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Etching Technique Used for Composite Restoration in Class II Cavities

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ABSTRACT

Background and Aim: Today, there are two types of adhesive bonding: etch-and-rinse adhesive bonding and self-etch adhesive bonding. Despite the fact that a separate phosphoric acid etchant is rinsed from the surface in etch-and-rinse systems, whereas self-etch adhesives use an acidic monomer contained in a separate primer or inside a single liquid component, both types of systems are total-etch. This study aims at finding the most common type of etching techniques used for composite restoration in class II cavities. It is a single centered retrospective study conducted in a private dental institution, in Chennai. The data was collected from the dental hospital management system. Ethical clearance for this study was obtained from the Institutional review board. Materials and method: The data included a varied population predominantly South Indian population. All the details of the patients from April 2020 to February 2021 were collected. Total of 335 patients, who had class II composite restoration, details were obtained.

Results: It was observed that for composite restoration total etch technique was most commonly used which was about 81.98% compared to self-etch technique which was 18.02%. It was also observed that there was no significant relationship between age, gender and type of etching technique used.

Conclusion: Within the study limits it is concluded that total etches technique was most commonly used compared to self-etch technique in class II composite and there was no significant difference between age, gender.

Key words: Class II restoration, Etching technique, Total-etch, Self-etch

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INTRODUCTION

The breakthrough in the etch-and-rinse total-etch approach was first described in the late 1970s by Fusayama et al. [1]. Another research path for dentin bonding investigated the use of an etch-and-rinse total-etch approach, etching the enamel and dentin simultaneously with phosphoric acid [2].

At the time, there was concern that phosphoric acid placed on dentin would cause pulpal inflammation and necrosis. Jennings and Ranly demonstrated that the pulpal effect of phosphoric acid on dentin for one minute was minimal [2,3]. Early results reported with dentin etching were disappointing because the adhesive resin utilized was the same unfilled hydrophobic bonding resin (ie, Bis-GMA) used for etched enamel. [4]. The hydrophobic resin would not wet the moist, vital dentin, and predictable adhesion could not be produced [5].

They proved the efficacy of the etch-and-rinse total-etch adhesive bond by adding a hydrophilic monomer to the primer and adhesive [e.g., hydroxyethyl methyl methacrylate (HEMA)] [6]. The adhesive resin can enter the peritubular dentin and dentinal tubules thanks to this hydrophilic monomer [6,7]. Bowen was also looking at the use of a dentin primer, which was essentially a self-cure adhesive that was painted on the enamel and dentin and produced clinically acceptable bonding. This primer was commercialized and went on to produce two of the first etch-and-rinse total-bond adhesives, which are still in use today. In recent years, self-etch adhesives for bonding to enamel and dentin have been introduced [8].

Today, there are two types of adhesive bonding: etch-and-rinse adhesive bonding and self-etch adhesive bonding [9]. Despite the fact that a separate phosphoric acid etchant is rinsed from the surface in etch-and-rinse systems, whereas self-etch adhesives use an acidic monomer contained in a separate primer or inside a single liquid component, both types of systems are total-etch [10]. For the purposes of this article, etch-and-rinse refers to when a separate acid application with rinsing

is part of the clinical procedure, while self-etch refers to when there is no need for rinsing [11]. Our team has extensive knowledge and research experience that has translate into high quality publications [12–31]. This study aims at finding the most common type of etching techniques used for composite restoration in class II cavities.

MATERIALS AND METHOD

It is a single centered retrospective study conducted in a private dental institution, in Chennai. The data was collected from the dental hospital management system. Ethical clearance for this study was obtained from the Institutional review board. The data included a varied population predominantly South Indian population. All the details of the patients from April 2020 to February 2021 were collected. Total of 335 patients, who had class II composite restoration, details were obtained. All data were cross verified by another examiner. The internal validity included cases diagnosed as per selection criteria, medical history, chief complaints and clinical findings. Inclusion criteria include patients above the age of 18 years and patients who underwent class II composite restoration and etching type used. Exclusion criteria include presence of systemic disorders and pediatric patients. The data collected was tabulated under following parameters: Age, gender, structural abnormalities. The arch form was determined by using photographs from the patient record management system. The independent variable includes age and dependent variables include dental malocclusion and arch form. The data analysis was performed using SPSS software of version 21. The chi square test was used to compare the data and check for the distribution at 0.05 level of significance for effect of statistical significance.

