

EVALUATION OF ERRORS IN PREPARATION DESIGNS FOR ESTHETIC VENEERS

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ABSTRACT

Esthetic veneers are thin custom made shells that cover the labial part of the anterior teeth. They are also known as dental veneers, porcelain veneers, porcelain laminate veneers. They are used to mask the tooth discoloration, further used to the teeth which are worn out, chipped, broken, uneven or irregular in shaped teeth. For the success of esthetic veneers proper preparation design is needed. The aim of the study was to evaluate errors while preparing designs for esthetic veneers. We reviewed patients records, analysed data of 400 patients between June 2019 to March 2020 and clinical findings were recorded. The data was then tabulated in microsoft excel. Chi square test was used for comparison of groups. Within the limitations of the study, we found that the clinical errors surfaced after evaluation are moderately low. This shows a positive outcome of the esthetic veneer treatment.

Key words

Discrepancies, Margin, Preparation design, Smile line, Veneers

INTRODUCTION

Esthetic veneers are thin, custom- made shells that cover the labial aspect of the tooth. They are also known as Dental veneers, Dental laminates, Porcelain veneers, Porcelain laminate veneers. The reasons for placing veneers are correction of unaesthetic surface defects such as hypoplastic enamel or enamel lost by erosion or abrasion (Clyde and Gilmour, 1988), (Dunne and Millar, 1993), masking of discolouration resulting from trauma, Endodontic treatment, to cover the stains, repair of structural deformities such as fractured incisal edge diastema and peg laterals (Dunne and Millar, 1993; Pascottoet al., 2012). Porcelain veneers have been a popular means of conservatively restoring unaesthetic anterior teeth since early 1980. Currently feldspathic veneers, glass based ceramics have an improved thermal shock resistance. Indirect porcelain laminate veneers require minimal but irreversible preparation of teeth. The veneers are bonded to the teeth using modern dental adhesive systems. Direct veneering becomes a considerably more viable treatment option as properties of the materials improve and practitioners become more familiar with manipulating them. In addition the introduction of light cured composites has allowed more time for adjustment of the veneer before setting (Wakiagaet al., 2004).

Subgingival margin design is the most esthetic method to achieve the best appearance in patients with a high smile line (Spear, 2009) . However equigingival and supragingival margin designs can be given in patients with medium(average) smile line and low smile line respectively. The benefits of supragingival margin are not interfering with gingival health. Labial veneer preparation needs a careful reduction of the tooth structure to provide a minimum of 0.3 mm (feldspathic porcelain) or 0.6mm (empress ,e max) preparation. The enamel thickness at the gingival third is 0.3-0.5mm up to 0.6-1 mm at the middle third and 1.0 -2.1 mm at the incisal third (Ho, 2017).

The esthetic treatment of anterior teeth is a challenge in clinical practice. With the improvement of dental materials, many restorative choices for example all ceramic crowns, resin composites and ceramic veneers became accessible. In these conditions, dentists and patients must choose the best alternative to improve oral conditions and esthetic results. Ceramic laminate veneers might be recommended when there is anterior dental wear and presence of sufficient tooth structure (Guess *et al.*, 2011). Ceramic veneers are recommended because of ceramic's biocompatibility, mechanical properties, color stability and esthetics. Esthetics treatments must not be performed without a proper restorative planning. The preparation design and the remaining sound tooth structure have significant effects on load to failure of ceramic veneers(Guess *et al.*, 2011; Schmidt *et al.*, 2011). The possibility of minimally invasive restorations is significant for success of restoration (Bloom and Padayachy, 2006), (Radz, 2011).

Tooth preparation is one of the significant aspects of restorative dentistry. Understanding anatomy of tooth morphology is basic for preparation. The marginal preparation should give optimal peripheral seats from restoration to tooth and should be supragingival so that achieving isolation will be easy. Furthermore, ideally margins should be confined to enamel to avoid micro leakage. Therefore margins should be well adapted (AL-Dwairi, AL-Hiyasat and Aboud, 2011)

Previous studies reported that the degree of mismatch between the gingival margin, below the gingival margin is 119-34mm and 51-22 mm respectively (Christensen, 1966; AL-Dwairi, AL-Hiyasat and Aboud, 2011). A maximum marginal gap of 120 microns is accepted in clinical practice(McLean and Von, 1971)(Jacobs and Stewart Windeler, 1991), (Goldman, Laosonthorn and White, 1992). Although the effect of ceramic veneer preparation designs is evaluated,very limited information is available regarding errors in preparation designs for esthetic veneers.

The study focuses mainly on the type of errors encountered while doing preparation designs for esthetic veneers. Errors can be minimised by practising better preparation techniques. Errors while preparing the tooth can affect the veneers longevity. The aim of the study is to evaluate errors while preparing designs for esthetic veneers.

