

## Original Research

### Assessment of effects of removable dental prostheses and aging on blood flow in the palatal mucosa

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#### ABSTRACT:

**Background:** The effects of wearing removable dentures and aging on palatal mucosa blood flow can vary person to person. The present study was conducted to assess the effects of removable dental prostheses and aging on blood flow in the palatal mucosa. **Materials & Methods:** 90 subjects of both genders were divided into 2 groups of 45 each. Group I included young, healthy dentulous subjects and group II included elderly edentulous subjects. For group I, measurements were taken in a single session; for group II, the measurements were taken in two sessions: The first just before the prosthetic load (E1) and again 1 week after new dentures were provided (E2). Blood flow was measured with an LDF Perfusion Monitor. In group II, recordings were obtained on the palatal mucosa at three different anatomical sites: The retro-incisive papilla (RPI), the medial raphe (MR), and the Schroeder area (SA). **Results:** A significant difference between the two groups at the three measured areas. Young dentulous participants had PU values showing much less blood flow compared to edentulous participants ( $P < 0.05$ ). This finding remains significant when the analysis includes the effects of gender and smoking. The mean E1 measurements in partial and total edentulous subjects requiring removable dental prostheses at RPI was 205.2 and 213.2, at MR was 184.6 and 134.0 and at SA was 142.5 and 184.6 respectively. The difference was non-significant ( $P > 0.05$ ). The mean E1 measurements in partial and total edentulous subjects carrying removable dental prostheses at RPI was 164.2 and 193.2, at MR was 157.6 and 302.8 and at SA was 191.5 and 314.6 respectively. The difference was non-significant ( $P > 0.05$ ). There was no significant difference between the two sets of measurements at the three sites ( $P > 0.05$ ). **Conclusion:** In comparison, wearing removable dental prosthesis does not alter the blood flow of the palatal mucosa after a week, but the aging process dramatically alters it.

**Keywords:** removable dentures, Palatal mucosa, blood flow

Received Date: 29 January, 2024

Acceptance Date: 27 February, 2024

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**This article may be cited as:** Mungara VS, Jain A, Byrappa B, Muradi SK, Ulchala RP, Khan FA, Assessment of effects of removable dental prostheses and aging on blood flow in the palatal mucosa. J Res Health Allied Sci 2024; 10(1):12-15.

#### INTRODUCTION

The effects of wearing removable dentures and aging on palatal mucosa blood flow can vary person to person. Aging is associated with a decrease in blood flow to various tissues, including the oral mucosa.<sup>1</sup> This decrease in blood flow can affect the palatal

mucosa, potentially leading to reduced tissue oxygenation and nutrient delivery. Removable dentures can create pressure points on the underlying palatal mucosa. Prolonged pressure can compromise blood flow to these areas, leading to tissue ischemia (lack of blood flow) and potential tissue damage. With

aging, the resilience of oral tissues decreases. This can make the palatal mucosa more susceptible to damage from pressure exerted by removable dentures.<sup>2</sup> Changes occur in the submucosa, the underlying bone, the epithelium, and the connective tissue (lamina propria) when the palatal mucosa is covered by a denture.<sup>3</sup> The mucosa is a highly vascularized tissue that has a significant amount of blood and interstitial fluid. Its protective role is derived from the mechanical cushioning effect. Tissue heterogeneity influences the way the palatal mucosa responds to pressure from a detachable prosthesis. Clinical supervision is necessary for deeper connective tissue and a distorted epithelium.<sup>4</sup> These two tissues may be impacted by prolonged exposure to occlusal loading throughout the day. Therefore, to properly handle any concerns with the tissues, it is imperative to comprehend the biomechanics when managing injured tissues. Denture pressure creates a pumping effect that forces interstitial fluid into adjacent tissues that are not invited. The vascular alterations that result from oral mucosa inflammation mostly include capillary dilatation and increased blood flow.<sup>5</sup> The present study was conducted to assess the effects of removable

dental prostheses and aging on blood flow in the palatal mucosa.

