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Research Article

EFFECT OF DISINFECTION ON LINEAR DIMENSIONAL CHANGES AND SURFACE DETAIL REPRODUCTION OF VINYL SILOXANE ETHER (VINYL POLY ETHER SILICONE) V/S POLY VINYL SILOXANE AND POLYETHER - A COMPARATIVE IN VITRO STUDY

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A B S T R A C T

Introduction: VinylSiloxaneEther, a novel impression material introduced recently was claimed to be better than the currently trending materials. No studies were conducted till now regarding the effect of disinfectants, Glutaraldehyde and Sodium hypochlorite on few properties of new material.

Aim: To evaluate effect of disinfectants on dimensional accuracy and surface detail reproduction of Vinyl Siloxane Ether (VSE) versus Poly Vinyl Siloxane (PVS) and Polyether (PE).

Methodology and results: A total of 120 impressions were made from a metal die (ADA no.19), grouped as A, B and C based on the impression material and further sub grouped as AG,AH;BG,BH;CG,CH based on disinfectant used. Measurements were taken to evaluate linear dimensional changes and surface detail reproduction; formulated with one way ANOVA statistical analysis and executed with the help of IBM SPSS 21.0 software. Value of $p<0.05$ was considered to be significant. More dimensional changes occured in Group-A,PVS(0.0114mm), followed by Group-C,VSE(0.0110mm) and then by Group-B,PE(0.0090mm). Dimensional changes caused by glutaraldehyde is less than that of by Sodiumhypochlorite. Regarding surface detail reproduction, PE showed better results than PVS and VSE materials.

Conclusion: PE presented better dimensional accuracy and produced good surface details comparatively. VSE showed significant expansion after disinfection. Sodium hypochlorite caused more dimensional changes than glutaraldehyde, however statistically and clinically insignificant.

INTRODUCTION

Dimensional accuracy and surface detail reproduction are some of the indispensable qualities for best possible impressions [19] (Stober T *et al*.,2010).Besides transferring the required information; these traditional impressions also act as a remarkable source for cross contamination of various microbial organisms from infected saliva and blood to which they have been exposed. Set impressions are a supply of reservoir of pathogens which contain micro-organisms like bacteria, fungi and viruses following their removal from patient's mouth and while the models are being poured, these microorganisms are transmitted onto dental plaster and stone. Such models embody a potential chance of disease transmission to dental health care workers and laboratory employees through indirect contact [24, 8](Thota K K *et al*.,2014; Khan A *et al*.,2015).

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Simply washing with water or rinsing under tap water does not completely eliminate these contaminating microbes from the impression surface [14](Melilli D *et al*.,2008).Therefore, pursuing a suitable infection control protocol before and after impression making is a must to get clear of cross contamination and the risk of disease transmission[24] (Thota K K *et al*.,2014).

Disinfecting the impressions with appropriate disinfectants before they are delivered to the lab may reduce the risk. Disinfection procedure can be done either by immersion method or by spray method. Immersion disinfection is appreciated to be more potent, effective and authentic rather than disinfection by spray method [8](Khan A *et al*.,2015). In the present days, Elastomers are the widely used impression materials because of their excellent dimensional stability, detailed reproduction and their ability to retain the properties even after the disinfection procedures. Very recently, a new material has been developed based on 'Best of both Worlds' concept, Vinyl Siloxane Ether (VSE)[9](Kronstrom M H *et*

al.,2010). This material has been purported by the manufacturer to possess good dimensional accuracy and stability and better ability to reproduce the surface details and compatible with all the commercially available disinfectants. VSE is a combination of Poly Vinyl Siloxane (PVS) and Poly Ether (PE) impression materials. It has two components, a vinyl component and an ether component. In the presence of platinum catalyst, both of them together form Vinyl Siloxane Ether (VSE). Research studies already proved the efficacy of 2% glutaraldehyde and 0.5% sodium hypochlorite on PVS and PE impression materials whereas no documented studies were available on VSE materials. The purpose of the present study is to evaluate the effect of the disinfectant solutions 2% glutaraldehyde and 0.5% sodium hypochlorite on the dimensional accuracy and surface detail reproduction of Vinyl Siloxane Ether (VSE)compared to the currently gravitate impression materials Poly Vinyl Siloxane (PVS) and Poly Ether(PE).

