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Introduction

• Complete dentures may suffer from a lack of proper border extension, but none are more important than the posterior limit and the posterior palatal seal on maxillary complete dentures.

• The posterior border is terminated on a surface that continues and is movable in varying degrees and not at a turn of tissue as are the other borders of denture.

• The posterior palatal seal is located at the posterior border of the denture.
Introduction

• **Posterior palatal seal (PPS)** is defined as the seal area at the posterior border of a maxillary removable dental prosthesis.

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• **Posterior palatal seal area** is defined as the soft tissue area at or beyond the junction of hard and soft palates on which pressure, within physiologic limits, can be applied by a denture to aid in its retention.

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Anatomical and physiologic considerations

- The PPS is divided into two separate but confluent areas based upon anatomic boundaries.
- The postpalatal seal extends medially from one tuberosity to the other.
- Laterally, the pterygomaxillary seal extends through the pterygomaxillary notch (hamular notch) continuing for 3-4 mm anterolaterally approximating the mucogingival junction.
• The pterygomaxillary seal occupies the entire width of the **pterygomaxillary notch**, which is defined as that band of loose connective tissue lying between the pterygoid hamulus of the sphenoid bone and distal portion of the maxillary tuberosity.

• The notch is covered by the pterygomandibular fold, which extends from the posterior aspect of the tuberosity posterior-inferiorly to insert into the retromolar pad.

• The **hamular process** is covered by a thin layer of mucous membrane. Therefore, the hard denture base should never cover the process, which would otherwise cause patient pain, if encroached upon.
• Thus, the length and direction of pterygomaxillary seal is affected by the position of the hamular process i.e., located 2 to 4 mm posteromedial to the distal limit of the maxillary residual ridge.

• There are two glandular openings (fovea palatini) within the tissues of the posterior portion of the hard palate, usually lying on either side of the midline.

• The fovea are ductal openings into which the ducts of other mucous glands drain. They serve no function.
According to some authors, the fovea palatini are located, on an average, 1.31 mm anterior to the anterior vibrating line (an imaginary line that marks the beginning of motion of the soft palate).

In another investigation it was found out that fovea were located either on or behind the anterior vibrating line.
• Therefore, the position of fovea does not represent the junction of hard and soft palates.

• When a prominent midpalatal fissure extends onto the soft palate, PPS should be extended into this fissure to ensure proper peripheral seal.
• If the **torus** extends to the bony limit of the palate, leaving little or no room to place the posterior border seal, then its removal is indicated.

• The presence of **thick, ropy saliva** can create hydrostatic pressure in the area anterior to the PPS, resulting in a downward dislodging force exerting upon the denture base.

• To alleviate this potential problem, a fine line or Cupid’s bow can be scribed on the master cast, anterior to the cluster of palatal mucous glands (and distal to any torus that is present).
Anterior and posterior vibrating line

• The anterior vibrating line is an imaginary line located at the junction of the attached tissues overlying the hard palate and the movable tissues of the immediately adjacent soft palate.
Anterior and posterior vibrating line
One way to locate the anterior vibrating line is to have the patient perform the Valsalva maneuver, which requires that both nostrils be held firmly while the patient blows gently through the nose.

This will position the soft palate inferiorly at its junction with the hard palate.

Another way to locate can be by visualizing the area, while instructing the patient to say “ah” with short vigorous bursts.
• Due to the projection of the posterior nasal spine, the anterior vibrating line is not a straight line between both hamular processes.

• The anterior vibrating line is always on soft palatal tissues.

• The posterior vibrating line is an imaginary line at the junction of the aponeurosis of the tensor veli palatini muscle and the muscular portion of the soft palate.
• It represents the demarcation between that part of the soft palate that has limited or shallow movement during function and the remainder of the soft palate that is markedly displaced during functional movements.

• The posterior vibrating line is visualized by instructing the patient to say “ah” in short bursts in a normal, unexaggerated fashion.
Soft palate

- Palatoglossus fold
- Palatine tonsil
- Palatopharyngeal fold
- Uvula
Soft palate is a mobile flap suspended from the posterior border of the hard palate.

Its free posterior border presents in the midline a conical projection called the uvula.

The soft palate is continuous at the sides with the lateral wall of the pharynx.

The soft palate is a thick fold of mucosa enclosing an aponeurosis, muscular tissue, vessels, nerves, lymphoid tissue and mucous gland.
In its usual relaxed and pendant position, the anterior (oral) surface of the palate is concave, and the posterior aspect is convex.

