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The effect of arabian coffee on acrylic denture base in comparison to other types of coffee

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Acrylic resins were introduced in 1936 and have been used to make the denture bases. Acrylic resin is thermally conductive, reasonable permeableness to mouth fluids and stable in colour. Polymethyl methacrylate resin has been used for a long time as the best choice to make complete or partial dentures, cause it is esthetically accepted and easily manipulated. However, the mechanical properties of acrylic should become better. Numerous studies have had been done to investigate the effects of several factors on denture teeth discolouration, like commercial types of denture teeth, their composition, filler, processes like polishing, mouthwashes, drinks and coloured food. In KSA, café is used up in a modified product called Gahwa (Arabian café). Gahwa is prepared by boiling roasted, crushed café beans with cardamom powder. The aim of the study was to assign the influence of normally made café kinds, in KSA, on polymethyl methacrylate denture base materials. Acrylic resin patterns were used (the material tested in the present study was heat-cure acrylic resin (Vertex rapid simplified, Holland). They were parted into five groupings; the control and four tentative groupings agreeably to four kinds of café had been used in the study. Each grouping had 10 specimens. Dental stone had been used for molds making, and Vaseline had been used as a separating medium. Colour exchange of acrylic resin had been shown significantly after dipping in the Espresso, the American and the Turkish café. The Espresso café caused most exchanges in colour then; the American and the Turkish kinds come afterward. There was non-significant difference between the Turkish and the American café. But then, no any exchange in colour of the acrylic resin material significantly had been shown with Gahwa. No significant exchange in colour from the patterns dipped in normal Saline (control) and specimens dipped in Gahwa. No meaning variation in the acrylic resin microhardness used in this present article pre- and post-dipping in the kinds of café. Nonetheless the café kinds were not a meaning substitute to exchange the acrylic resin surface microhardness ($P>0.05$). Though, no meaning variation had been detected between the acrylic resin material and the café kinds ($P>0.05$). A significant colour exchange had been shown after dipping of the acrylic resin material in Espresso, Turkish and American café. Most change in color been caused by Espresso café after that by Turkish and American café. On the other hand, No colour exchange of acrylic resin and specimens dipped in Gahwa, which expressed no indicative colour exchange from specimens dipped in normal saline. There was no meaning variation on surface microhardness of the acrylic tested in this research in preceding and afterward dipping in the various kinds of café.

Keywords: polymethyl methacrylate, Arabic café, colour change, Microhardness

INTRODUCTION

Acrylic resins were introduced in 1936 and have been used to make the denture bases.

Acrylic resin is thermally conductive, reasonable permeableness to mouth fluids and stable in colour (Asal and Al-AIShiekh, 2017).

Polymethyl methacrylate resin has been used for a long time as the best choice to make complete or partial dentures, cause it is esthetically accepted and easily manipulated. However, the mechanical properties of acrylic should become better (Abdallah, 2016).

Some changes in denture base resin structure and different procedures for making complete dentures have been undertaken to improve their mechanical properties (Kumar et al., 2016) and (Gad et al., 2017). Denture base resin had been inducted by mixing the suggested proportion till a breadly body is made, and the associated metal flask is contented, situated under pressure in a warm water bath or microwave, or the resin is left to be cured by its chemical composition (Gad et al., 2017).

Numerous studies have had been done to investigate the effects of several factors on denture teeth discolouration, like commercial types of denture teeth, their composition, filler, processes like polishing, mouthwashes, drinks and coloured food (Jain et al., 2014), (Kurtulmus-Yilmaz and Deniz, 2014), (Hipolito et al., 2013), (Koksal and Dikbas, 2008) and (Neppelenbroek et al., 2016).

It was concluded that the resistance of modern dental resins to discolouration still depends upon their forms, compositions and handling (Dietschi et al., 1994). In KSA, coffee is used up in a modified product called Gahwa (Arabian coffee). Gahwa is prepared by boiling roasted, crushed coffee beans with cardamom powder (Al-Samadani, 2013).

Objectives

The aim of the study was to assign the influence of normally made café kinds, in KSA, on polymethyl methacrylate denture base materials.

MATERIALS AND METHODS

Materials

Acrylic resin patterns were used (the material tested in the present study was heat-cure acrylic resin (Vertex rapid simplified, Holland). They were parted into five groupings; the control and four tentative groupings agreeably to four kinds of café had been used in the study. Each group had 10 specimens. Dental stone had been used for molds making, and Vaseline had been used as a separating medium.