MATERIALS AND METHODS

Materials used

Impression materials: (Fig 1)

1. Poly Vinyl Siloxane (PVS): 3M ESPE ExpressTM: Regular body: Hydrophilic: ISO 4823, Type 2.
2. Poly Ether (PE): 3M ESPE TM: Medium body: Monophase, Hydrophilic.
3. Vinyl Siloxane Ether (VSE): IDENTIUM® MEDIUM: KETTENBACH: Medium bodied consistency: ISO 4823, Type 2.

Disinfectant solutions

1. 2% Glutaraldehyde solution: GLUTIHYDE®: 2.05%: RAMAN and WEIL Pvt Ltd.
2. 0.5 % Sodium hypochlorite solution: Obtained by diluting commercially available 3% sodium hypochlorite solution: ASIAN sodium hypochlorite: ASIAN ACRYLATES Pvt Ltd.

Metal die: Stainless steel metal die fabricated according to revised ADA Specification number 19. (Fig 2)

Pentamix: 3M ESPE: PENTAMIXTM LITE; Auto mix dispensing Gun: 3M ESPE

Stereomicroscope: OLYMPUS – SZX16 with Image Pro Plus Software

Hydraulic press: Nikon DSLR camera

Metal Die: A Standardized stainless steel master die as per revised ADA specification number 19 was fabricated [22]. The master die consisted of a cylindrical ruled block and an impression material mold ring. The ruled block is of 31 mm height and 38 mm width (Fig. 2 A& B). A 3 mm height and 29.97 mm diameter raised step had been made on the sides of the die to which the impression material mold ring fits. The impression surface of the die consisted of three parallel lines inscribed on its surface named as X, Y and Z (Fig.2C). The distance between the three parallel lines measured in the microscope was approximately 2.5 mm from each other. The width and depth of the inscribed lines were as follows: X line, width-0.11mm and depth- 20µm; Y line, width-0.11mm and depth- 50µm and the Z line, width-0.11mm and depth- 75µm. Two cross lines were scribed perpendicularly on either side of the lines X, Y and Z .These two cross lines were separated by a distance of 25 mm. These lines acted as reference lines to measure the length of the lines X, Y and Z microscopically. These lines were of no specific width. The lengths of the lines X, Y and Z were measured from the outer edge of one cross line on one end to the inner edge of other cross line on the other end. Apart from the ruled block, the impression material mold ring had an outer ring diameter of 38mm, inner ring diameter of 30mm and a height of 6mm which fitted around the borders of the ruled block as a mold for the impression material.

Methodology: In this study, a total of 120 impressions were made from the metal die. 40 impression discs (named so due to their disc like shapes) were made with PVS impression material and grouped as Group A. 20 of these impression discs were immersed in 2% glutaraldehyde solution and sub grouped as AG. Rest of the 20 impressions were immersed in sodium hypochlorite solution and were sub grouped as AH. Similarly, 40 impression discs of each impression material PE and VSE were made and grouped as B and C. Each group was further sub grouped (BG, BH, CG, CH) based on the disinfectant used.

Impression procedure: The die was thoroughly cleaned with a cotton swab. A light coat of petroleum jelly was applied on the mold ring surface and sides of the ruled block except on the impression surface to facilitate easy removal of the ring from the die after the material sets. The ring was placed on the die, and the impression material was injected onto the surface of the die with a slight overfill. PVS impressions were made using an auto mixing dispensing gun (Fig.3 A). Once the impression surface within the mold ring was slightly overfilled, a clear polyethylene sheet with a glass slab on it was placed onto the test block to contain the material and to ensure a uniform thickness of the impression material all the times (Fig.3 B). Then it was kept under hydraulic press and care was taken that a force of 0.5 kg was applied on to the impression each time (Fig.3 C), to maintain the uniformity of the pressure applied during setting. After the material sets, the impression disc was carefully removed, and then the die was thoroughly cleaned and prepared for the next impression. Similarly, PE and VSE impressions were made except that these impressions were made using Pentamix machine (Fig.4 A&B). The resulting impression material discs had 3 parallel lines that duplicated the three engraved lines X, Y, and Z which are present on the metal die (Fig.4 C). Each impression was given a numeric code (A1 to A40). Similarly, PE impressions from group B and VSE impressions from group C were also given numeric codes respectively as (B1 – B40 and C1 – C40), (Fig.4 D).

