

# Evolution of Techniques in Recording Posterior Palatal Seal – A Review

Rajakumari Natarajan<sup>1\*</sup>, Priyadharshini Ramesh<sup>1</sup>, Sunantha Selvaraj<sup>2</sup> and Jayashree Mohan<sup>3</sup>

<sup>1</sup>Interm; <sup>2</sup>Senior Lecturer; <sup>3</sup>Professor and Head of Department, Department of Prosthodontics, Vinayaka Mission's Sankarachariyar Dental College, NH – 47, Sankari Main Road, Ariyanoor, Salem – 636308, Tamil Nadu, India; principal.vmsdc@vmu.edu.in, rajakumari.tn@gmail.com

Date of Receiving: July 2017

Date of Submission: Oct 2017

Date of Acceptance: Nov 2017

## Abstract

A perfectly constructed denture with significant retention will aid in patient's esthetic, functional and psychological factors. Retention of complete denture is based on both patient and denture factors. Fines sand knowledge of the clinician and technician plays a major role in denture factor. In a maxillary denture, border seal in the posterior region is taken care by proper recording of Posterior Palatal Seal (PPS). Lack of success of many dentures is due to improper formation of distal palatal length and absence of a posterior palatal seal. Generally, the diagnostic evaluation and enlacement of posterior seal are given only minor attention in complete denture fabrication. This article reviews the conspicuousness of the posterior palatal seal and various techniques of recording PPS.

**Keywords:** Complete Denture Retention, Posterior Palatal Seal, Posterior Palatal Seal Region, Soft Palate, Vibrating Line

## 1. Introduction

The widely accepted choice of treatment for edentulous patients is tissue supported complete dentures and their success depends on the relation between denture and anatomic structures that support and limit them<sup>1</sup>. Failure to have accurately adapted denture bases, correct thickness, shape and extension of denture flanges, proper relief adequate posterior palatal seal, polished and occlusal surfaces located in neutral zone and/or balanced occlusal surfaces may result in loss of retention<sup>2</sup>. According to Skinner, "The most effective addition to increase retention is post dam"<sup>3</sup>. Hardy and Kapur maintained that retention and stability that is achieved from adhesion, cohesion and interfacial surface tension are able to resist only those dislodging forces that act perpendicular to the denture base. Horizontal forces and lateral torqueing of the maxillary denture can be resisted only by adequate border seal. Therefore, the proper placement of Posterior palatal seal commands a definite clinical procedural pro-

ocol if one is to create an optimally retentive complete maxillary prosthesis<sup>4</sup>.

## 2. Definitions

According to Glossary of Prosthodontics Terms-8 "Posterior palatal seal is defined as a soft tissue along the junction of the hard and soft palates on which pressure within the physiologic limits of the tissues can be applied by a denture to aid in the retention of the denture"<sup>5</sup>.

"Fovea palatina are the two small pits or depressions in the posterior aspect of the palate, one on each side of the midline, at or near the attachment of the soft palate to the hard palate"<sup>5,6</sup>.

"The palpable notch at the junction of maxilla and the pterygoid hamulus of the sphenoid bone in the tissue surface of upper denture, a raised portion at its posterior extent is called postdam"<sup>5,6</sup>.

"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<sup>5,6</sup>.

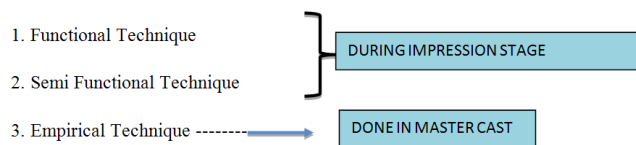
“Posterior vibrating line is an imaginary line at the junction of tensor veli palatini muscle and muscular portion of the soft palate<sup>5,6</sup>.”

### 3. Rationale of Posterior Palatal Seal

- Posterior palatal seal aids in retention of complete denture<sup>7</sup>.
- It serves as a barrier and prevents ingress of fluid, food, air between denture and tissue surface<sup>7</sup>.
- It helps in decreasing gag reflex by maintaining positive contact with moving soft palate<sup>8</sup>.
- It guides the positioning of custom tray during secondary impression<sup>7</sup>.
- By providing a thick border it compensates the warpage that occur during polymerisation<sup>7</sup>.
- It provides comfort and confidence to the patient by increasing the retention of denture<sup>9</sup>.