Palatine aponeurosis is a thin, fibrous expanded tendon of the tensor veli palatini muscle.

It is attached to the posterior border of the hard palate.

It is thick in the anterior 2/3rd of the soft palate but very thin further back.

Near the midline it encloses the musculus uvulae.

All the other muscles are attached to the aponeurosis.
Muscles of the soft palate

- Tensor veli palatini
- Levator veli palatini
- Musculus uvula
- Palatopharyngeus
- Palatoglossus
Classification of soft palate

- Based upon the angle that the soft palate makes with the hard palate, they are classified into three

**Class I** – indicates a soft palate that is rather horizontal as it extends posteriorly, with minimum muscular activity.

These are considered the most favorable configuration, since more tissue surface can be covered, yielding a potentially more retentive denture base.
• Class II: Soft palate makes a 45° angle to the palatal vault.

• Class III: Soft palate makes a 70° angle to the hard palate. Tissue coverage for posterior palatal seal is minimum. Class III soft palate is commonly associated with a V-shaped.
House's classification of the relationship between the soft palate and the hard palate is called the classification of palatal throat forms.

Class 1: Large and normal in form, relatively with an immovable band of tissue 5 to 12 mm distal to a line drawn across the distal edge of the tuberosities.
• Class II: Medium sized and normal in form, with a relatively immovable resilient band of tissues 3 to 5 mm distal to a line drawn across the distal edge of the tuberosities
• Class III: Usually accompanies a small maxilla. The curtain of soft tissue turns down abruptly 3 to 5 mm anterior to a line drawn across the palate at the distal edge of the tuberosities.
Rationale

• The primary purpose of the PPS is the retention of the maxillary denture.
• Terminating the denture borders on soft resilient tissues will allow the mucosa to move with the denture base during function and, thereby, maintain the denture seal. This seal prevents passage of air between the denture and the tissues.
• At the posterior aspect of the denture, in the area of the soft palate, there are no cheek tissues to seal the denture border.
• Therefore, the proper placement of the PPS commands a definite clinical procedural protocol, if one is to create an optimally retentive complete maxillary prosthesis.
Designs of PPS

The most common Posterior palatal seal configuration described by Winland and Young

- A bead posterior palatal seal
- A double bead posterior palatal seal
- A butterfly posterior palatal seal
- A butterfly posterior palatal seal with a bead on the posterior limit
- A butterfly posterior palatal seal with the hamular notch area cut to half the depth of a #9 bur
- A posterior palatal seal constructed in reference to House’s classification of palatal forms;
Methods of recording PPS

• There are several established ways for the placement of the PPS.

Arbitrary
• Conventional technique
• Boucher’s technique

Physiologic
• Fluid wax technique
• Stick compound technique
• Extended palatal technique

Empirical - Arbitrary scraping of cast
Conventional Approach

• An accurate and fully extended final impression is made, boxed, and poured, a well-adapted resin or shellac tray is fabricated on the stone cast.

• The patient is seated in an upright position and instructed to rinse with an astringent mouthwash to remove stringy saliva that might prevent clear transfer markings.
The posterior palatal area is then dried with gauze; a "T" burnisher or a mouth mirror is used to palpate for the hamular processes. Once located, they should be marked with an indelible pencil or noted visually to ensure that they are not covered by the denture.
• Then place it along the posterior angle of the tuberosity until it drops into the pterygomaxillary notch.

• Locating the notch with an instrument is necessary, as there are times when small depressions in the residual alveolar ridge may resemble the pterygomaxillary notch.
• Then, marking through the notch and extending 3 to 4 mm anterolateral to the tuberosity, approximating the mucogingival junction will complete the outlining of the pterygomaxillary seal.

• The patient is asked to say "ah" in short bursts in an unexaggerated fashion (noting the area between shallow displacement or quivering and marked muscular activity), the posterior vibrating line is marked with an indelible pencil.

• The patient is instructed to keep the mouth open to prevent smudging of the markings.
- The resin or shellac tray is then inserted into the mouth and seated firmly to place. Upon removal from the mouth, the indelible lines should have been transferred to the tray.
- The resin tray is trimmed with a carbide bur, while a shellac tray may be trimmed with a hot knife to approximate the posterior denture border.
• Returning again to the mouth, the palatal tissues anterior to the posterior border are palpated with the "T" burnisher or mouth mirror to determine 'their compressibility in width and depth.

