

“Customized denture base shade guide”-A Simplified approach towards pinnacle of esthetics”

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Abstract: -

Statement of problem- In today's world of rehabilitation we should deliver optimal function along with aesthetics so shade matching plays a significant role.

Purpose- The purpose of this invitro study was to evaluate the flexural strengths of various heat cure denture base resins customising with various proportions with clear heat cure acrylic denture base resin and preparing a shade guide.

Materials and methods. Denture base resins of 4 groups named A, B, C, D consisting of Triplex, acryln H, DPI, trevalon were taken in 4 different proportions mixed with clear acrylic resins. The ratios were 25:75,50:50,75:25,100%. An acrylic shade guide was prepared. 80 samples of 4 different ratios of clear and heat cure resins were mixed similar to the shade guide proportions of size measuring 65×10×2mm. These samples were checked in a universal testing machine to know the flexural strength of the material.

Results: Results showed flexural strength of group C showed good flexural strength than compared to the other groups.

Conclusion- All the analysis led to the conclusion that the shade guide provides an easy and convenient method to select mucosal shade. The flexural strength was better in DPI resin.

Keywords: *Dentures, Shade guide, Shade selection, Smile analysis, Gingival shade guide.*

1. Introduction

Today's world is governed by aesthetics. Any patient who walks in to a clinic expects optimum treatment. They expect a rehabilitation that not only provides aesthetics but also optimal function and satisfaction too. Shade matching is an important aspect in dentistry. Shade guides are commercially available in the market which helps in selection of the most appropriate match. Shade determination through visual aids in obtaining an appropriate match which continues to be a challenge for the clinician.¹

A prosthesis may be judged for the efficacy in terms of the aesthetics and function based on the attempt made by the prosthodontist to match with the adjacent tissues.² The value and success of a biologically acceptable prosthesis are considered compromised if the shade doesn't match with the adjoining tissue. So as a prosthodontist giving a prosthesis that is having retentive aids and matching the colour by intrinsic colouration producing a base shade.²

Acrylic prostheses must have acceptable mechanical and physical properties in order to thrive in a hostile oral environment, including flexural strength, hardness, water sorption, and solubility.³ Flexural strength is a common fatigue weakness of denture base polymers, limiting their use in demanding clinical situations.⁴

With the increased demands, it has become pre-emptive for the patient to make an informed decision. There are ample options available in market regarding denture shade guides, teeth shade, mould guides etc. But a shade guide that can provide the patient with a range of options where the patient not only chooses the shade but is well aware of the strength the denture base too. Acrylic resin polymers are extremely stiff and hard and have aesthetic limitation, so the present invitro study is done to prepare a shade guide by mixing acrylic resin with different concentrations of clear acrylic and to measure its flexural strengths of fabricated format.

2. Objectives

- A. To prepare a shade guide by mixing heat cure acrylic resins with different proportions of heat cure clear acrylic.
- B. To check the flexural strengths of fabricated formats.
- C. To compare the fabricated formats for flexural strength.

3. Methods

Four commercially available acrylic resin were used in this study naming triplex, acrylyn H, DPI, trevalon.

1. A metallic mould of dimensions 10mm×10mm×2mm was fabricated.
2. Petroleum jelly was applied then wax was melted and poured into the metallic mould, left to set and then they were retrieved.
3. By using the flask, the first pour was done keeping the wax block in the middle. Fig-1a
4. A mould measurements 2mm×10mm×65mm was fabricated
5. Petroleum jelly was applied and melted wax was poured in it. Fig-1b
6. 4 groups named A, B, C, D consisting of Triplex, Acrylyn H, DPI, trevalon, which had 4 subgroups with different proportions including 25:75 which had 25% of the group resin mixed with 75% of clear acrylic resin, 50:50 which contained 50% of the group resin and clear resin, 75:25 which contained 75% of group resin and 25% of clear acrylic resin, 100 which had 100% of group resin.
7. A was triplex heat cure resin, B contained acrylyn H heat cure resin, C had DPI heat cure resin and D was trevalon and the shades were arranged in the order from 1 to 4, in which A1 was 25% of the sample group and 75% of clear acrylic resin. A2 was 50% of sample resin and 50% clear acrylic resin, A3 was 75% of sample resin and 25% clear acrylic resin and A4 contained 100% sample resin.
8. Then the second pour was done and the elimination of the wax was done.
9. The samples were made for the 1st group by mixing different proportions of triplex and clear acrylic resin as mentioned which were packed and acrylized and that group was noted as A, and shades were marked from A1 to A4.
10. The same was done for Acrylyn H acrylic resin, containing different proportions of acrylyn H and clear acrylic resin which was packed and acrylized and this samples were noted as B and the shades were noted from B1 to B4.
11. 4 moulds for DPI acrylic resin were packed and acrylized, containing 4 different proportions of DPI and clear acrylic resin which were packed and acrylized. These samples were noted as C and the shades were arranged from C1 to C4.

