

Color Changes of Pediatric Dental Bridges

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Abstract

Dental technology that depended on the standardized lost-wax casting technology has been greatly improved with the introduction of dental CAD / CAM systems. The aim of the present study was to compare between the color changes of CAD/CAM acrylic and manually performed acrylic bridges used for pediatric patients. Forty study casts of children aged 2 - 4 years old of both genders, with prematurely lost one of the maxillary central incisors and the adjacent lateral incisor was carious and considered to be abutment tooth were involved in this study for construction of cantilever bridges. For each cast, two bridges were constructed; 1st one is CAD/CAM acrylic bridge and the other one is manually performed acrylic bridge. After immersing the bridges in saturated chocolate solution for different time intervals, color changes of the bridges were measured using 3Shape scanner system.

Keywords: Color; Changes; CAD/CAM; Bridges; Pediatric; Patient

Introduction

Trauma and/or dental caries is the common causes those result in premature loss of teeth in children. Cosmetic/aesthetic restoration of such condition considers to be challenging in the pediatric dental field. In case of premature tooth loss in anterior incisal segment there will result in arch space loss and teeth's inclination that causing a collapse of the anterior teeth and midline shifting [1], as well as may lead to parafunctional habits [2]. Mahmoud (2009) found that anterior tooth loss had effect on patient's quality of life and gave negative effects on him/his [3]. Al Rawi (2017) found that placement of cantilever acrylic bridges for restoring the aesthetic dental appearance of preschool children resulted in positive successes both to the child and parents [4]. Extrinsic discoloration of teeth and oral prostheses is stains caused by foods or beverages. In pediatric patients such stain mostly occurred due to colored foods such as beets or chocolate as well as berries and candies [5, 6]. This study considered to be the first step of our series studies deal with determining different physical and mechanical properties of the prostheses used for pediatric patients we planned to carry out (*in vitro* and *in vivo* studies). Starting with the present study that aimed to compare between the color changes of CAD/CAM and manually performed acrylic bridges used for pediatric patients. After immersing the bridges in chocolate

solution for different time intervals, color changes of the bridges were measured using 3Shape scanner system.

Material and Methods

This study starting with collection of forty study casts of children aged 2-4 years old of both gender, with prematurely lost one of the maxillary central incisors and the adjacent lateral incisor was carious and considered to be abutment tooth were involved in this study for construction of cantilever bridges (Figure 1). For each cast, two bridges were constructed; 1st one is CAD/CAM acrylic bridge and the other one is manually performed acrylic bridge (Figure 2). Construction CAD/CAM bridge: The cast was 3D scanned by special scanner (710 3D) (smart optics Sensortechnik GmbH, Germany). The design of the bridge was carried out using Exocad Program (smart optics Sensortechnik GmbH, Germany). Acrylic block (Poly-methyl methacrylate) of classic shade A1 (Ivoclar vivadent, Switzerland) was used for fabrication of the bridge using CAD/CAM machine (Charly dental, ZI Fonlabour, France). The bridge was finished and polished very well [4]. Construction of manually acrylic bridge: Wax pattern was fabricated on cast then followed the technique of typical wax loss; the heat-cure acrylic (Ivoclar vivadent, AG, FL-9494 Schaan/Liechtenstein) of classic shade

A1 was used for bridge fabrication. Finally, surface finishing and polishing was done [7]. Saturated chocolate solution was prepared using 15g chocolate powder (MacChocolate TM, Malaysia) with 100ml distilled water. Baseline color readings for acrylic bridges were taken then immersed in chocolate solution for different time intervals (one week and two weeks) and maintained in incubator of 37 °C, Fresh chocolate solution was prepared every day. Before color measurements after one week and two weeks' time intervals, the bridges were rinsed with distilled water for 30 seconds, cleaned

with a soft bristle toothbrush and then dried with tissue paper [8]. Color measurement was carried out in the facial surfaces at the center third of the abutment and the center third of the pontic part of each bridge as shown in Figure 3. Color measurements of the bridges were measured using 3Shape scanner system (3 Shape A/S, Holmens Kanal 7.1060 Copenhagen K Denmark) and according to the software program of the system, Classic shade (Ivoclar vivadent, Switzerland) was depended.