Testing procedure prior to disinfection: All the impression discs were tested for dimensional accuracy and surface detail reproduction prior to disinfection to evaluate and compare the effectiveness of the impression materials irrespective of disinfection. The impression discs were measured by focusing under stereomicroscope with an attached camera (Fig.5 A&B). The readings were obtained via attached software, Image Pro Plus (Fig.5C). These readings were taken as control for the test dimensions obtained after disinfection. The measurements were made with the aid of the edges of the cross lines (outer edge of cross line on one side to inner edge of cross line on the other side) and were performed each time in the same way, measuring the same distance.

Disinfection procedure: For the disinfection procedure, 20 discs of group A were immersed in a 2% glutaraldehyde solution at room temperature for 15 minutes, as recommended by the manufacturer, and then rinsed under running water for 15 seconds. These impressions were also labelled as AG1– AG20. The other 20 impressions were immersed in 0.5% sodium hypochlorite solution for 15 minutes according to recommended disinfection time and then removed and rinsed under running water for 15 seconds. These impressions were labelled as AH1– AH20. The impression discs were then thoroughly dried and made ready for observation. Similarly, impressions from group B and group C were immersed in the two disinfectants and sub grouped accordingly.

Testing procedure post disinfection: The measurements were taken after disinfection to evaluate the effect of disinfectants on the linear dimensional changes and surface detail reproduction. The measurements were made in the similar way as performed on the discs prior to disinfection.

Evaluation of dimensional accuracy: The linear dimensional changes were evaluated after 24 hrs. Among the three lines; X, Y, Z, the most well reproduced line is taken for measurement and the measurement of this line was made between the cross lines. Dimensional change was calculated as follows:
Dimensional change %, $\Delta L = (L – L') / L \times 100$.

L: Dimension on the control
L': Dimension on the test specimen

Evaluation of Surface Detail Reproduction: Surface detail reproduction was evaluated macroscopically immediately after the impressions were recovered from the dies. Evaluation was achieved using two methods.The first evaluation was an assessment of the continuity of line replication according to ADA specification 19 with a slight modification. Secondly, rather than only evaluating the continuity of 1 of the 3 horizontal lines in 2 out of 3 specimens, all 3 lines were assessed for each specimen. If at least 2 of the 3 horizontal lines were reproduced continuously between cross-points, the impression was considered satisfactory. Roughness pits, and voids on other areas of the impression rather than the recording lines were neglected considering as manual mistakes of making impression. However, in clinical situations, if these imperfections were located in critical areas, such as prepared finish lines, they would render the impression unacceptable. Later, the surface detail reproduction was evaluated microscopically for any micro pits / voids.

Statistical analysis: All the measurements obtained were tabulated in a Microsoft Excel worksheet 2007 and the statistical analysis was performed with one way ANOVA analysis using IBM SPSS 21.0 software. The P value less than 0.05 was considered to be of significance [P<0.05 - significance].

RESULTS

In the results, the linear dimensional changes and surface detail reproduction were evaluated separately.

Linear dimensional changes: The length of the three lines X / Y / Z in the original metal die was 24.5000 mm (L). This acted as the control for the dimension of the line reproduced in the impression discs in group A (LA), group B (LB) and group C (LC). The change in mean dimension was calculated as L – LA where LA was the mean dimension of the impressions in group A. Similarly, change in mean dimensions in groups B and C were calculated as L – LB and L – LC respectively where LB was the mean dimension of the impressions in group B and LC was the mean dimension of the impressions in group C. The percentage of dimensional change is calculated as
$\Delta L = (L\text{-}LA/B/C)/L \times 100$.

Table 1: Reveals comparative evaluation of the mean change in dimension and percentage change in dimension of the three groups. More amount of dimensional change occurred in group A (0.0114 mm and 0.0467%) indicating its least accuracy followed by group C (0.0110 mm and 0.0448%) and then group B (0.0090mm and 0.0367%) indicating its highest accuracy compared to all the three materials. However, using one way ANOVA, the p value of all the three groups [P=0.140] was indicating insignificant mean change in dimension in the impression materials.

