

THE IVOCLAR BIOGENIC PROSTHETIC TECHNIQUE

Today's prosthetic challenges can be treated successfully with a blend of sound basics, new ideas, better products and materials within the Biogenic System. The basis of the Ivoclar Biogenic System is a recognition of the importance of tooth guided denture function and the arrangement of denture teeth in gliding contact with each other.

Healthy, natural gliding tooth function will lie within the anatomical constraints of each individual person's working masticatory system. Some important variable factors within these working systems can be grouped to identify the needs for denture tooth design and arrangement. For instance, the shape group of the maxillary arch, buccolingual width of the teeth and overbite are just a few. In addition, Cusp/fossa interdigitation and the gliding planes of the cusps that guide teeth through the excursions from eccentric to centric occlusion are all important parts of the function. Condylar movements are neuromuscularly guided until the instant of tooth contact, then the gliding surfaces of the teeth mechanically take over and continue guidance of the mandible. Healthy condylar path inclinations can vary from steep to flat. There are three common combinations of condylar path inclination and degree of dental overbite. Each has a typical associated excursion and disclusion pattern.

1. Steep condylar inclination combined with slight to medium overbite is an idealized "normal" situation that results in gliding disclusion in the area of the molars only. "N-Type" Ivoclar posterior teeth are indicated.
2. Steep condylar inclination combined with deep overbite quickly discludes all posteriors during excursive movement. "T-Type", deep bite Ivoclar posteriors are indicated.
3. Flat condylar inclination combined with little or no overbite develops group contact associated with Angle's Class III and crossbite malocclusion. "K-Type", crossbite Ivoclar posteriors are indicated.

Successful full dentures will restore an individual's teeth. But selection of the right artificial teeth is critical. Ivoclar teeth have been designed to offer that necessary system of gliding plane areas to restore natural and functional movements to the mandible. ■

ANATOMIC REFERENCE

A prescription for full dentures with pertinent information, precise directions, and bite rims that have been carved for lip fullness, correct occlusal planes, smile line, midline and cuspid lines is not always made available to the dental technician. Dentofacial landmarks can be used as references to justify functional and aesthetic aspects of setting teeth. The technician can develop confidence and consistency in prosthesis fabrication. All it takes is a dedication to the development of skills to identify anatomic landmarks and relate them to plane lines for reference in the setting of teeth.

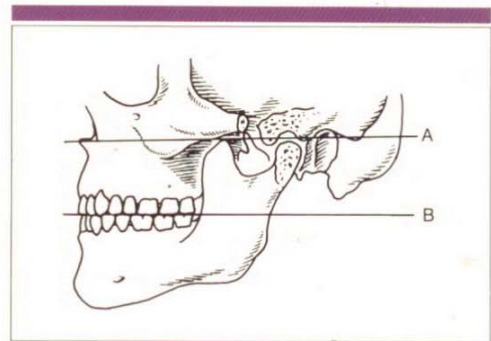


Fig. 1 A — Camper's Line B — Plane of Occlusion

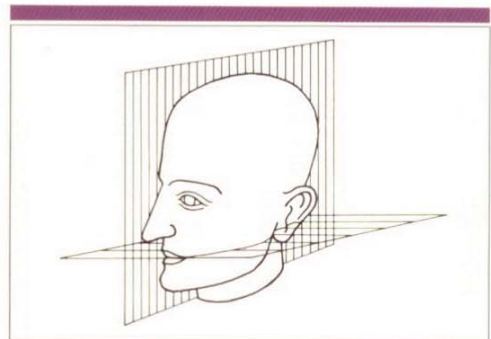


Fig. 2 Plane References

Dentists, for many years, have created a visual plane on the face of patients and paralleled the occlusal surface of maxillary bite rims to a frontal view of ink marks made at the base of the nose and at the tragus of each ear. The midline of the face, when directly viewed, can also be scribed on the wax rim. Symmetrical balance for aesthetics and function can be achieved by following these reference planes as shown in Figs. 1 and 2. ■

CAST ARTICULATION

Various types of articulators have different methods for the mounting of casts; hinge axis, hinge bow transfers, horizontal plane mounting jigs and so on. The plane line or simple hinge articulator is used to mount better than 85% of casts. The only benefit of the plane line is that it will hold casts at a given vertical dimension with plaster or stone. Lateral movement is limited and not related to the patient in any way. Intercondylar distance on the plane line is generally a lot smaller than the accepted human average of 110 mm. Early studies by Dr. Bonwill on 2,000 skulls generated the 110 mm intercondylar average and lasting theories on cast articulation related to anatomic averages. The Bonwill triangle also places the mandibular central incisors 110 mm from the center of each condyle (or for mounting purposes, axis of articulator). This, for clarity, is an equilateral triangle. Bonwill also found that an average occlusal plane was located 40 mm down from the condylar axis and formed a 22 degree angle at the mandibular central incisors with the plane of the Bonwill triangle. The 22 degrees emerged as an ideal cusp angle to consider when selecting or grinding teeth.

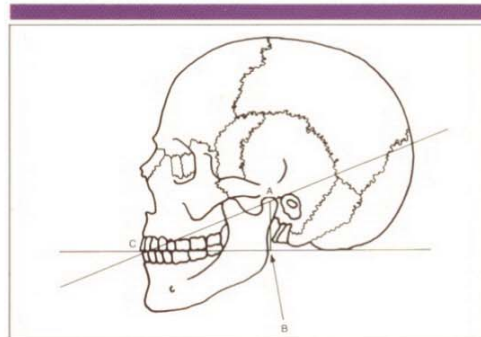


Fig. 3 A to C Establishes a 22° angle
A to B Hinge Axis to Occlusal Plane 40mm

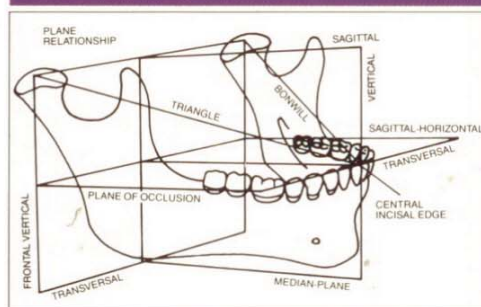


Fig. 4 Bonwill Triangle within plane references

A plane edge view of the Bonwill triangle lies along line C of Fig. 3 between the incisal edges of the mandibular centrals and along to the rotational center of the condyle. Fig. 4 depicts the Bonwill triangle from a right lateral and partly frontal view. Follow the triangle in Fig. 4 from condyle to condyle

to incisal edge and note the occlusal plane 22 degrees below the plane of the triangle. Patient adaptability and compliance with dentures is increased when the mandibular cast is located within the Bonwill triangle rather than a random mounting. ■

ORTHO PLANE ANALYZER (OPA)

This instrument is available from Ivoclar and has been designed to be used as a template that is related directly to anatomic landmarks of a maxillary or mandibular cast. It's use is for the purpose of fabricating functional occlusal bite rims and aids during the selection and setting of denture teeth. Proper use of the OPA related to landmarks will reduce resets and lost time by relating anatomic averages to individual cases with predictable accuracy. The hamular notches are the posterior reference for the OPA. This will parallel the horizontal line of the setup to the pupils of the eyes better than 85% of the time. The incisal papilla is the anterior reference for the stylus of the OPA. Stylus setting at half the intervestibular measurement plus overbite establishes a plane of occlusion. The template base has surface curvature of a 5.1 inch radius sphere and yields practical curves of Spee and Wilson that relate to function and smile line (curve of patient's lower lip).

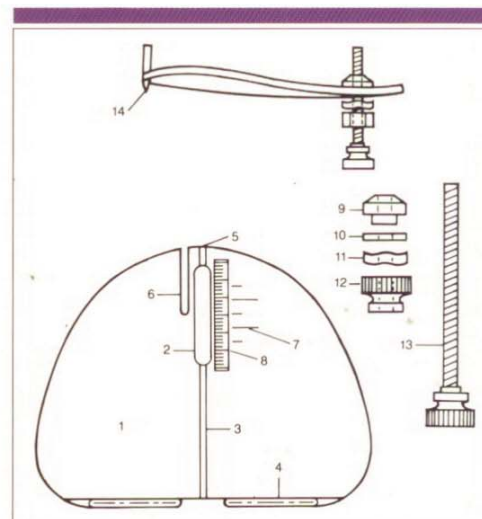


Fig. 5 Ivoclar Ortho Plane Analyzer

1. Template base with 5.1 inch radius
2. Anterior slide cutout for stylus (13)
3. Median line for relating to casts
4. Hamular notch reference rim
5. Anterior median line
6. Ruler slot for vertical measurement to the depth of the labial vestibular fold
7. Precalculated scale for selecting coronal length of maxillary centrals
8. Millimeter reference lines for setting maxillary centrals for proper lip support
9. Stay nut
10. Slide washer
11. Spring washer
12. Compression nut
13. Stylus
14. Mandibular posterior grip shoe ■

MAKING FUNCTIONAL OCCLUSAL RIMS



knowledge of anatomical landmarks is necessary to use the OPA effectively. It will help to review

Fig. 6 and practice identification of these relevant landmarks on practical edentulous casts. Labial and buccal corridor identification is also helpful for determining occlusal outline of bite rims. These corridors follow the depth of the sulcus of the mucobuccal and mucolabial folds, around the periphery of the edentulous cast. The corridors are used for drawing reference lines with washable ink onto the template and will simplify shaping wax in order to follow a designated outline.

