PREVALENCE AND CHOICE OF COMBINATION OF CORDS USED FOR DOUBLE CORD TECHNIQUE IN GINGIVAL RETRACTION BY DENTAL STUDENTS - A RETROSPECTIVE STUDY

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ABSTRACT:

The quality and accuracy of final impressions play a vital role in successful prosthetic rehabilitation. And hence, an adequate understanding and knowledge of the relationship between periodontal tissues and prosthetic dentistry is of utmost importance to ensure adequate form, function, esthetics, and comfort of the dentition. Before final impressions, preparation of an ideal environment is of paramount importance. The quality and stability of the recorded soft tissues must be preserved during the intracrevicular placement of crown margins which are required for esthetic profile and the impression phase. For this reason, the gingival displacement must be carried out carefully and without any trauma or discomfort to the patient. This study determines the preference and choice combination of cords for double cord technique in gingival retraction by the dental students and also its sextant-wise distribution. A total of 780 sample sheets were assessed retrospectively. Prevalence of 00 + 1 combination of cords was found in 48.33% by the dental students. In both Males and Females, 00+1 was most prevalent. 0+2 is least prevalent. Chi Square test [(Pearson's Chi-square value: 7.864, df : 2, p-value: 0.020 (p>0.005)] was done showing no association of choice of combinations of cords and gender. In all sextants, 00+1 was most prevalent. 0+2 is least prevalent. Chi Square test [(Pearson's Chi-square value: 20.882, df: 12, p-value: 0.052 (p>0.005)] was done showing no association of choice of combinations of cords and sextant. It was also inferred that maximum fixed partial dentures are required in sextant 2 which suggests the prevalence of edentulism in it. 0+2 combination was mostly used in sextant 2.

KEYWORDS: Accuracy; final impression; gingival retraction; retraction cords

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INTRODUCTION:
The success of all the prosthodontic procedures not only depends on the impression taking step, but also involves the preprosthetic phase (like conditioning and health of the soft tissues, tooth preparation, type of provisional restorations). Accurate final impression of the prepared teeth is of extreme importance for long term clinical outcome of fixed prosthetic restorations. One of the problems appearing in the process of the impression making is the recording of marginal details. A number of materials and methods have been mentioned and used in the literature for the retraction of gingival tissue.

Clinically, gingival retraction finds wide applications in dentistry; in fixed prosthodontics to expose subgingival finish line of crown margins (1), in restorative dentistry for management of cervical abrasion, root caries, and root sensitivity and more recently in the field of implant dentistry to record an accurate impression and to enhance the marginal fit of the implant prosthesis(1,2).

A good quality impression is influenced by location of finish lines, periodontal health and sulcus bleeding during impression making (1–3),(4). Impression techniques in prosthetic dentistry require displacement of gingival tissues to expose the subgingival finish lines on tooth preparations for which gingival cords are most commonly used. Not only is exposure of the gingival margin important, but it is essential to have adequate horizontal and vertical gingival displacement to provide a bulk of impression material at the margin to prevent its tearing upon removal of the impression(5).

Gingival retraction should be mandatory prior to impression so as to expose the prepared tooth surfaces (5,6). Impressions with less sulcular width have higher incidences of voids, tearing of impression materials, and reduction in marginal accuracy (7,8).

According to a 1985 survey, 95% of North American dentists routinely used gingival retraction cords (9). There are approximately 125 gingival retraction cords in various shapes, sizes and medications available in the market. Gennaro (10) studied the histological responses among humans to plain cord and cord impregnated with potassium sulfate, hemodent and 8% racemic epinephrine and concluded that there was no practical difference between the cords.

According to Benson, (11) gingival retraction measures fall into one of the four categories 1) mechanical methods, 2)mechanico-chemical methods, 3) rotary gingival curettage (gingititage), and 4) electrosurgical methods. Of these, the chemico- mechanical method of gingival retraction is the most widely used method (9). In this study , experimental gingival cords of Ultrapak™ company are used.

Previously numerous clinical trials (12), (13), (14), systematic reviews (15, 16), (16,17), reviews (18,19,20), in vitro studies (21, 22), case reports (22,23), (23,24) and surveys (25), (25,26) have been conducted in Saveetha dental college over the past 5- 10 years . Now, we are carrying out many such researches with our huge university database.The aim of this study is to determine the preference and combination of choice among dental students for double cord technique in gingival retraction.

MATERIALS AND METHODS:

Study Setting:

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

Study Design:
The study was designed to include all dental patients of the age groups who are undergoing treatment for fixed partial denture. The patients who did not fall into these inclusion criteria were excluded.

**Sampling Technique:**

The study was based on a non probability consecutive simple random sampling method. To minimise sampling bias, all case sheets of patients who are undergoing treatment for fixed partial denture were reviewed and included. For this study, Ultrapak™ Company cords were used which had sizes ranging from 000(thinnest) to 3(thickest) that can be used as single or in combinations (Figure 1). The internal and external validity of the sample selected and all the samples are selected based on a simple random sample.

