

# Clinical and histopathological changes in palatal mucosa following two treatment modalities in patients wearing maxillary complete dentures with suction cup

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## Abstract

**Aim:** The aim of the study was to determine the clinical and histopathological effect on palatal hyperplasia caused by suction cups by different methods of management used for recovery of abused tissues. **Materials and Methods:** A total of 35 subjects agreed for biopsy procedure, from 50 patients who gave consent for the study. Out of the 35 subjects, 20 were randomly selected for treatment with discontinuation of denture (Group I) and 15 selected for denture relined with tissue conditioner (COE-comfort) (Group II). Punch biopsy procedure was performed on these patients to study the histopathology of the lesion before the two modalities of treatment was administered on them. **Results:** Inflammation caused by suction cup decreased considerably by both the treatment modalities, i.e., the use of tissue conditioner as well as discontinuation of denture (tissue rest) for a period of 2 weeks. **Conclusion:** It was concluded that wearing denture day and night considerably increased the severity of inflammatory papillary hyperplasia of palate. Healing was better with tissue conditioner when compared with tissue rest.

**Keywords:** Papillary hyperplasia, suction cup, tissue conditioner

## Introduction

A basic concern of edentulous patients is retention of their dentures. Retention of complete dentures is a complex phenomenon involving many factors. Considerable experimentation and research has been done and still going on to perfect dentures which compensates for the loss of natural teeth. The use of suction cups in maxillary denture satisfies the requirements of retention and stability, due to which it gained popularity in the past. However, the use of suction cups and vacuum chambers was discouraged because of their pathological effect (papillary hyperplasia) on the soft-tissues of the oral mucosa. Inflammatory papillary hyperplasia caused by maxillary complete denture usually involves the hard

palate, which may occasionally extend to the mucosa of the residual ridges, but most of the patients are unaware of its presence. Papillary hyperplasia of the hard palate is also known as inflammatory papillary hyperplasia, papillomatosis, pseudoepitheliomatous hyperplasia, and denture stomatitis.<sup>[1]</sup>

Papillary hyperplasia is a painless and irreversible lesion of the keratinized oral mucosa. The factor most likely to be involved in the formation of papillary hyperplasia is negative pressure. The tissues under the ill-famed rubber suction cup are subjected to a negative pressure. A similar condition exists when the "vacuum chamber" is used in the upper denture.<sup>[2,3]</sup>

The treatment of papillary hyperplasia is aimed primarily at reducing the inflammation by leaving dentures out of the mouth or by the use of tissue-conditioning materials. Biopsy or excision of the lesion is indicated whenever complete regression of the lesion does not occur after all irritating agents have been eliminated.

Several studies reviewed on inflammatory papillary hyperplasia<sup>[2-4]</sup> caused due to retentive aids used in complete maxillary denture, but very few studies compared clinically and histologically recovery of the lesion by the use of a tissue conditioner on the denture and complete tissue rest.<sup>[5]</sup>

Hence, the present study was carried out to determine the clinical and histopathological effect on palatal hyperplasia caused by suction cups by different methods of management used for recovery of abused tissues.

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## Materials and Methods

A hospital-based cross-sectional study was carried out on patients wearing old denture with suction cups. A total of 50 patients were randomly selected for this study. Information about each subject's duration of denture use, denture hygiene, handling, and wearing was obtained through questionnaire before the clinical examination. Patients with papillary hyperplasia due to wearing of denture with suction cup were diagnosed by history and clinical examination. A consent form was taken from all the participants after properly explaining them about the study protocol.

A total of 35 patients agreed to participate in the study involving biopsy procedure, out of 50 patients. All the patients gave consent for the study. Following this, subjects were randomly allocated to two groups: 20 patients for treatment with discontinuation of denture (Group I) and 15 for denture relining with tissue conditioner (COE-comfort) (Group II). For both the groups, hematological investigations, i.e., hemoglobin%, bleeding time, clotting time, receptor binding site, hepatitis B surface antigen, screening test for HIV was done in the clinical laboratory followed by a punch biopsy at the time of participation.

