approach end to end relationship

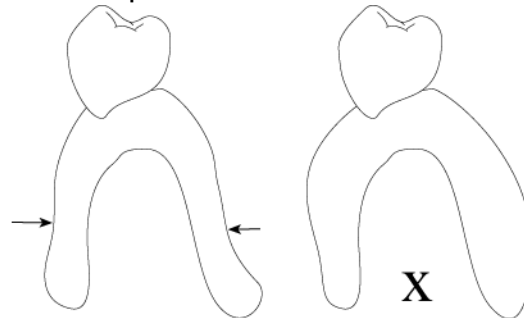


Fricative sounds (F, V, 'Fifty-Five', ask patient to count from 50 to 60) - upper incisal edges should just touch the posterior one third of the lower lip

7. Denture base contours

Denture base contours can affect phonetics, comfort and retention. In general, the denture bases should not be convex in shape.

External contours should be slightly concave (arrows), rather than convex, to aid retention and comfort



Remove excess wax to provide room for tongue if the patient struggles with phonetics or notes that they do not have enough tongue space. Ensure that the denture base is not unduly thick or thin. Excess bulk will impair comfort, and a base that is too thin will be structurally weakened.

8. Patient Input

At any point in the try-in appointment, ask for patient input, using open ended questions ("How do you like the appearance?" rather than "Don't the new dentures look great?"). If the patient sounds unconvincing in their approval of the setup, attempt to get more information by asking further questions. Do not let the patient dissuade you that the wax try-in stage should be rushed in the interest of saving time.

B. Final Wax Try-in

The second try-in appointment is used to confirm that the prescribed changes have had the desired effect. While it is possible that no changes may be required at this appointment, the clinician should not shy away from making further alterations if any aspect of the setup is not acceptable. **If any changes have been made to the vertical dimension, centric position, tooth position, or excursive contacts, then these aspects of the setup should be rechecked.** Otherwise, the final try-in appointment should be used to concentrate on the aspects of esthetics, phonetics and patient comfort. By this appointment diastemas will have been closed, and phonetics should be similar to that in the final denture, making assessment easier.

C. Completion of the Laboratory Prescription

Complete the laboratory prescription, requesting processing, finishing and polishing of the denture. Also request the lab to fabricate remount casts and to remount the maxillary denture. Add any special instructions for touch up of the set-up or other unique requirements. Send your remount jig to the laboratory with the dentures.

Delivering and Adjusting Complete Dentures

Processed dentures should be returned in a sealed pouch. Prior to the patient appointment identify and eliminate any spicules, sharp areas or imperfections on the denture surface by dragging gauze over the denture. Inspect the posterior border - it should be 2-3 mm thick, gradually tapering to the soft palate (right), not thick or ending in a sharp ledge (left)



If necessary, use a large acrylic bur to blend any sharp changes in the denture contours. Smooth and polish prior to the patient appointment to save valuable chair time.

8 Step Complete Denture Delivery

The next steps in delivering a denture involve the patient. Follow the principle of only adjusting a denture where an indicating medium indicates the exact location that adjustment is required.

Step 1. Adjust the fit of the denture base with Pressure Indicating Paste

- Never adjust the occlusion prior to this step as correct seating of the prosthesis can affect occlusal contacts
- Apply paste to the base without including the peripheral edge. It will be easier to insert and remove this way.
- Dry the denture thoroughly and apply disclosing paste with a stiff brush to leave streaks with so that the surface colour is mostly that of the paste, not that of the underlying denture
- Prior to insertion dampen the tissues and the paste covered-denture to reduce potential for paste to stick to the mucosa
- Rotate the denture into place so to avoid smearing paste on the lips or cheeks
- Place heavy pressure on 1st molars – the patient's head should sink into the headrest unless there is pain
- Always use fingers and not occlusion to apply pressure to prevent tipping of the denture at this stage
- remove by breaking the seal in the buccal vestibule

- Adjust areas of burn-through by relieving the denture where there is no paste. These are areas of excessive pressure. Areas with paste that have streaks remaining are areas with no contact with the denture. Adjust and reapply paste repeatedly until there is even distribution of paste with no streaks in the majority of the denture base and no pain on pressure.
- Paste is applied, and the denture is inserted similarly in the mandible. Pressure is applied over the first molars with the dentist providing support on the inferior border of the mandible
- If there is no pain on heavy pressure, then any discomfort that occurs while chewing will be likely be caused by tilting, twisting from occlusion

Step 2 Denture peripheries (one quadrant at a time)

- Easiest to check one side at a time so paste doesn't wipe off on cheek or lips during insertion
- Apply up and over the periphery, lapping onto the buccal surface by 5-10mm.
- Apply paste crossing the midline slightly at the labial frenum
- Border mold and have patient make functional movements until the denture doesn't displace or show heavy burn-through on the periphery
- Coat the entire posterior buccal surface of the denture with paste and have the patient make side to side movements to check that there is no impingement from the coronoid process during function
- Also check to ensure no overextension in the area of the pterygomandibular raphe by having the patient open as wide as possible while the denture is stabilized
- In the maxilla, check posterior border position and retentive seal with indelible stick and outward and upward pressure on lingual of maxillary canine
- Denture base adjustments are completed when pressure indicating media indicates relatively uniform contact, when you can put firm pressure over the first molars without discomfort and when the denture does not displace during border molding procedures

Step 3 Occlusal Adjustment – articulator remount (**AFTER** Denture Base adjusted)

- perform a clinical remount on an articulator using an elastomeric bite registration material. A remount will actually save time
- have the lab fabricate remount casts and remount the maxillary denture prior to returning the finished dentures
- take a centric record guiding the patient into centric relation position
- Mount the mandibular denture using the remount cast and centric record and immobilizing the casts with sticky wax and wooden sticks
- Check the mounting with a second centric relation record.

- If not identical, take a third record and remount with it if the mounting still appears incorrect
- Use articulating paper
- Adjust looking for
 - even contacts (no prematurities)
 - centric contacts on flat surfaces (not inclines)
 - centric maxillary lingual cusp contacts to the middle of mandibular occlusal table
 - eliminate all centric buccal cusp contacts
- On the articulator, correctly adjusted centric contacts should sound sharp and loud, and feel firm not bouncy
- Excursive contacts should be bilateral and evenly distributed, no bumps or jumps and with light anterior contacts that do not disclude posterior teeth

Step 4 Chew Test – For looseness and discomfort

- Have the patient chew on a dampened cotton ball the size of the occlusal table of a premolar
- Move the ball around arch while continuously chewing, identifying all problem areas (pain, looseness, discomfort)
- On the articulator, analyse contacts of the teeth in the vicinity of the problem areas using articulating paper. Identify and eliminate heavy contacts, contacts on inclines, contacts on buccal cusps on those teeth that caused problems during chewing.
- Reinsert the dentures and administer the chew test again. Continue to adjust until the patient rates the problems ~90-100% improved.