## MATERIALS & METHODS

The present study consisted of 90 subjects of both genders. All gave their written consent to participate in the study. Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 45 each. Group I included young, healthy dentulous subjects and group II included elderly edentulous subjects. For group I, measurements were taken in a single session; for group II, the measurements were taken in two sessions: The first just before the prosthetic load (E1) and again 1 week after new dentures were provided (E2). Parameters such as angle classification, shape, colour, adhesion, and surface texture of the palate were recorded. Blood flow was measured with an LDF Perfusion Monitor. In group II, recordings were obtained on the palatal mucosa at three different anatomical sites: The retro-incisive papilla (RPI), the medial raphe (MR), and the Schroeder area (SA). Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table: I Comparisons of blood flow in E1 in group I (control group and group carrying prosthesis)**

Groups	Variables	Mean	SD	P value
RPI	Control	-132.6	23.1	0.04
	Group carrying prosthesis			
MR	Control	-196.4	28.6	0.05
	Group carrying prosthesis			
SA	Control	-120.8	29.4	0.02
	Group carrying prosthesis			

Table I shows a significant difference between the two groups at the three measured areas. Young dentulous participants had PU values showing much less blood flow compared to edentulous participants (P < 0.05). This finding remains significant when the analysis includes the effects of gender and smoking.

**Table: II Comparisons of E1 measurements between partial and total edentulous in subjects requiring removable dental prostheses**

Parameters	Partial edentulous	Total edentulous	P value
E1- RPI	205.2	213.2	0.17
E1- MR	184.6	134.0	0.34
E1- SA	142.5	184.6	0.52

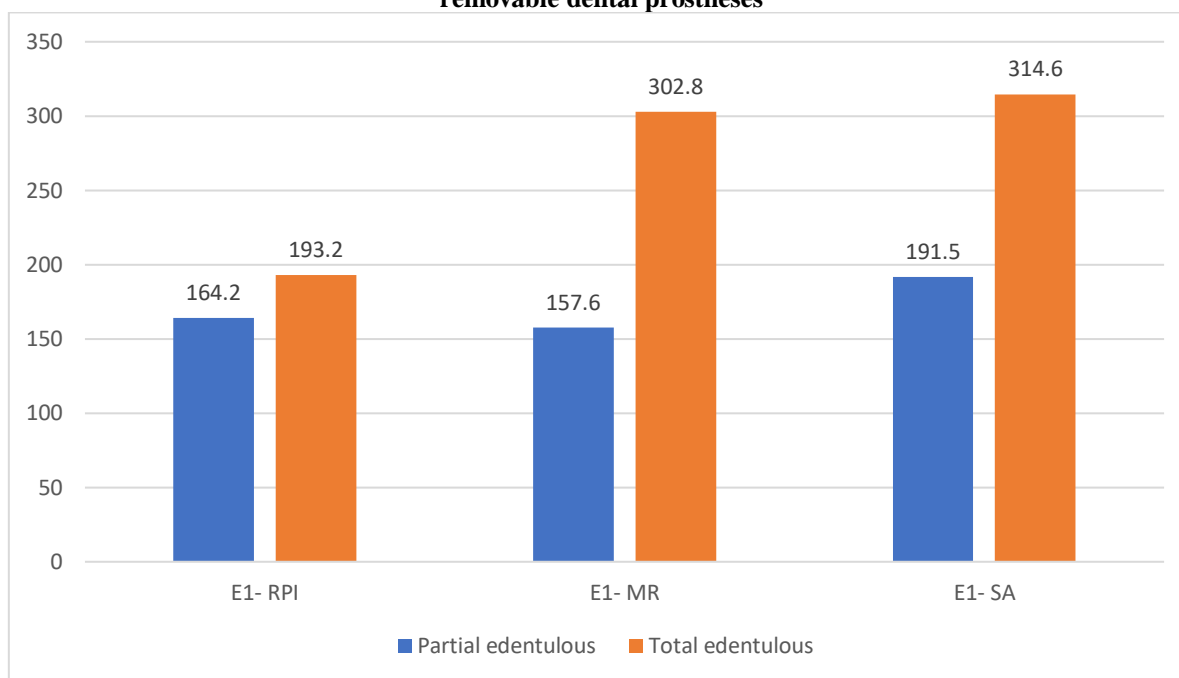
Table II shows that mean E1 measurements in partial and total edentulous subjects requiring removable dental prostheses at RPI was 205.2 and 213.2, at MR was 184.6 and 134.0 and at SA was 142.5 and 184.6 respectively. The difference was non-significant (P > 0.05).