RESULTS AND DISCUSSION

It is known from previous studies that when etch and rinse adhesives are used on enamel, a reliable and favorable bonding interface is produced . However, when using dual-cured composites in conjunction with dual-cured dental adhesives, the self-etching approach has been proved to perform better on dentin [32]. Therefore, a selective enamel etching would ensure a more adequate bonding effectiveness even when a self-etching system is selected.

The current study results showed that there were 333 patients out of whom there were 189 males and 144 females (Figure 1). The subjects were divided based on age into 20-30 years which included 115 patients, 31-40 years which included 95 patients, 41-50 years which included 82 patients, 51- 60 years which included 29 patients and 12 patients under 61-70 years (Figure 2).

It was observed that for composite restoration total etch technique was most commonly used which was about 81.98% compared to self-etch technique which was 18.02% (Figure 3). It was also observed that there was no significant difference in association between age, gender and type of etching technique used (Figures 4 and Figure 5).

The bond to enamel is generally more efficient than dentin with phosphoric acid etching. Frankenberger et al. observed the performance of bond self-etching adhesives was improved when phosphoric acid was selectively applied to the enamel [33] However, etching the dentin before the application of a universal adhesive did not improve the bond efficiency. According to Jang et al., universal adhesives may guarantee a reliable bond to dentin, regardless of the application method [34].

Rasha et al. analysed the Nano leakage of universal

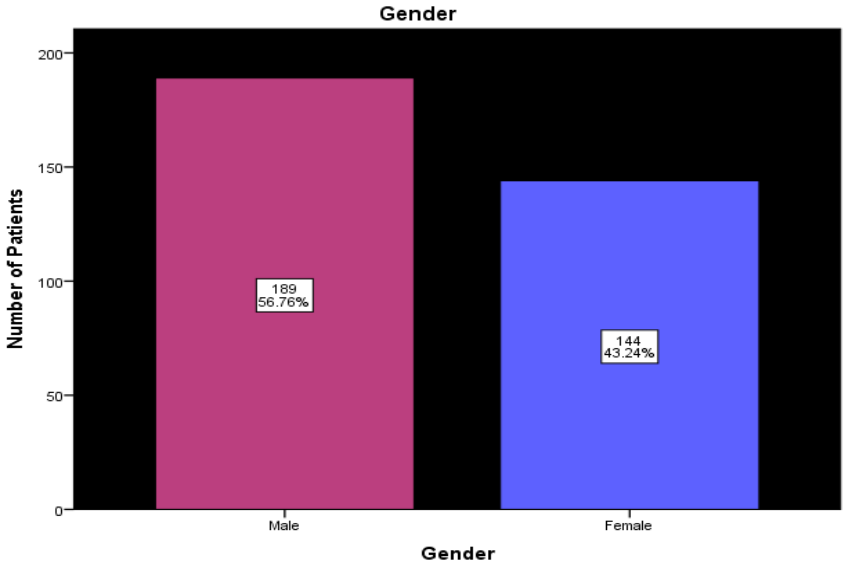

Figure 1: Bar graph depicting the association between age of patients and frequency of patients who underwent class II composite restoration. The x-axis represents age of the patients and y-axis represents the number of patients who underwent class II composite restoration procedures. The purple colour represents the number of male and blue colour represents number of female who underwent class II composite restoration.