Table 2: Depicts comparison of mean change of dimensions among all the groups A, B and C after immersion in 2 different disinfectants solutions. After disinfection with disinfectant 1 (2% glutaraldehyde) and disinfectant 2 (0.5% sodium hypochlorite), the impressions showed slight change in their dimensions. Negative value indicates shrinkage of the impression material and positive value indicates expansion of the impression. The table clearly illustrated that PVS impression material showed slight shrinkage on immersion in 2% glutaraldehyde solution (-0.0270 mm) and in 0.5% sodium hypochlorite solution (-0.0475 mm),(P=0.201). PE impression material showed slight expansion on immersion in 2% glutaraldehyde solution (0.0680 mm) and slight shrinkage on immersion in 0.5% sodium hypochlorite solution (-0.0490 mm),(P=0.230) whereas VSE impression material showed slight expansion on immersion in 2% glutaraldehyde solution (0.0350 mm) and in 0.5% sodium hypochlorite solution (0.0575 mm),(P=0.105). However, the p values of PVS, PE and VSE shows statistically insignificant.

Table 1 Comparative evaluation of the mean change in dimension and percentage change in dimension of the three groups A, B and C. *P*> 0.05 (Not Significant - NS)

	N	Mean dimension in mm	Mean Change of dimension in mm	% of mean dimensional change $[(L – L_{A/B/C})/L] \times 100 = \Delta L$	Std. Deviation	F value	*P* value
Group A	40	24.4886	0.0114	0.0467%	.0048	2.318	*0.140*
Group B	40	24.4910	0.0090	0.0367%	.0060		
Group C	40	24.4890	0.0110	0.0448%	.0079		

Table 2 Comparison of mean change of dimensions among the groups A, B and C after immersion in 2 different disinfectants.

		N	Mean dimesnion before disinfection (Control)	Mean dimension after disinfection (Test)	Mean change of dimension	Std. Deviation	T value	*P* value
GROUP A	Disinfectant 1	20	24.4886	24.4616	-.0270	.0045	1.671	*0.201*
	Disinfectant 2	20		24.4411	-.0475	.0060		
GROUP B	Disinfectant 1	20	24.4910	25.1700	.0680	.0063	1.219	*0.230*
	Disinfectant 2	20		24.4420	-.0490	.0040		
GROUP C	Disinfectant 1	20	24.4890	24.8390	.0350	.0039	1.659	*0.105*
	Disinfectant 2	20		25.064	.0575	.0046		

Table 3 Comparative evaluation of effect of each disinfectant on the linear dimensional changes of the three groups A, B and C.

	Group A	Group B	Group C	(A + B + C)/3
	Mean change in dimension (mm)	Mean change in dimension (mm)	Mean change in dimension(mm)	Average change in dimension
Disinfectant 1 (Glutaraldehyde)	-0.027	0.068	0.035	0.0433
Disinfectant 2	-0.0475	-0.049	0.0575	0.0513

(Sodium hypochlorite)

Table 4 Comparison of surface detail reproduction of the three different impression materials

	N	No: and % of impressions - satisfactory	No: and % of impressions - unsatisfactory	Chi-square value	*P* value
GROUP A	40	39(97.5%)	1(2.5%)		
GROUP B	40	100(100%)	0(0%)		
GROUP C	40	39(97.5%)	1(2.5%)	0.218	*0.897*

Fig 1 Impression Materials- A. PVS(Poly Vinyl Siloxane);B- PE(Poly Ether); C- VSE (Vinyl Siloxane Ether)

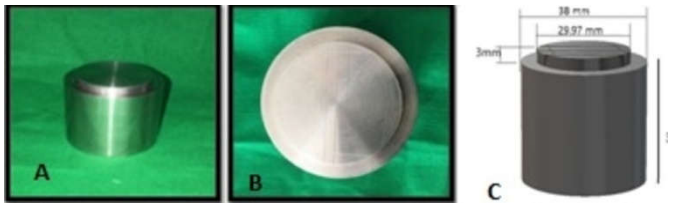

Fig 2 Metal Die- A and B Metal Die; C-Metal Die with Measurement specifications

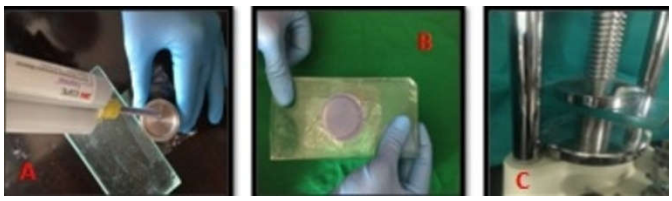

Fig 3 A- Making of PVS Impression; B- Application of clear polyethylene sheet with a glass slab on the impression material; C- Impression while setting placed under hydraulic press to ensure equal amount of pressure on each impression.