Step 5 Check OVD, Esthetics & Phonetics

- May take time to adjust to changes
- Ensure no major problems, have patient speak out loud

Step 6 Check Contours, Finish & Polish

- Smooth and round very sharp or angular areas,
- For small areas, use large rubber polishing points in clinic
- for final polish or extensive areas
 - disinfect, gloves off, take to lab
 - clean pumice with liquid soap (emulsifies) on clean ragwheel,
 - tin oxide on clean ragwheel, discard ragwheels when complete

Step 7 Care Instructions verbal & written with pamphlet, toothbrush, denture cup

Step 8 Recall/Follow-up

- As soon as possible (24 hours suggested)
 - o Within 24 hours mandatory for immediate dentures
 - o Eliminate problems early – happier, comfortable patients
 - o Adjust until no areas of inflammation and no discomfort or problems
 - o Dal – 6 month recall
 - o Practice – yearly recall

Rationale for Clinical Remounts for Occlusal Adjustment

- A clinical remount involves remounting the processed dentures on an articulator for the purposes of adjusting the occlusion extraorally
- Overall, the clinical remount can save time - there will be fewer subsequent adjustment appointments, and the operator doesn't have to continually remove and replace the dentures intraorally during the adjustment procedure
- Clinical remounting allows identification of interferences that may not be seen intraorally, since occlusal interferences can cause pain or instability of the dentures. When this occurs, patients reflexively avoid the interferences, so that the problem may be difficult to identify
- While not all dentures will require an occlusal remount, we will routinely remount dentures over the course of the next several years, so that you become proficient in this procedure. All dentures with cusped tooth forms and any dentures with 0° tooth form and a demonstrated centric record occlusal discrepancy should be remounted, and the denture occlusion be adjusted for centric and excursive contacts on the articulator.

Fabrication of Remount Casts

Usually when a denture is processed, it can only be removed from the master cast by destroying the cast. Therefore, if you want to remount the dentures on an articulator for the purpose of adjusting occlusion, new remount casts will be needed. Normally you should ask the laboratory to make a remount cast and a remount index on **your** remount jig. The remount index is used in lieu of a facebow transfer for reorienting the maxillary cast to the hinge axis. If you have not requested a remount cast from the lab, one can be made as outlined below:

1. Place petroleum jelly on the tissue surface of denture
2. Block-out ALL undercuts in maxillary and mandibular dentures with plasticine, putty, wet paper towel or small pieces of dampened facial tissue.
3. Set the denture into the index fabricated on your remount jig (or into a new facebow record, if an index has not been fabricated) attached to the articulator.
4. Vibrate fast set plaster into the denture and attach to the maxillary mounting ring. Plaster should capture the peripheral roll of the denture flange, but it should not overlap onto the external surface of the denture, or it will be difficult to remove from the cast. When plaster is set, separate the denture from the remount cast. Alternatively, casts can be made separately from the articulator and subsequently attached with mounting plaster.

Instructions to Patients: How to Clean Dentures

Dentures should be cleaned at least once a day to remove food and plaque. Plaque is a slightly clear or whitish film made up of bacteria that use food to attach to a denture. It can cause a buildup of tartar and stain on a denture and it can cause mucosa (gums) to become swollen and reddened. This can result in a less secure fit of a denture.

Because plaque is like a film of glue, it must be mechanically removed by a brush. It cannot be rinsed off by water, a salt rinse, a mouthwash or even a dental irrigating machine. Best evidence suggests using a combination of brushing a denture and then soaking it overnight with an antibacterial solution which can be a commercial denture cleaner or diluted bleach.

Because plaque is transparent or whitish when damp, it is difficult to see so brushing needs to be thorough and systematic to make sure all of the plaque is removed. If areas of plaque are not removed, calcium in saliva can deposit on it, hardening to form calculus or tartar on the denture. Like plaque, tartar can be almost invisible on a denture when it is wet, so patients may not be aware they have the problem. Tartar cannot be removed with a brush and unfortunately it forms a rough surface which makes further buildup easier. Dentists can clean calculus off dentures with instruments, pumice and ultrasonic cleaners.

Prior to brushing a denture, patients should fill their sink with water or place a facecloth over the basin, so the denture will not break should it be accidentally dropped.

Patients should rinse their denture, then use either a regular soft bristled tooth brush and/or a long-bristled denture brush if it makes it easier to get into all the nooks and crannies of the surface. There are several different shapes and models – patients can experiment to find one or more that works well for them. They should avoid hard bristled brushes that will increase wear on the denture. Liquid dish detergent (not dishwasher soap), a mouth rinse or a denture toothpaste should be used for brushing, dampening the brush before using it to minimize scratching of the denture. In general, it is best to avoid regular toothpastes or baking soda as they have abrasives that may wear a denture faster than normal. Whitening toothpastes will not whiten denture teeth.

Scrubbing firmly or using a hard-bristled brush is not necessary and won't clean a denture any better. It is more important is to ensure the denture is brushed over the entire outer and inner surfaces using a vibration to dislodge and remove all of the plaque. Brushing should not be haphazard, so areas are not missed. Patients should be encouraged to develop an order of brushing that makes sure all areas are cleaned. For most people it will take about 1 minute per denture to ensure proper cleaning.

Patients should hold their toothbrush with their whole hand rather than at the end or with a few fingers. For most people this will give the best control. When brushing a lower denture, patients should hold one side at a time rather than gripping the whole prosthesis as they brush so they don't end up accidentally squeezing and breaking it. Patients should use a wiggly motion or vibration to try to dislodge the plaque from denture in cervices or hard to reach areas. Brushing strokes should be used over the broad smooth areas of the denture. Cleaning the inside of the denture is just as important as cleaning the teeth because inner surface affects the health of the supporting mucosa (gums).

Patients should brush very well at least once a day prior to soaking at night. Brushing after meals is helpful, but in many instances this may not be possible. Dentures should be rinsed after meals if brushing is not possible. It is preferable to clean the denture thoroughly at least once a day than to brush poorly many times a day and continually miss areas on the denture.

Wearing dentures all day and all night is like going to bed with shoes on. Patients should remove dentures overnight to allow their soft tissues to have a rest. Prior to bed they should use a dampened soft bristle tooth brush or dampened face cloth to massage their gums prior to bed for best tissue health and denture fit.

Overnight dentures should be soaked in a liquid cleanser to keep them moist, so they don't warp. For most patients it is easiest to use a commercial cleaner in their denture cup following the manufacturer's instructions. Dentures can also be soaked in diluted vinegar (1 part vinegar to 9 parts water) overnight to help dissolve tartar buildup occasionally or to in diluted bleach (1 part bleach to 10 parts water) for no longer than 10 minutes for disinfection and stain removal. Patients should never use full strength bleach on a denture or soak it in dilute bleach longer than 10 minutes as bleach can discolour, roughen the surface and reduce the strength of the denture. Dentures should be thoroughly rinsed after soaking prior to placing them intraorally. Bleach or other cleansers can cause irritation to mouth tissues and should not be consumed.

Dentures with a soft liner or removable partial dentures with metal components should not be cleaned with bleach or normal commercial cleaners. The bleach in these products can damage the liners or corrode the metal. Instead, a commercial cleaner specifically designed for these dentures should be used, following any dentist's special cleaning instructions.

Post Insertion Problems

- Minimal problems if remount
- Most problems will be occlusal if denture base has been adjusted properly

Principles

Never adjust unless you can see exactly where to adjust on denture – Use indicator medium such as pressure indicating paste (PIP), indelible marker, articulating paper, etc.)

Patients can be frequently wrong in **exactly locating** source of problem

Spend time to look and think

Ask patient to describe in detail:

Where? - dentist needs to locate (PIP, tip of instrument, indelible stick)

When? (chewing only?)

