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Association of Gingival Biotypes and Retraction Method Used on Quality of Two Stage Putty Impressions- A Retrospective Study

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ABSTRACT

Objective: The present study assessed the influence of gingival biotypes and retraction methods on the quality of two stage putty impressions.

Methodology: A total of 518 documented and completed FPD cases were selected for assessment of gingival biotype, retraction cords used and degree of flash achieved in master impression. The prevalence of gingival biotype and its association with the combination of cords used and the quality of two-stage putty impressions obtained was evaluated using descriptive statistics.

Results: A statistical significant correlation ($p=0.024$) was found between the gingival biotypes and quality of the master impression (function of degree of flash). A 360° flash was significantly higher in the scalloped and thin gingival type (55% cases). A significant correlation between the biotype and the combination of retraction cord used ($p<0.05$).

Conclusion: Based on our study, use of 00+1 or 000+1 gingival retraction cords is advised for thin gingival biotypes which in turn would help in achieving a greater quality of impression and preserve the periodontal attachment for survival of the prosthesis.

Keywords: *retraction cords, impression, gingival biotype, flash*

INTRODUCTION

The accurate transfer of the surface geometry that receives a prosthetic restoration is crucial for achieving clinical success. This is especially true for Fixed Dental Prostheses, where the marginal adaptation of the prosthesis and the periodontium are closely linked.(1)(2) It is crucial to achieve accurate recording of the

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prepared tooth surface, while simultaneously ensuring the preservation of periodontal health. Although supra-gingival and equi-gingival margins are effective in maintaining periodontal health, they may not always deliver optimal aesthetics.(3)(4). In some cases, such as when there is a need for increased retention, the presence of root caries, refinement of margins, cervical abrasion, or when aesthetics are of utmost importance, sub-gingival placement of the restoration margin may be necessary. However, it is important to balance the need for accurate recording of the prepared tooth surface with the maintenance of periodontal health. While supra-gingival or equi-gingival margins may help to promote periodontal health, they may not provide the most optimal aesthetic results.(5)(6)

In these circumstances, adjacent gingival tissues must be displaced and gingival fluid seepage and hemorrhage should be controlled to ensure acceptable impressions(7)(8)

As a dental professional, obtaining an accurate impression is crucial for delivering high-quality restorations, especially for fixed dental prosthesis. The displacement of gingival tissues to expose the finish lines of the tooth preparations is essential to achieve accurate impressions(9,10).One of the critical components of a well-made impression is obtaining adequate marginal flash, which refers to the amount of impression material that captures the tooth beyond the preparation margin. This extra material is crucial for the dental practitioner and the technician when fabricating the final prosthesis. The marginal fit of the prosthesis significantly influences the periodontal conditions post-restoration, which is closely related to the quality of the impression(11)(12).

To obtain accurate impressions for fixed dental prosthesis, it is necessary to displace gingival tissues to expose the finish lines of the tooth preparations. Gingival retraction is a crucial step in this process. It is recommended to use a gingival retraction cord or paste to displace the gingiva and increase the sulcular width prior to taking the impression(13).Impressions taken with inadequate sulcular width may result in higher incidences of voids, tearing of impression materials, and reduction in marginal accuracy. Therefore, it is essential to ensure adequate gingival retraction before taking impressions to achieve accurate and well-fitting restorations.(14). Retraction techniques available include mechanical, mechanico-chemical, electro-surgical and rotary or gingitage(15). The most common among these are mechanical or mechanochemical methods that use displacement cords alone or with hemostatic agents.(16)(17).

The classification of gingival biotypes into "scalloped and thin" and "flat and thick" was first described by Oschsenbien and Ross in 1969. It is important to evaluate the gingival biotype before choosing a displacement technique.(18). The biotype of the gingiva governs the response of tissue to inflammation and trauma. Hence, before attempting to perform gingival displacement using retraction cords, it is paramount to assess the gingival biotype of the teeth involved in impression making.(19)

Currently there is no literature available linking the 3 parameters included- gingival biotype, retraction cord used and quality of impression obtained. Hence the aim of this retrospective study is to access the influence of gingival biotype and the retraction cords used on the quality of two- stage putty impressions. Our team has extensive knowledge and research experience that has translate into high quality publications(20–29)(30–35)

METHODS AND MATERIALS

Study Setting

The current retrospective research was based in Chennai, India under a university setup in Saveetha Dental College.The ethical approval was provided by the Institutional Ethics Committee of the Saveetha University [SDC /SIHEC /2020 /DIAS-DATA /0876-0233]. The study included a single reviewer, two assessor and single guide.