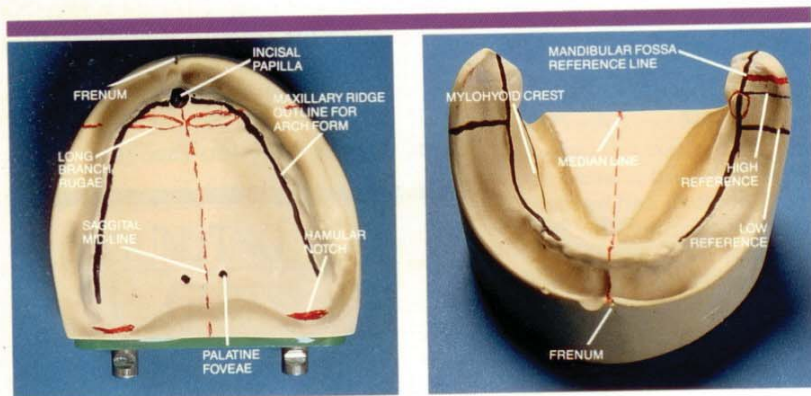


Fig. 6 Anatomical Landmarks

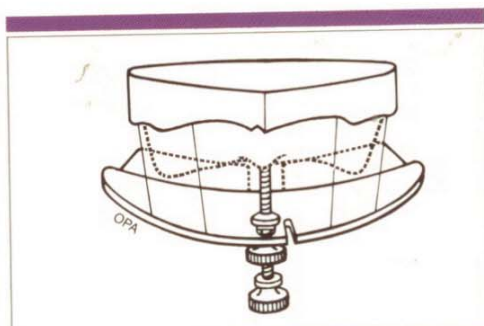


Fig. 7 Aesthetic Functional Bite Rim with OPA Template

Frontal view of aesthetic functional bite rim (Fig. 7). OPA template provides curve of Wilson that can be confirmed chairside with relation to lower lip smile line. Hamular notches transfer horizontal plane to rim and can be checked for parallelism with the patient's pupils. Cuspid position is identified relative to the area dividing labial from buccal corridors and may be confirmed chairside.

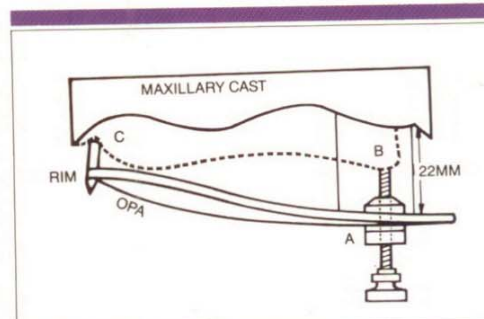


Fig. 8 Functional bite rim formed with OPA Template

Lateral view of OPA template. The hamular notch rim is seated in the notch. Anterior stylus touching incisal papilla and adjusted to 22 mm (or desired rim height) from sulcus of labial corridor to upside of the template. A plane of occlusion is established that incorporates a practical curve of Spee.

- A. Cuspid eminence line
- B. Incisal papilla
- C. Hamular notch

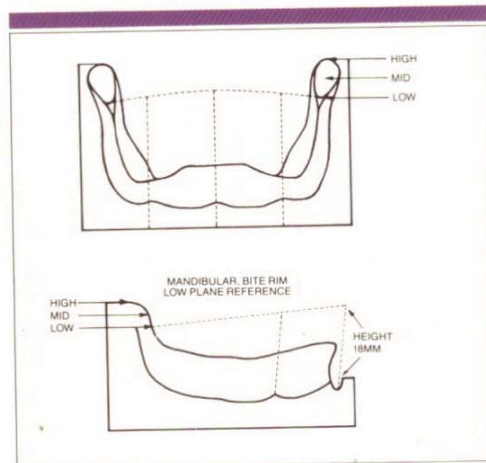


Fig. 9 Mandibular Bite Rim Uses Low Plane Reference

Lateral view of mandibular cast showing relation of OPA used for making lower occlusal rims. The posterior rim grip shoe rests at the lower reference line of the retromolar pad. This leaves sufficient interarch space for the addition of softened wax and bite registration. Low posterior wax rim height also minimizes the possibility of an incorrect bite due to subluxation or dropping of the condyles. Anterior rim height is set with the stylus to an average 18 mm or desired height from the sulcus of the labial corridor to the underside of the template.

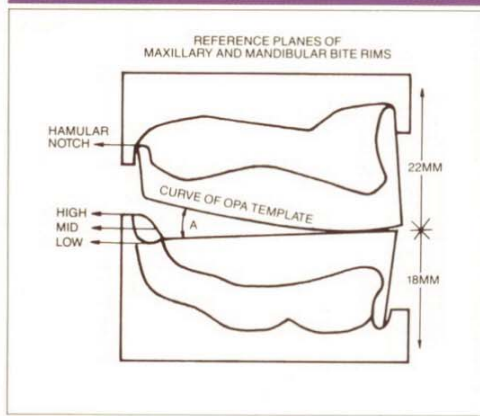


Fig. 9A Clearance between Maxillary and Mandibular Bite Rims

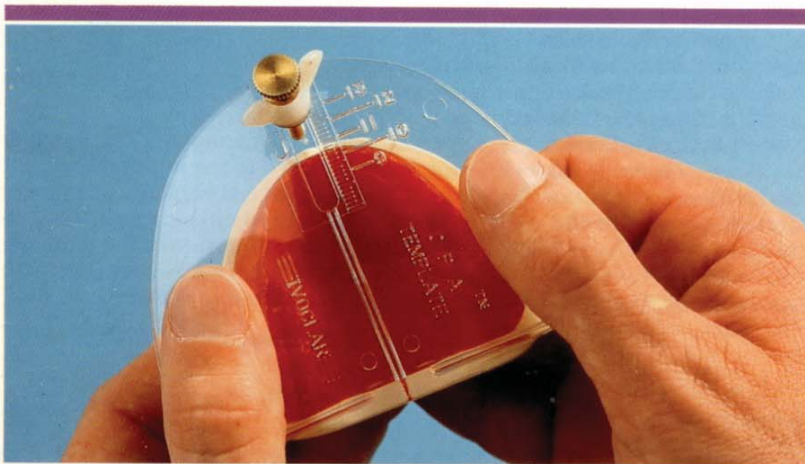


Fig. 10 Outline Labial and buccal corridors on OPA Template

Fig. 10 depicts an occlusal view of the OPA template on a maxillary cast. Note the superimposition of median lines and relation to landmarks. Outlining of labial and buccal corridors on the template with washable marker is done from this view on either maxillary or mandibular casts. The line forms a border to follow when pressing and shaping softened wax to the OPA template.

Some helpful hints to remember when using the OPA template to make occlusal bite rims:

1. Mark relevant anatomy with pencil.
2. Notch cast edge where needed for ruler access before using the ruler slot to measure and set stylus height.
3. Extend lower plane reference lines of the retromolar pads to the mandibular cast edge. They will then be visible when a base plate is on the cast.
4. Before adapting the wax to a baseplate and pressing with the OPA, roll and shape about one half sheet of prewarmed and softened baseplate wax.

Model defects, obvious discrepancies, short impressions, gross asymmetry, etc. are problems that effect any technique of baseplate and occlusal rim fabrication. Consult with the prescribing dentist for confirmation. You'll need to agree on compensating measures like model carving or amounts of temporary height adjustments with wax to compensate for asymmetry or atypical tuberosites, hamular notches and retromolar pads. ■

AFTER BITE REGISTRATION

This manual is directed to the denture technician to provide sound basics and successful arbitrary methods related to anatomy when pertinent information is not available in the prescription or by consultation. We have a responsibility to do our best during a variety of circumstances and maintain professionalism in our health services related careers.