A questionnaire was given to all the 50 patients having inflammatory papillary hyperplasia of palate (IPHP). It provided data on patients who had comfortable dentures, wore denture during waking hours only and those wearing them day and night and cleanliness of the denture (denture hygiene). Patients were examined and the relevant data were entered into the proforma. Clinical grading of inflammatory papillary hyperplasia was done according to Budtz-Jorgensen<sup>[6]</sup> as follows:

1. Slightly inflamed: Slight erythema, scraping with a spatula does not produce any reaction of pain [Figure 1a]
2. Moderately inflamed: Distinct erythema, scraping with a spatula produces a reaction of pain [Figure 1b]
3. Severely inflamed: The mucosa is fiery red, scraping with a spatula produces a reaction of pain and bleeding of the mucosa involved [Figure 1c].

Following clinical examination, a punch biopsy [Figure 1d] with a depth of 2 mm was performed including both affected and unaffected part of palatal mucosa with papillary hyperplasia and the histopathological evaluation was done. Histopathological grading of inflammatory papillary hyperplasia was done and all sections were examined qualitatively for epithelial and connective tissue inflammatory reactions, and graded histologically according to Budtz-Jorgensen<sup>[6]</sup> as follows:

1. Not inflamed (0): Inflammatory cells not present
2. Slightly inflamed (+): A few, scattered inflammatory cells present
3. Moderately inflamed (++) : Diffuse infiltration with inflammatory cells

4. Severely inflamed (+++): Diffuse infiltration alternating with dense infiltration of inflammatory cells.

Patients in Group I were explained to discontinue the use of denture for 2 weeks. Denture relining was done in Group II patients after removing the suction cup from the denture tissue surface. After 2 weeks, clinical examination in both groups was completed and a second biopsy was done adjacent to previously inflamed area, 0.5-1.0 cm from the first biopsy site and histopathologically evaluated.

Data collected was statistically analyzed using two-tailed Chi-square test and Student's *t*-test.

## Results

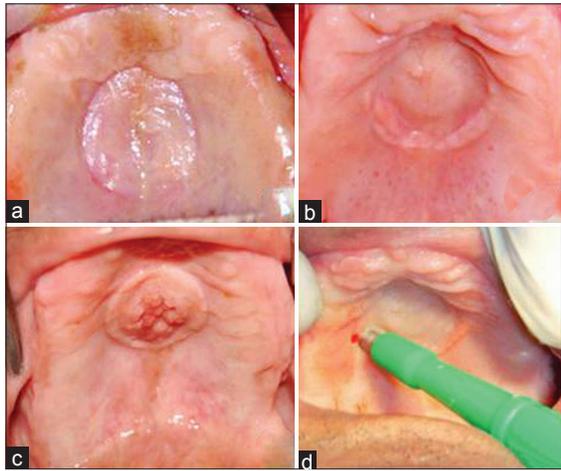
Clinically, the patients of IPHP were evaluated on the basis of questionnaire. Of the 50 denture wearers, 18 (36%) wore their dentures during the waking hours, in which clinically 9 patients showed slight inflammation, 7 showed moderate inflammation and 2 showed severe inflammation. The remaining 32 (64%) wore the maxillary dentures 24 h in which 4 patients showed slight inflammation, 17 showed moderate inflammation and 11 showed severe inflammation [Table 1]. Further when Denture wearing was compared with clinical grading of the lesion there was a statistically significant difference ( $P \leq 0.05$ ), but when the clinical grading was compared with denture hygiene there was no significant difference seen.