12. 4 moulds of DPI acrylic resin group containing different proportions as mentioned in the subgroups were mixed and packed and acrylized. And the samples were noted as D and shades were named from D1 to D4.
13. All the specimens were finished and polished.
14. The shade guide tab was arranged according to the designated alphabets in ascending order of shades from A1 to D4. Where A1-A4 was the triplex group and B1-B4 was Acrylyn H and C1-C4 was DPI resin and D1-D4 was trevalon. And the samples were 25% of the sample resin and 75% of clear acrylic resin. 2 was 50% of sample resin and 50% of clear acrylic resin and 3 was 75% of sample resin with 25% of clear acrylic resin and 4 denoted 100% of sample resin. (figure 2)
15. All the samples were sent for flexural strength assessment under a universal testing machine (UNITEK 9450, FIE, model) applying 50kN/2.5kN at a speed of 1mm/min. (figure 3)
16. The results were statistically analyzed by post-hoc analysis and Mann-Whitney U test was done to compare between the subgroups.

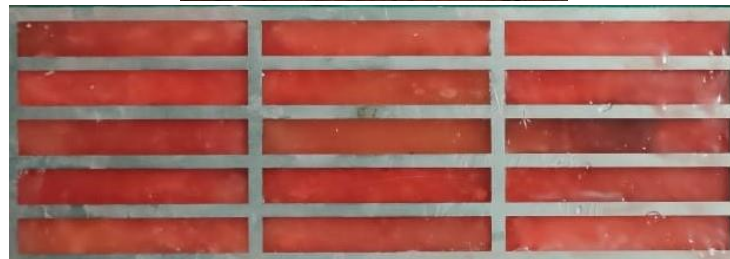


Figure-1a: wax pattern fabricated for shade guide

Figure-1b: wax pattern fabricated for flexural strength assessment

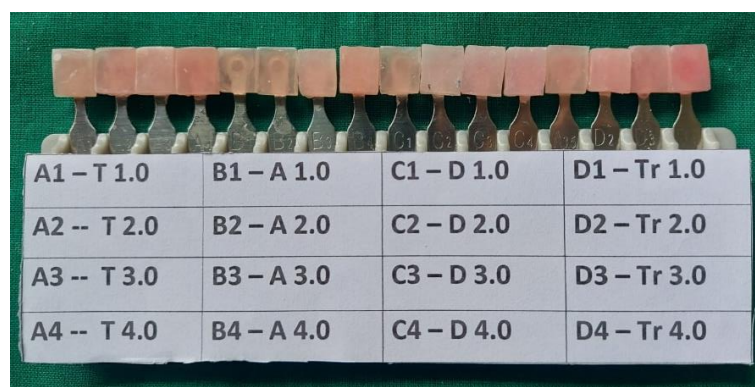


Figure 2- shade guide tab depicting all the samples

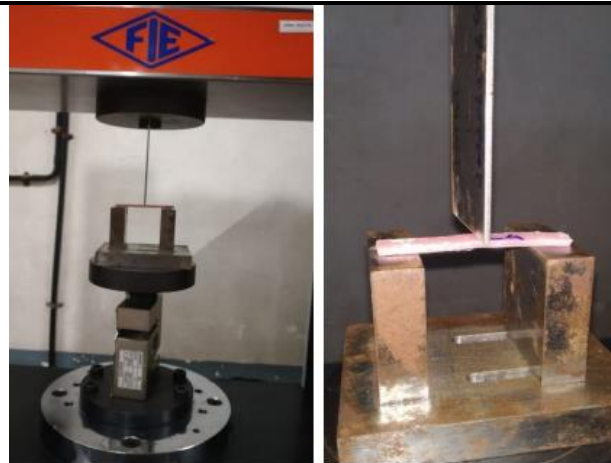


Figure 3- universal testing machine used for testing the fracture resistance

4. Results

Since the overall comparison of the means of the different subgroups in the four shades were found to be statistically significant, a post-hoc analysis was done to identify the significance of two groups individually. Therefore, all the 6 combinations of post-hoc analysis for a 4-group system was conducted using Mann-Whitney U test. Majority of the combinations of the subgroups of the four shades was found to be statistically significant, signifying that an actual mean difference existed between them. The only two exceptions were the comparison of mean difference between Group A2 vs Group A4 and Group B2 vs Group B3. The test revealed that they were not statistically significant. The post-hoc analysis of the comparison of the four shades was done using Mann-Whitney U test to check for statistically significance between the different combinations of two groups individually and the results are presented in **Table 1**. Since there were 4 shades, there were 6 possible combinations. The mean difference between the two groups in 5 combinations were found to be statistically significant ($p < 0.05$). The only combination that was an exception was the comparison between Group A and Group D. The mean difference between them was found to be statistically insignificant ($p > 0.05$).