The following practical sections include:
Mounting casts Page 4, 5

Cast Analysis for Resorption Evaluation Page 6, 7

Cast Analysis for Cuspid Location Page 7, 8
Cast Analysis for Anterior Mould Selection Page 9, 10, 11

OPA Template Denture Setup Page 12, 13, 14, 15, 16

Quattro Block Posteriors Page 16 ■

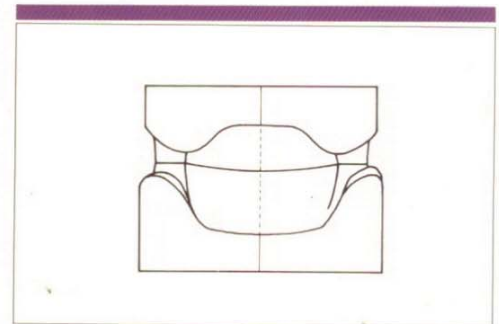


Fig. 11 Transfer Maxillary Median Line to Mandibular Cast

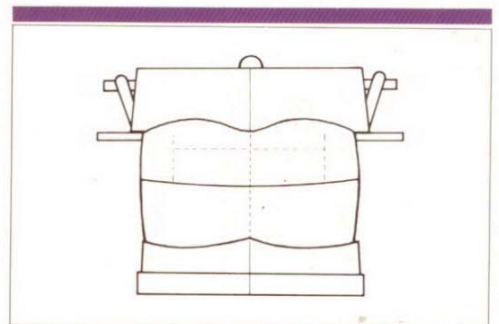


Fig. 12 Parallel mounting of Maxillary Cast using Rod in Hamular Notch

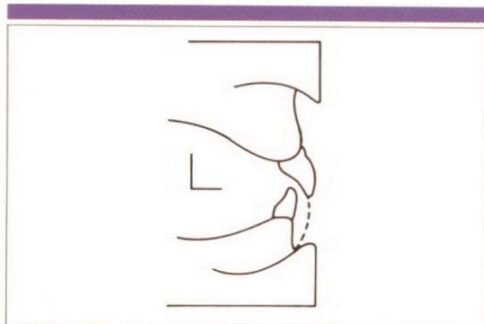


Fig. 13 Class I relationship

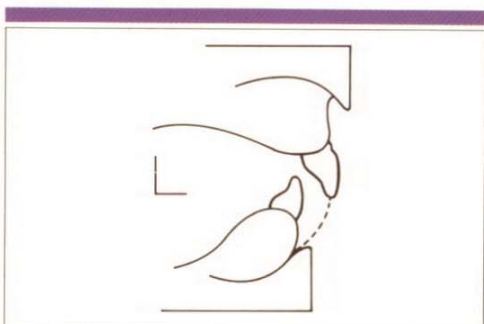
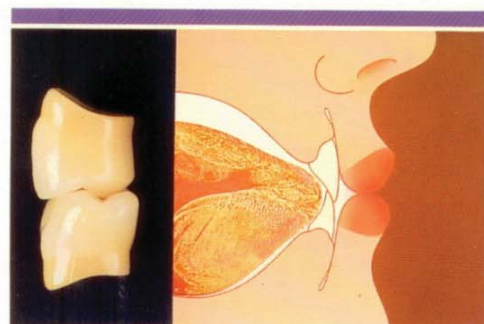


Fig. 14 Class II relationship

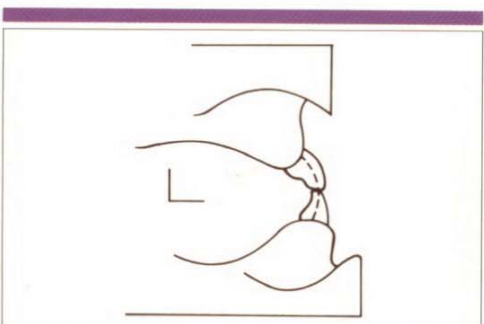
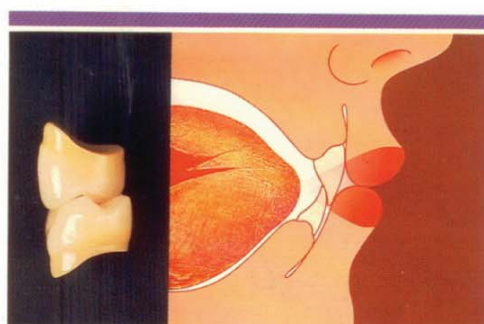
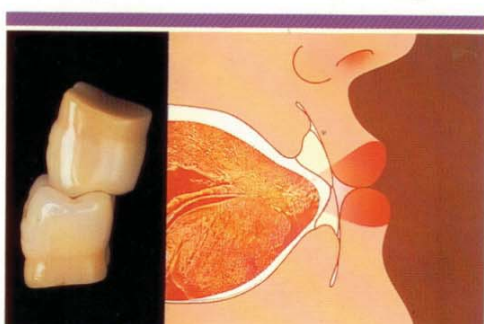


Fig. 15 Class III relationship



MOUNTING CASTS

After bite registration has been accomplished, the median line of the maxillary cast should be transferred to the posterior of the mandibular cast as shown in Fig. 11. Extend the line to the mandibular labial frenum. This reference line will be useful when setting posterior teeth and can be helpful in the identification of gross midline discrepancy. Extend the midlines of both casts to the frontal area of their bases as seen in Fig. 12. A small diameter dowel rod may be luted with wax to the hamular notch area of the maxillary cast (Fig. 12). It provides a temporary, but visual, horizontal plane reference.

Follow these instructions to mount the casts on a plane line articulator and utilize the Bonwill Triangle.

1. Align the midline plane of the casts to the midline plane of the articulator.
2. Align the horizontal plane of the casts to the articulator by paralleling the luted dowel rod in hamular notch visually to the hinge axis of the articulator.
3. Measure an approximate distance of 110 mm

from the condyles of the articulator to the anterior incisal edge area of the maxillary bite rim.

The enclosed angle from the hinge axis of the articulator to incisal edge to occlusal plane of the bite rims will approximate 22 degrees. Fix the base of the mandibular cast to this position on the articulator using plaster or stone. While the plaster is setting, measure and visually check that the occlusal plane is within the Bonwill Triangle, as described. Fix the upper member of the articulator to the maxillary cast and your mounting is complete.

Practice and study as often as necessary until you are comfortable with the techniques, always check your work.

Analysis of articulated casts may be utilized for the selection of posterior tooth type. Figs. 13, 14, 15 demonstrate how mounted casts relate to Class I normal bite, Class II overbite and Class III crossbite. Ivoclar posteriors are available in SR-Orthotyp-PE hardened acrylic or SR-Orthosit-PE composite to satisfy the classifications. ■

CAST ANALYSIS FOR RESORPTION EVALUATION

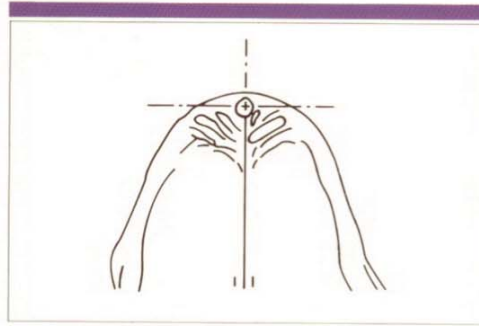


Fig. 17 Minimum ridge resorption

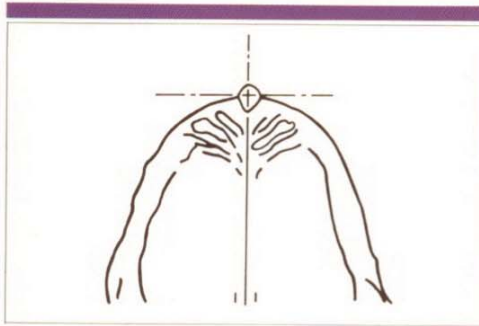


Fig. 18 Maximum ridge resorption

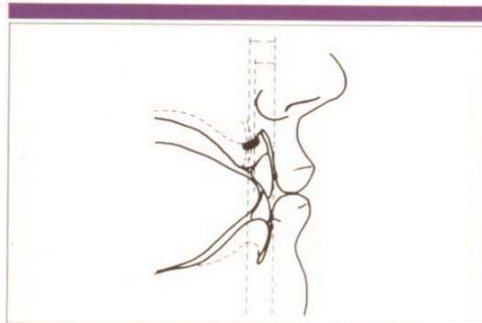


Fig. 19 Positioning of teeth for proper lip support

Edentulous patients present various degrees of alveolar bony ridge resorption. Correct evaluation is important for identifying ridge relation as Class I, II, or III. Proper tooth selection and arrangement is dependant on correct ridge relation classification. Lip and facial support, provided by the finished denture tooth position and base contour, also have a direct relation, along with cast analysis, for ridge resorption. See Figs. 17, 18, 19. ■

CAST ANALYSIS FOR CUSPID LOCATION

Let's evaluate a maxillary cast. That palatal view of Fig. 20 shows one side with dentition (A) and the other side (B) edentulous. Rugae and incisal papilla remain after tooth loss and resorption. These anatomic landmarks continue to be relative to tooth position after the loss of natural teeth. Fig. 21 is a lateral view of the same cast. Notice vertical ridge height loss from resorption along with labiolingual dimension loss also related to resorption. Frontal view of the cast in Fig. 22

depicts more resorption in the buccal corridors compared to the lingual. Note that proper positioning of posterior teeth and contouring of the denture base in these areas is important for the restoration of aesthetics and vertical space.