How long?

Anything makes it better or worse?

Have patient demonstrate problem

Limited number of problems:

1. **Denture base**
2. **Occlusion**
3. **Retention**
4. **Vertical Dimension**
5. **Allergies and Infections**
6. **Tooth Position**

1. Denture base

- impingements, spicule, sharp edges.
- Dx - PIP (never adjust unless marks)
- **sore all time**; if changes throughout day, think occlusion
- may still be occlusal, if inflammation causes swelling

2. Occlusion

ONE OF THE MOST COMMON POST-INSERTION PROBLEMS

- can cause both pain or looseness
- typical history- **fit changes** or **comfort deteriorates** through day
- difficult to determine intraorally – reflex avoidance of the problem
- **fingers on canines** –should feel smooth
- use a clinical remount to identify problems and adjust

3. Retention Problems

Short flanges

- PIP - still streaky
- look for space intraorally
- may be retentive for a period if a lip seal is established, until movement disturbs the lip seal

Long flanges

- burn-through on periphery using PIP
- displaces vestibular tissue when inserted
- may not dislodge if good seal, may loosen after much function

Post-palatal seal

- if the denture is short of the vibrating line, the denture may bind on hard palate, minimizing the posterior seal (check with PIP)
- if there is inadequate tissue contact, food may get underneath the denture, bubbles may extrude as the denture is placed (check intraorally with PIP)
- if over-extended to the movable portion of the soft palate, the denture may drop during function due to the constant movement of tissue at the border

4. Occlusal Vertical Dimension (OVD)

- continual & generalized pain & fatigue or muscle soreness (excessive OVD)
- no power (insufficient OVD)

5. Allergies and Infections

- rare allergies - general inflammation
- hygiene - generalized inflammation

6. Tooth Position

- instability (teeth not over ridge)
- difficulty chewing (occlusal table not long enough -esp. rational teeth)
- check and lip biting (insufficient overjet)
- esthetic, phonetic problems
- may have to grind off teeth and reset

Most Common Areas Requiring Adjustments**Maxillary**

- Hamular notches – ulceration can occur if over-extended
- Labial frenum – requires adequate relief (often feels bulky to the patient)
- Mid-line fulcrum on the bony raphe
- Zygomatic impingement

Mandibular

- Lingual frenum – impingement can cause displacement of the denture or ulceration
- Retromylohyoid overextensions - sore throat; denture moves when swallowing
- Buccal shelf over extension

Phonetic problems - wait and allow time for adaption

- add soft wax to palate and check
- if anterior poorly positioned, then remove and replace

Diagnosing Denture Pain & Looseness: Principles and Practice

General Principles for Diagnosing Denture Problems

Clinicians can save time and minimize repeat visits for patients with complete or removable partial denture problems by employing five strategies for eliminating etiological factors: 1) establishing a differential diagnosis, 2) identifying variations from normal 3) having denture patients demonstrate their problems, 4) always using an indicating medium when making adjustments to prostheses, and 5) having the patient rate how much better they feel after adjustments.

Establishing a Differential Diagnosis

To effectively eliminate denture problems, one must correctly identify the etiology of the problem. Take a good history and perform a thorough clinical exam. Establish a list of potential causes (a differential diagnosis), rank them as to which ones occur most commonly, and begin by eliminating the causes that could most likely be causing the problem. If the cause of a problem is removed, the pain, ulceration or other related signs and symptoms should normally resolve in 10-14 days. Biopsy is mandatory in any lesion that fails to heal within 14 days of onset², particularly when a denture has been ruled out as the source of the ulcer. Work down the list of differential diagnoses until the problem is eliminated.

Looking for Normal

Many denture problems can be identified by inspecting dentures critically for variations from normal (Fig. 1-5). Unusual extensions, contours, tooth position, thickness and finish can all be sources of denture problems. Intraoral inspection for anatomical or tissue abnormalities or variants may also give clues to the cause of some denture problems (Fig. 6-8). If an abnormality is found, attempt to ascertain if it is related to patient signs and symptoms by correcting the denture. If the source of the problem is eliminated, there should be resolution of signs and symptoms within 10-14 days.

Have a Patient Demonstrate the Problem

Many times asking the patient to demonstrate how the problem occurs will help a clinician identify the source of the problem. If the problem occurs only when the patient chews, cut a small piece of a cotton roll, dampen it and let the patient demonstrate the location where the bolus causes the symptom (Fig 9). If a problem occurs during speaking, singing, drinking, or opening wide have the patient replicate the circumstances. Have the patient describe what they feel is happening and watch carefully to determine the cause of the problem. Attempt to eliminate the cause and recall the patient in 10-14 days to ensure the problem has resolved.

Never adjust without using diagnostic media

Clinicians normally check occlusion of restorations using an indicator such as articulating paper or shim stock. Similarly, denture adjustments are more accurate and effective, when made using an indicating medium. Pressure or fit checking medium, indelible markers and articulating paper can all be used to aid in the location and the determination of the degree of adjustment that is required.

How Much Better?

If a patient is asked if a denture adjustment has made a problem 'better', the most likely response will be 'yes'. But if the adjustment has only made things feel 20% better, the patient may be dismissed only to be seen again at a subsequent appointment. A less biased question to ask is 'how does that feel?' Then, if the patient states that the problem feels 'better', they should be asked to rate how much better it feels in terms of a percentage. An ulceration may not feel '100%' better at the end of an appointment but it should feel closer to 90% than 20%.

Diagnosing Denture Problems

Causes of Denture Pain

- Occlusion
- Denture base (fit & contour)
- Vertical dimension
- Infection
- Systemic disease/condition
- Allergy (rare)

Causes of Denture Looseness

- Occlusion
- Denture base (fit & contour)
- Tooth Position Problems
- Poor Anatomy

It is probable, but not proven, that occlusion and denture base fit cause more repeat visits for denture-related pain and looseness than the other causes listed above. Infection, systemic diseases and allergies should never be overlooked, especially when ulcers or pain are persistent despite interventions.

Many clinicians deal with denture-related pain by grinding the denture base in the area of the reported pain. This type of blanket solution is akin to a physician prescribing a

broad-spectrum antibiotic to all patients reporting with a sore throat and runny nose. It assumes, incorrectly, that the denture base is the source of all denture pain.

Diagnosing the problem requires a thorough history from the patient, including specific information such as:

- When did it start?
- How long does it last?
- What makes it better?
- What makes it worse?

Combined with the information of the clinical exam, this information will help establish a differential diagnosis, ranking most likely causes at the top of the list. The clinical examination should use the strategies of identifying variations from normal, having denture patients demonstrate their problems, and always using an indicating medium.