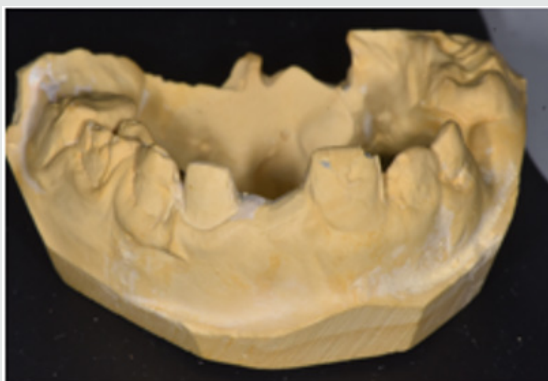


Figure 1: One of the study casts involved in this study.



Figure 2: CAD/CAM acrylic bridge and manually performed acrylic bridge for each cast involved in this study.



Figure 3: Demonstrated the color shade measurement of the abutment and pontic portions of the acrylic bridge.

Results

Table 1 demonstrated the color shade of all samples at the baseline and after one-week and two weeks-time intervals. The results of the present study revealed that for all samples, the color measurement demonstrated that in CAD/CAM group even with using A1 shade acrylic block but at the baseline measurement the abutment revealed A0 shade while the pontic revealed A1 shade.

Meanwhile, in manual group the abutment measured to be A1 shade and the pontic gave B1 shade. The results demonstrated that for all samples there were no changes in the color shade of CAD/CAM and manually fabricated acrylic bridges after one-week time interval, meanwhile, there were significantly color changes of all abutment and pontic portions of all samples of both bridge types after two weeks-time interval immersed in chocolate solution (Figure 4 & 5).