Cuspids are the visual corners of the maxillary dental arch. Notice Fig. 23A. Placement of the cuspid is 9mm buccal from the tip of the first long branch rugae. Slight normal resorption is assumed in 23A and the central incisor is placed 7 mm labial from the center of the incisal papilla. Proper lip support from the central incisor and an aesthetic labial to buccal corridor effect relative to cuspid position are just good basics. Now, see Fig. 23B, assume gross resorption here and improper setting of the teeth that is short of the recommendations used on Fig. 23A. 23B has cuspids only 7.5 mm buccal from the tip of the first long branch rugae and the central is only 6 mm from the center of the incisal papilla. Gross resorption combined with tooth position falling short in Fig. 23B will result in poor lip support and a malrelated cuspid position giving a poor appearance.

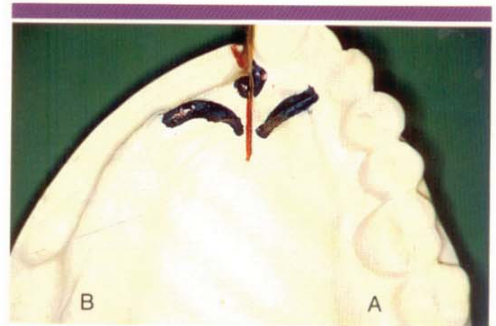


Fig. 20 Rugae can relate to ridge resorption

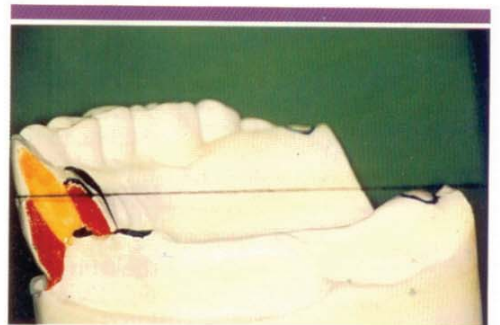


Fig. 21 Loss of Vertical height from resorption compared to original tooth position — sideview

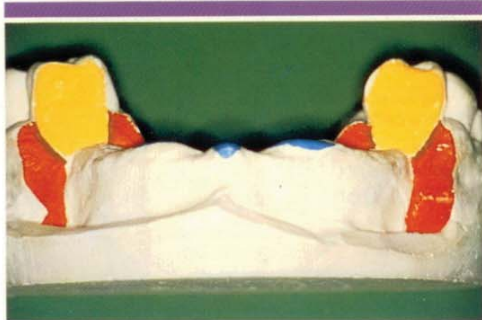


Fig. 22 Frontal view of Figure 21

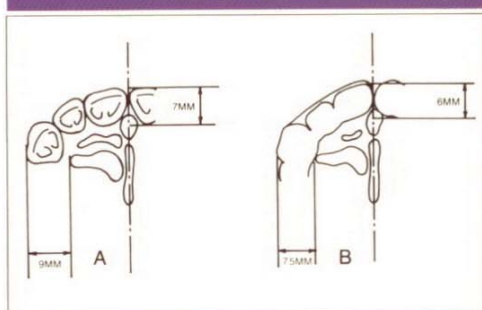


Fig. 23A Recommended positioning of Maxillary Anteriors
Fig. 23B Improper Positioning of Maxillary Anteriors

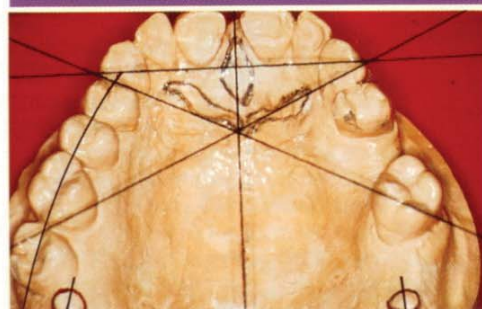


Fig. 24 Reference lines to position Maxillary and Posterior Teeth



Fig. 25 Outline land areas of edentulous cast

Fig. 24 shows natural dentition on a maxillary cast. Relative cuspid position has been verified with line analysis. The midline is identified and a horizontal reference line is drawn perpendicular to the midline at the center of the incisal papilla. The diagonal lines approximate a path through the length of the first long branch rugae. A successful arbitrary position for cuspid location is verified where the rugae diagonal line intersects the horizontal papilla traversing line.

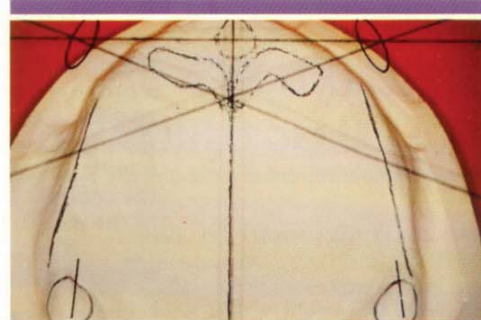


Fig. 26 Maxillary cusps positioned to reference lines

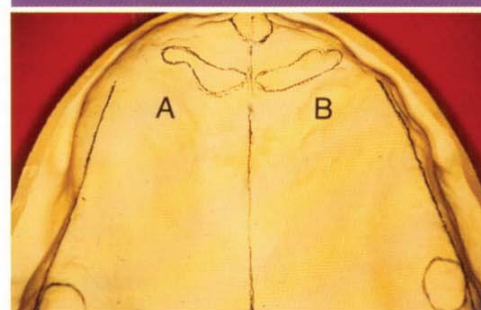


Fig. 27 Asymmetric resorption between A and B

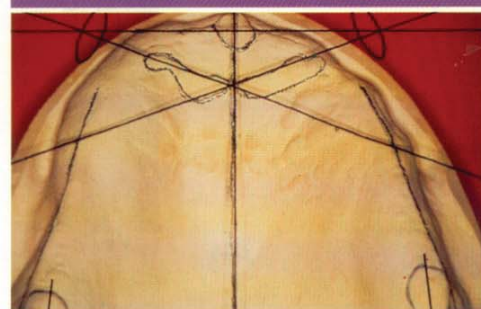


Fig. 28 Reference lines to position cuspid not ridges

A reference line through the central fossae of the posterior teeth is also seen in Fig. 24. Note that this line does not run through the marked center of the tuberosity. The center of the tuberosity is in line with the lingual gumline of the posterior teeth. If the central fossae reference line was set onto the mid-tuberosity line, improper cheek support and restriction of tongue space would result. Fig. 25 shows the similar relation to the mid-tuberosity line on an edentulous cast. Samples of line analysis for the projection of cuspid location continue with Figs. 26 through 31. Fig. 26. Horizontal and diagonal reference lines intersect at the approximate position of maxillary cuspid. Normal resorption is represented on the cast, 9 mm from the tip of the long branch rugae can be used to confirm the line relationship for the cuspid. Fig. 27. Resorption seen on this cast is asymmetric. Notice greater resorption in area B and less resorption in area A.

Fig. 28 is the same cast of Fig. 27. Line analysis and the 9 mm measurement from the tip of the long branch rugae restores a projected symmetrical position to the cuspids. Gross anterior resorption is also seen in the relative position of the incisal papilla and this will be restored by setting the centrals 7 mm anterior from the center of the papilla.

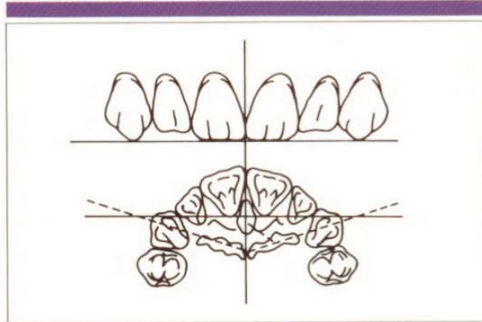


Fig. 29A Line analysis on ovoid arch

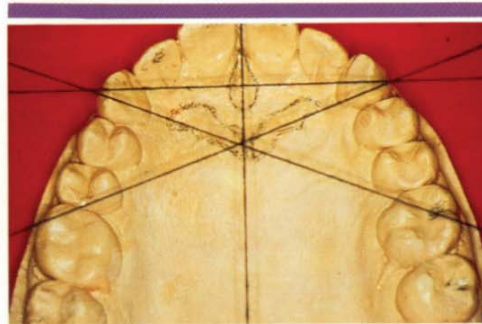


Fig. 29B

Fig. 29 has ovoid dental arch form with a shallow palate that is typical with ovoid arches. Cast line analysis verifies cuspid location.