MATERIALS AND METHODS

This retrospective study examined the records of patients from 01 June 2019 to 31st March 2020 who visited saveetha dental college and hospital. Ethical approval was taken from the institutional review board/SDC/SIHEC/2020/DIASDATA/0619-0320. The study sample included both male and female gender, predominantly south indians.

The sample size was 22 patients. Data such as age, gender, smileline, teeth number, discrepancies, margin level was recorded. Incomplete patient records were excluded.

Data was recorded in Microsoft Excel and exported to the statistical package of social science for windows (SPSS) and subjected to statistical analysis. Chi square tests were used for comparison of groups.

RESULTS AND DISCUSSION

In this study, the sample consisted of 22 patients. The patients with esthetic veneers are commonly seen in age groups 25-35 years(63.6%) followed by 15-25(36.4%) .Male (77.3%) patients have undergone significant esthetic veneers procedures when compared to females (22.7%) (Table-1).

The common discrepancies encountered during the preparation are irregular margin(18.8%) cases, indistinguishable margin(4.5%), margin width is more on labio mesial aspect(13.6%), margin width is more on labio distal aspect(18.8%) and no noticeable discrepancies observed in 45.4% of cases (figure-1). The most commonly prepared margin level is supragingival (40.9%) followed by subgingivalmargin(31.83%) and equigingival margins which accounts for (27.2%)

When the correlation between margin level and discrepancies were analysed it showed that equigingival margin showed irregular margin (4.55%) in one cases, margin width is more on the labio mesial aspect(9.09%), margin width is more on the labio distal aspect(9.09%) observed in 2 cases. In the case of supra gingival margin higher number of discrepancies are noted as follows irregular margin is seen in 3 cases(13.64%) followed by indistinguishable margin and margin width is more on labio mesial aspect ie., 4.55% each. Whereas in case of subgingival margin only one discrepancy is recorded that is margin width is more on the labio distal aspect(4.55%) (figure-2).

Most of the patients who underwent esthetic veneer procedure shown that patients with low smile line are given equigingivalmargin(4.55%) and supra gingival margin(22.73%).whereas patients with average smile line, equigingival margin (22.73%), supragingival margin(18.18%) and subgingival margin (27%). Patients with high smile line are given with subgingivalmargin(4.55%).The correlation between margin level and smile line gave a chi square value (p) = 0.051 (statistically not significant). (Figure-3)

According to the results of the study incidence of errors during esthetic veneer preparation is quite common. This study provides baseline data conveying dental practitioners the most common errors encountered in general during esthetic veneer preparation.

The present research has origins from previous studies where the investigators involved in studies which were based on systematic reviews by (Arigaet *et al.*, 2018), (Selvan and Ganapathy, 2016), (Subasree, Murthykumar and Dhanraj, 2016), (Kannan and Venugopalan, 2018). In Vitro studies by (Ajay *et al.*, 2017) and clinical and Interventional studies performed by (Jyothiet *et al.*, 2017), (Duraisamyet *et al.*, 2019), (Ganapathyet *et al.*, 2016), (Jain, Ranganathan and Ganapathy, 2017), (Vijayalakshmi and Ganapathy, 2016), (Ashok and Suvitha, 2016), (Ashok *et al.*, 2014), (Venugopalanet *et al.*, 2014), (Basha, Ganapathy and Venugopalan, 2018), (Ganapathy, Kannan and Venugopalan, 2017) .

This study found that the repeatedly recorded discrepancies are supragingival margin of irregularities. If the width of the shoulder varies from one region to another, it can vary the ceramic thickness with a potential for premature fracture during fabrication (Shetty, Bhat and Srivatsa, 2010). In this study over preparation on the labio mesial plane and labio distal plane is recorded.This findings are similar to the study performed by the private dental practitioner in jordan(AL-Dwairi, AL-Hiyasat and Aboud, 2011)who stated that only 17% of all

preparations were found to follow the recommended anatomical labial preparations. Error of no clear margin accounts for 12% in the previous studies (Sutton and McCord, 2001), which is contrast to the present study; this may be due to investigating large sample size; method of recording the errors is different, however present study relied only on the photographs. Uniform anatomic reduction is needed to enhance strength for crown and for better esthetics (Goodacre, 2004). Ideally finish line should be designed according to the smile line but in reality it is not possible because sometimes esthetics dictates the margin but certainly it ensures that epithelial attachments are not compromised (Silness, 1970)

This study is limited as subjects are not available for direct examination. The examination is fairly based on photographs and case sheets available in the Record Management System. The sample size is very less which is 22. Further research is needed as noticeable errors can be avoided, awareness in esthetics can be conveyed. Thus the study serves as an evidence and adds to the consensus that can be utilised for further studies at the larger population and clinical studies.

CONCLUSION

Within the limitations of the study, following conclusions can be drawn, the clinical errors surfaced after evaluation are moderately low. This shows a positive outcome of the esthetic veneer treatments. Further clinical trials with respect to preparation designs and ergonomics are essential to improve the precision and minimise the errors in designing porcelain laminate veneers.