• The termination of the glandular tissues usually coincides with the anterior vibrating line. The use of the Valsalva maneuver or visualizing the area while the patient says "ah" with short vigorous bursts may also be used.
• This line is marked with an indelible pencil and transferred to the master cast in a manner similar to that used with the posterior vibrating line. The visual outline is in the shape of Cupid's bow.

• The area between the anterior and posterior vibrating lines is usually narrowest in the midpalatal region because of the projection of the posterior nasal spine.
A Kingsley scraper is then used to score the cast. The deepest areas of the seal are located on either side of the midline, one third the distance anteriorly from the posterior vibrating line. It is usually scraped to a depth of approximately 1 to 1.5 mm.

The tissue covering the median palatal raphe area is scraped to a depth of approximately 0.5 to 1.0 mm.
DESIGNING THE POSTERIOR PALATAL SEAL
• Within the outline of Cupid's bow, the cast is scraped to a depth of about one half the amount to which the palatal tissues in that area can be compressed, being tapered progressively shallower anteriorly until it feathers out in the area of the anterior vibrating line.

• Just posterior to the deepest portion of the seal, it is also tapered to the posterior vibrating line. Failure to taper the seal posteriorly may lead to tissue irritation.
• If a shellac tray is used, it can now be replaced on the remoistened master cast, reheated, and readapted to conform to the scored palatal seal area.

• After it is cool, it is tried in the mouth to evaluate the retentive qualities of the trial base.

• The patient is again instructed to say "ah" in a short, unexaggerated manner.
• The position of the base in relation to the soft palate during function is once again observed. This procedure is repeated until no separation of the base and tissue is noted.

• If a resin tray has been used, small amounts of Autopolymerising resin can be added to the tray after the master cast has been scraped and a proper separating medium applied.
Advantages to placing the seal in the trial base are as follows:

- The trial base will be more retentive; this can produce more accurate maxillomandibular records.
- Patients will be able to experience the retentive qualities of the trial base, giving them the psychological security of knowing that retention will not be a problem in the completed prosthesis.
- The practitioner will be able to determine the retentive qualities of the finished denture, leaving nothing to chance at the insertion appointment.
- The new denture wearer will be able to realize the posterior extent of the denture, which may ease the adjustment period.
Disadvantages

- It is not a physiologic technique and therefore depends upon accurate transfer of the vibrating lines and careful scraping of the cast.
- The potential for overcompression of the tissues is great.
Boucher’s technique

- The posterior vibrating line is located and transferred on to the master cast as previously described. The temporary denture base is reduced to this line.
- A groove which is V-shaped (1 to 1.5 mm deep and 1.5 mm wide) is scraped slightly anterior to this line.
This will create a raise, narrow and sharp bead along the posterior portion of the denture which sinks into the tissues and forms a seal.

If the bead has been made too high it will show as an area of redness within 24 hours, in which case it can be relieved.

**Advantage**

According to Boucher a broad seal causes greater tissue displacement and tends to push the denture down. According to him a narrow bead like seal is more effective.
Fluid wax technique

- All of the procedures regarding the location and transfer marking of the anterior and posterior vibrating lines delineated under the conventional approach are performed for the fluid wax technique.
- In this method, the indelible transfer markings are recorded on the final wash impression.
- Zinc oxide and eugenol or plaster are preferred over the elastic impression materials, as they set rigid.
Any one of four types of wax can be used for this technique

- Iowa wax, white, developed by Dr. Earl S. Smith;
- Korecta wax No. 4, orange, developed by Dr. O.C. Applegate;
- H-L physiologic paste, yellow-white, developed by Dr. C.S. Harkins; or
- Adaptol, green, developed by Nathan G. Kaye). These waxes are designed to flow at mouth temperature.
• The melted wax is painted onto the impression surface within the outline of the seal area.
• The wax is applied slightly in excess of the estimated depth and allowed to cool to below mouth temperature to increase its consistency and make it more resistant to flow.
• The impression is carried to the mouth and held in place under gentle pressure for 4 to 6 minutes to allow time for the material to flow.
• The position of the head and tongue during the fluid wax procedure is of particular importance.
• Nelson feels that if an effective posterior seal is to be established without inducing tissue irritation, the soft palate should be impressioned in its most functionally depressed position.
• The maximum depression (downward and forward position) of the soft palate will be recorded when the Frankfort plane (porion-orbitale) is 30° below the horizontal and the tongue is firmly positioned against the mandibular anterior teeth.
• The head and tongue position translate the mandible anteriorly.
• The soft palate will then be passively brought downward and forward due to the indirect attachment of the soft palatal tissues to the body of the mandible and the insertion of the palatoglossus muscle into the side of the tongue.
• After four to six minutes, the impression tray is removed from the mouth and the wax examined for uniform contact throughout the posterior palatal seal area.