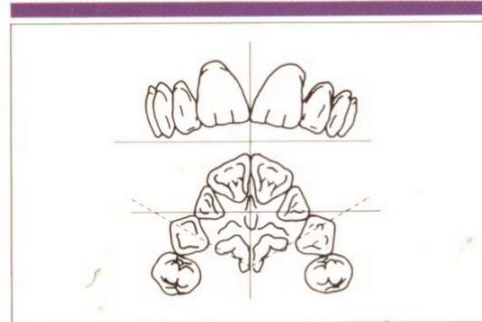


Fig. 30A Line analysis on tapering arch

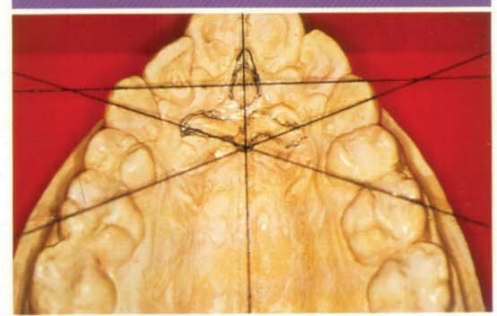


Fig. 30B

Fig. 30 has a pronounced tapering dental arch with its typical deep palate, but the same principals of line analysis apply and do verify cuspid location.

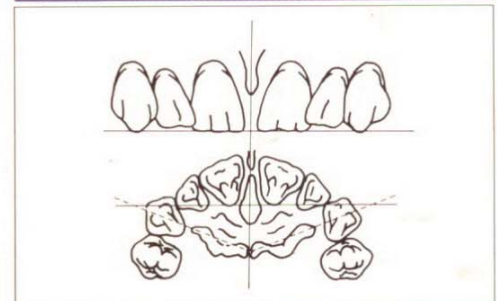


Fig. 31A Line analysis on square arch

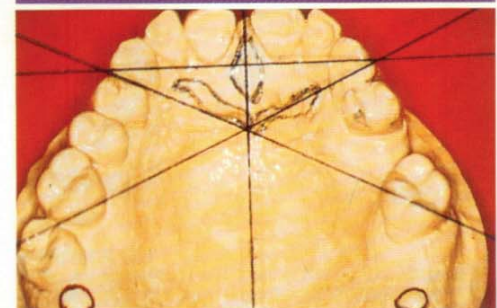


Fig. 31B

Fig. 31 has square arch form, shallow palate and a central diastema. Line analysis is still valid with these conditions and the same principals have been used.

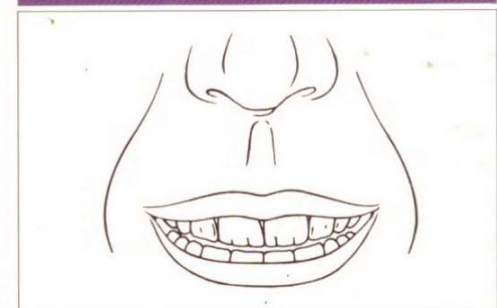


Fig. 32 Pleasant smile line related to curvature of lip

CAST ANALYSIS FOR ANTERIOR MOULD SELECTION

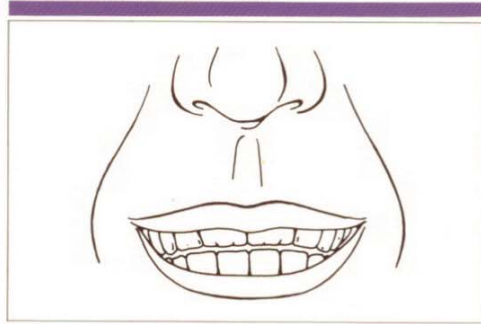


Fig. 33 Unnatural setting of anterior teeth

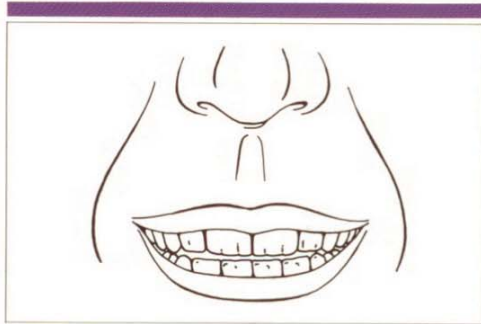


Fig. 34 Vigorous setting of anterior teeth

The most prominent aesthetic effect noticeable when a person smiles is the arrangement of anterior teeth and the relation of this arrangement to the lower lip. This important visual perception is particularly related to denture wearing people. A first impression of appearance or even personality can be effected with denture tooth arrangement. A natural and pleasant view of this smile line is seen in Fig. 32. The anterior teeth from cuspid to cuspid curve at their incisals, parallel to the lower lip. This curvature is also the frontally visible portion of the functionally related curve of Wilson. The curve of Wilson can be understood as a developmental result of lateral mandibular excursions. When the working condyle rotates in function, this rotation arcs the opposite condyle in a movement called translation. The arcing shape of function has a resulting coincidence with the physiologic smile line of the teeth. The lips just follow during a natural smile.

Fig. 33 shows a reverse curve with unpleasant aesthetics. Reverse curve can result from not following the lower lip line or from tipping the occlusal plane downward in the posterior and out of the Bonwill Triangle during the denture setup. However, a vigorous aesthetic value can be achieved by paralleling the anteriors to the horizontal plane during the denture setup. Slight dropping of the cuspids toward the smile line will render a vigorous appearance as seen in Fig. 34. ■



hairside selection of anterior teeth by the dentist is encouraged. The maxillary arch form shape may be highlighted at the ridge crest with a pencil and will suggest a mould group shape as in Fig. 35. This simple procedure will provide an anatomic basis for shape group selection of anterior teeth when no information is prescribed or available.

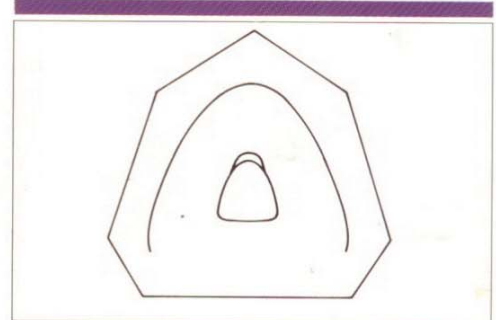


Fig. 35A Tapering Arch Form

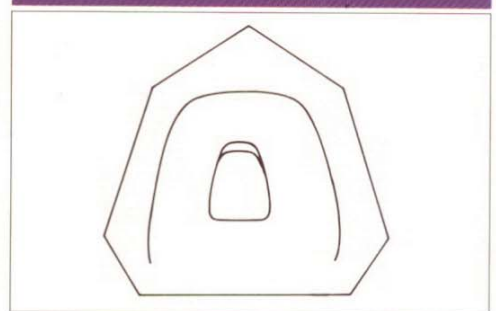


Fig. 35B Square Arch Form

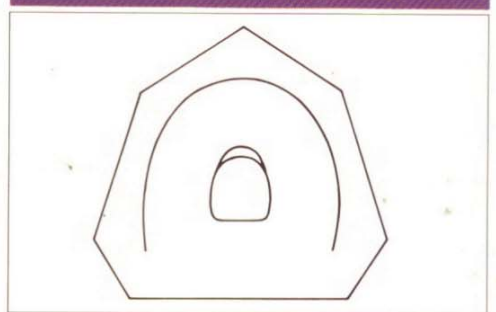


Fig. 35C Ovoid Arch Form

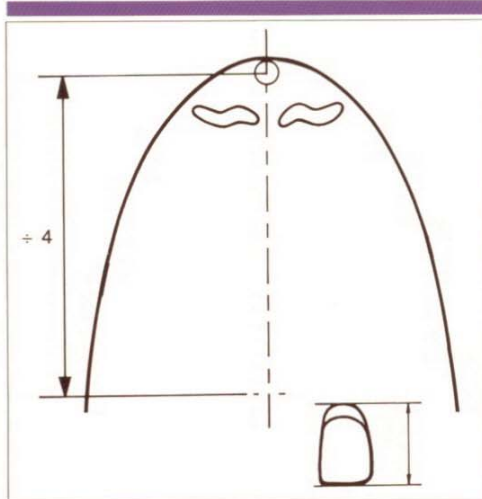


Fig. 36 Using Maxillary cast landmarks for selection of anterior teeth

Coronal length of the maxillary central incisor may be estimated through anatomic relation. Measure the distance from the center of the incisal papilla to the fovea palatina area and divide by 4. Remember that coronal length does not include the cervical collar root area of denture teeth, only the crown portion. Coronal width of the maxillary central incisor is related to the total width of all 6 anterior teeth. Two basic, anatomic related methods may be employed to project the total width of 6 maxillary anterior teeth for a given edentulous cast. The width of 6 anterior teeth can be measured and specified on a mould chart in one of two very different ways. There is no standard. Ivoclar measures this width flat. Understand that this "flat" measurement is from distal to distal of cuspids when the teeth are lying on a flat surface. Some manufacturers specify measurement of 6 anteriors on a curve. The difference between the two should be clearly understood.