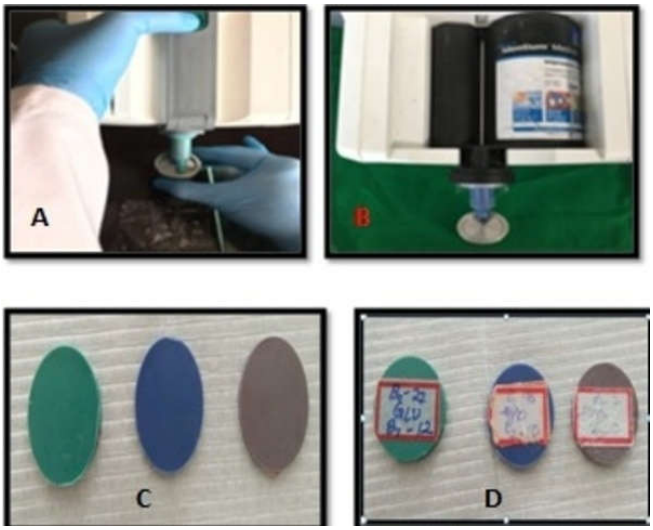

Fig 4 A- Impression making PE (Poly Ether); B-with VSE(Vinyl Siloxane Ether) impression materials; C-Obtained three impression material discs ; D-Labeled three impression discs.

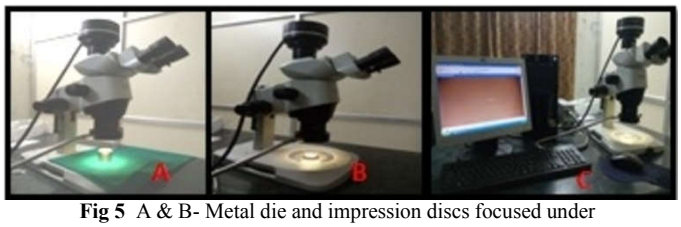

Fig 5 A & B- Metal die and impression discs focused under stereomicroscope; C- Dimensions evaluated with an attached system using image pro plus software

Table 3: Explains the comparative evaluation of effect of each disinfectant on the linear dimensional changes of the three groups A, B and C. It revealed that glutaraldehyde caused less average change in dimension (0.0433) compared to sodium hypochlorite (0.0513).

Surface detail reproduction: The surface detail reproduction was evaluated according to the guidelines given by ADA specification number 19.The impressions were observed under low angle illumination without any magnification. In the second method, all 3 lines were assessed for each specimen.

Table 4: Discloses comparison of surface detail reproduction of the three impression materials. It showed mean percentage of impressions which were considered satisfactory among the three groups. It illustrated that 97.5% of PVS impressions were considered to be satisfactory when compared to the original die. Whereas 100% of PE impressions were considered to be satisfactory when compared to the original metal die. But 97.5% of VSE impressions were considered to be satisfactory. PE impressions showed more detailed reproduction on impression making of the original die and PVS impressions showed less detailed reproduction. However the results are statistically insignificant [*P=0.897*].

After disinfection, there was no noticeable change in the surface detail reproduction of the three impression material discs. Hence, surface detail reproduction being more accurate in PE impression material discs before disinfection continued to be the same even after disinfection. This showed that there was no effect of immersion disinfection in the two disinfectant solutions on the surface detail of the reproduction three impression materials.

DISCUSSION

The prime convergence point of the present study was to evaluate the linear dimensional changes and the surface detail reproduction of the newly formulated impression material VSE after immersion disinfection procedures in comparison to the already proven PVS and PE impression materials. Sterilization procedures are of crucial significance for dentistry as the dental professionals are more liable to exposure of wide variety of morbific microbes in blood and saliva. Among the disinfection procedures, Immersion disinfection is the most recommended method [5].