### 4. Techniques of Recording Posterior Palatal Seal

According to Hardy and Kapur, the technique of recording posterior palatal seal can be classified into three types:



#### 4.1 Functional or Physiologic Technique

Functional technique is a technique in which tissues are displaced within its physiologic limits. A low melting wax/soft stick modeling wax is border moulded in posterior palatal seal area of final impression by functional movements made by the patient.

##### 4.1.1 Fluid Wax Technique

In this technique low melting wax such as Iowa wax (white), Korecta wax no. 4 (orange), H-L physiologic paste (yellow–white), Adaptol (green) are used. After taking wash impression this technique is applied<sup>10</sup>. Fluid wax has good adhesion with zinc oxide eugenol and impres-

sion plaster so they are used. With the help of an indelible pencil anterior vibrating line and posterior vibrating line are marked in patient’s mouth. These markings are transferred to wash impression. In the margins of palatal seal fluid wax is painted in excess. They are cooled below the mouth temperature so they have resistance against flow. Patient’s head is positioned 30 degree below Frankfort’s horizontal plane so that soft palate is at its maximum downward and forward position and head is flexed to prevent aspiration of impression material and saliva. Patients tongue is positioned against mandibular anterior tooth to pull the palatoglossus anteriorly. Custom tray is inserted into mouth and patient is asked to periodically rotate the head, for functional movements of soft palate without altering the plane. The tray is removed after 4-6 minutes. The areas where tissue is contacted appears glossy and other areas remains dull. In the dull areas wax is added and procedure is repeated. The excess wax beyond posterior vibrating line is removed<sup>4</sup>.

#### 4.2 Semi Functional Technique

Border moulding is done by the dentist. Border moulding is defined as “determining the extension of a prosthesis by using tissue function or manual manipulation of the tissues to shape the border areas of an impression material” – GPT 8

#### 4.3 Empirical Technique

Developed on the cast by grooving the cast to the desired depth

##### 4.3.1 Conventional Technique (Winkler)<sup>4</sup>

In this technique anterior vibrating line and posterior vibrating line is outlined using an indelible pencil and transferred to master cast. Following are the steps to outline, Remove the stringy saliva by instructing the patient to wash the mouth. Using a cotton or gauze posterior palatal seal is dried. Pterygomaxillary seal is outlined using a T-burnisher/mouth mirror palpate hamular process and mark it with a indelible pencil and the burnisher is moved along the posterior angle of tuberosity until it drops into pterygomaxillary notch. A line is drawn through the notch and extends it 3 to 4 mm anterolateral to tuberosity approximating mucogingival junction. Post palatal seal is outlined by instructing the patient to say “ah” in short bursts in an unexaggerated fashion, movement of posterior vibrating lie

is observed and marked. By connecting the line through pterygomaxillary seal with the line just drawn, demarcating the post palatal seal, the posterior denture extension is delineated (Figure 1).

Resin/Shellac tray is inserted in mouth and markings are transferred to master cast to complete the transfer of posterior border and tray is trimmed. Anterior vibrating line is marked using an indelible pencil at the junction of hard and soft palate. Patient is asked to perform “Valsalva manuevre” to record anterior vibrating line and they are transferred to master cast. A Kingsley scraper is used to scrape the cast. About 1 to 1.5 mm is scraped in the deepest part of the see in master cast which is one third the distance anteriorly from posterior vibrating line and about 0.5 to 1mm depth in region of mid palatine raphae (Figure 2) and it is tapered towards hamular notches, anterior vibrating line, posterior vibrating line so that it blends with palatal tissues.

#### 4.3.2 Boucher's Technique<sup>11,21</sup>

The width of the posterior palatal seal is limited to a bead on the denture that is 1.5 mm deep and 1.5 mm broad at its base with a sharp apex. The resulting design is a beaded posterior palatal seal.

#### 4.3.3 Bernard Levin's Technique<sup>12,21</sup>

It is for class III soft palate forms: He described a, “double bead” technique for class III soft palate. In this technique, a depth of about 1mm and width of 1.5mm is scraped in posterior vibrating line. A distance 3 to 4 mm from posterior border, anterior vibrating line is beaded. This is known as rescue bead.

#### 4.3.4 Swenson's Technique<sup>13</sup>

A groove is cut along the posterior line to a depth of 1 to 1.5 mm that will cause the posterior border stand straight out from the hard palate, turning neither up nor down. Posterior line is tapered towards the anterior line by scraping the cast.