**Data Collection and Tabulation:**

Data Collection was done using the patient database with the timeframe work 01 June 2019 and 31 march 2020. About 780 case sheets were reviewed and those fitting under the inclusion criteria were included. Cross verification of data for errors and measures are taken to minimise sampling bias all data were included. The inclusion criteria was all the patients who are undergoing fixed partial denture. The exclusion criteria were patients with systemic disorders. Data was downloaded from DIAS and imported to Excel, Tabulation was done. The values were tabulated and analysed.

**Statistical Analysis:**

Descriptive statistics was used to evaluate the prevalence of choice of combinations of cords used by dental students, its association with gender and sextant wise distribution. Chi-Square test was performed and the p value was determined to evaluate the significance of the variables it was used to evaluate. The association between gender, sextant wise distribution and combinations of cords used were evaluated and statistics were carried using SPSS Software version 23.0 by IBM. The results were obtained in the form of graphs and tables.

**RESULTS AND DISCUSSION:**

Retrospective analysis of the preference and combination of choice for double cord technique in gingival retraction by dental students was done. A total of 780 sheets were analysed and data for which was extracted from the university database.

The maximum combination of cords used was 00+1 around 48.33%, (Table 1) represents the data extracted about the various different combinations of cords used by dental students.

In the graphical representation (Figure 2), it was observed that the most prevalent combination of cords used was 00+1 that is about 48.3% followed by 38.08% of the students using a 000+1 combination and 0+2 combination was least used.

In this retrospective study, the choice of combination of cord used and its association with gender was assessed with cross tabulation (Table 2). The choice of combination of cords according to gender shows prevalence of 030+1 combination in about 46.2% in females and 50% in males followed by 000+1 about 43% in females and 34.2% and least was the 0+2 combination (Figure 3).
The sextant wise distribution of choice of various combinations of cords would give us an overall idea as to how the tissue is present in every sextant and its response towards gingival displacement during cord packing and thus it was analysed retrospectively (Table 3).

Graphical representation (Figure 4) depicts the sextant-wise distribution. It was observed that in sextant wise distribution, 00 + 1 was the most preferred combination about 48.3%. It was also inferred that maximum number of cords were used for sextant 2. This brings us to the conclusion that more fixed partial dentures are required in sextant 2 which suggests the prevalence of maximum edentulism in it. Also, 0+2 combination was mostly commonly used in sextant 2.

The recording of accurate impressions being mandatory for proper fit of prosthesis, the impression materials should readily flow into the minute details of the cavity preparations and accurately prepared grooves, pinholes, and cervical finish line details. For that reason, proper exposure of finish lines is necessary.

For obtaining atraumatic gingival displacement, great importance should be given to the choice of products and the technique. Among the different techniques proposed in the literature, the retraction cord procedure seems to be less traumatic when compared to electrosurgery (27) or rotative gingival curettage (28) and lowers the risk of gingival recessions caused by the impression.

The retraction cord technique, used at the University of Geneva since the early 1980s, has demonstrated its reliability and allows the operator to control all the parameters in many clinical situations (29). Retraction cords were developed for application around natural teeth where the junctional epithelium is robust. In a study by (30) chemical adjuncts included in the cord may lead to inflammation of the sub sulcular tissues.

Gingival sulcus can be enlarged by placing a cord into the sulcus and leaving it in place for a considerable period of time. The cords provide more effective control of gingival hemorrhage when used in conjugation with medicaments than when used with no medicaments.

For the chemo-mechanical retraction epinephrine impregnated cords were used as they can be expected to better reduce sulcus bleeding than adstringent containing cords(31,32).The use of a single retraction cord often provides inadequate gingival retraction. The dual cord technique in which the first cord remains in the sulcus reduces the tendency for the gingival cuff to recoil and partially displace the setting impression material.

Results from the study included samples which had undergone double cord technique for gingival retraction with various different combinations of cords. Undertaking what is a considerable combination of cords used for gingival retraction, 47.92 % of dental students preferred the 00 +1 combination of cords for gingival retraction.

While assessing sextant wise distribution, 00 + 1 was the most preferred combination. It was also inferred that maximum FDP’s are required in sextant 2 which suggests the prevalence of edentulism in it. 0+2 combination was mostly used in sextant 2.

Limitation of this study is that it has been done in an institutional setting, hence the sample size is limited. As it is an institutional study, operator bias and protocol bias can be seen.

CONCLUSION:

Within the limitation of the study, we concluded the most prevalent choice of combination of cords in double cord technique in gingival retraction by dental students was 00 +1 combination, followed by 000+1 combination and
least was 0+2 combination. For sextant wise distribution, 00 + 1 was the most preferred combination. Sextant 2 showed maximum edentulism, and that 0 + 2 combination of cords was mostly used for it.