Preparation of Specimen

Metal models have been used to fabricate

acrylic samples (20*20*3mm were prepared) (Chandu, 2015). Separating medium had been applied to the upper and lower halves of a metal flask to ease stone mold removal during deflasking. Then after mixing dental stone at a creamy state had been placed in the lower half of the flask and patterns smoothly in the middle part as taking into deliberation, half of patterns must be uncovered so, they can be removed easily after complete setting of the layers of the dental stone, the separating medium had been added and the upper half had been placed into its position. Additional mix of dental stone had been prepared and had been settled over the two patterns and dental stone surface. The form had been left for an hour. Then it had been opened to discard the metal sample. the mold had been lubricated by separating medium and had been left to dry. Another layer of separating medium had been applied. The powder and liquid of acrylic had been mixed due to the instructions of the manufacturer. The acrylic in the dough had been packed into the mold; the flask had been compressed under hydraulic presser and then cured. Once curing had been completed, the flask had been left to be chilled. The specimen had been removed from the metal flask, finished and polished. Polished with no. 600 silicone-carbide sandpaper (Nejatian et al., 2015). Then the specimens had been stored in water for fear of Shrinkage of acrylic till running the tests.

Specimen's treatment

Acrylic resin specimens had been parted to four groupings agreeably to the four café kinds. Café had been prepared according to the recommended manufacturer's instructions. Café four kinds used illustrated in table (1).

Table (1): Types of café which used in this study.

Types of café	The producing company
Gahwa	AL-Rifai
American café	Jofery
Turkish café	Jofery
Espresso	Jofery

Specimens had been then dipped in liquid-can occupying 20 ml of every kind of café for twenty one days (Awliya et al., 2010). The unlike kinds of café had been made new every day preceding the discolouration process. The fifth grouping of pattern material had been stored-up in 20 ml of saline to be as a control. Twenty one days later on, surface microhardness and colour of all patterns had been registered once more. All the

data had been collected and statistically analyzed.

Color testing

All the patterns had been washed undergoing purified water and dried before measuring the colour. The colour of the patterns had been valued by Colour Optic 7000.0 spectrophotometer (Gretag Macbeth, New Windsor, NY, USA); opposed to blank backcloth by CIELAB colour blank in relation to CIE criterion illumination D65. Specimens' colour preceding and afterward dipping in the variable kinds of café had been valued in accordance with the rule (Nikzad et al., 2012): $E^* = [(L_o^* - L_1^*)^2 + (a_o^* - a_1^*)^2 + (b_o^* - b_1^*)^2]^{1/2}$

E^* = colour variation, L^* = Brightness level reflectivity, a^* = reddish green colour reference, b^* = yellowish blue colour reference, o = standard, l = afterward handling.

Microhardness assessment

Vickers microhardness measures had been assessed with a tester of Micromet Buehler Microhardness (Company of Buehler, Bluff Lack Illinois, United States). The patterns had been personally set in the appliance after that, placed of the same kind that the pattern surface was vertical to the depress. A weight of three hundred gram had been laid upon every pattern for 30s. Three depressions had been made, on top surfaces of every pattern. The depressions had been evenly located above a top of a round and far than one mm of the near others also far from the pattern borders (Farina et al., 2012). 3 records' mean had been calculated and microhardness utility had been accounted before and after staining microhardness measurements had been made on the similar superficies of every pattern (superficies).

Statistical analysis

By using analysis of variance (ANOVA) (one and two ways) and Post Hoc Tukey's test at a significant level of $p < 0.05$ comparing among the variable groupings, Colour exchange ΔE^* and microhardness data had been analyzed. Three

Table (3): Vickers's microhardness measures of the acrylic resin material pre and post-dipping in the various kinds of café.

CAFÉ	Pre-treatment (Mean±SD)	Post-treatment (Mean±SD)	P-value
Gahwa	79.62±9.53	74.58±2.76	0.095
American café	77.38±7.66	77.30±3.96	0.207
Turkish café	79.96±3.97	75.76±3.19	0.736
Espresso café	79.90±3.11	73.58±2.76	0.832
Saline	79.90±5.03	73.48±2.85	0.198

different intervals had been used to differentiate differences of color 1 had been considered as not satisfying by the eye of the human. Value of ΔE^* by skilled operators *3.3 had been considered perceivable, as long as a utility * 3.3 had been regarded perceivable likewise by unskilled operators. So from the clinical point of view, it's unacceptable (Guo et al., 2013).

RESULTS

Colour exchanges

The findings utilitie of colour exchange ΔE^* of the patterns afterward dipping in the variable kinds of café for every acrylic resin materials had been used in this study had been summarised in table (2).

Table (2): Mean colour exchanges of the acrylic resin afterward dipping in variable kinds of café (AE*).

Café	Mean±SD
Gahwa	1.89±0.81
American café	5.24±0.71*
Turkish café	4.21±1.79*
Espresso	6.71±1.91*
Saline	2.09±0.81

*Means: colour is clinically non-significant.