#### 4.3.5 Calomeni, Feldman, Kuebker's Technique<sup>14,21</sup>

In this technique a depth of 1 to 1.5 mm scraped as posterior bead in which extends through hamular notches and distance of 5 to 6 mm from posterior line, anterior line is beaded. Using a Kingsley scraper No.1 a depth 0

at anterior line to a depth of 1 to 1.5 mm along posterior border is scrapped. A distance of 2 to 3 mm should be present in between the anterior and posterior lines from the midline.

#### 4.3.6 Pound's Technique<sup>15,21</sup>

Pound recommends a single bead posterior palatal seal with anterior extensions for additional air seal. In the palate from the hamular notch to hamular notch a ‘V’ shaped groove is carved measuring a width of 1 to 1.5 mm and depth of 1 to 1.5 mm and is placed 2 mm anterior to vibrating line. In order to provide adequate air seal a loop is carved on either side of the midline. Palpate the area with a blunt of the instrument to determine the width of anterior loop.

#### 4.3.7 Silverman's Technique<sup>16</sup>

Using a pencil a line is drawn from hamulus to hamulus midway between the anterior and posterior flexion lines. Posterior flexion line is scored to one half deep of that of midscore line. Anterior flexion line is marked with a shallow scratch. Deepness of the cast from the midline to anterior and posterior vibrating line is tapered.

#### 4.3.8 Hardy and Kapur Technique<sup>17</sup>

Using the ball portion of the T burnisher depth of posterior palatal seal is examined. Augment the posterior palatal seal of denture for 4 mm from distal borders. Then the hamular notch region is narrowed to 2 mm. Posterior palatal seal is at its maximum depth in center and minimizes to zero at its anterior and posterior border by scoring the cast.

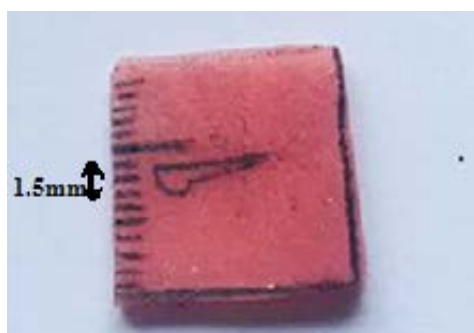
## 5. Ultrasonic Technique of Recording Posterior Palatal Seal

Rajeev MN et al., used Ultrasonic effects of nonionizing energy to displace electrons from orbital shell. The image of soft tissue is viewed with the help of miniature transducer along with real time B-mode. Conventional method is used to mark the posterior palatal seal. A thin rubber is placed on the anterior one third of transducer which also appears as index in the monitor. Use the toothpaste as a line couplant. The hard and soft palate junction is located using transducer. This is done by taking the transducer into the oral cavity and displacing it to the left of the mid-

line. There is no display of polaroid picture as the rubber band is visualized on the posterior vibrating line and it is moved to the right side of the palate<sup>18</sup>.



**Figure 1.** Posterior palatal seal design (Winkler’s technique).



**Figure 2.** Posterior palatal seal design sectional view (Winkler’s technique).

It is indicated only for class I, II type of palates not for class III as it prevents complete adaptation of transducer and it is contraindicated in neuromuscular impairment conditions and in pronounced gag reflex patients.

## 6. CAD-CAM Denture Base

The warpage of acrylic resin during polymerization leads to elevating of the denture base away from posterior palatal seal<sup>19</sup>. In order to minimize the dimensional change, the denture base is fabricated by CAD-CAM technology. This advanced denture gives better retention and less dimensional instability. These kinds of digital dentures has stored digidata and thus does clinical procedures, virtually thereby reducing the clinical visit. So, the patient can get spare or future dentures in one visit with great accuracy<sup>20,21</sup>.

## 7. Conclusion

Recording the posterior palatal seal in proper and effective manner is of great importance, because it is vital factor in establishing the peripheral seal which enhances retention by utilizing the atmospheric pressure. Posterior palatal seal preparation is an integral part of maxillary complete denture fabrication, requiring an assessment of physiological and technical parameters and careful exam-

**Table 1.** Troubleshooting

	Diagnosis	Causes	Correction
Overextension	Painful and difficulty in swallowing due to ulceration in soft palate.	Due to rapid extension of denture base.	Selective relief of pressure areas and minimize the distal length.
Underextension	Loss of physical retention.	Due to consideration of fovea palatine as the terminating border. Due to fear of gagging. Due to over trimming by technician.	Adding a posterior palatal seal to existing denture.
Underpostdamming	By placing the wet denture and gently pressing in midpalatalregion. Observe for air bubbles through distal denture border.	Improper technique of recording PPS.	If the conventional technique is used, score the cast and readapt the denture base. In Fluid wax technique is used, add more wax and prevent the patient from opening the mouth.
Overpostdamming	In case of significant overpostdamming -displacement of posterior border inferiorly can be observed. In moderate postdamming – mild irritation is seen.	Due to aggressive scraping of the cast.	Selective reduction of denture border with bur followed by light pumicing.

ination during the diagnostic phase of the treatment can alleviate many potential problems. Thus, the discernment of posterior palatal seal efficaciously is an indispensable responsibility to dentist.

