

EVALUATION OF DIFFERENT INTRAOPERATIVE PATIENT PREFERENCE FACTORS ON SUB-GINGIVAL CLAMPS VERSUS RETRACTION CORD PLACEMENT IN NON-CARIOUS CERVICAL LESIONS

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(Received, 15th August 2023, Revised 05th November 2023, Published 2nd December 2023)

Abstract: *This study aimed to compare two gingival displacement and isolation techniques: rubber dam with sub-gingival clamps and retraction cord with cotton rolls. The study also assessed the factors influencing patients' preference for one method, including the need for anesthesia, gingival bleeding, gingival laceration, post-operative spontaneous sensitivity, and time consumption. The study was conducted as a randomized control trial with 34 patients, each with one pair of comparable non-carious cervical lesions (NCCL) on opposing sides of the same arch. A total of 68 restorations were placed, with each patient receiving one restoration using a retraction cord with cotton rolls (RC/CR) and the other using a rubber dam (RD) with sub-gingival clamps. Four dentists with at least five years of clinical experience under the supervision of two dental consultants with more than 14 years of clinical experience carried out the procedures to ensure uniformity in technique and assessment. The preferences of the patients were noted, and gingival bleeding, gingival laceration, spontaneous sensitivity, time consumed to apply RD and RC/CR, and the need for anesthesia were recorded immediately after the procedure. Two weeks later, gingival laceration and gingival bleeding were assessed again. Statistical analysis was performed on each criterion evaluated using a t-test, Chi-square test, and Mann-Whitney test with a significance level of $P \leq 0.05$. The results showed statistically significant differences between the RD group and the RC/CR group in terms of patients' preference ($P=0.0000$), post-operative gingival laceration ($P=0.0032$), need for anesthesia ($P=0.0000$), and time of application ($P=0.0000$). 76% of patients preferred rubber dams with sub-gingival clamps. Gingival laceration, discomfort, and increased time of application were recorded in the RC/CR group. Spontaneous sensitivity reported by patients post-operatively ($P=0.7204$), gingival tissue laceration assessed after two weeks ($P=1.0000$), and gingival bleeding assessed immediately ($P=0.6891$) and in follow-up visits ($P=1.0000$) were insignificant in both groups. In conclusion, patients preferred rubber dam with sub-gingival clamps due to more comfort, lesser gingival tissue injury, and lesser time of application.*

Keywords: Cervical Lesion, Rubber Dam, Gingival Health, Retraction Cord, Patients' Preference, Sub-Gingival Clamp, Technique Sensitivity

Introduction

Non-carious Cervical Lesions (NCCLs), which cause the loss of hard tissue from the cervical regions of teeth, result from processes unrelated to caries. NCCLs are a frequent pathology brought on by dietary and lifestyle changes. It is commonly acknowledged that various factors interact to produce these lesions. These include erosion, abrasion, abstraction, excessive tooth brushing in the horizontal direction, and consuming acidic drinks and foods (Goodacre et al., 2023; Peumans et al., 2020). Also, with age, cervical wear is more common and more severe (Peumans et al., 2020). As a result, demineralization occurs, creating a wedge-shaped depression that advances in length and depth or as rounded saucer-shaped depressions with smooth surfaces. These depressions and indentations not only raise aesthetic concerns for patients but also cause dentin hypersensitivity, due to which patients seek treatment (Faraoni). Dentin hypersensitivity manifests as sharp pain due to the flow of fluids in open dentinal tubules exposed to the oral environment in response to non-noxious stimuli (Faraoni; Veitz-Keenan et al., 2019). In some cases, it can affect people's quality of life (Veitz-Keenan et al., 2019). Management of NCCLs includes restorative treatment, gingival grafts, and periodontal surgeries.⁴ For restorative

treatment, poly acid- resin-based composite filling material and resin-modified glass ionomer cements are among newer generations of adhesive restorative materials used to treat NCCLs (Veitz-Keenan et al., 2019). The longevity of these adhesive restorative materials depends on technique, application of material, extent of isolation, and moisture control (Veitz-Keenan et al., 2019).

Achieving isolation, visual clarity, clean surfaces, and access to surfaces of teeth is crucial to ensure the bonding of restorative materials to treat NCCLs. Gingival displacement (GD) methods fall into three categories: chemical-mechanical, surgical, and mechanical. The surgical methods can also be divided into electro-surgery and rotary curettage.