Typical history when pain is related to occlusion:

- Hurts only when chewing
- Gets worse with chewing
- Gets worse as the day progresses
- The patient may have to remove the prosthesis late in the day (discomfort)

Typical history when pain is related to denture base fit:

- Problem starts when the patient inserts the denture; it often feels tight or sore
- Patient has discomfort even when not chewing
- May or may not get worse as the day progresses

Typical history when pain is related to occlusal vertical dimension (OVD) ^{3, 4}:

- Excessive OVD:**
- Soreness over entire ridge
 - Worse during the day (increased occlusal contact)
 - Dentures 'click' when speaking
 - Feels 'too full', difficulty getting lips together

- Insufficient OVD:**
- Lack of chewing power
 - Minimal ridge discomfort
 - Angular cheilitis
 - Esthetic complaints:
 - Chin prominent
 - Minimal vermilion border display

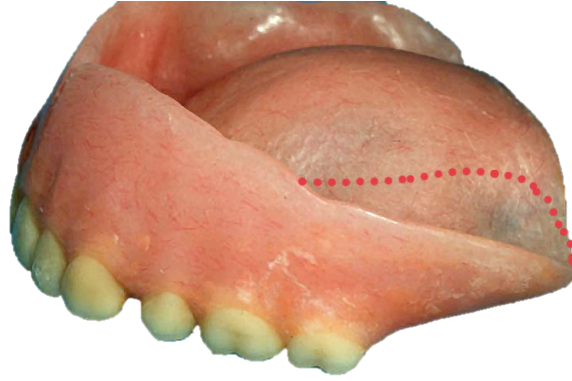


Figure 1. The posterior buccal flange of this denture is shorter than normal. It should be extended to the dotted line. Compound or light-cured acrylic resin could be added to the periphery to attempt to extend the border. When this was done, the patient's denture became markedly more retentive.



Figure 2. The transparent areas of resin over the tuberosities provide a clue that the opposing denture is contacting the denture, thereby wearing the base. Such denture base contact can cause loosening of the denture.



Figure 3. The severe and uneven wear on these dentures are responsible for esthetic problems, discomfort and difficulty chewing.

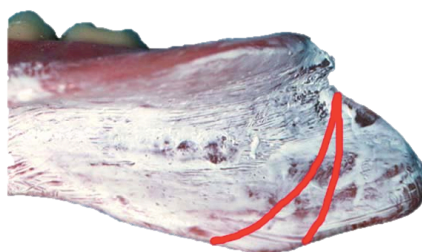


Figure 4. The disto-lingual flange of this mandibular denture looks different than a typical flange. It goes too far posteriorly from the position of the retromolar pad. Normally the flange contour will either proceed straight down or arc gently downward and forward from the pear-shaped pad. This overextension caused pain on swallowing for the patient.



Figure 5. The chief complaint for this patient was multiple denture sore spots. The denture midlines are off and the denture teeth in the second and third quadrants are meeting cusp to cusp, suggesting that occlusion could be the cause of the patient's problems. This explains why previous adjustments to the denture bases had not provided the patient with any relief.



Figure 6. This patient had three unsuccessful maxillary partial dentures made within one year. All three dentures failed due to fracture of denture teeth and severe mobility of the prostheses. Previous care providers failed to identify lack of inter-arch space for the prosthesis because, in taking direction from the patient, they were only looking to restore the maxillary arch. Ensure the clinical exam is thorough and identifies all potential problems and variations from normal.

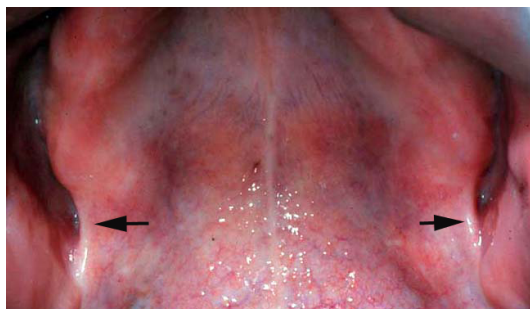


Figure 7. This patient has very tight pterygomandibular raphes (arrows). During opening, as the raphes tighten, they pull on the posterior border of the denture, causing it to loosen (the patient's chief complaint). Relief must be provided for these structures during the making of impressions. Anatomical variations must be identified in order to minimize denture problems.

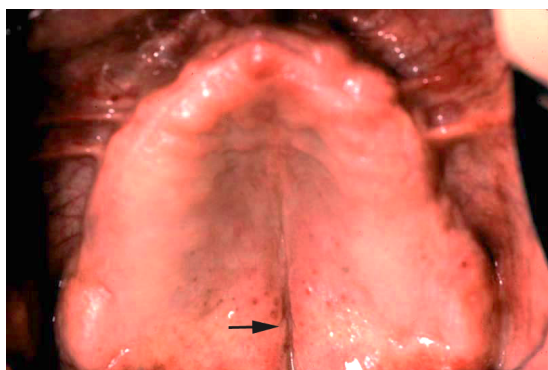


Figure 8. The deep midline soft tissue fissure at the posterior of the palate caused a break in the seal of the denture, causing looseness and dropping of the denture. Special attention needs to be paid to ensure the posterior palatal seal of the denture maintains tissue contact to provide adequate retention.



Figure 9. This patient is using a small piece of a cotton roll to demonstrate where his maxillary denture loosens during chewing. Having patients demonstrate their problems while the dentist watches can often expedite the diagnosis of denture problems.



Figure 10. Ulcers, sore spots or areas of hyperkeratosis on the sides of the ridges, which are not identified using pressure indication medium are typically caused by tipping of the denture. Tipping is frequently associated with occlusal problems.



Figure 11. Posterior interferences between the denture bases can cause tipping of the dentures, resulting in pain similar to that caused by occlusal problems.



Figure 12. Posterior teeth set over the ascending portion of the ramus can cause a denture to slide or shift during function, causing occlusion-related pain. Don't set denture teeth posterior to the arrow.



Figure 13. When single dentures oppose a natural dentition, the occlusal plane should not have a severe Curve of Spee. Such a curve will place tilting forces on the denture in excursive movements, frequently causing both looseness and discomfort.

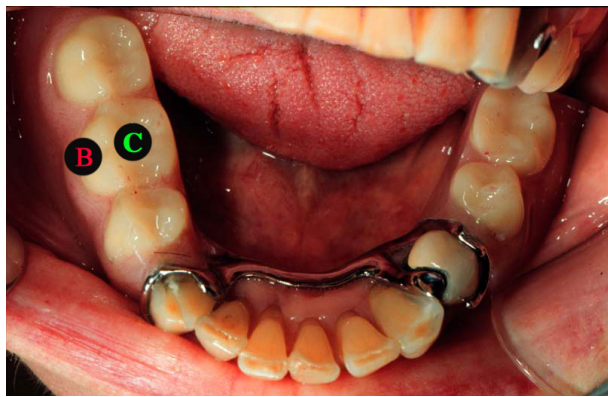


Figure 14. Normally it is better to load posterior denture teeth centrally (C) over the ridge. More tipping problems result when occlusal forces are placed buccal to the ridge (B). This can cause both movement and pain.

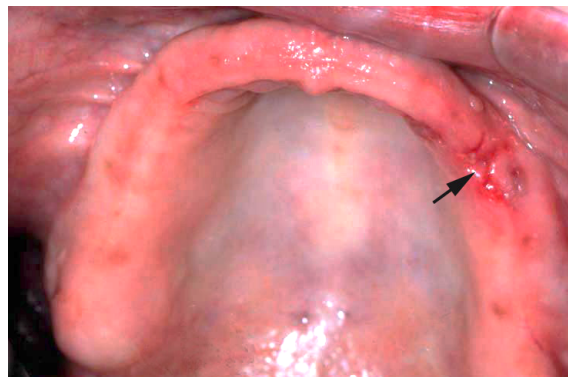


Figure 15. Areas of inflammation or ulceration that are caused by the denture base are often discrete and cannot visually be distinguished from those related to occlusal problems. Diagnosis needs to be established using the history, clinical exam and indicating medium. Often the definitive diagnosis will be determined by exclusion of other possible etiologies.