Comparison was done in both groups for the pre- and post-clinical grading. There was a statistically significant difference ( $P \leq 0.05$ ) in both groups [Table 2]. Comparison of pre histological features in Group I [Figure 2] and Group II [Figure 3] patients showed no statistically significant difference [Table 3]. Post histological features in Group I [Figure 4] and Group II [Figure 5] patients showed a statistically significant difference in squamous epithelial

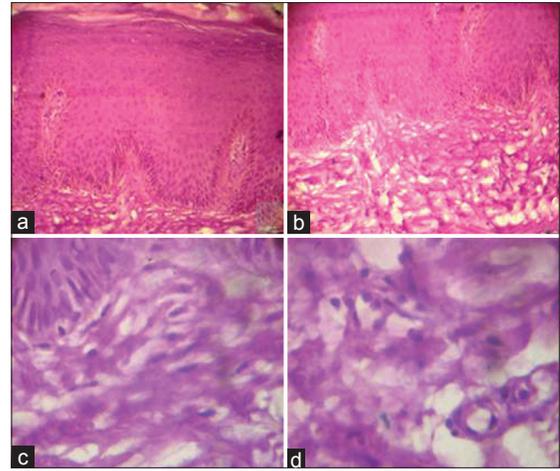
## Discussion

A variety of oral mucosal lesions require definitive histopathological diagnosis before appropriate therapy, and inflammatory papillary hyperplasia is one of them. For obtaining samples either punch or incisional biopsy can be done, but being the number of artifacts more with the incisional, in the present study punch biopsy was carried out. Oral punch biopsy when appropriately used, is fast, simple, inexpensive, and safe method to obtain representative mucosal biopsy specimens from most of the areas of mouth.<sup>[7]</sup>

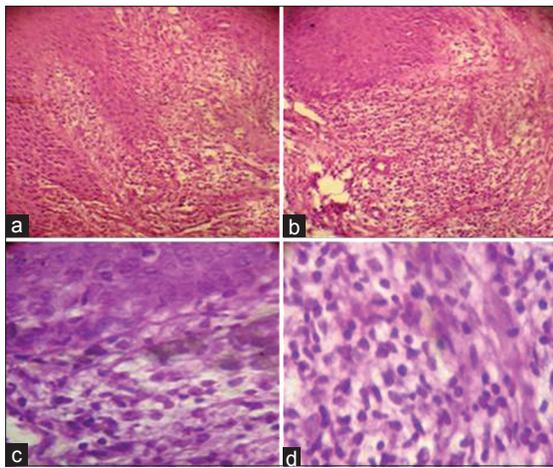
None of the studies<sup>[2-4]</sup> in the literature correlated the denture wear to clinical inflammation but Bhaskar *et al.*<sup>[8]</sup> and Lambson<sup>[1]</sup> suggested that approximately 20% of patients who wear dentures 24 h a day show IPH and the lesion occurs 10 times



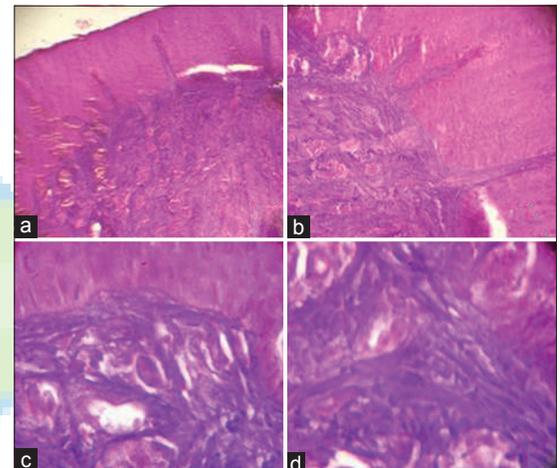
**Figure 1:** (a) Mild inflammatory papillary hyperplasia of palate (IPHP) (b) moderate IPHP (c) severe IPHP (d) punch biopsy