REFERENCES:


Figure 1: Commonly used cords ranging from sizes 000, 00, 0, 1, 2 and 3 from which size 000 being the thinnest and 3 being the thickest. These cords are generally either used as single or in combinations of a thin chord followed by a thick chord (Image courtesy: Ultradent Products, Inc.).
TABLE 1: Frequency distribution of various combinations of cords and the number of students using it. It shows distribution of prevalence of use of 00+1 combination in 48.3% , followed by 000+1 in 38.2%% and least 0+2 combination in 13.6%. The maximum choice of combination of cords used was 00 +1.

<table>
<thead>
<tr>
<th>COMBINATION OF CORDS</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 0+2</td>
<td>106</td>
<td>13.6</td>
</tr>
<tr>
<td>2) 00+1</td>
<td>377</td>
<td>48.3</td>
</tr>
<tr>
<td>3) 000+1</td>
<td>297</td>
<td>38.1</td>
</tr>
<tr>
<td>Total</td>
<td>780</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 2: Bar graph depicts various choices of combinations of cords used in gingival retraction. X-axis represents combination of cords, Y axis represents number of students using it. The graph shows prevalence of 00+1 combination in 48.33%, followed by 000+1 combination in 38.08% and least 0+2 combination in 13.59%.
Table 2: Frequency distribution of choice of combination of cords according to gender which shows prevalence of 00+1 of about 46.2% in females and 50% in males followed by 000+1 about 43% in females and 34.2% and least was the 0+2 combination. The maximum choice of combination of cords used in both men and women was 00 + 1.

<table>
<thead>
<tr>
<th>Gender *</th>
<th>Combo Cross tabulation</th>
<th>Chi Square Test &amp; Cross tabulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% within Gender</td>
<td>Combination of Cords</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0+2</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>10.8%</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>15.8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>13.6%</td>
</tr>
</tbody>
</table>

The Pearson's Chi-square Test showed that chi square value = 7.864, and that p value obtained during correlation of gender with choice of combination of cords is 0.020 (p>0.05) respectively, thus making no correlation of gender and choice of combination of cords making them statistically insignificant.

Figure 3: Bar graph depicting choice of combinations of cords in gingival retraction. X-axis represents gender, Y axis represents prevalent combinations of cords. In both Males and Females, 00+1 (green) was most prevalent. 0+2 (blue) is least prevalent. Chi Square test [(Pearson's Chi-square value: 7.864, df : 2, p-value: 0.020(p>0.005)]
was done showing no association of choice of combinations of cords and gender making them statistically insignificant.

Table3: Frequency distribution of choice of combinations of cords in various sextant shows prevalence of 00+1 combination in all sextants about 48.3% followed by 000+1 combination in 38.1% and least was 0+2 combination in 13.6%. Maximum use of all combinations of cords was observed in sextant 2 about 37.3% which also signifies maximum edentulism in sextant 2.

<table>
<thead>
<tr>
<th>Combination</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%within Combo</td>
<td>9.4%</td>
<td>47.2%</td>
<td>17.0%</td>
<td>8.5%</td>
<td>3.8%</td>
<td>14.2%</td>
<td>100%</td>
</tr>
<tr>
<td>%within sextant</td>
<td>12.2%</td>
<td>17.2%</td>
<td>18.0%</td>
<td>9.4%</td>
<td>4.0%</td>
<td>13.9%</td>
<td>13.6%</td>
</tr>
<tr>
<td>00+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%within Combo</td>
<td>11.9%</td>
<td>36.3%</td>
<td>11.4%</td>
<td>13.0%</td>
<td>13.0%</td>
<td>14.3%</td>
<td>100%</td>
</tr>
<tr>
<td>%within sextant</td>
<td>54.9%</td>
<td>47.1%</td>
<td>43.0%</td>
<td>51.0%</td>
<td>48.5%</td>
<td>50.0%</td>
<td>48.3%</td>
</tr>
<tr>
<td>000+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%within Combo</td>
<td>0.7%</td>
<td>9.1%</td>
<td>35.0%</td>
<td>13.1%</td>
<td>12.8%</td>
<td>16.2%</td>
<td>13.1%</td>
</tr>
<tr>
<td>%within sextant</td>
<td>100%</td>
<td>32.9%</td>
<td>35.7%</td>
<td>39.0%</td>
<td>39.6%</td>
<td>47.5%</td>
<td>36.1%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%within Combo</td>
<td>0.3%</td>
<td>10.5%</td>
<td>37.3%</td>
<td>12.8%</td>
<td>12.3%</td>
<td>12.9%</td>
<td>13.8%</td>
</tr>
</tbody>
</table>

The Pearson's Chi-square Test showed that chi square value = 20.882, and that p value obtained during correlation of sextant with choice of combination of cords is 0.052 (p>0.05) respectively, thus making no correlation of sextant and choice of combination of cords making them statistically insignificant.
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