TABLE 1: POST-HOC ANALYSIS FOR COMPARISON BETWEEN FOUR SHADES (A, B, C and D) USING MANN-WHITNEY U TEST

	MANN-WHITNEY U TEST	Z-VALUE	p-VALUE
GROUP A vs GROUP B	0.000	7.739	0.000*
GROUP A vs GROUP C	0.000	6.513	0.000*
GROUP A vs GROUP D	360.500	1.190	0.234
GROUP B vs GROUP C	0.000	7.741	0.000*
GROUP B vs GROUP D	0.000	7.747	0.000*
GROUP C vs GROUP D	0.000	7.736	0.000*

* $p < 0.05$ = statistically significant

5. Discussion

Both keratinization and vascularization are responsible for the natural colour changes that occur between the connected and detached gingiva. In opposed to the degree of vascularization, which depends on local mechanical loading and host reaction, the degree of keratinization varies from person to person and is influenced by mechanical stress and the rate at which dead cell layers are eliminated. Many periodontal and gingival illnesses that cause hyperaemia can also cause changes in the mucosa's colour.⁵

The increased focus on dental aesthetics has aided in the advancement of more precise intraoral shade matching techniques. There is no way to match a wide range of gingiva and other soft tissue colours with a single shade of pink denture base resin. To evaluate the colour of connected gingiva, papillae, and alveolar mucosa, Munsell colour tabs had been employed. For coordinating with oral soft tissues, newer shade guides are commercially available. Such shade guidance systems are available for gingiva colour matching, but they are ineffectual for complete dentures, in which case colour matching must be done with the inner lip mucosa.⁵

The four standard colours of denture base acrylic polymer are clear, pale pink, dark pink, and veined. The commercially available shade guides don't match up perfectly with any of the acrylic shades indicated above. In order to create a shade that matches the chosen shade tab provided by the dentist, dental labs must mix and match the different colours of acrylic polymer. The acrylic resin colour that results from this approach need not be an exact match.

Matching the colour of acrylic resin to create denture bases can be challenging because to variations in oral mucosal colour. Although there are many commercially available mucosal shade guides, none of them match any heat-cured acrylic resin shade. A customised shade guide has been created to make this issue simpler. It assists us in matching the mucosal colour to the shade guide and in fabricating the appropriate acrylic resin shade by combining different acrylic polymer shades in predetermined ratios. The customised shade guides don't have proportions of different commercially available denture base resin brands. Mostly, they have used DPI as the standard resin. But we have used different proportions of 4 major resin brands. Thus, making the shade guide usable in wide range of clinical set ups and materials.

The shade guide follows the regular arrangement of commercially available tooth shade guides. The shades are named as A1-4, B1-4, C1-4 and D1-4. The proportion of clear acrylic to pink acrylic being kept in increment order from 1-4. And a clear idea of flexural strength of each shade is mentioned on the shade tab instruction manual.

Most frequent site of denture base fracture is in the midline. During functional movements of mandible denture is subjected to various flexural stresses. Flexural strength is a measure to know the resistance of the polymer to flexural deformation. Thus, just taking care of aesthetics need not be the only function of a shade guide. It can very well be used to assess the functional capacity of the product we are providing the patient with.⁶

6. Conclusion

Shade matching necessitates a delicate equilibrium between practical goals and individually held expectations. Consistent and accurate shade selection is critical for the placement of cosmetic restorations, which are an important element of daily practise.⁸

Matching to the gingival colour and knowing the strength of the material makes a big step towards aesthetics in today's world. Using various combinations of acrylic powders in variable distributions, an almost infinite number of samples can be created.⁷ However, the procedure is time consuming and is generally confined to specialty practice the colours in shade guides differ for each manufacturing company.⁸

7. Limitation

The shades in a guide are not logically organized and do not cover the volume of colour space that exists in natural dentition; a shade guide tab reflects and transmits light, creating translucency and an appearance of vitality but cannot replicate the soft tissues accurately.

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