**Table: III Comparisons of E1 measurements between partial and total edentulous in subjects carrying removable dental prostheses**

Parameters	Partial edentulous	Total edentulous	P value
E1- RPI	164.2	193.2	0.19
E1- MR	157.6	302.8	0.68
E1- SA	191.5	314.6	0.85

Table III shows that mean E1 measurements in partial and total edentulous subjects carrying removable dental prostheses at RPI was 164.2 and 193.2, at MR was 157.6 and 302.8 and at SA was 191.5 and 314.6 respectively. The difference was non-significant (P > 0.05).

**Graph: I Comparisons of E1 measurements between partial and total edentulous in subjects carrying removable dental prostheses**



**Table: IV Comparisons of E2-E1 measurements**

Parameters	Old removable dental prostheses wearers	New removable dental prostheses wearers	P value
E2-E1- RPI	7.4	-10.5	0.19
E2-E1- MR	86.2	-65.2	0.68
E2-E1- SA	-12.7	-79.4	0.85

Table IV shows that there was no significant difference between the two sets of measurements at the three sites ( $P > 0.05$ ).

**DISCUSSION**

Reduced blood flow exacerbates this vulnerability, as compromised blood circulation impairs tissue healing and repair processes. Long-term use of removable dentures can contribute to tissue atrophy in the oral cavity, including the palatal mucosa.<sup>6</sup> Atrophied tissues may have diminished blood supply due to reduced vascularity, further exacerbating the effects of aging on blood flow.<sup>7,8</sup> Proper oral hygiene practices become increasingly important with aging and denture use. Poor oral hygiene can lead to inflammation and infection of the oral mucosa, which can further compromise blood flow and tissue health.<sup>9,10</sup> The present study was conducted to assess the effects of removable dental prostheses and aging on blood flow in the palatal mucosa. We found that a significant difference between the two groups at the three measured areas. Young dentulous participants had PU values showing much less blood flow compared to edentulous participants ( $P < 0.05$ ). This finding remains significant when the analysis includes the effects of gender and smoking. Kouadio AA et al<sup>11</sup> in their study blood flow was measured in two groups using the Laser Doppler Flowmeter at three specific anatomical sites: Retro incisive papilla, medial raphe, and Schroeder area. Group 1 included young, healthy

dentulous individuals (mean age:  $23 \pm 3$  years), and Group 2 contained elderly edentulous individuals (mean age:  $62 \pm 11.69$  years). For Group 1, measurements were taken in a single session; for Group 2, the measurements were taken in two sessions: The first just before the prosthetic load (E1) and again 1 week after new dentures were provided (E2). Measurements of blood flow of the palatal mucosa showed that the healthy young dentulous participants had significantly lower perfusion unit values than the elderly edentulous participants at all three anatomical sites ( $P < 0.05$ ). For Group 2, the comparisons between the measurements taken before (E1) and after (E2) new dentures were provided showed no significant differences

We found that mean E1 measurements in partial and total edentulous subjects requiring removable dental prostheses at RPI was 205.2 and 213.2, at MR was 184.6 and 134.0 and at SA was 142.5 and 184.6 respectively. We found that mean E1 measurements in partial and total edentulous subjects carrying removable dental prostheses at RPI was 164.2 and 193.2, at MR was 157.6 and 302.8 and at SA was 191.5 and 314.6 respectively. There was no significant difference between the two sets of measurements at the three sites ( $P > 0.05$ ). Le Bars et

al<sup>12</sup> assessed the sensitivity of laser Doppler for measuring the microcirculation of the palatal mucosa, assessing the median raphe (MR), Schroeder area (SA), and retroincisive papilla (RP). A Doppler PeriFlux 5000 System, containing a laser diode, was used. 54 healthy participants were recruited. The numerical values for palatal mucosa blood flow differed significantly among the anatomical areas ( $p = 0.0167$ ). The mean value of Schroeder area was 92.6 (SD: 38.4) and was significantly higher than the retroincisive papilla (51.9) (SD: 20.2) ( $p < 0.05$ ), which in turn was higher than that of median raphe (31.9) (SD: 24.2) ( $p < 0.0001$ ). The limitation of the study is the small sample size.

### CONCLUSION

Authors found that in comparison, wearing removable dental prosthesis does not alter the blood flow of the palatal mucosa after a week, but the aging process dramatically alters it.

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