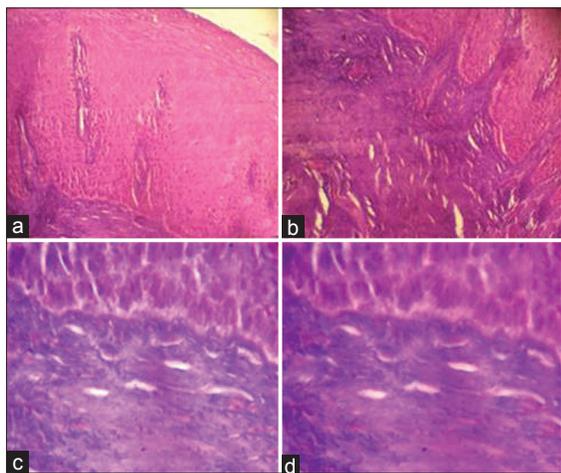
**Figure 2:** (a and b) Group I (pretreatment) showing epithelial hyperplasia (×10), (c and d) Group I (pretreatment) showing subepithelial infiltration of chronic inflammatory cells (×40)



**Figure 3:** (a and b) Group II (pretreatment) showing narrow rete ridges (×10), (c and d) Group II (pretreatment) subepithelial infiltration of chronic inflammatory cells (×40)



**Figure 4:** (a and b) Group I (posttreatment) showing reduced epithelial hyperplasia (×10), (c and d) Group I (posttreatment) showing subepithelial mild to moderate collection of collagen fibrils with few vascular channels (×40)



**Figure 5:** (a and b) Group II (posttreatment) showing shortening of rete ridges, (c and d) Group II (posttreatment) showing subepithelial dense collection of collagen fibrils arranged in bundles (×40)

more frequently in patients who sleep with dentures. On clinical observations, Jones concluded that the factor most likely to be involved in the formation of papillary hyperplasia is a negative pressure.<sup>[9]</sup> The tissues under the ill-famed rubber suction cup are subjected to a negative pressure; a similar condition exists when the “vacuum chamber” is used in the upper denture.

Fisher and Rashid<sup>[10]</sup> has only recommended the removal of denture as a mode of therapy whereas Bhaskar *et al.*<sup>[8]</sup> have suggested electrocauterization, cryotherapy and surgical removal of lesion. Tissue recovery, i.e., the return of traumatized and deformed soft-tissues to their normal form and health, can be observed when ill-fitting dentures are removed from the mouth for a period of time. The length of time required for recovery varies with the individual patient. In the absence of extremely abused tissue and favorable systemic factors, 48-72 h (1 week end) is enough time for the tissues to return to a satisfactory condition for impressions.<sup>[5,8,11-16]</sup>

**Table 1: Clinical grading of IPHP based on duration of denture wear and denture hygiene**

	Clinical grading of IPHP (inflamed (%))			P value
	Slightly	Moderately	Severely	
Denture evaluation	9 (18)	29 (58)	12 (24)	0.010*
Wears dentures 24 h	4 (12.5)	17 (53)	11 (34.5)	
Wears denture during working hours	9 (50)	7 (39)	2 (11)	
Denture hygiene				
Good	5 (55.6)	4 (44.4)	0	0.351
Fair	7 (39)	9 (50)	2 (11)	
Poor	5 (22)	14 (61)	4 (17)	

\*Significant ( $P \leq 0.05$ ). IPHP: Inflammatory papillary hyperplasia of palate

**Table 2: Comparison of clinical grading by two treatment methods in both study groups**

Study groups	Clinical grading (%)				P value
	Zero	Slightly inflamed	Moderately inflamed	Severely inflamed	
Group I					
Pre	0	7 (35.0)	10 (50.0)	3 (15.0)	0.007*
Post	7 (35.0)	9 (45.0)	3 (15.0)	1 (5.0)	
Group II					
Pre	0	3 (20.0)	9 (60.0)	3 (20.0)	0.006*
Post	5 (33.3)	7 (46.7)	3 (20.0)	0	

\*Significant ( $P \leq 0.05$ )