Two techniques widely used to achieve GD are rubber dam (RD) with dental clamps and retraction cords with cotton rolls (RC/CR). Both of these techniques not only help to achieve isolation but also retract gingival tissue so that the dentist

can easily approach NCCLs, which are usually located on the cervical region of the crown of the tooth, sometimes crossing cemento-enamel junction, which is in close proximity to the gingival margin (Favetti et al., 2021). Rubber dam also prevents swallowing of liquids/materials

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and damage to other tissues from instruments used during treatment (Wong et al., 2021).

The rubber dam kit includes a rubber dam sheet, metal clamps, and a metal frame.

Rubber dam isolation has resulted in much-improved restoration retention (Mahn et al., 2015) but an alarming drawback is gingival recession caused while restoring NCCLs using sub-gingival clamps (Favetti et al., 2021). Application of rubber dam clamps may induce bleeding in unhealthy gingiva (Abuzenada, 2021) and hence increase treatment time. Despite all the benefits indicated, the use of rubber dams in dentistry has not yet been entirely accepted due to a number of obstacles, including patients' acceptance, difficulty in placing rubber dams, time needed for placement, expense of materials and equipment, operator's lack of training, and patient discomfort (Telang et al., 2019). Retraction cords with cotton rolls (RC/CR) are another method employed for gingival displacement. They are thought to be a frequently utilized technique for gingival tissue displacement. They can be knitted, twisted, or braided, and depending on the fabrication, they can also be categorized as impregnated (if they already contain a medication or hemostatic agent) or non-impregnated. Cords absorb blood, gingival crevicular fluid, and medicaments used during the procedure (Gupta et al., 2020). Clinicians typically describe a lengthy placement process, as well as pain, bleeding, and induction of an acute gingival injury. Additionally, packing the cord into the sulcus may result in biological width violation and junctional epithelium injury, which can cause gingival recession, bone resorption, and even infection (Beleidy and Serag Elddien, 2020).

Both methods are technique-sensitive, costly, and time-consuming. They both have their pros and cons. This study aims to focus on patients' preference regarding rubber dam and retraction cord concerning pain, gingival laceration, gingival bleeding, duration of the procedure, healing of gingiva, and post-operative sensitivity to teeth.

Methodology

A study was conducted over six months, from June to November 2022, in the Operative Dentistry Department at Nishtar Institute of Dentistry, Multan. The study design was a split-mouth, randomized control trial that used two gingival tissue displacement techniques as variables. The control group used the retraction cord technique, which is more commonly used for treating non-carious cervical lesions (NCCLs) and is generally more frequently used. The intervention group used a rubber dam with sub-gingival clamps technique. The Ethical Research Committee of Nishtar Institute of Dentistry, Multan, approved the study, and written informed consent was obtained from all participants after the study's objectives were explained and confidentiality was ensured.

The study involved six dentists in operative dentistry who screened patients to ensure they fulfilled the eligibility criteria. Four dentists were assessors with over five years of clinical experience, while two were senior consultant dentists with over 14 years of clinical experience. To select each patient, a consensus of at least two dentists was necessary, and in case of ambiguity, a third dentist was called in. Out of 82 patients assessed, 40 were selected for the study.

The inclusion criteria were as follows: patients in the age group of 18 to 35 years with no less than 20 teeth, paired NCCLs of the same size on either side on the same arch without undercuts in anterior teeth, non-carious cervical lesions on gingival or sub-gingival level, teeth with occlusal contacts, vital teeth with NCCLs showing no signs of irreversible pulpitis, healthy gingival and periodontal tissues, thick gingival biotype, no gingival attachment loss, and plaque or calculus deposits, no bleeding on probing, and patients who follow good oral hygiene.

The exclusion criteria were as follows: patients with systemic diseases, compromised immune systems and medical conditions, those who are mentally or physically disabled, patients who are not educated enough to understand and comply, patients who are contraindicated for placement of rubber dam, those with severe bruxism, and those with poor oral hygiene.

Before starting the procedure, the gingival condition of each patient was recorded by assessors under supervision. A periodontal probe was used to evaluate bleeding of the gingiva on probing. Patients were asked about spontaneous sensitivity, and assessors explained the study before giving oral hygiene instructions. The split-mouth technique was used to assess patients' preference for displacement of gingival tissues. The composite restoration was placed on the same day on paired NCCLs in each patient using a retraction cord for one tooth and a rubber dam for the other. The supervisors were in charge of ensuring uniformity and scrutiny of the procedure.