Colour exchange of acrylic resin had been showed significantly after dipping in the Espresso, the American and the Turkish kinds of café. The Espresso café caused most exchange in colour then; the Turkish and the American coffee come afterward. No difference between the Turkish and the American café significantly. But then, no any exchange in colour of the acrylic resin material significantly had been showed with Gahwa. No significant exchange in colour from the patterns dipped in normal Saline (control) and specimens dipped in Gahwa ($P > 0.05$).

Microhardness changes

The outcomes of testing microhardness are exhibited in table (3).

One-way ANOVA showed that there was no meaning variation in the acrylic resin microhardness which was used in the current article pre- and post-dipping in the kinds of café. Nonetheless the café kinds was statistically non-significant meaning substitute to exchange of the acrylic resin microhardness surface ($P>0.05$). Though, non-significant meaning variation had been detected between the acrylic resin material and the café kinds ($P>0.05$).

DISCUSSION

This study invoked the dispute of the colour stability of acrylic resin by inquiring into its susceptibleness to stains induced by usually used up kinds of café. Discolouration had been assessed by vision and usage of specialised apparatuses kind as Spectrophotometer that can possibly exclude illusory faults in colour valuation (Guo et al., 2013). Spectrophotometer had been also used in numerous former studies for meting colour exchange (ΔE^*) by comparison of the measure pre and post-treatment, by the formula declared before (Goiato et al., 2011) and (Mancuso et al., 2012).

Intrinsic and extrinsic factors may cause resin based material discolouration. The resin material discolouration had been involved by the intrinsic factors, as in the resin matrix variation and the matrix and fillers part. This intrinsic discolouration might be caused by incomplete polymerisation or dipping in water to a great extent of times. Due to contamination of extrinsic factors from external causes like café, tea, nicotine and drinks spotting by internal or external sorption of colourants happen (Catelan et al., 2011) and (Janda et al., 2005).

According the findings of the current study, significant colour exchange of acrylic resin material have been showed post-dipping in the 3café kinds (Espresso, American, and Turkish cafés). Staining susceptibleness of resin-established substances may be allied to sealing material of the resin, type of the matrix resin or the spotting factor kind (Koksal and Dikbas, 2008) and (Comba et al., 2018). Admitting that resin capable of water imbibition so, it can also imbibe another liquid, leading to discolouration. Water imbibition happens primarily due to ingenuous occupation in the resin matrix (Dietschi et al., 1994).

In this study, immersion of the used acrylic resin base materials didn't show any affection on surface microhardness by any tested kind of café. O'Brien (1997) defined hardness "the material's

opposition to indenture correlating directly to the rigidity and strength of the material" (Tornavoi et al., 2012). The matter may come to be either harder or softer according to various agents like the constitution of the matter, storing period and the environment kept in (Jain et al., 2014) and (Awliya et al., 2010). In this study, the tested resin material had been dipped in 4 kinds of café for twenty one days. Even if an indicative colour exchange of the acrylic material had been induced in this period of time, it could be sufficient to make any kind of exchanges in surface hardness.

The present research discovered that the Espresso and the Turkish café are the most kinds of café that affect colour exchanges of the 3 acrylic matters and the American café comes after. Former discoveries exposed that café occupies yellow colourants; these colourants are washed afterward. Hence, discolouration from café is because of external and internal sorption of café colourants (Malekipour et al., 2012). The dusky colour and property of café inventories (the Espresso, the Turkish and the American) could be what fore of colour exchange in this research.

But then, lightsome colour and reduced café content of Gahwa regarding to another kinds of café. Gahwa had been done using large quantity of water, could be the reason of smaller colour exchange in relation to the 3 stained acrylic matters. Still farther researches are requested to affirm this particular point.

These consequences acquired from this research have applied relevancy and supply researcher with knowledge about the possible spotting of these usually taken drinks on denture base material. Dipping the patterns in the various kinds of café and ignoring of cleanup and oral hygiene control are important determinants resulting in susceptibleness of matter spotting. Even so, actually spotting inside the mouth need a prolonged time, this is because the intermitting character to café exposing. Additionally, spittle and another liquid will attenuate spotting environment and the patient may use the denture cleansing agent.

CONCLUSION

A significant colour exchange had been showed after dipping of the acrylic resin material in Espresso, Turkish and American café. Most change in color been caused by Espresso café after that by Turkish and American café. On the other hand, No colour exchange of acrylic resin and specimens dipped in Gahwa, which expressed no indicative colour exchange from

specimens dipped in normal saline. There was no meaning variation on surface microhardness of the acrylic tested in this research in preceding and afterward dipping in the various kinds of café

CONFLICT OF INTEREST

The author declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

NH designed and confirmed the study objectives and procedures, wrote the manuscript, fulfilled data collection and analysis, reviewed, read and approved the final version.

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