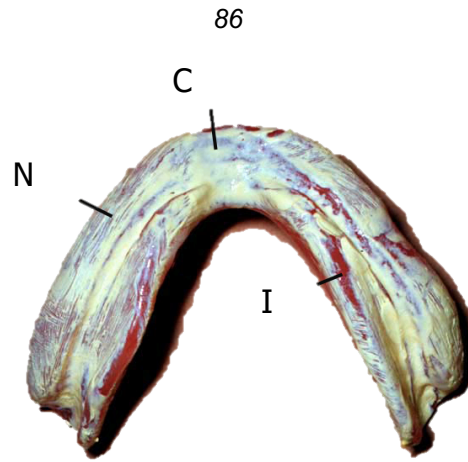


Figure 16. Pressure indicating medium is necessary to identify denture base impingements. Place medium with a stiff bristle brush, coating with enough paste so that the base is mostly the colour of the medium. Leave streaks in the paste. Place the denture intraorally, avoiding contact with cheeks and lips. Press firmly into place over the first molars. Do not tip, tilt or wiggle. Remove and inspect. Areas with paste and no brush strokes represent areas of moderate tissue contact (C). Areas without paste (burn-through) represent areas of tissue impingement (I). Areas with streaks remaining in the paste have not contacted the tissue (N)



Figure 17. A well-adjusted denture base. Areas of tissue inflammation that do not correlate to areas of burn-through are most likely caused by tilting of the denture. Investigate occlusal causes for these problems.

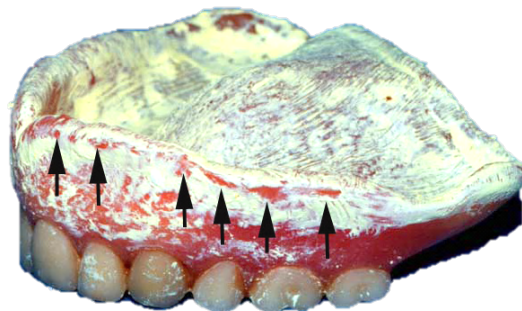


Figure 18. Lines of burn-through on flanges often indicate areas that are overextended or too thick. They may require repeated paste applications and adjustments.



Figure 19. Pressure indicating medium can be used on non-bearing surfaces of the denture to identify other undesirable contours. This photo demonstrates an impingement of the coronoid process on the posterior denture flange in lateral excursions. This interference caused both pain and loosening of the denture.

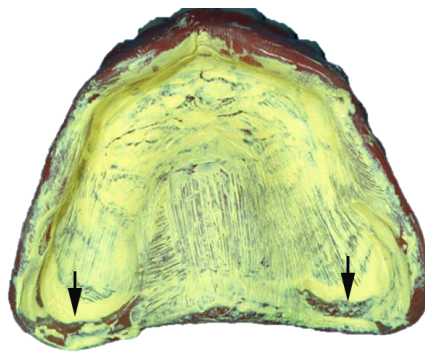


Figure 20. A sharp, thin or overextended periphery in the hamular notch area can cause very painful ulcers for a denture wearer. Use of indicating medium for adjustment of these areas is critical, as removal of acrylic in the wrong area can result in a breach of the posterior palatal seal, resulting in loosening of the denture with little relief of the discomfort.



Figure 21. Examples of insufficient (left) and excessive occlusal dimension (right). See text for diagnostic criteria. While adjustments are sometimes helpful, normally a remake of the denture is required to completely resolve these serious denture problems.

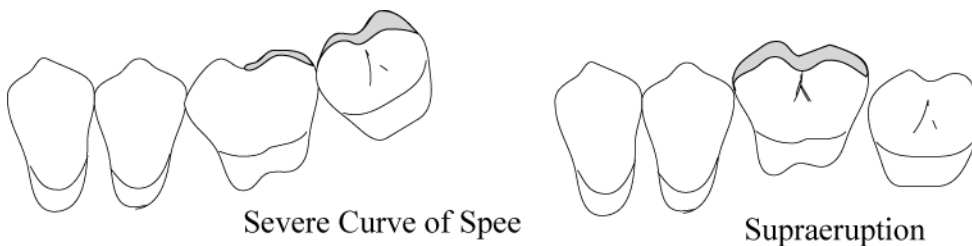
Single Complete Dentures

Single dentures are more often fabricated in the maxillary arch, as these teeth are usually lost before their mandibular antagonists. Mandibular single dentures should rarely be considered, unless a means of stress reduction can be used - a processed resilient denture liner, overdenture or implant retained denture. Otherwise rapid and severe residual ridge resorption can result from the forces on the mandibular ridge. Single dentures tend to be difficult to fabricate for the following reasons:

1. More force from the opposing natural dentition tends to displace the denture, or cause fracture due to flexure
2. Greater forces from the natural dentition (especially anterior teeth) can result in severe residual ridge resorption, making denture retention & stability more difficult.
3. Tooth malpositions (extrusion, tipping, rotations) cause the denture to be less stable (difficult to balance occlusion)

Treatment differs from normal complete denture therapy in the following ways:

1. Occlusal adjustment of natural teeth may be required to level the plane of occlusion by:
 - a. reducing a severe curve of Spee
 - b. leveling steps in the occlusal plane caused by supraeruptions
 - c. alter the contour of rotated teeth to permit bilateral contacts on flat surfaces



Reduce cusps in shaded area, to level plane of occlusion

2. A diagnostic cast should be obtained to assess the occlusal plane. Mock adjustment can be performed on the diagnostic cast and a reduction template fabricated to aid intraoral adjustment

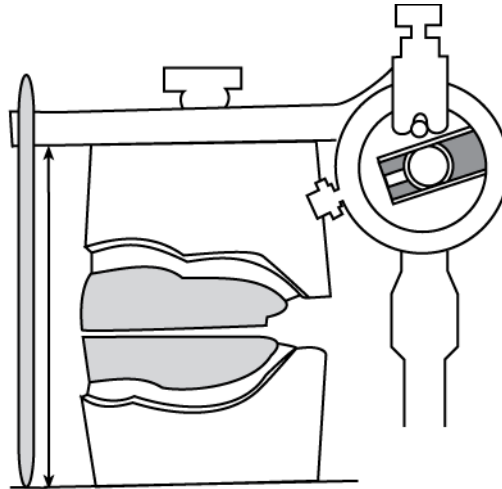
3. Avoid a complete single denture against an opposing 6- 8 teeth in the anterior of an arch - it can lead to resorption or loosening or fracture of the denture.