**Table 3: Comparison of histopathological features in patients with Group I and Group II**

Biopsy	Histopathological features	Mean±SD		P value
		Group I	Group II	
Pre	Epithelial hyperplasia	1.20±0.410	1.29±0.469	0.576
	Inflammation	1.75±0.550	1.86±0.663	0.611
	Fibrosis	1.05±0.224	1.07±1.267	0.801
Post	Epithelial hyperplasia	1.50±0.513	1.07±0.267	0.007*
	Inflammation	1.05±0.224	1.07±0.267	0.801
	Fibrosis	1.05±0.224	1.43±0.514	0.006*

SD: Standard deviations

The tissue-conditioning resins are very effective in that the resin remains relatively plastic and continues to flow under pressure. In this way, the resin distributes applied stresses evenly while maintaining intimate contact with the underlying mucosa as sloughing and healing of tissue occurs. When the tissue-conditioning resin is used instead of the zinc oxide dressing, healing time is accelerated by 3 or 4 days, but the superiority of the resins lies in the fact that they are more comfortable for the patient and permit them to wear the modified denture during the entire healing interval.

According to Kawano *et al.*<sup>[17]</sup> and Graham *et al.*<sup>[18]</sup> the tissue conditioner provides more effective result because of better compressibility and absorbs more of occlusal stresses that are transmitted to the liner and more effectively “cushions” the recovering supporting tissues.<sup>[19]</sup> Abdel Razek<sup>[18]</sup> used Coe-comfort as a tissue conditioner because it is soft, flexible, pliable and allows the bruised and distorted soft-tissues to return to their normal size and shape. It also reduced inflammation and swelling. Douglas and Walker supporting Abdel Razek reported that tissue conditioning materials like Coe-comfort exhibit some fungicidal properties for a limited time and also contains bactericidal and fungicidal agents to retard the growth of bacteria. The powder in this resin is a “methyl methacrylate” combined with inert fillers and the liquid contains alcohol solvents and a plasticizer.<sup>[18,20]</sup> In the present study, Coe-Comfort tissue conditioner was used as it gives better results in decreasing squamous epithelium hyperplasia, and increase in fibrosis which indicates healing and recovery of abused tissues.<sup>[19,21]</sup>

The denture hygiene was classified as good, fair, and poor. When the denture hygiene was correlated to the clinical inflammatory grading, there was no significant difference observed, but Budtz-Jorgensen<sup>[6]</sup> in his study found a pronounced statistical significant difference between poor denture cleanliness and heavy inflammation. The probable reason being, the subjects he studied were of denture stomatitis that is caused mainly by *Candida albicans*. Whereas, this study is on the localized IPHP caused negative pressure by suction cups alone without showing a generalized denture stomatitis or papillary hyperplasia involving the entire palate.

On comparison of pre- and post-clinical grading by two different treatment methods, there was decrease in inflammation grading in decreasing order in Group I and II patients. There was statistically significant difference in both pre- and post-clinical grading suggesting that the removal of irritants caused decrease in inflammation and increase in healing.

In the present study, the histopathological effect was based on the three features namely-squamous epithelium hyperplasia (increase or decrease in the length of rete ridges, acanthosis, keratinization), inflammation (sub-epithelial infiltration of inflammatory cells) and fibrosis (replacement of inflammatory cells by collagen fiber bundles) which is a clear indicator of healing that is taking place. On comparison of pre- and post-treatment histological features in Group I and II, the results showed a statistically significant difference between the groups for squamous epithelium and fibrosis. There was no significant difference in inflammation when both groups were compared posttreatment. In both study groups, the inflammation decreased significantly suggesting both groups are effective methods to bring down the inflammation however, healing by collagen deposition was higher in group II patients, in which tissue conditioner was applied.

## Conclusion

From the results obtained and within the limitations of the study, it can be concluded that wearing dentures day and night considerably increases the severity of inflammatory papillary hyperplasia. Denture hygiene was not as significant a factor in severity of inflammatory papillary hyperplasia when compared to wearing the dentures 24 h a day. Inflammation caused by suction cup decreased considerably by both the methods, i.e., the use of tissue conditioner as well as discontinuation of denture (tissue rest) for a period of 2 weeks, but healing was better when tissue conditioner was used, when compared with tissue rest.

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