• If tissue contact has not been established, the wax will appear dull. If the tissue has been contacted, the wax will have a glossy appearance.

• In areas, the wax appears dull, more wax should be applied and the procedure repeated. If, on the other hand, excess wax protrudes from the end of the tray, it should be removed with a hot scalpel.
• While the impression is out of the mouth, the patient should be cautioned against rinsing with cold water, as this will cause contraction of the tissues and act to reduce the flow properties of the wax upon insertion.

• The secondary impression is reinserted and held for three to five minutes under gentle pressure, followed by two to three minutes of firm pressure applied to the midpalatal area of the impression tray.

• During the period that the wax material is in the mouth, the head and tongue positions must be maintained to prevent over placement of the palatal seal area.
• Upon removal of the tray from the mouth, it is carefully examined to see if the wax terminates in a feather edge near the anterior vibrating line.
• If a butt joint is present instead of the feather edge, then the proper flow has not taken place and the impression tray should be reinserted.
• The final impression with the physiologic posterior border seal is carefully boxed and poured in stone as soon after completion as possible.
Advantages

- It is a physiologic technique displacing tissues within their physiologically acceptable limits.
- Overcompression of tissues is avoided.
- PPS is incorporated into the trial denture base for added retention.
- Mechanical scrapping of the cast is avoided.
Disadvantages

- More time consuming during the impression appointment.
- Difficulty in handling the materials, and added care during the boxing procedure.
Stick compound technique

Stage of Recording
- During border moulding of the special tray, before the final impression is made.

Method A variation of the fluid wax technique is practiced in some dental schools, where stick compound is used instead of wax.
- The stick compound is softened and applied on the tray between the anterior and posterior vibrating lines and pressed gently into place in the mouth.
- After the material hardens, excess material beyond the anterior vibrating line is trimmed off and tapered.
Extended palatal technique

• This technique was described by Silverman in 1971.
• In this technique the denture border is extended 8.2 mm beyond the anterior vibrating line. This method is not widely used currently.
• Method After border molding the posterior border of the tray is extended by adding black compound. The head is flexed downward 30 degree.
• Greenstick compound is then applied to the seal area and the procedure is repeated. An angular depression like a curved gothic arch is seen in the compound.
Advantages of placing the palatal seal on the temporary record base

- The trial base will be more retentive which can produce a more accurate jaw relation.
- The patient will get a psychologic security of knowing that retention will not be a problem with the final denture.
Arbitrary scraping of master cast

This technique is the least accurate, as it relies upon the dentist’s recollection of the palatal configuration and tissue compressibility in order to “guesstimate” the anterior and posterior vibrating lines and depth to which the cast should be scraped.
Significance of posterior palatal seal

- Firm contact with the tissue of the soft palate reduces the tendency to gag.
- Provide retention.
- To make the sunken distal border less noticeable to the tongue.
- Aids in compensating for dimensional changes in curing.
- The proximity of the tissue contact prevents food from getting under the denture base.
- The thickened area provides added strength across the denture.
Troubleshooting

• Underextension
• Underpostdamming
• Overpostdamming
• Overextension
• Adding a PPS to an existing denture
Underextension

• The most common cause for failure of the seal in the PPS is the underextended distal denture border.

  This is a result of the practioner’s use of the fovea palatini as the landmark for terminating the denture base.

• By doing so, the actual denture base may be deprived of as much as 4 – 12 mm of tissue coverage.

  Gaggers make the practioner very aware that they can not tolerate any material far back against their palates.
• Under this type of pressure, the practitioner who is unsure of his technique, or lacks the understanding of a properly extended PPS, may comply with patient wishes.

• There are various methods to overcome this voluntary reflex.

• One method is to ask the patient, during impression making, to concentrate upon a point on the wall while taking even and equal breaths through the nose.
• In cases who require more conditioning, it may be necessary to construct a highly polished autopolymerized resin tray on the master cast that is extended to the posterior vibrating line.
• The patient is instructed to wear this appliance in comfort of his and once successfully maintained this base in the mouth, the fabrication of the denture can be completed.
Underextended posterior border also result from misinterpreting the proper posterior border extension by dentist.