AUTHOR CONTRIBUTIONS

Author 1 (LasyaGenji), carried out the retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Dr. L.KeerthiSasanka) aided in conception of the topic, has participated in the study design, statistical analysis and has supervised in preparation of the manuscript. Author 3 (Dr. Sandhya Raghu) has supervised and has coordinated in developing the manuscript. All the authors have discussed the results among themselves and contributed to the final manuscript.

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CONFLICTS OF INTEREST

None declared

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TABLES

	Number of participants	Percentage
Age		
15 to 25 years	8	36.3%
26 to 35 years	14	63.64%
Gender		
Male	17	77.2%
Female	5	22.7%

Table 1: Shows the age and gender distribution in the sample population. 63.64% of the patients belonged to the age group between 26 to 35 years and 36.3% of the patients belonged to the age group between 15 to 25 years. The total Male patients were 77.2% and female patients were 22.7%.

GRAPHS

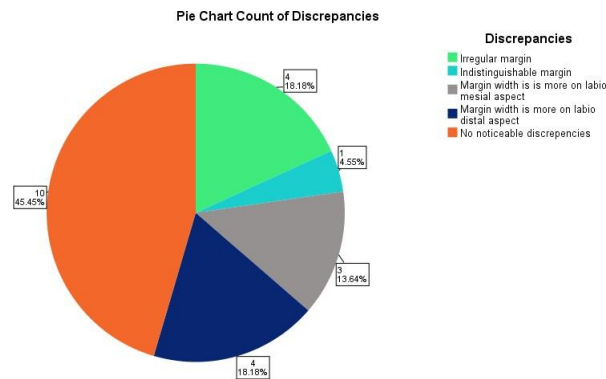


Figure 1: Pie chart showing various discrepancies encountered during esthetic veneer preparation. Light green colour denotes irregular margin, light blue denotes Indistinguishable margin, grey colour denotes margin width is more on the labio mesial aspect, dark blue colour denotes margin width is more on the labio distal aspect, orange colour denotes no noticeable discrepancies. The most common discrepancies encountered during esthetic veneer preparation is irregular margin and marginal width is more on the labio distal aspect ie.,18.8%

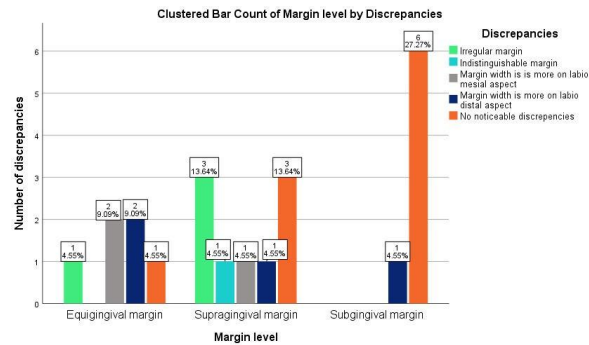


Figure 2: Bar chart depicts the association between margin level and discrepancies encountered. X axis represents margin level and Y axis represents frequency distribution of discrepancies encountered during esthetic veneer preparation. Light green colour denotes irregular margin, light blue denotes Indistinguishable margin, grey colour denotes margin width is more on the labio mesial aspect, dark blue colour denotes margin width is more on the labio distal aspect, orange colour denotes no noticeable discrepancies. Supragingivalmargin showed a high number of discrepancies compared to equi gingival and sub gingival margins. Chi square test was done and the p value was found to be .09 ($p > 0.05$ statistically not significant).

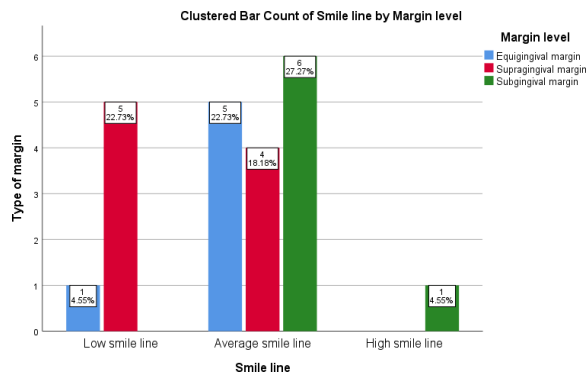


Figure 3: Bar chart depicts the association between smile line and margin level. X axis represents smile line and Y axis represents margin level. Blue colour denotes equigingival margin, red colour denotes supragingival margin and green colour denotes subgingival margin. Patients with low smile line, supragingival margin is commonly preferred, in patients with average smile line subgingival margin followed by equigingival margin is preferred, whereas in patients with high smile line only subgingival margin is preferred. Chi square test was done and the p value was found to be .051 ($p < 0.05$ statistically significant).