CONSIDER FABRICATING AN OPPOSING PARTIAL DENTURE IF THERE IS EXTENSIVE LOSS OF POSTERIOR TEETH IN THE OPPOSING DENTITION

4. Jaw relation records can be more complicated. When mandibular natural anterior teeth are present, the **maxillary wax rim is only used for establishing the occlusal vertical dimension** and not for establishing the incisal display. This is because it is essential for centric records that the occlusion rim have no overbite or inclines that could potentially adversely affect jaw position during the making of records. Incisal display is instead is established by determining how much overbite can be permitted functionally and esthetically and drawing a line on the mandibular incisors of the opposing cast indicating how much vertical overlap is desired.
5. If a partial denture is to be fabricated opposing a complete denture, the dentures should be made at the same time. RPD preparations are made, an impression taken, and the framework fabricated. While the framework is being fabricated, the final complete denture impression is made, and the record base constructed. The framework is adjusted, the denture base is added to the framework and jaw relations recorded between a complete denture occlusion rim and an opposing occlusion rim on the framework. Setting the complete denture and RPD denture teeth at the same time allows maximum control of tooth positions to optimize the occlusion. Any crowns or bridges should be waxed up against the CD tooth setup for the same reason.
6. Setting of the anterior teeth is more difficult. Setting them for esthetics may result in a placement which produces excessive overbite in relation to the natural teeth. This will compromise stability of the denture. Anterior teeth are often set in a compromised position, taking esthetics and function into consideration. Maxillary teeth may have to be set higher to avoid excess overbite, which compromises display of the incisal edges.
7. Posterior denture teeth require more grinding to obtain stable centric contacts. Tip: After obtaining the proper vertical dimension, increase the incisal pin height 1mm on articulator (i.e. increase OVD 1mm) set all posterior teeth, let wax harden, return pin to original position and grind occlusion until pin touches table. Use a

type IV stone (e.g. Silky Rock) on the opposing dentate cast to minimize abrasion during setup.

Increase the pin height by 1mm (arrows), so the teeth will actually be set too high in occlusion. Then reduce the pin height 1mm (to its original position), and grind the denture teeth until there are even contacts and the incisal pin rests on the



8. A cast metal complete denture base can be considered if fracture of denture has occurred repeatedly. Fractures usually are caused by the heavy forces from the natural dentition in combination with occlusal contacts on inclines (causes flexing of the denture) or impingement on a bony midline (again causing wedging forces on opposite sides of the denture).
9. Denture teeth will wear more rapidly against natural teeth. Patients must have more frequent recalls to adjust the denture occlusion to prevent changes in stress distribution.

Never use porcelain denture teeth against natural teeth - they can cause severe attrition. It is preferable for the denture teeth to wear, rather than the natural teeth.

Materials, Equipment & Procedures for Complete Dentures

Robert Loney

First Appointment - Examination, Treatment Planning, Preliminary Impressions, Tissue Conditioning

Instruments and Materials Check List

Instruments	Materials
a. RPD kit	a. alginate (pre-dispensed into cup)
b. straight handpiece (for adjusting denture, if required)	b. rope wax for posterior border of max. tray
c. acrylic burs	c. gauze (for drying mucosa, denture)
d. stock edentulous impression trays	d. indelible sticks (Dr. Thompson transfer markers)
e. rubber bowl	e. cotton tipped applicators
f. Butane Torch (if trimming soft liner)	f. pressure indicating paste (if required)
g.	g. tissue conditioner if required (Lynal)
h.	h. blade for red-handle knife
i.	i. mixing cup for tissue conditioner
	j. 12cc Monoject syringe for alginate
	k. Vaseline for alginate syringe

Clinical Procedures

1. History + clinical examination
2. Treatment plan discussed with cluster supervisor.
2. Patient education, discussion of finances, timing, plan signed.
3. Preliminary impressions - irreversible hydrocolloid
4. Marking vibrating line with indelible stick (line will transfer to impression). After disinfecting the impression, refresh the line with a new indelible stick.
5. Adjust denture with acrylic burs if required for comfort, retention, stability, etc.
6. Tissue conditioner - as indicated.
6. Emphasize the need for leaving out dentures 24 hours (minimum 12 hours) prior to the final impression

Laboratory Procedures

1. Disinfect impression, refresh vibrating line/posterior palatal seal area
2. Pour & trim casts (double pour acceptable), draw outline for custom tray extension
3. Complete prescription and send to lab to fabricate custom tray(s)

RPD Kit includes:

Scissors

Cotton pliers

Dental Mirrors x2

#7 Wax Spatula

Wax Cottrell

Ball burnisher

Red Handled knife handle

Scalpel handle

Alginate Spatula (Plastic Handle)

Plaster Spatula (Metal Handle)

Articulating Paper Forceps

Boley gauge

Second Appointment - Border Molding & Impressions**Instruments and Materials Check List**

Instruments	Materials
a. RPD kit	a. green stick compound
b. straight handpiece	b. indelible sticks
c. acrylic burs	c. gauze & cotton rolls
d. water bath (135°F)	d. PVS light body impression material, syringe tips and mixing gun
e. butane torch ± Hanau torch	e. PVS adhesive and brush for application
f. rubber bowl of cold water	f. cotton tip applicators
g.	g. sticky wax (¼ stick)
h.	h. Korreкта wax #4 (small piece)
i.	i. Vaseline
j.	j. blade for red-handle knife
k.	k

Clinical Procedures

1. Adjust tray introrally (check frenal & vestibular relief) until it doesn't displace during cheek & lip movements & the periphery is at least 2 mm short of vestibular fold, no discomfort
2. Border mould with green stick compound
3. Trim excess compound and remove relief wax (drill relief holes in upper tray with round bur)
4. Paint tray with adhesive 5 minutes prior to impression
4. Dry mouth with 2 x 2 gauze and lightly Vaseline the skin around the mouth.
5. Make the final impression. Use two mirror technique with operator seated, patient reclined
6. Use sticky wax, then Koreкта wax #4 to repair voids
7. Place, adjust & polish tissue conditioner on the existing denture as indicated.

Laboratory Procedures

1. Box and pour master casts. Ensure no critical anatomy on impression covered by alginate
2. Trim and notch base of master cast (maintain 3 mm width and 3mm height of land area from vestibular fold)
3. Complete prescription and send to lab to fabricate record bases and occlusal wax rims

Third Appointment – Jaw Relation Records

Instruments and Materials Check List

Instruments	Materials
a. RPD kit	a. bite registration medium (PVS)
b. straight handpiece	b. PVS mixing tips, and dispensing gun
c. acrylic burs	c. indelible stick
d. bite fork (edentulous)	d. wooden tongue depressor (split for mounting)
e. Fox plane (optional)	e. ½ sheet of baseplate wax
f. butane torch ± Hanau torch	f. sticky wax (¼ stick)
g. facebow	g. Dentsply plastic Autorule
h. articulator	h. shade guide
i.	i. blade for red handle knife
j.	j.