The most routinely used disinfectants for dental impressions are Glutaraldehyde and Sodium hypochlorite which were already proved to be potent disinfectants by many research studies [2,3,10,19](Bond W W *et al*.,1983; Howard C R *et al*., 1983; Kobayashi H *et al*. 1984; Stober T *et al*.,2010) The PVS impression material is familiar for its high dimensional stability, superior elastic recovery, adequate tear strength, detailed reproduction of surface in dry settings. But, in moist areas, because of its hydrophobicity, it exhibits less detail

reproduction relatively. On the inverse side, PE impression material is hydrophilic generating fine details even in moist environment and it is also well appreciated for its high mechanical properties, high tear strength and minimal shrinkage. But, the material being highly rigid and stiff, it makes it tough to have withdrawn from undercuts. The manufacturer outlines that VSE material has 5% to 20% PE compound, which adds the property of hydrophilicity to the impression material. The rest of the material, the PVS component consisted of a combination of Vinyl dimethyl Polysiloxane (10 – 50%), Methyl hydrogen dimethyl Polysiloxane (3–10%) and silicone dioxide (30 – 65%). This combination, by the manufacturer, is claimed to be accountable for the superior elastic recovery and good tear strength of impression material. Because of this unique composition of PVS and PE, it is rational to weigh up the conduct of VSE on these 2 impression materials [15](Nassar U *et al*., 2013).

The surface detail reproduction of three impression materials was evaluated as according to ADA specification number 19, which states that an elastomeric impression material should be able to replicate one of the 0.02 mm width horizontal lines in 2 of the 3 specimens [22]. In this investigation, the detail reproduction ofthe PVS impression material could meet this criterion to 97.5% (*P = 0.897*) which is almost in concurrent with the study conducted by Petrie *et al*.,2003[20] and Nagrath *et al*.,2014[16]. Similarly, the impressions made by PE impression material could meet the criterion to 100% which reveals the augmented accuracy of PE impression discs when compared to PVS impression discs. These results were on line with the study conducted by Johnson GH *et al*.,2003[6].The impressions made from VSE were shown to be 97.5% satisfactory (*P=0.897*). In the comparative evaluation, all the results were insignificant both statistically (based on p value) and clinically thus indicating the satisfactory and almost identical surface detail reproduction by the three materials.

To evaluate the linear dimensional changes of the impression discs prior to disinfection, they were compared to the dimension of original metal die as control. The results in the present study revealed that PE impressions showed very less percentage of dimensional change, 0.0367% (*P=0.140*), followed by VSE impressions of 0.0448% (*P=0.140*), then PVS impressions of 0.0467% (*P=0.140*). According to these results, the PE impressions were shown to be more accurate, followed by VSE impressions and then by PVS impressions. However, all the changes were considered to be negligible as they are statistically insignificant (*P>0.05*). The percentage changes were also within the ADA standards for mean dimensional change[22]. Regarding the dimensional changes, the present study results were on par with the studies done by Thota K K *et al*.,2014[24]Melilli D etal.,2008[14] Jacob SA *et al*.,2010[7]and Pattanaik B *et al*.,2017[21] but in contrary with the study results of Lepe X *et al*.,1997[13] which showed that PVS and PE impressions were equally dimensionally accurate.
After disinfection, the impressions were thoroughly cleaned, dried and focused under stereomicroscope for evaluation of dimensional changes. These dimensions were compared to the mean dimensions obtained prior to the disinfection which acted as control. PVS impressions showed a mean dimensional change of -0.0270 mm and -0.0475 mm when immersed in 2% glutaraldehyde solutions and 0.5% sodium hypochlorite solutions respectively (*P=0.201*). PE impressions showed a mean dimensional change 0.0680 mm and -0.0490 mm under immersion disinfection in 2% glutaraldehyde and 0.5% sodium hypochlorite solutions respectively (*P=0.230*) whereas VSE impressions showed a mean dimensional change of 0.0350 mm and 0.0575 mm on immersion in 2% glutaraldehyde and 0.5% sodium hypochlorite solutions respectively (*P=0.105*). According to these results, it was clear that PVS showed least mean dimensional change on disinfection, followed by VSE then PE. Based on the statistical analysis (one way ANOVA) and obtained p values, the mean changes in dimensions of all the three impression materials were considered to be insignificant statistically. The results of this study were in confirmatory with the study findings of Aerean H *et al*.,2014[1]; Tullner J B *et al*.,2004[26]; Nassar U *et al*.,2017[17]; Herrera SP *et al*.,1986[4] and Kamble SS *et al*.,2015[11] whereas the study findings of Stober T *et al*.,2010[23] were in contrary to the present study.