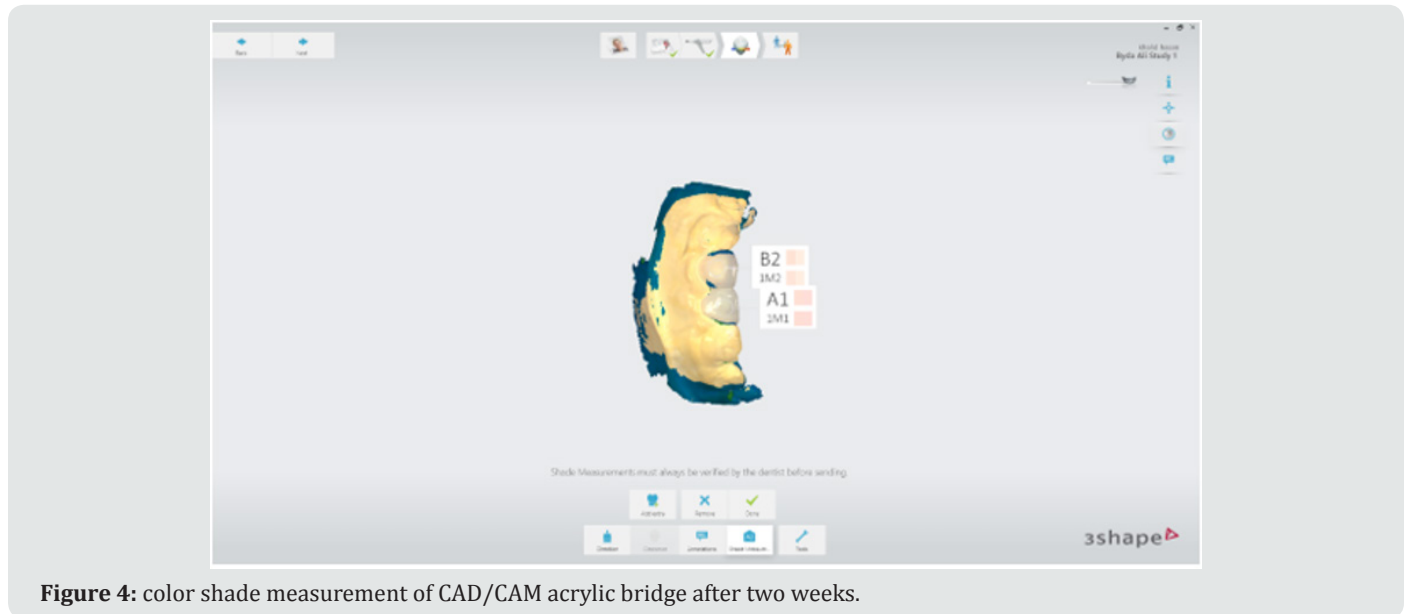


Figure 4: color shade measurement of CAD/CAM acrylic bridge after two weeks.

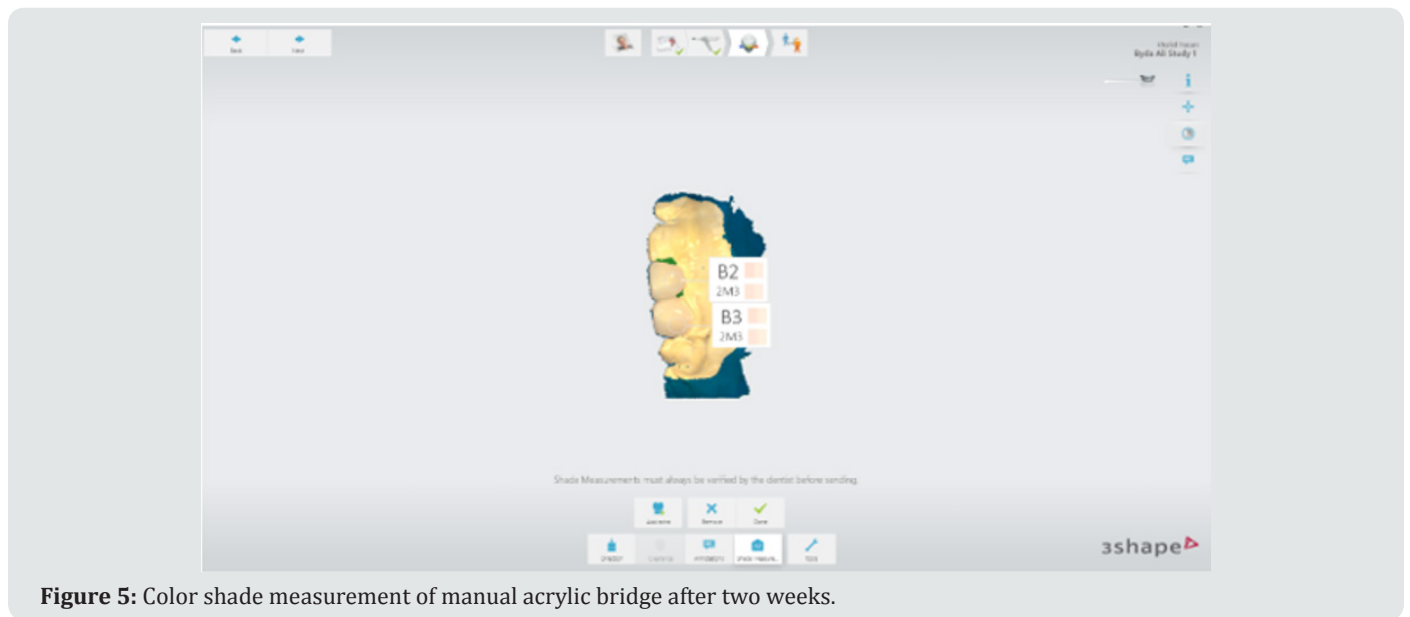


Figure 5: Color shade measurement of manual acrylic bridge after two weeks.