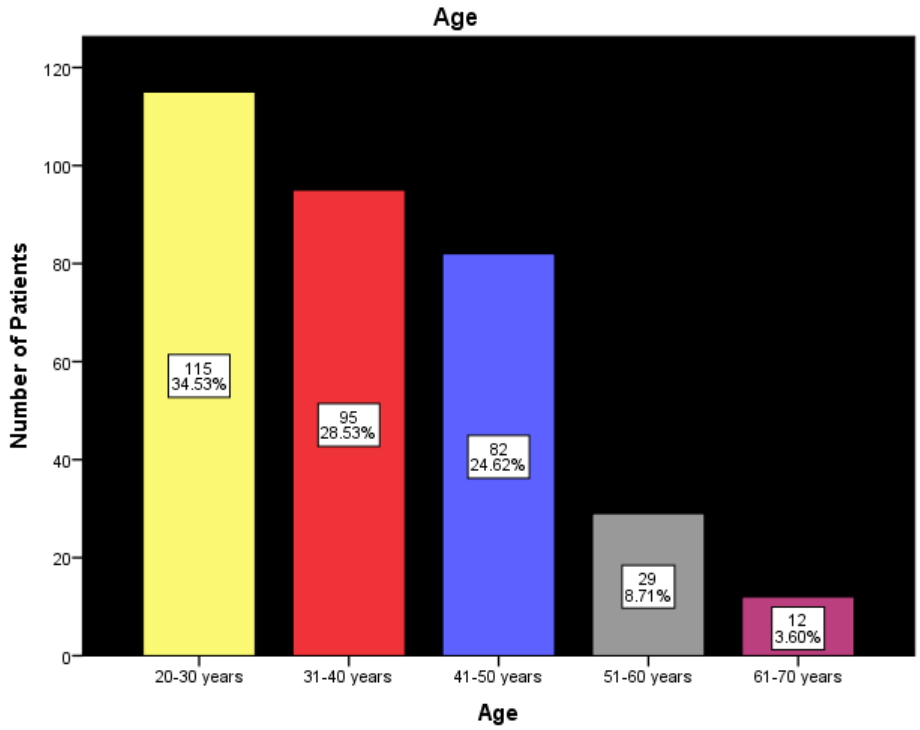

Figure 2: Bar graph depicting the association between age of patients and frequency of patients who underwent class II composite restoration. The x - axis represents age of the patients and y - axis represents the number of patients who underwent class II composite restoration procedures. The age groups included 20-30 years which is represented by yellow colour, 31-40 years which is represented by red colour, 41-50 years which is represented by blue colour, 51-60 years which is represented by grey colour and 61-70 years which is represented by purple colour.