Here's an example: Ivoclar maxillary anterior mould A27 measures 48.5 mm "flat" as specified. Anterior teeth are set around the archform curvature, and when this is done the embrasure contacts are angled to go around the curve. The curving causes the distal to distal cuspid measurement to increase 5 mm. So, the A27 will measure 53.5 mm on a curve. Keep these "flat" or on a "curve" meanings in mind when using any method to select anterior 1 x 6 width.

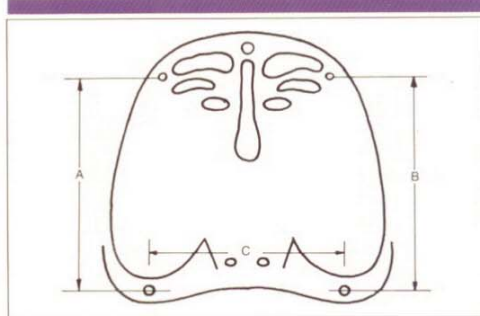


Fig. 37 Land area's to determine selection of Maxillary anterior teeth

Method 1

1. Measure "A" from the tip of the long branch rugae to hamular notch.
2. Measure "B" from the tip of the long branch rugae to hamular notch.
3. Measure "C" the distance between tuberosity crests.
4. Add the three values and divide by 3.
5. The average of the three values (step 4) approximates an on curve measurement from the long axis of one cuspid to the long axis of the other.

For instance: Long axis to long axis measurement between cuspid on a curve does not include the distal portions of the cuspid and an additional factor is needed for compensation. The compensation is related to cuspid width in a 1 x 6 and these guidelines should be used:

- If step 4 is less than 44 mm, add 6
- If step 4 is 44-49 mm, add 8
- If step 4 is 49-54 mm, add 10

Here is an example:

A = 42
 B = 46
 C = 44
 Total = 132
 Total ÷ 3 = 44
 44 + 8 = 52 mm
 width at anteriors on curve
 So then, 52 - 5 = 47 mm
 width of anteriors flat

OPA TEMPLATE DENTURE SETUP

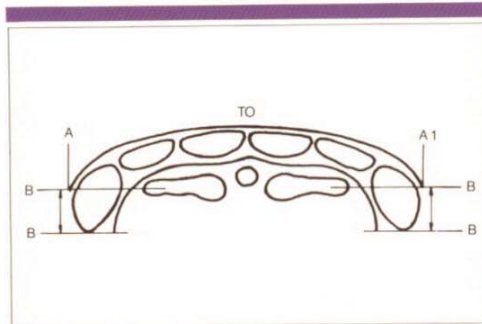


Fig. 38 Measure in sulcus of labial fold from right to left long branch Rugae to select Maxillary anterior teeth

Method 2

1. Pencil a line along the depth of the sulcus of the labial corridor (A to A1).
2. Extend cuspid long axis reference lines from the tip of the long branch rugae horizontally through the corridor line of step 1 at both cuspid areas.
3. Use a flexible ruler and measure the corridor line length between cuspid long axis reference lines.

Now, if the measurement is less than 44 mm add 6, 44 - 49 add 8, 49 - 54 mm add 10.

The addition will compensate for full cuspid width and yield a recommended width of six anteriors on a curve. For a recommended width of six anteriors measured flat subtract 5 mm.

Example: Corridor line between cuspid long axis reference lines measures 46 mm
 $46 \text{ mm} + 8 = 54$
 $54 \text{ mm} =$ width of six anteriors on curve
 $54 - 5 = 49 \text{ mm}$
 $49 \text{ mm} =$ width of six anteriors on flat

Study and practice both methods on a variety of practical edentulous maxillary casts to gain proficiency. Determine an anatomic related and appropriate crown shape and length for the maxillary central incisor, explained earlier in this section. Project the width of six anteriors by anatomic relation and you are ready to use this data on mould charts for the selection of maxillary anterior tooth moulds. The charts will have recommendations for mandibular anterior moulds and posterior moulds. ■

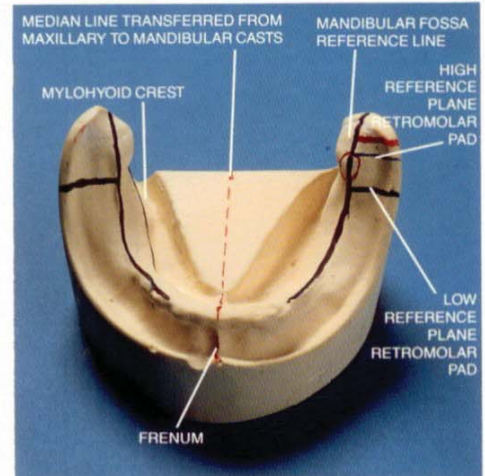
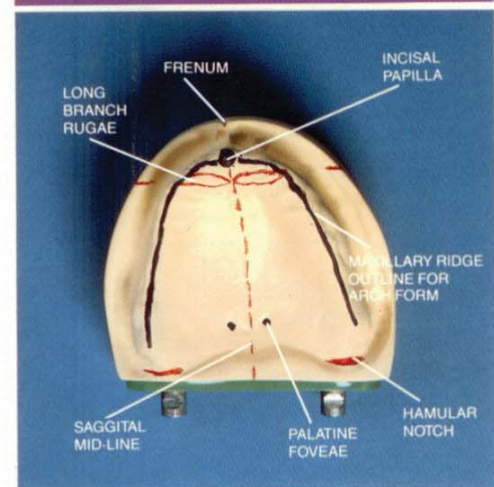


Fig. 39 Anatomical Land area

Denture tooth setup with the aid of the Ortho Plane Analyzer is highly related to anatomic reference. Relative anatomical landmarks need to be highlighted in pencil on the casts. The maxillary cuspid reference line from the long branch rugae is extended to the cast land area. Fully extend the median lines. High and low reference lines from the retromolar pads and mandibular ridge crest lines are all extended on to the cast land areas.

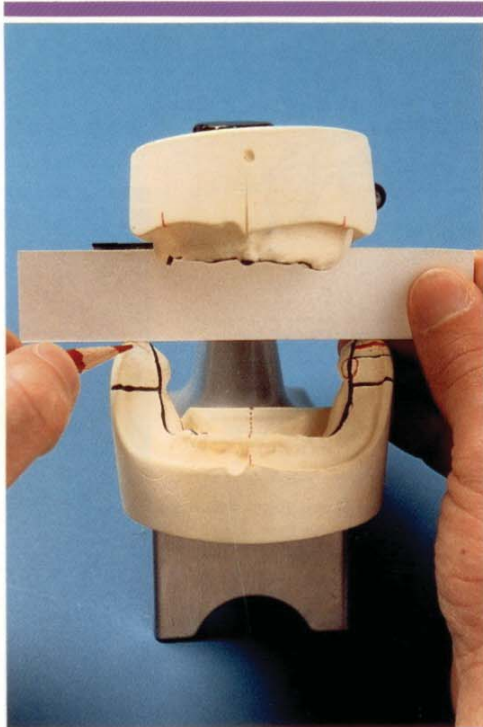


Fig. 40 Establish Plane of occlusion from Hamular Notch Reference

Plane line articulators are commonly used in dental laboratories and they are adequate for the setup procedure with the OPA. Begin relating the OPA to mounted casts on any articulator by identifying the posterior level of the occlusal plane on the mandibular cast. Fig. 40 demonstrates how this is done. Place a straight edge in contact with both hamular notches. Maintain contact with the notches and guide the parallel edge while closing the articulator. When you close to the point where the parallel edge is aligned with the high reference line of the retromolar pad, stop. Pencil mark the cast land area using the parallel edge as a guide. You now have a posterior height reference for the plane of occlusion that is parallel to the hamular notches. This is very close to being parallel with the pupils of the patient. The new marks on the cast will be used to locate the posterior grip shoe of the Ortho Plane Analyzer during the mandibular setup.

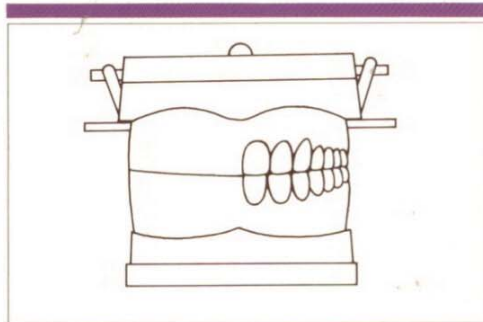


Fig. 41 Prescribed bite rims for positioning of teeth

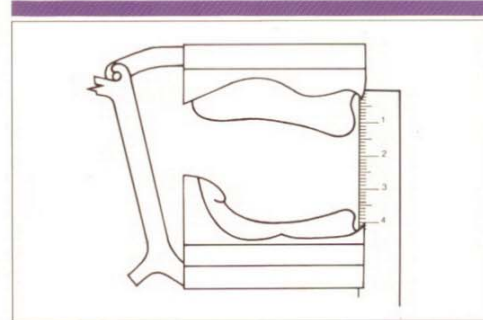


Fig. 42 Determine position of Maxillary Central in space

Fig. 41 illustrates a dentist prescription with high and low lip line, cuspid eminence reference and plane of occlusion.