Cotton rolls, suction, and a mouth retractor were used for the control group to ensure moisture control. The gingival tissue was displaced with a retraction cord to treat NCCL with composite restoration. The manufacturer's instructions were followed when applying the retraction cord. Cotton rolls were placed in the patient's vestibule to keep the operating field dry, and suction was used. To help with sub-gingival placement, the cord was applied using a retraction cord applicator slightly angled apically. The retraction cord was left for a minimum of 3 to 8 minutes and then removed to assess bleeding, followed by the placement of the cord again.

A rubber dam was placed with a sub-gingival clamp for the case group. Following the manufacturer's instructions, the rubber dam sheet was applied. After placing and stabilizing the rubber dam sheet, the sub-gingival clamp was advanced cervically with the clamp forceps until the lesion's cervical margins were barely visible. Stabilizing the sub-gingival clamp was essential to prevent unanticipated slipping and injury during the procedure.

After placing both the retraction cord and sub-gingival clamp, patients were asked if they felt comfortable or needed anesthesia to control pain. If the patient answered yes, anesthesia was given, and the procedure of composite restoration was completed. The time for placing the rubber dam and retraction cord was recorded with a stopwatch.

Patients' preferences and gingival conditions were recorded immediately after the procedure. Patients were evaluated clinically again on a follow-up visit after two weeks.

Data was analyzed using SPSS version 26. The score for gingival hemorrhage was used to evaluate bleeding time. The bleeding was then scored from 0 to 2 according to its severity. Score 0 indicated no bleeding occurred on removal, score 1 indicated the bleeding was stopped using

an air and water spray within one minute, and score 2 said bleeding did not stop within 1 minute. Gingival laceration was assessed visually post-operatively and two weeks after the procedure. The need for anesthesia was recorded as yes or no based on patients' needs. Spontaneous sensitivity was recorded as yes or no based on patients' observations post-operatively and two weeks after the procedure. Patients were asked about their preference for one of two techniques post-operatively, and another assessor, using a stopwatch, recorded the time of application.

Results

Forty patients were selected for the split-mouth technique to restore NCCLs using RC/CR and RD. Eighty teeth in total were restored. All 40 patients were assessed pre-operatively and post-operatively. However, 34 patients reported back after two weeks for follow-up. Therefore, data was calculated for 34 patients who came in for follow-up. The participants included 20 males (59%) and 14 females (41%). The average age of patients was 26.88. Table 1 shows the demographic profile of patients based on gender, teeth, and arch selection.

Table 1: Demographic Profile of Patients

Gender	
Males	20 (59%)
Females	14 (41%)
Paired-Teeth selected	
Incisors	Ten pairs
Canines	Seven pairs
Arch	
Maxillary arch	9 pairs
Mandibular arch	8 pairs

Patients were asked about their preferred method of gingival displacement right after the procedure. Twenty-six patients

opted for rubber dam (RD); eight preferred retraction cords and cotton rolls (RC/CR). The chi-square test revealed a significant difference between the two groups, i.e., $p=0.0000$ at $p< 0.05$. Patients favored rubber dams with clamps more.

Regarding the need for anesthesia after placing the metal clamp and retraction cord, 22 patients out of 34 from the RC/CR group asked for anesthesia. In the RD group, five patients asked for anesthesia out of 34. Chi-square test indicated that the difference between the two groups is statistically significant, i.e., $P=0.0000$ at $P<0.05$, making rubber dam and clamps more comfortable for patients to treat NCCLs.

The time for application of both techniques was recorded using the stopwatch. Rubber dam sheet and clamp application took a mean time of 84.05 ± 2.47 seconds. The mean application time for the retraction cord was 121.2 ± 3.85 seconds. Retraction cord application required significantly more time than rubber dam with sub-gingival clamps, according to the Independent student t-test ($P=0.0000$).

Gingival bleeding scores between the RD group (0.88 ± 0.69) and RC/CR group (1 ± 0.79) ($P=0.6891$) were statistically insignificant at $P<0.05$, as shown by the Mann-Whitney test. Patients in both groups reported no gingival bleeding two weeks after the procedure.

Gingival tissue was observed right after the procedure and two weeks after the process for laceration. Gingival laceration for the RD group immediately after the procedure was recorded as statistically significant ($p=0.0032$), as shown by the chi-square test. Gingival laceration was not seen in either group after two weeks of follow-up.