Table 1: Demonstrated the color shade of all samples at the baseline and after one-week and two weeks-time intervals.

Samples' Group	Bridge's portion	Classic Shade	Baseline color measurement (no.)	Classic Shade	One-week color measurement (no.)	Classic Shade	Two weeks color measurement (no.)
CAD/CAM Bridges	Abutment	A0	40	A0	40	A1*	40
	Pontic	A1	40	A1	40	B2*	40
Manual Bridges	Abutment	A1	40	A1	40	B2*	40
	Pontic	B2	40	B2	40	B3*	40

Discussion

Restorations in the oral cavity are exposed to several factors that make them vulnerable to color changes, such as temperature, humidity, food and beverages. In the oral environment, restorative materials are also subjected to numerous other liquids, to temperature and load stress, and to tooth brushing. The success of restorations depends not only on mechanical and physical properties, but also on the esthetic appearance [9]. The color measurement in this study demonstrated that in CAD/CAM group even with using A1 shade acrylic block but at the baseline measurement the abutment revealed A0 shade while the pontic revealed A1 shade. These occurred because the thickness of the abutment was only about 0.5mm lead to that the color measured of the abutment was lighter than the pontic portion. Meanwhile, in manual group the abutment measured to be A1 shade and the pontic gave B1 shade. These results agreed with other studies those found the thickness of the material significantly affected the color shade of the prostheses [10,11].

The results demonstrated that the color changes demonstrated only after two weeks-time intervals immersed in chocolate solution. Even the color shades recorded in the CAD/CAM group considered to be lighter than in manual fabricated group, the discoloration from chocolate solution was probably due to adsorption of color colorant of chocolate solution at the surface of the prostheses.

The CAD/CAM bridges fabricated from blocks of pre-polymerized acrylic resin those had a hydrophobic surface that repels water [12]. As well as, perfect polishing surfaces of the bridges involved in this study revealed the limited discoloration that occurred agreed with other research [13]. As the duration of immersion increased, the color change values of both types of prostheses were recorded by 3Shape scanner system. Thus, the time is considered to be important factor in the staining of the dental prostheses and these results agreed with others [14,15]. Fabrication of dental prostheses with the help of CAD/ CAM technology is related to the advantages of high-density polymers based on highly cross linked polymethylmethacrylate [16]. Those advantages include; good esthetic, low water solubility and absorption, sufficient strength, low toxicity, easy repair with simple fabrication technique [17]. The using of hot cure acrylic for fabrication of dental prostheses even of some advantages but the main disadvantages include porosity with the presence of residual monomer which is a potential allergen, increased finishing time, brittle and uneven thickness [18]. A limitation of this study is that it was an *in vitro* study and need to be collected with *in vivo* study to measure the degree of color changes of the prostheses with presenting the effect of saliva and oral hygiene measures. Further clinical and *in vitro* studies are necessary to evaluate the susceptibility of CAD/CAM and manually acrylic bridges to discoloration by other beverages and nutrients.

Conclusion

Color considered as the most important factors for aesthetic appearance of dental restorations. In addition to the optimal chemo

mechanical properties of acrylic resins, their availability in different color-shades has increased their application in fixed and removable prostheses. Acrylic resins can have acquired discoloration over time because of the process of adsorption and liquid molecules adhere to resin materials which was decreased their effect with using of CAD/CAM technology over conventional methods of acrylic resin prostheses fabrication.

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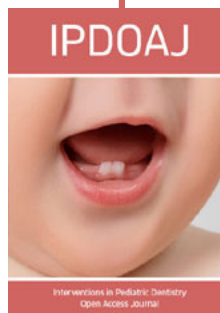
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