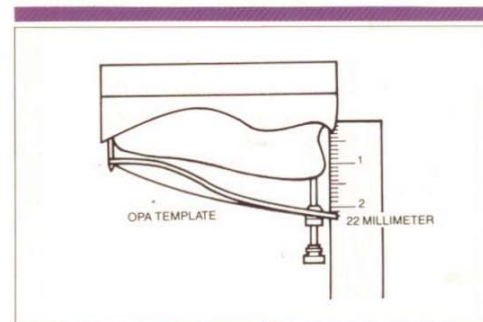


Fig. 42A

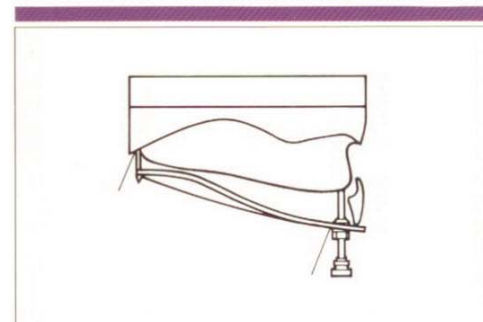


Fig. 42B

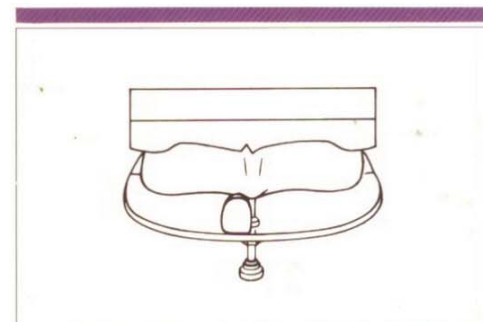


Fig. 42C

Let's continue with the assumption that functional bite rims have not been provided and a case is proceeding with bite rims, no scribed midline and a vertical interarch registration only.

Use a millimeter ruler or caliper and measure the vertical distance from the sulcus of the labial corridor near the maxillary central incisor to the corresponding mandibular area. Notching cast land areas here will improve access for measurement. This measurement is known as the intervestibular vertical dimension, or simply V.D. Record the V.D. on the casts and on the prescription for reference. Follow Fig. 42. The V.D. of this sample is measured at 40 mm. Seat the posterior rim of the OPA into the hamular notches. Place a ruler in the ruler slot and adjust the stylus of the OPA to contact the center of the incisal papilla. Now, lock the stylus at half the V.D. plus the desired overbite. A normal 2 mm overbite is included in Fig. 42B with a 22mm setting of the stylus.

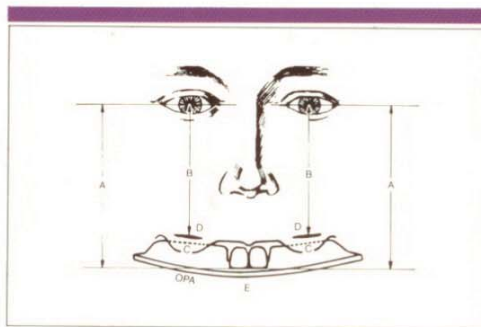


Fig. 43 Setting Maxillary Anterior Teeth using OPA Template

The OPA template related to oral and facial anatomy. The rim of the template is seated into the hamular notches to maintain parallelism with the pupils of the eyes and the transverse plane of the skull. "E" depicts the position of the centrals on the template.

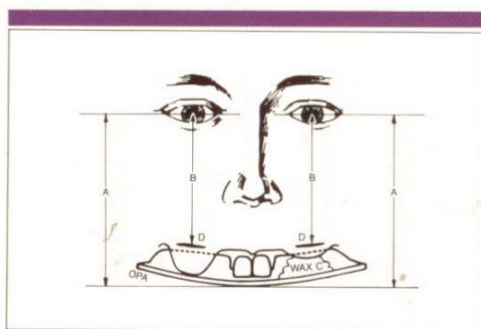


Fig. 44 How to use OPA Template if large tuberosity is present

Large or asymmetric tuberosities may prevent the rim of the template from seating. Wax may be added to compensate a shallow side and keep the rim of the OPA an equal distance from both hamular notches.

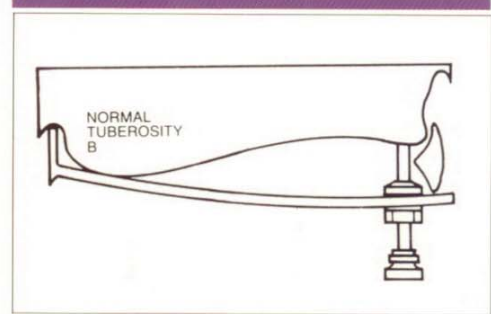


Fig. 45 Placement of Maxillary Centrals using OPA Template

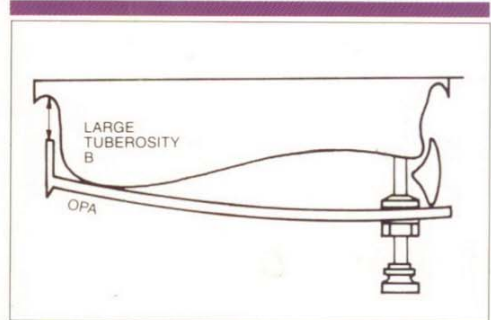


Fig. 46 Placement of Maxillary Centrals using OPA template

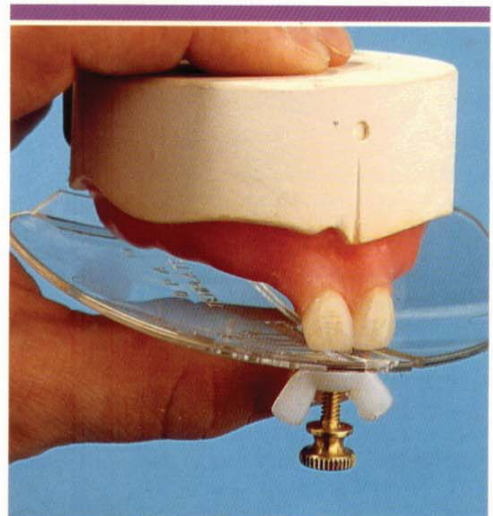


Fig. 47 Placement of Maxillary Centrals using OPA template

The OPA is hand held to the maxillary cast for the setting of central incisors. Fig. 46 is a side view of the template resting on the tuberosity and still stabilizing the template for tooth setting. Fig. 47 is a side view of the template with its rim resting in the hamular notch. Basic technique for setting maxillary central incisors includes:

1. Locate the template's rim on, or parallel to, the hamular notches.
2. Lock the stylus on the center of the incisal papilla with a distance of half the V.D. plus overbite to the upside of the template.
3. Set the centrals with their incisals on the template and their labial surface 7 mm (scale on the template) anterior from the center of the incisal papilla for lip support and smile line aesthetics. (Fig. 48)

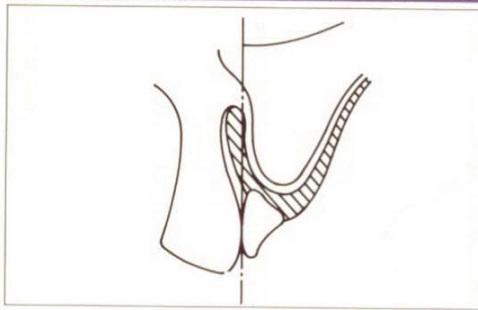


Fig. 48 Proper setting of Maxillary Central will support lip for a natural effect

The template, hand held in place on the maxillary cast, will continue to act as a guide for the setting of maxillary lateral incisors, cuspids and first bicuspid. The arch form ridge crest line and the labial/buccal corridor lines are visible through the template. Cuspid axis reference lines are visible also. Laterals are set with their incisals near or on the template and their labial surfaces in line with the centrals and parallel to the corridor line. Cuspids are set with their tips on the template, labial surface parallel to the corridor line and crown long axis aligned with the cuspid axis reference lines. The first bicuspid are set with their buccal cusps on the template, buccal surfaces paralleled to the corridor lines and crown long axis perpendicular to the template.