## 8. References

1. Thomason JM, Feine J, Exley C, Moynihan P, Muller F, Naert I, et al. Mandibular two implant-supported over dentures as the first choices standard of care for edentulous patients—the York Consensus Statement. *Br Dent J*. 2009; 207(4):185–6. Crossref PMid:19696851
2. Jacobson, Krol. A contemporary review of the factors involved in complete denture retention, stability, and support (Part I) stability. *J Prosthet Dent*. Feb 1983; 49:165–72. Crossref
3. Skinner E, Campbell R, Chung P. A clinical study of the forces required to dislodge maxillary denture bases of various designs. *J Am Dent Assoc*. 1953; 47(6):671–80. Crossref PMid:13108514
4. Winkler S. Essentials of complete denture prosthodontics. 2nd ed. New Delhi: AITBS India; 2009.
5. Glossary of Prosthodontic Terms. *J Prosthet Dent*. 2005; 94:10–92. Crossref
6. Hardy IR, Kapur KK. Posterior border seal: Its rationale and importance. *J Prosthet Dent*. 1958; 8:386–97. Crossref
7. Anthony DH, Peyton FA. Dimensional accuracy of various denture base materials. *J Prosthet Dent*. 1962; 12:67. Crossref
8. Ali Mariyam, Verma AK, Chaturvedi S, Ahmad N, Shukla A. Posterior Palatal Seal (PPS): A brief review. *Journal of Scientific and Innovative Research*. 2014; 3(6): 602–5.
9. Weintraub GS. Establishing the posterior palatal seal during the final impression procedure: A functional approach. *J Am Dent Assoc*. 1977; 94:505–10. Crossref PMid:320245
10. Ettinger RL, Scandrett FR. The posterior palatal seal. A review. *Aust Dent J*. 1980; 25:197–200. Crossref PMid:7004416
11. Boucher CO, Hickey JC, Zarb GA. Prosthodontic treatment for edentulous patients (10th ed). St Louis: The CV Mosby Co; 1975. p. 141–61.
12. Levin B. Impressions for complete dentures. Quintessence Publishing Co; 1984. p. 35–70. PMid:11651859
13. Swenson MG, Terkla LG. Complete Dentures. 6th ed. St. Louis: The CV Mosby Company; 1970. p. 65–70,372–76.
14. Calomeni AA, Feldmann EE, Kuebker's WA. Posterior palatal seal location and preparation on the maxillary complete denture cast. *J Prosthet Dent*. 1983; 5:628–30. Crossref
15. William EA. A comparison of the retention of complete denture bases having different types of posterior palatal seal. *J Prosthet Dent*. 1973; 29:485–93.
16. Silverman SI. Dimensions and displacement patterns of the posterior palatal seal. *J Prosthet Dent*. 1971; 25:470–82. Crossref
17. William EA. A comparison of the retention of complete denture bases having different types of posterior palatal seal. *Journal of Prosthetic Dentistry*. May 1973; 29(5):484–93.
18. Rajeev MN, Appelbaum BM. An investigation of the anatomic position of the posterior seal by ultrasound. *J Prosthet Dent*. 1989; 61:331–6. Crossref
19. Stawarczyk B, Ender A, Trottmann A, Ozcan M, Fischer J, et al. Loadbearing capacity of CAD/CAM milled polymeric three-unit fixed dental prostheses: Effect of aging regimens. *Clin Oral Investig*. 2012; 16:1669–77. Crossref PMid:22209963
20. Goodacre BJ, Goodacre CJ, Baba NZ, Kattadiyil MT. Comparison of complete denturebase adaptation between CAD/CAM and conventional fabrication techniques. *J Prosthet Dent*. 2016; 116:249–56. Crossref PMid:27112416
21. Bindhoo YA, Thirumurthy VR, Jacob SJ, Anjanakurien, Limson KS. Posterior palatal seal: A literature review. *International Journal of Prosthodontics and Restorative Dentistry*. July-Sept 2011; 1(2):108–14.