Patients were asked about spontaneous sensitivity after the procedure and in follow-up visits. No significant difference was seen between both groups ($P=0.7204$). Table 2 shows the comparison of both techniques.

Table 2: Comparison of RD and RC/CR on the basis of preference factors

Preference Factors	Retraction cord (n=34) %	Sub-gingival clamp (n=34) %	P-value
Patient satisfaction	8 (23.5%)	26 (76.5%)	0.0000
Need for anesthesia	22 (64.8%)	5 (14.7%)	0.0000
Gingival tissue laceration immediately after the procedure	27 (79.41%)	10 (29.41%)	0.0032
Gingival tissue laceration two weeks after the procedure	0	0	1.0000
Spontaneous sensitivity	4 (11.8%)	5 (14.7%)	0.7204
	mean±SD	mean±SD	
Time of application	121.2 ±3.85	84.05±2.47	0.0000
Gingival bleeding immediately after the procedure	1 ± 0.79	0.88 ± 0.69	0.6891
Gingival bleeding two weeks after the procedure	0	0	1.0000

Discussion

Both methods of gingival displacement provide adequate isolation. However, both ways can cause damage to the periodontium, but due to the high capacity of the gingiva to repair itself, the patient feels negligible after-effects (Haekkinen et al., 2000).

This study observed that patients preferred rubber dam compared to retraction cords. Rubber dam creates an aseptic

environment that isolates the tooth from saliva and enhances access and visibility to the operating field. Additionally, it guards against the potential aspiration or ingestion of objects, medications, irrigating fluids, and tooth/material debris (Sengupta and Pandit). 14.7% of patients asked for anesthesia due to pain they felt while applying sub-gingival clamps, while 64.8% of patients asked for anesthesia due to discomfort caused by the placement of the retraction cord. Literature has reported that packing the retraction cord

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causes bleeding, discomfort, and sensitivity to teeth. Also, excessive force while packing the retraction cord can cause damage to the epithelium, resulting in attachment loss of gingiva and shrinkage of marginal tissues, leading to recession, bone resorption, pain due to sensitivity, and gingivitis caused by calculus deposits (Merchant et al., 2022). These findings align with my study, in which more patients asked for anesthesia while a retraction cord was placed. My study's results contradicted those found in studies (Loguercio et al., 2015; Shehab Eldin et al., 2021), where an almost equal number of participants from both groups asked for anesthesia.

This study concluded that gingival bleeding was observed immediately after the procedure in both groups, but the difference was insignificant. These findings agree with other studies (Daudt et al., 2013; Loguercio et al., 2015; Shehab Eldin et al., 2021) in which it was deduced that gingival bleeding observed in both groups was the same. However, gingival laceration in patients with retraction cord was observed more compared to the RD group, which is in contrast to the previous studies where it was observed that gingival laceration was significantly more due to gingival clamps and no significant difference was observed in both groups (Loguercio et al., 2015). The results of this study are comparable to other studies where no gingival laceration was seen two weeks after the procedure (Shehab Eldin et al., 2021). Another study reported that bleeding with a retraction cord was significant, but using astringent-controlled bleeding was substantial (Sarmiento et al., 2014). Results of this study show that spontaneous sensitivity was insignificant between both groups. The Gingival retraction has been linked to tooth sensitivity, according to Bennani et al. and Sarmiento et al. (Bennani et al., 2020; GUTIÉRREZ and MARTINI, 2020; Sarmiento et al., 2014) Throughout the course of the experiment, no group showed any tooth sensitivity to cold, according to Sarmiento et al. (Sarmiento et al., 2014) According to the study by Bennani et al., the sensitivity of tooth was a temporary issue that could be solved by using Sensodyne toothpaste for a few days (GUTIÉRREZ and MARTINI, 2020).

The time required for retraction cord placement was statistically significant compared to the rubber dam application. The results of my study were incomparable with other studies (Loguercio et al., 2015; Shehab Eldin et al., 2021) in which the time difference was insignificant. However, It is commonly seen that rubber dam is considered time-consuming, challenging to use, and cumbersome to apply (Joshi et al., 2023; Jurado et al., 2021).

Conclusion

Patients preferred rubber dam with gingival clamps to retraction cords with cotton rolls. Factors supporting this preference were lesser gingival laceration and bleeding, more comfortable technique, and less time consumption

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Authors Contribution

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