Clinical Procedures

1. Check maxillary wax rim intraorally and adjust to proper lip support, 1mm below lip
2. Adjust mandibular wax rim intraorally for proper lip support, level with corners of mouth, occlusal plane intersects record base ½ way up retromolar pad
3. Adjustment of rims to obtain 2-4 mm interocclusal space using Boley Gauge, flat even bilateral contact only between wax rims in centric position
4. Obtain face bow record and **[Lab]** mount notched maxillary cast in laboratory with fast set plaster
5. Record initial centric relation using small amount of pvs bite registration material over entire occlusal table
6. **[Lab]** Mount mandibular cast using sticky wax ± sticks to immobilize
7. Confirm centric relation record with new centric bite registration with centric locks released
8. Make a protrusive record and set condylar guidance on articulator
9. Mark reference lines on wax rims. Ensure proper overbite in anterior region, overjet for entire arch
10. Select teeth using old dentures and measurements as a guide
11. Replace tissue conditioner if indicated
12. Request patient to bring a relative or friend for the next appointment

Laboratory Procedures

1. Ensure all mountings and settings are correct, wax rims proper orientation to each other
2. Complete prescription and send to lab for initial tooth setup and return for wax try-in

Fourth Appointment – Wax Try-in**Instrument and Materials Check List**

Instruments	Materials
a. RPD kit	a. bite registration medium (PVS)
b. straight handpiece	b. PVS mixing tips (small)
c. acrylic burs	c. indelible stick
d. butane torch ± Hanau torch	d. wooden tongue depressor (split for mounting)
e. articulator with waxed dentures	e. ¼ sheet of baseplate wax
f. full face mirror	f. sticky wax (¼ stick)
g.	g. articulating paper
h.	h. gauze

Clinical Procedures

1. Verify centric relation prior to anything else. New PVS record used with unlocked condylar guides
2. Remount if necessary after making a second new PVS record that demonstrates incorrect mounting
3. Check vertical dimension - external measurements, phonetics, feel for interocclusal distance.
4. Check lip support, esthetics, phonetics
5. Check to ensure posterior centric contacts even, centered over mandibular ridge, even bilaterally, not on inclines or buccal to residual ridge
6. If changes required, discuss with instructor to determine if to be done clinically or to send back to lab
7. Request patient acceptance. If changes required, repeat 'Fourth Appointment' procedures at subsequent appointment prior to acceptance.

Laboratory Procedures

1. Ensure all mountings and settings are correct
2. Complete prescription and send to lab for processing, finish and polish, fabrication of remount index, remount casts and mounting of the maxillary denture

Fifth Appointment – Adjustment, Delivery & Care Instructions**Instruments and Materials Check List**

Instruments	Materials
a. RPD kit	a. bite registration medium (PVS)
b. straight handpiece	b. PVS mixing tips (small)
c. acrylic burs	c. articulating paper
d. butane torch ± Hanau torch	d. wooden tongue depressor (split)
e. articulator	e. sticky wax (¼ stick)
f. finished dentures	f. PIP (Pressure Indicating Paste)
g. full face mirror	g. 'Your New Dentures' pamphlet
h. acrylic resin polishing points	h. denture toothbrush
i.	i. plastic denture cup
j.	j. gauze
k.	k. cotton rolls
l.	l. cotton tipped applicators (for cleaning paste)

Clinical Procedures

1. See '8 Step Complete Denture Delivery' next page. Also posted on website in 'Docs' menu

8 Step Complete Denture Delivery

Step 1 Adjust Denture base with PIP (spray water on tissue and PIP prior to seating)

- until heavy pressure on 1st molars causes no pain
- If no pain on heavy pressure, then discomfort while chewing will be probably caused by tilting, twisting from occlusion

Step 2 Denture peripheries with PIP (one quadrant at a time)

- until border molding doesn't displace denture or show heavy burnthrough

Step 3 Occlusal Adjustment – remount on articulator (**AFTER** Denture Base adjusted)

- centric contacts on flat surfaces, middle of occlusal table
- minimize buccal cusp contacts
- should sound like loud knocking when centric contacts are even
- excursive contacts distributed, no bumps, jumps, light anterior contacts

Step 4 Chew Test & Patient Rating – until no pain, looseness

- patient chews on cotton ball the size of the occlusal table of a premolar throughout the arch, noting each place there is a problem. Clinician records location
- on remounted dentures, isolate problem teeth and using articulating paper and a bur, eliminate contacts that are heavy, buccal to ridge, or on inclines
- keep adjusting until patient states it is ~ 90% better, 'You got it', 'that's much better!'

Step 5 Check OVD, Esthetics & Phonetics

Step 6 Polish

- small areas, use Brasseler polishing points in clinic
- for final polish or extensive areas
 - disinfect, gloves off, take to lab
 - clean pumice with liquid soap (emulsifies) on clean ragwheel,
 - tin oxide on clean ragwheel,
 - discard both ragwheels when complete

Step 7 Care Instructions verbal and written with pamphlet, toothbrush, denture cup

Step 8 Recall/Follow-up

- As soon as possible (next day suggested)
 - Within 24 hours mandatory for immediate dentures
 - Eliminate problems early – happier, comfortable patients
 - Dal – 6 month recall
 - Practice – yearly recall

Sixth Appointment – Adjustment appointments

Instruments and Materials Check List

Instruments	Materials
a. RPD kit	a. PIP (Pressure Indicating Paste)
b. straight handpiece	b. articulating paper
c. acrylic burs	c. gauze
d. butane torch ± Hanau torch	d. cotton rolls
e. articulator	e. bite registration medium (PVS) if remount required
f.	f. PVS mixing tips (small)
g.	g. sticky wax (¼ stick)
h.	h. wooden tongue depressor (split)
i.	

Clinical Procedures

1. Take careful and detailed history of all problems. List problems, possible causes, means to test & eliminate possible causes (example below) *
2. For sore spots, press with fingers on first molars to see if elicits discomfort. If so, use PIP to adjust until no pain on pressure.
3. When no pain on pressing, but pain with chew test, remount and adjust to eliminate heavy contacts, contacts on inclines, contacts buccal to ridge. Adjust extraorally on articulator
4. For looseness, check extensions, tissue adaptation, occlusion
5. Assess for esthetic/phonetic/other functional issues
6. Final chew test and rate improvement.

Repeat ‘**Sixth Appointment**’ protocol for additional appointments for adjustments as needed

*Sample Problem List:

<u>Problems</u>	<u>Possible Causes</u>	<u>Test Hypothesis</u>
1. Sore, feels long maxillary lip, midline	- long flange - frenum needs relief - thick flange - tipping from occlusion	} use PIP } chew test } artic. paper.
2. Pain, lower right side when chewing.	- occlusion - Sharp edge on denture → irritates when chewing.	} chew test, artic. paper } remount } PIP

Complete Denture Checklist

1. Diagnosis and Treatment Plan

- Significant clinical findings and history recorded in data base
- Pertinent radiographs taken
- Required diagnostic procedures identified (consults, diagnostic casts, etc.)
- Student understands significance of data collected
- Treatment plan appropriate for prosthodontic and health problems identified
- Treatment plan recorded in correct sequence
- Infection Control/Other/Other _____

2. Preliminary Alginate Impressions

- Peripheries well defined (minimum of voids; showing muscle and frenal attachments)
- Accurate recording of the retromolar pads, retromylohyoid area, post palatal seal area and proper height of floor of mouth
- Material properly mixed as indicated by impressions
- Minimum of voids
- Trays properly selected and centered over the ridges
- Minimal areas where trays have contacted tissues
- Accurately records the available supporting tissues
- Infection Control/Judgment/Other _____

3. Acrylic Impression Trays

- Tray not significantly underextended
- Stable, does not rock on cast or in mouth
- Tray not significantly overextended
- Uniform thickness (2-3mm; wax /cast not showing through tray)
- Tray flange adapted as closely to residual ridge as possible
- Wax relief over mobile tissue, undercuts, incisive papilla, other critical anatomy
- Labial and buccal notches properly placed
- Borders rounded, not sharp
- Small handles, properly positioned
- Infection Control/Other/Other _____