Study Design

The study was formulated to incorporate data of patients of all age groups who had undergone and were undergoing treatment for fixed partial

dentures in Saveetha Dental College and Hospitals, Chennai, India and passed the inclusion and exclusion criteria.(see Figure-1)

Sampling Technique

The study utilized a non-probability consecutive simple random sampling method, in which all case sheets of patients receiving treatment for fixed partial denture and meeting the inclusion criteria were reviewed and included to minimize sampling bias. The internal and external validity of the sample was ensured by selecting all the samples based on a simple random sample.

Data Collection and Tabulation

The collection of data was done using the online patient database starting from 1st May 2019 till 20th October 2020. About 1623 case sheets were reviewed among which 518 where chosen according to the inclusion criteria.The gingival biotype from the collected case sheets were then classified under the Ochsenbein and Ross as: Scalloped and thin; Flat and thick by the use of UNC-15 probe. The mode of gingival retraction used was evaluated and categorized as: 00+1,000+1 and 0+2. Subsequently the quality of impression was also assessed by two independent reviewers with kappa coefficient value of 0.86. Based on the degree of extent of flash, it was classified into: complete 360 degree flash, >180 degree flash, <180 degree flash and no flash. Data was imported and tabulated in excel sheet. The data was cross-verified for errors, and measures were taken to minimize sampling bias.

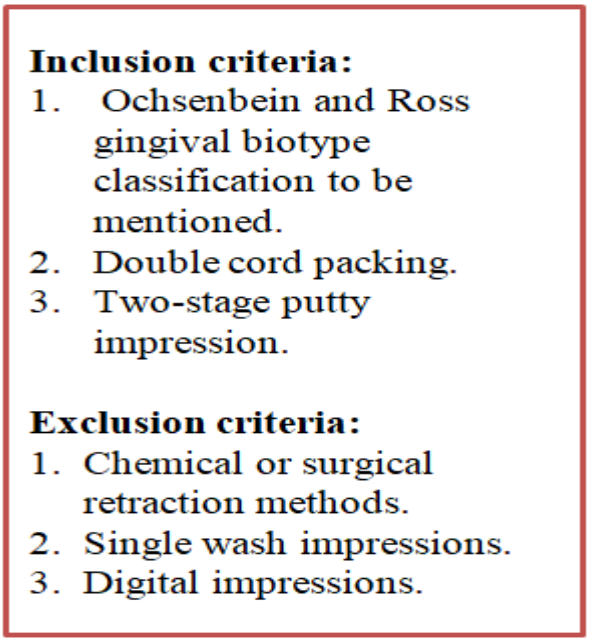

FIGURE 1: Inclusion and exclusion criteria for patient selection

Statistical Analysis

Descriptive statistics was employed to assess the prevalence of gingival biotype and its correlation with the combination of cords used and the quality of two-stage putty impressions obtained. To determine the significance of the variables, a Chi-Square test was conducted, and the p-value was calculated using IBM SPSS Software version 23.0. The findings were presented in the form of tables and graphs.

RESULTS

The study comprised 55% males and 45% females. The results showed that 64% of the participants had a scalloped and thin gingival biotype, while 36% had a thick gingival biotype.

The tabulated data revealed no significant association between gender and gingival biotype (p>0.05).

Use of combination of 00+1 cords was most prevalent (52.3%) followed by 000+1 (37.6%) and 0+2 (10.7%).[Figure 3]There was significantly higher usage of 00+1 combination in Scalloped and thin biotype p= 0.001 [Figure 4 and Table 2]

Out of 518 impressions assessed 268 showed a complete 360 degree flash i.e. 52% of the population.[Figure 2] There was a significant association between the gingival-biotype and the quality of impression obtained (p=0.024), with a complete 360 degree flash achieved in 55.2% of cases with scalloped and thin gingiva as compared to 45.5 % of cases with flat and thick type.[Figure 5 and Table 1]