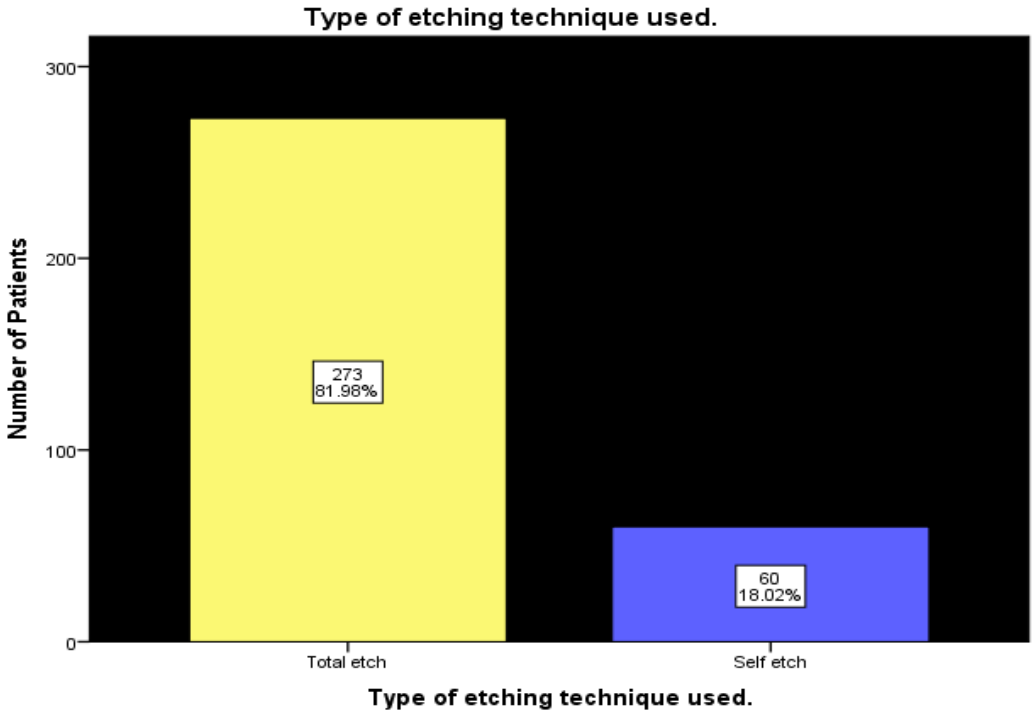

Figure 3: Bar graph depicting the type of etching technique used and number of patients. The x - axis represents the type of etching technique and y-axis represents the number of patients who underwent class II composite restoration procedures. The yellow colour represents the total etch technique and blue colour represents the self-etching technique.

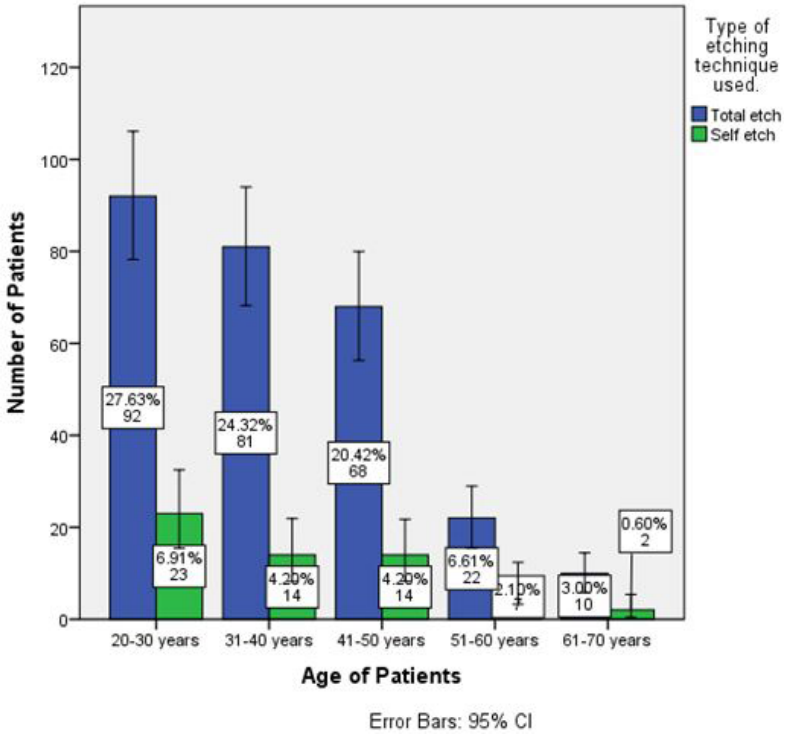

Figure 4: Bar graph depicting the association between age of patients and frequency of patients who underwent class II composite restoration. The x-axis represents age of the patients and y-axis represents the type of etching technique used in patients who underwent class II composite restoration procedures. The blue colour represents total etching technique and green colour represents self-etching technique.