4. Border Molding-Maxillary

- Tray stays in place at rest and during slight manipulation of tissues
- Tray exhibits firm suction when an attempt is made to remove it
- Labial and buccal flanges extend into height of vestibule
- No tray is showing through border molding
- Flange thickness generally no greater than 4-5 mm (unless severely resorbed)
- Patient feels no areas of discomfort
- Posterior palatal seal is properly covered
- Frenal areas properly contoured
- Flanges smooth, continuous; rolled and not sharp
- Flanges relatively symmetrical on contralateral sides
- Infection Control/Other/Other _____

5. Border Molding – Mandibular

- Tray stays in place at rest and during slight manipulation of tissues
- Tray is relatively stable when a vertical force is applied (within constraints of anatomy)
- No tray is showing through border molding
- Flange thickness generally no greater than 4-5 mm
- Patient feels no areas of discomfort
- Labial and buccal flanges extend into depth of vestibule
- Frenular areas properly contoured
- Flanges smooth, continuous; rolled and not sharp
- Flanges relatively symmetrical on contralateral sides
- Covers retro-molar pads
- Does not extend past buccal shelf
- Lingual flanges at or slightly below mylohyoid ridges
- Posterior extensions of lingual flanges extends into retromylohyoid spaces
- Palpation over masseter reveals no over-extension
- Infection Control/Other/Other _____

6. Final Impression - Maxillary

- Post-palatal seal area recorded (vibrating line & displaceable tissue outline)
- Peripheries covered by a thin layer of impression material (.5-1 mm)
- Tray properly vented and compound relieved
- No significant voids
- Impression is stable and retentive when moderate pressure is applied to the canine region No significant areas of "burn through"
- Accurately records available supporting structures
- Infection Control/Other/Other _____

7. Final Impression - Mandibular

- Peripheries covered by a thin layer of impression material (.5-1 mm)
- Tray compound properly relieved
- No significant voids
- Impression is stable with tongue at rest when moderate unseating pressure is applied
- No significant areas of "burn through" (distortion of the contours of the surrounding tissue)
- Mandibular retention evident - when tongue at rest and moderate vertical force applied
- Accurately records available supporting structures
- Infection Control/Other/Other _____

8. Master Casts

- No significant bubbles or flaws in stone
- Includes all anatomical surfaces of final impressions
- Posterior border of maxillary cast clearly demarcated
- Includes 3-4 mm. land area
- Base approximately parallel to ridge and approximately 1/2 inches thick (minimum)
- Evidence of a dense stone surface
- Clean and well trimmed (no dried slurry on casts)
- Infection Control/Other/Other _____

9. Record Bases and Occlusal Rims

- Well adapted to cast with no rocking
- Uniform thickness - about 2 mm.
- Wax rim at level 1/2-2/3 up the retromolar pad; level with corner of mouth anteriorly; parallel to ala-tragus lines and line between pupils of eyes
- Undercuts blocked out so baseplate does not scrape master cast upon removal
- Peripheries smooth and rounded
- Wax rim centered over ridge (mandibular), slightly facial to ridge (maxillary)
- Labial inclination on anterior portion of wax rim
- Width approximately 7 mm anteriorly and 10 mm posteriorly
- Flat occlusal surface, even contact between rims
- Wax smooth, neat and sealed to base
- Record base well adapted to cast tissue surface
- Infection Control/Other/Other _____
-

10. Facebow Record (Check prior to removal from patient & prior to mounting)

- Casts properly notched
- Bitefork correctly oriented on occlusal rim and tightened
- Facebow condylar arms properly oriented
- Maxillary cast mounted in same relationship to articulator as maxilla to arbitrary hinge axis
- Proper anterior reference point used
- Incisal pin correctly oriented
- Cast well united to mounting ring with a smooth neat finish
- Infection Control/Other/Other _____
-

11. Vertical Dimension

- Palpable closure from physiologic rest to OVD (usually 2-4 mm)
- Interocclusal distance measures 2-4 mm using extraoral marks
- Lips or cheeks do not appear or feel strained
- Phonetics tests ("50`s-60`s" or "Mississippi") - 1mm between rims
- Patient seated upright or standing during vertical dimension evaluation
- Infection Control/Other/Other _____

12. Centric Relation

- Repeatable recording (within constraints of patient)
- Occlusal rim properly reduced for recording medium (2nd PM to 2nd molar)
- Mandibular cast notched and grooves lubricated
- Proper quantity and utilization of medium
- Indices interdigitate accurately
- Horizontal component is correct
- Vertical component is correct
- Cast well united to mounting ring with smooth neat finish
- Casts and/or record bases not touching
- Infection Control/Other/Other _____

13. Protrusive Record

- Mandibular cast and articulator guides indicate the proper amount of protrusion
- (usually 4-6mm)
- Proper quantity and utilization of medium
- Indices interdigitate accurately
- Condylar inclination properly adjusted and locked
- Lateral condylar guidance (Bennett Angle) set at 15° (or calculated angle)
- Protrusion relatively centered
- Registration at a jaw opening greater than the vertical dimension of occlusion
- Casts and/or record bases not touching
- Infection Control/Other/Other _____

14. Wax Try-In

- Centric record verified with recording medium on widely separated teeth
- Vertical dimension verified (guidelines):
 - a. 2-3 mm between lip closure and teeth touching
 - b. Phonetics tests ("50`s-60`s" or "Mississippi") - space between rims
 - c. Lips appear and feel unstrained
- Tooth form, arrangement and shade verified
- Phonetics verified ("S","F" and "M" sounds)
- Balanced occlusion, anterior teeth only grazing in protrusion
- Infection Control/Other/Other _____

15. Insertion/Delivery - Denture base

- Retentive, does not displace with moderate vertical pressure
- Proper flange extension (not dislodged by moderate tissue manipulation; palpation reveals no overextensions)
- Indicating medium reveals no areas of significant soft tissue impingement
- Not underextended
- No spicules and well polished
- Proper flange thickness (generally not > 4-5 mm, rolled not sharp)
- Proper relief of frenula
- Bases terminate at proper anatomical landmarks (post-palatal seal area, hamular notches retromolar pads, mylohyoid ridge, retromylohyoid spaces)
- Patient comfortable
- Not rocking on overdenture abutments
- Infection Control/Other/Other _____

16. Insertion/Delivery-Occlusion and Vertical Dimension

- Posterior teeth contact bilaterally and simultaneously when closed, without denture shift as jaw is guided to centric position
- Degree of balance evident in centric and eccentric positions
- Acceptable interocclusal space
- Anterior teeth are not in contact in centric occlusion, only grazing contact in protrusion
- Acceptable æsthetics
- Acceptable phonetics
- Instructions re: use and home care
- Infection Control/Other/Other _____

17. Clinical Remount

- Accurate centric record using medium on widely separated teeth
- Mounted accurately and neatly on an articulator
- Occlusion balanced in centric relation
- Occlusion balanced in eccentric relation
- Occlusal interferences eliminated
- Infection Control/Judgment/Other _____

18. Adjustment

- Demonstrates knowledge of problem prior to adjustment
- Adjustment not overextended
- Patient comfortable, no evidence of tissue irritation
- Infection Control/Other/Other _____