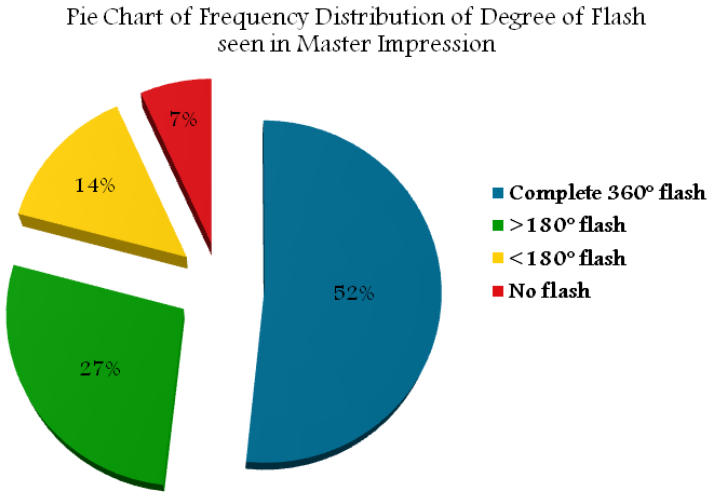

FIGURE 2: Pie chart of frequency distribution of quality of impression

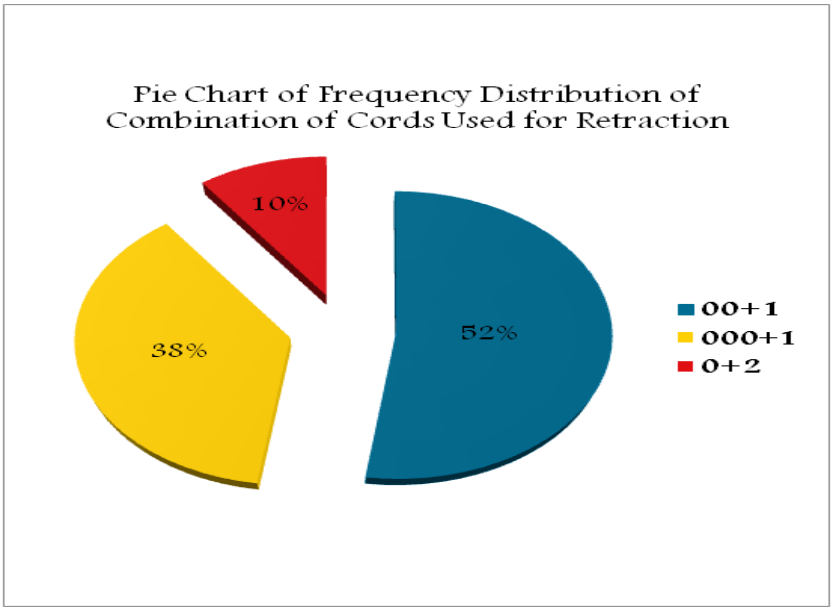

FIGURE 3: Pie chart of combination of retraction cord used overall.

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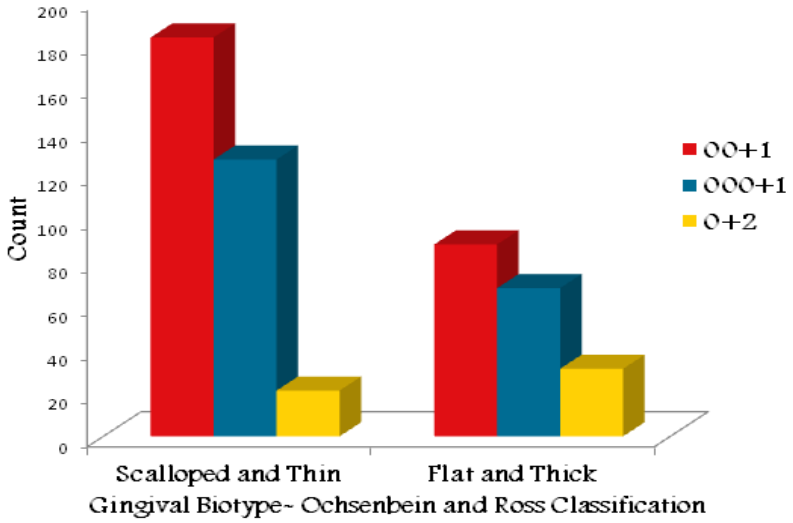

FIGURE 4: Clustered bar graph depicting association between gingival biotype and combination of retraction cord used

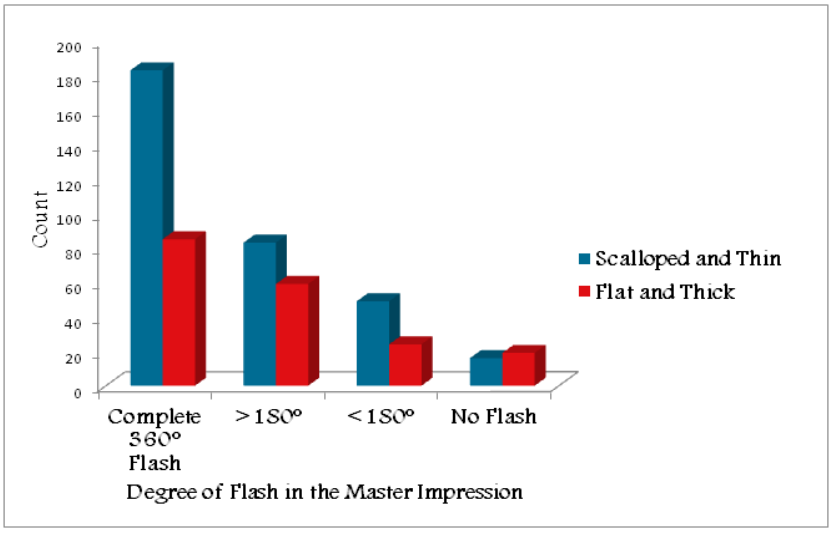

FIGURE 5: Clustered bar graph depicting association between gingival biotype and quality of master impression