PVS impressions showed slight shrinkage on disinfection which is insignificant. The main reason for this dimensional contraction in PVS impressions were presumed to be polymerisation shrinkage, loss of volatile components and water [15](Nassar U *et al*.,2013). The hydrophobic nature of the PVS impression materials may also be taken as a cause for dimensional shrinkage on disinfection. It may be presumed that because of its hydrophobic nature, the material went inert with the disinfectant material and just showed time dependent storage shrinkage on disinfection. The hydrophobic nature of PVS can be explained by the material's chemical structure, which contains hydrophobic, aliphatic hydrocarbon groups surrounding the Siloxane bond.

The PE impressions showed expansion on immersion in Glutaraldehyde disinfectant solution. This expansion might be because of material expansion during storage[15](Nassar U *et al*.,2013).The expansion of the PE impressions may indirectly be attributed to the hydrophilic nature of PE impression material. PE impression materials are hydrophilic because of chemical structures containing available functional groups that attract and interact with water molecules through hydrogen bonding. However, in the present study, PE impressions showed contraction on immersion in sodium hypochlorite solution. This might be again due to polymerization shrinkage and its lack of elastic recovery[15](Nassar U *et al*.,2013). The impressions of VSE also showed expansion on disinfection with both the disinfectants. Though it was insignificant, this might be attributed to the PE compound of VSE which because of its hydrophilic nature might have absorbed water from the surrounding environment and led to expansion of the material. The same was proved in the study results of Nassar U and Chow AK [18](Nassar U *et al*.,2014).

The dimensional changes observed in the present study were statistically insignificant and were well below the value of ADA specification standard[22]. Such findings agree with many studies reported by previous investigators which evaluated different combinations of impression materials and disinfectant products[1,4,11,18,26](Aerean H *et al*.,2014; Herrera S P *et al*.,1986; Kamble S S *et al*.,2015; Nassar U *et al*.,2014; Tullner J B *et al*.,2004). However, a number of authors reported

significant dimensional changes, but it must be noted that they used longer immersion procedures or different protocols[12,25](Khinnavar P K *et al*.,2015; Thouati A *et al*.,1996).

When compared the effectiveness of the disinfectants used, 2% glutaraldehyde was shown to cause less change in dimension compared to 0.5% sodium hypochlorite solution. This is in confirmatory to the study conducted by Khinnavar PK *et al*.,2015[12] but the study findings by Lepe X *et al*.,1997[13] showed significant dimensional changes with 2% glutaraldehyde which is in contrary to the present study. After disinfection procedure, the impressions apart from focusing under microscope to evaluate the dimensional changes, they were also evaluated macroscopically for any changes in the detailed reproduction of the discs. No change was noticed both macroscopically and microscopically. Hence, this may be concluding that there was no effect of immersion disinfection on surface detail reproduction of the three impression materials.

Some documented evidences have reported that PVS and PE impression materials can be safely immersed in glutaraldehyde and sodium hypochlorite disinfectant solutions for a short time ranging from 10 to 15 minutes without any adverse effects on the material properties. The results of this study demonstrated that immersion of the new impression material, VSE in a 2% buffered glutaraldehyde solution for 15 minutes and 0.5% sodium hypochlorite solution for 15 minutes encountered the slight material expansion which was clinically and statistically insignificant. Hence, the newly formulated material, VSE can be effectively disinfected with 2% glutaraldehyde and 0.5% sodium hypochlorite solutions without any variation in the linear dimensional changes and surface detail reproduction properties of the material.

CONCLUSION

According to the results of this study, none of the 2 disinfectants has showed potential changes in the linear dimensional changes and surface detail reproduction of the three impression materials; however, insignificant change in dimensions had been noticed. Among the three impression materials used, PE was found to be more dimensionally accurate and produced better surface details. Within the limitations of the present study, only 2 variables were tested. But, several other aspects like gypsum compatibility, elastic recovery, tear strength, biological properties, rheological properties, wetting properties etc., are yet to be studied in order to confirm the stability of VSE material.

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