It may also result, when technician is asked to trim and polish the processed denture borders and he trims it arbitrarily.
Underpostdamming

- It may be the result of recording the tissues when the mouth was wide open during the final impression, leading to insufficient placement of tissues at some points along the terminal border of the denture.
- When the mouth is in the wide open position, the pterygomandibular fold becomes taut.
When the patient assumes any position other than a wide open position, a space will be present between the denture base and the tissue, since the fold is no longer activated.

Diagnosis of this condition is done by placing the wet denture base into the mouth and slowly pressing in the midpalatal region until it is firmly seated, all the while observing the distal denture border.
• If air bubbles can be seen escaping from beneath the distal border, then at point the denture base is underpostdammed.

• Correction can be made by further scrapping the cast and readapting the trial base if the conventional approach is used, or by adding more wax and reminding the patient to refrain from opening the mouth so wide if the fluid wax technique is employed.
Overpostdamming

• If significant overpostdamming has taken place, especially in the pterygomaxillary seal area, then upon insertion of the denture the posterior border will be displaced inferiorly.
• If it is moderately overpostdammed, then at the first or second postinsertion appointment, tissue irritation will be discernable across the post palatal region.
• Selective reduction of the denture border with a carbide bur, followed by lightly pumicing the area while maintaining its convexity will remedy the problem.
Overextension

• In an attempt to maximize the retentive qualities of the denture, practitioner may inadvertently violate the physiology of the soft palate musculature and place the posterior denture border too far distally.

• It is usually the small area rather than the entire border that is overextended.

• The most frequent patient complaint is painful and difficult swallowing.
- Small ulceration in the region of the soft palate will be evident.
- If the hamuli is covered by the denture base, the patient will experience sharp pain, especially during function. The pterygoid hamulus should never be covered by the denture base.
Adding a PPS to an existing denture

- The deficiency in PPS region may be either in depth or in length or in both of the completed denture base.

- If the correct esthetic and phonetic requirements, the proper vertical dimension and centric relation positions have been established, and the remaining denture borders correctly extended, then one should undertake the correction of the PPS area.

- There are numerous method to improve the PPS on an existing denture.
Moghadam and Scandrett suggest a procedure that utilizes the fluid wax technique.

All of the steps outlined for locating, marking, and placing the wax in the seal area are followed, except that this time the wax is placed on the processed denture base.

After the wax has had an adequate chance to flow, the denture is removed from the mouth. An indelible pencil is used to outline the anterior extent of the seal on the denture. Utility wax is placed vertically across the palate, separating the posterior two thirds from the anterior region, and extended around the posterior portion of the denture.
• Stone is vibrated into the denture-wax surface outlined by the utility wax. After the stone has set, the wax is eliminated and the denture cleaned. The denture base is ground distal to the anterior vibrating line that has been delineated by the indelible pencil.
• Care should be exercised not to perforate the polished side of the denture.
• Lubricant is then applied to the ungrounded areas, including the polished surface, and a separating medium is applied to the stone cast.
• The denture is then replaced on the stone cast and held firmly with rubber bands.
• Autopolymerising acrylic powder is sprinkled between the denture base and the cast while held on a vibrator. Monomer is then added drop wise.
• This is continued until the void has been completely filled. The cast and denture are placed in an upright position until the initial set has taken place.

• They are then placed in a pressure pot with water (140°F) for 20 minutes under 30 psi pressure. After the cast and denture are separated, the excess acrylic is trimmed and the border polished lightly.

• If there is any question concerning the presence of free monomer that might irritate the tissues, the denture should be stored in water for 24 to 36 hours.
• Light cured resin can be utilized for the intraoral correction of the posterior palatal seal.

• This material allows for accurate placement of the seal by adding material selectively, similar to the fluid wax technique, curing it in stages.
Advantages to this technique are as follows:

• No exothermic reaction to irritate the oral tissues
• Minimal volumetric shrinkage during curing
• More closely approximates a physiologic technique
• Can be performed with relatively little chair time

The only disadvantage is the cost of the curing unit.
Summary

• The placement of the correct posterior palatal seal area is not a difficult procedure once the anatomy and physiology of the area are understood.

• Established techniques for the placement of the border seal will ensure a more retentive prosthesis for the patient.
References


Thankyou!