TABLE 1

Chi-Square Tests Correlating the Quality of Impression with the Gingival Biotype			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.407a	3	.024
Likelihood Ratio	9.188	3	.027
Linear-by-Linear Association	4.698	1	.030
N of Valid Cases	518		

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TABLE 2

Chi-Square Tests for Correlation of Combination of Cords Used and Gingival Biotype			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.139a	2	.001
Likelihood Ratio	13.527	2	.001
Linear-by-Linear Association	9.138	1	.003
N of Valid Cases	518		

DISCUSSION

The idea that gingival biotype can affect diagnosis and treatment in prosthodontics is not a new concept. The type of biotype can indeed alter our treatment decisions, as the expected tissue response may differ from that of a thicker biotype. It is important to consider this before beginning any restorative therapy(36). Scalloped and thin biotype was more prevalent in the current study population(64%). There was not a statistically significant association between the prevalent biotype and gender. These results contradicted previous investigations where a thin biotype was mostly associated with females (37,38). But a study by Shah et al 2015 showed no association of biotype and age and gender(39).

Gingival displacement is the process of stretching the gingival border away from the prepared tooth surface, allowing enough two dimensional space (vertical and horizontal) to inject enough impression material(10,40). Gingival retraction can be mainly classified under mechanical, chemical, surgical or a combination of aforementioned. In the current study double cord packing was used as retraction method. Using the dual cord technique can reduce the likelihood of gingival cuff recoil and partial displacement of the impression material, as the first cord remains in the sulcus. A survey of 696 dentists revealed that 92% used gingival displacement cords, while 20.2% used a soft tissue laser and 32% used electrosurgery as an adjunct(41). In the current study, use of a combination of 00+1 cords was most prevalent (52.3%) followed by 000+1 and 0+2. There was no significant difference seen between different cords used and quality of impression in the current study, which was similar to the findings of many authors (42,43).

One of the most difficult procedures in dentistry is obtaining an optimum impression for fixed dental prostheses(44). The creation of an indirect restoration involves several stages, but it is crucial to ensure that the impression is of good quality to produce a high-quality restoration(45). In the current study, among 518 impressions 52% were of good quality according to the reviewers. Winstanley et al conducted a multi-laboratory study and found that only 57% of the impressions resulted in satisfactory restorations, which is consistent with our study's findings. The main reason for defects in the working impressions was imprecise recording of the preparation margins(46). A similar study by Albashaireh et al deemed 50% of the impressions as unsatisfactory/ unusable(47) while a study by Samet et al in 2005 stated that 89% among the impressions assessed revealed at least one detectable error(48).There was a statistically significant relation in between the quality of the impression and gingival biotype($p=0.024$) with a complete 360 degree flash achieved in 55.2% of cases with scalloped and thin gingiva as compared to 45.5 % of cases with flat and thick type. This can be attributed to the fact that proper gingival retraction techniques were used which helped achieve a good Impression even though no significant association was found between the retraction cords used and quality of impression.

The findings of our study need to be validated through larger studies that involve a diverse population. Future research can explore the development of a more adaptable classification system that includes the pressure exerted by the cord and tissue retraction of the gingiva, which could be linked to the selection of the retraction method. This could also facilitate the creation of

a protocol that uses standardized techniques for retraction based on gingival biotypes.

Inclusion of a limited number of cases can be attributed to the study setting. As it is an institutional study, operator and protocol bias can be seen. The clinical scenarios when impressions were made in our retrospective research were not the same as various operators and different clinical conditions were involved.

CONCLUSION

Based on our study, we advise use of smaller cords for gingival displacement of Scalloped and thin biotypes i.e. 00+1 and 000+1 as the tissue is more prone to recession and aesthetic failure. The results of our study demonstrate that with the use of an appropriate retraction method, a 360-degree flash can be achieved even in unfavorable thin gingival biotypes, as indicated by our findings. This not only minimizes trauma but also enables us to create an emergence profile for the restoration that promotes gingival health.

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