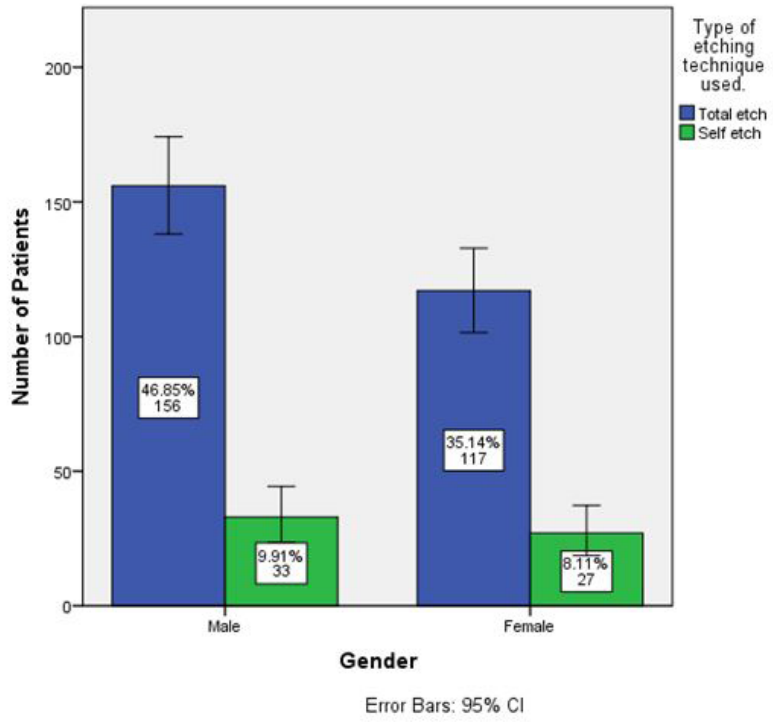

Figure 5: Bar graph depicting the association between gender of patients and frequency of patients who underwent class II composite restoration. The x-axis represents gender of the patients and y - axis represents the type of etching technique used in patients who underwent class II composite restoration procedures. The blue colour represents total etching technique and green colour represents self-etching technique.

bonding agents in the self-etch and total-etch techniques and found that the leakage in the self-etch strategy was much higher than in the total-etch approach, which is consistent with the findings of our investigation [35]. Other studies demonstrated that SE adhesives are effective only on ground enamel, but are less effective

on intact enamel, because SE materials do not result in an enamel-etching pattern as well-defined as the one produced by phosphoric acid etching [36]. Miyazaki and colleagues30 conducted a study in which they found a significant decrease in enamel bond strengths for the three SE adhesives tested when specimens were thermo cycled up to 30,000 cycles, while for three of the four TE adhesives tested, they found no significant differences from baseline to 30,000 cycles [37].

Self-etching adhesives have the capacity to condition the dental structures due to the presence of acid monomers in their composition. Nevertheless, these adhesives have a reduced conditioning potential when compared with etch- and-rinse systems, leaving a large portion of the dentinal tubules obstructed with smear layer residues and contributing to less post-operative sensitivity [38]. Thus, selective conditioning of enamel is recommended prior to the application of a universal adhesive, as a recommendable strategy for optimizing the bond strength.

By acid etching only the enamel prior to employing the adhesive, the selective-etch technique solves the fundamental shortcoming of the self-etch technique, which is suboptimal etching of mineralized enamel. By providing a deep etch on the enamel, this technique optimizes enamel bond strength, while removing the risk of over-drying or over-etching the dentin, which can lead to postoperative sensitivity [39]. This approach can be particularly advantageous when working with deep areas in the tooth where acid is at increased risk of causing sensitivity. While selective-etching may take a few more steps than other etching techniques, treating each surface individually can create a stronger bond [39,40]. However, precision is required Practitioners must ensure that no etchant reaches the dentin, as it can compromise bond strength.

Error Bars help to indicate estimated error or uncertainty to give a general sense of how precise a measurement is. This is done through the use of markers drawn over the original graph and its data points. Typically, Error bars are used to display either the standard deviation, standard error, confidence intervals or the minimum and maximum values in a ranged dataset. Since the study population is limited to a single institution, the data is not compared with larger populations. Thus additional studies with larger sample size and longer periods of observations are needed.

CONCLUSION

Within the study limits it is concluded that total etches technique was most commonly used compared to self-etch technique in class II composite and It was also observed that there was no significant difference in association between age, gender and type of etching technique used.

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CONFLICT OF INTERESTS

All the authors declare that there was no conflict of interest in the present study.

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