Setup of the maxillary first bicuspid at this particular step of sequence has several advantages:

1. An occlusal key relative to the setting of mandibular first bicuspid is established.
2. Spaces in the setup or the necessity of mesiodistal grinding of mandibular bicuspid to fit a small space is minimized or avoided.
3. Vertical height of the occlusal plane at the mandibular first bicuspid is established. See Figs. 49 and 50.

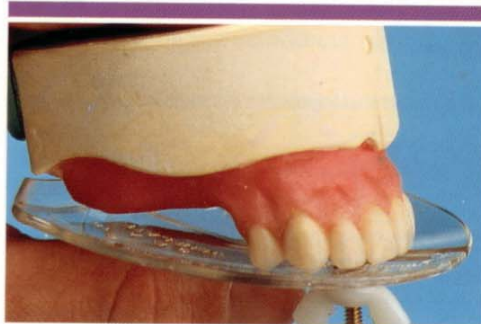


Fig. 49 Positioning of Maxillary Anterior Teeth and first Bicuspid

Set the maxillary first bicuspid with the anteriors. They will provide a key for the setting of the mandibular first bicuspid and the mandibular cuspid position will be well defined.

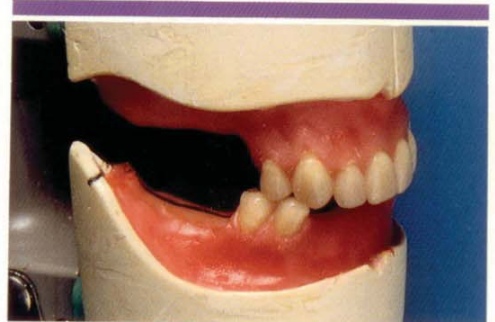


Fig. 50 Position of Maxillary First Bicuspid provides proper positioning of Mandibular First Bicuspid

Now that the maxillary anteriors, the maxillary first bicuspid and mandibular first bicuspid all have been set, step 3 is next. The OPA template is related and stabilized to the mandibular cast. Make a wax support for posterior orientation of the template. Position the posterior grip shoes on warmed and softened wax blocks at the retromolar pad areas of the baseplate. Keep the median reference line of the template aligned with the median line of the mandibular cast while pressing the template. Align the posterior of the template with the high reference lines of the retromolar pads and bring the anterior of the template to rest on the buccal cusps of the mandibular first bicuspid. See Figs. 51 and 52. Use a washable ink pen and draw two lines on the template for a posterior tooth setting reference. Locate these two lines with an occlusal view. Draw each from the occlusal fossa of the mandibular first bicuspid to the midretromolar pad mandibular fossa reference line on the cast. Review Fig. 39.



Fig. 51 Wax stop "A" for stabilizing the OPA Template on Mandibular Cast

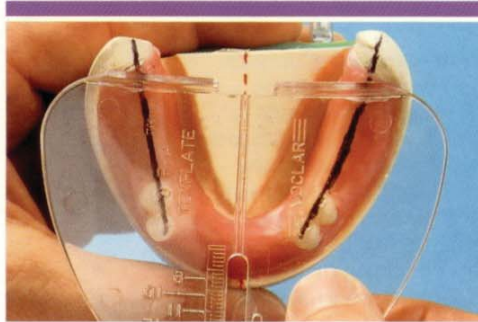


Fig. 52A Using OPA Template to record ridges for Fossa Reference of posterior teeth

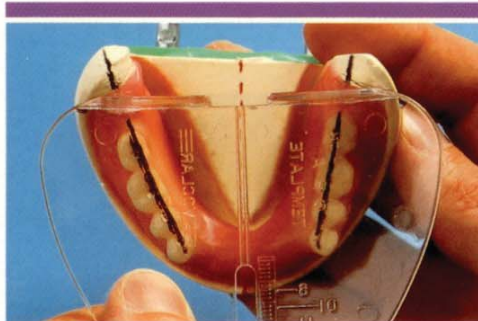


Fig. 52B Utilizing OPA Template to record ridges for Fossa Reference of posterior teeth

Step 4 is the setting of mandibular second bicuspid, first and second molars. Set the second bicuspids in softened wax over the ridge. Press them in place with the template. Adjust as necessary so that both buccal and lingual cusps touch the template, the occlusal fossa is aligned with the fossa reference line on the template and the buccally viewed crown long axis is perpendicular to the template. Now, set the first molars in softened wax over the ridge. Press them in place with the template. Adjust as necessary so that three cusps (mesiolingual, mesiobuccal and distobuccal) touch the template (Figs. 52A, 52B) and the occlusal fossa is aligned with the fossa reference line on the template. The mandibular second molars follow. Set them in softened wax over the ridge. Press them in place with the template and adjust them as necessary, just as you did with the first molars. Fig. 52B shows fossa relation to template reference lines. Fig. 53 shows mandibular cusp tips to underside of OPA template. Fig. 54 shows posterior cusp relation to template and posterior grip shoe keying.

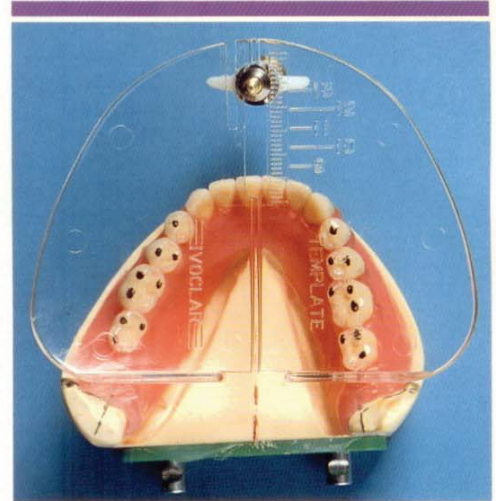


Fig. 53 Cusp contacts of posterior to underside of OPA Template

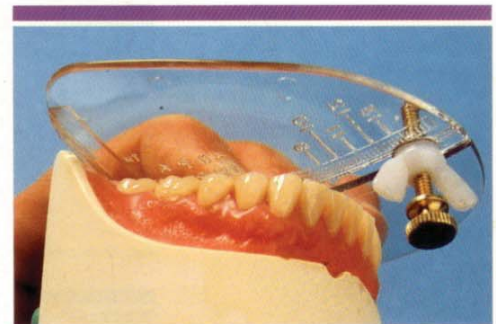


Fig. 54 Checking curve of SPEE Posterior Cusps contact with OPA Template

Step 5 is the positioning of the maxillary posteriors. The mandibular posteriors have been set previously with the OPA Template. They should have no spaces, cusp contact with the OPA as indicated and good mesial and distal marginal ridge height continuity of adjacent teeth. These are characteristic of an idealized mandibular posterior denture setup that will allow maxillary posteriors to literally fall in place. (See Figs. 59A and 59B.) The illustrations show nestling by gravity to full occlusion of design over a good mandibular setup.

Before setting the teeth with wax, place them as shown in 59A and 59B. Check available space with articulator closure and grind ridgelaps to fit as needed. Place softened wax on the maxillary baseplate where needed for the quadrant of posteriors, place the teeth in the softened wax and close the articulator (Fig 55). The functionally carved and preprogrammed surfaces will guide the teeth into place. Repeat the procedure for the remaining quadrant of posteriors: Lute the teeth in position. Check for function and the type of disclusion that the teeth were designed to perform.

Step 6 completes the setup with positioning of mandibular anteriors (Fig. 56). The six anteriors are set in softened wax over the ridge. Press them in place with the template. This will relate their incisals to the curves of Spee and Wilson as has been done with all the teeth so far. Adjust the labial surfaces parallel to the corridor line for arch form. Now remove the template and close the articulator. Minor additional adjustment includes checking overbite to be half the vertical dimension plus two millimeters. Raise the mandibular cuspids one millimeter for slight prominence and interdigitation. Remove anterior interferences with tooth position adjustments (preferred) or minor grinding. Tooth setup is completed. ■



Fig. 55 Articulating the Maxillary posteriors



Fig. 56 Completion of Maxillary and Mandibular IVOCLAR teeth setup



Fig. 57 Quattro block posteriors in position

QUATTRO™ BLOCK POSTERIOR



Quattro block posteriors are available in normal bite type N3 and N5 mandibular moulds. They are available in 11 of the most popular shades. Quattro posteriors are positioned following the same guidelines as shown in Fig. 54.



Fig. 58 Pound line reference

Check **Pound Line** to be assured that tongue space is not compromised.



Fig. 59A Maxillary posterior buccal inter-digitation



Fig. 59B Maxillary posterior lingual inter-digitation

Setup procedure is simplified with Quattro. The OPA may be used as usual. Grinding to fit a limited vertical is easier with a block of teeth than with a number of individual teeth. Quattro provides built in curves of Wilson and Spee, arch form curvature and Ivoclar beauty. Orthotyp PE maxillary posteriors N3 and N5 will articulate easily against the Quattro block posteriors. ■