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Original Research

Efficacy of custom-made trays using 3D technique in application of fluoride gels : A randomized clinical trial

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ABSTRACT

Introduction: Professional topical application is a means of preventing dental caries in both deciduous and permanent teeth and is performed by dental specialists (dentists and dental hygienists) in dental clinics, health care facilities. Several recent studies have shown substantial oral retention and ingestion of F following professional application of F gels to children and adults. The ingested F from gels may produce side effects such as nausea, vomiting, and sharp elevation in plasma F levels

Aim : To compare the fluoride gel used and retained in the children by using the foam tray and in comparison with the custom made tray prepared using the intraoral scanner

Method : 30 participants was be divided into two groups using simple random sampling and for group 1 foam made trays will be used for topical fluoride application and for the group 2 custom made trays using the intra oral scanner will be used for the application of topical fluoride gel.

Results : Mean fluoride material used in foam trays and custom made trays was 5 and 3.9 ml respectively and the amount of gel recovered was 4.03 and 2.02 respectively and the dental caries was same for the individuals without change after 12 months interval

Conclusion : This study concludes that the foam trays needed more amount of material when compared to the custom-made trays and even the retainment was high in custom made trays

Introduction

Methods of topical fluoride application include professional topical application and home use of fluoride dentifrice and fluoride mouth rinse. Professional topical application is a means of preventing dental caries in both deciduous and permanent teeth and is performed by dental specialists (dentists and dental hygienists) in dental clinics, health care facilities, and other appropriate settings specializing in dental care. Advantages of professional topical fluoride application include the ability to treat patients starting from a very young age, immediately after the deciduous anterior teeth erupted, in addition to the fact that application is necessary only two to four times a year. In addition, the ingestion of fluoride from the professional topical fluoride application is not considered to be a risk factor in dental fluorosis.[1] The fluoride agents in professional topical application are available in liquid, gel, and foam types. Because the gel and foam are generally applied using a tray, these have an advantage in that the fluoride can be applied to all of the teeth simultaneously.[2]

Several recent studies have shown substantial oral retention and ingestion of F following professional application of F gels to children and adults. The ingested F from gels may produce side effects such as nausea, vomiting, and sharp elevation in plasma F levels. To minimize the side effects of gels, suggestions have been made to lower the concentration of the F gel. A totally different approach would be to develop a vehicle that is able to dispense F to the entire mouth with a minimum amount of fluoride required. [3-8]

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Hence the present study was conducted with aim to compare the fluoride gel used and retained in the children by using the foam tray and in comparison, with the custom-made tray prepared using the intraoral scanner.

METHODOLOGY

Study Design/ Study Type: Randomized control trial

Source of Data: The study was conducted on 6-12 year children who attended the department of public health dentistry. The participants were divided into two groups using simple random sampling and for group 1 foam made trays was used for topical fluoride application and for the group 2 custom made trays using the intra oral scanner was used for the application of topical fluoride gel.

Sample Size: The sample size was 15 per each group

Study Variables:

Independent variable:

- Material wastage
- Retention capacity
- absortion

Dependent variable:

- Dental caries

Inclusion Criteria:

- Subjects with the age range between 6-12 years
- Subjects with atleast 2 carious lesion
- Subjects willing for treatment and whose parents gave the consent

Exclusion Criteria:

- Subjects who were not willing for treatment .
- Subjects who were not cooperative.
- Subjects whose parents did not give consent to the treatment.

Apparatus and Materials:

Mouth mirrors, Explorers, Sterilized cotton, Disposable gloves, Disposable glasses, intra oral scanner, foam trays, APF gel.

Study procedure :

The present study was conducted in the Department of Public Health Dentistry of Peoples Dental College, Bhopal of Madhya Pradesh. The study was conducted on 6-12 year children who visited the department of Public Health Dentistry during the study period.

Before the start of the study the complete study procedure was explained to the parents of the children and their written consent was obtained.

The study participants were divided into 2 groups using lottery method, group 1 (foam trays) and group 2 (custom made trays).

Group 1

- Thorough oral prophylaxis was done to the patient
- The upper and lower foam trays are filed with the apf gel and inserted simultaneously into the patient mouth and the patient is asked to bite the trsys for 4 min
- The patient is asked to split the remaining material and asked not to eat , drink for 30 min

Group 2:

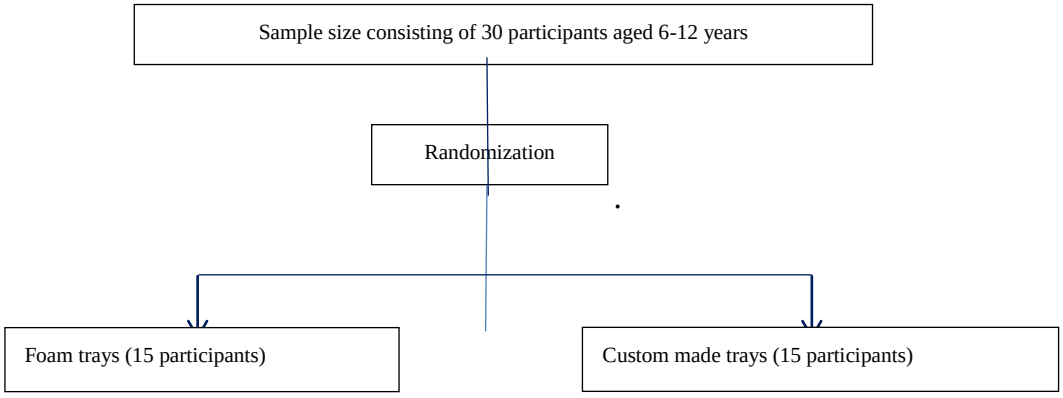
- In this using a intraoral scanner the oral cavity of the patient was scanned and custom made tray was prepared
- Before the start of treatment Thorough oral prophyalxis was done to the patient
- The upper and lower foam trays are filed with the apf gel and inserted simultaneously into the patient mouth and the patient is asked to bite the trsys for 4 min

- The patient is asked to split the remaining material and asked not to eat , drink for 30 min

Statistical Analysis:

Statistical analysis was done using SPSS version 30. t-test was to compare the amount of gel used and recovered among the study groups. statistical significance was denoted as p<0.05* levels.

Data collection procedure:



Results :

Table 1: Amount of material used in two groups

Groups	Mean	SD	t-value	p-value
Group 1	5.00	0.00	-17.6	<0.001*
Group 2	3.90	0.738		

Independent t test p<0.05* significant

The mean amount of material used in group 1 ie foam tray was 5 ml and in group 2 was 3.90 (0.738) and the difference was statistically significant with p=0.001*

Table 2 : Fluoride recovered

Groups	Mean	SD	t-value	p-value
Group 1	4.03	0.28	9.333	<0.001*
Group 2	2.02	0.738		

The amount of fluoride recovered was more in Group 1 foam trays 4.03 when compared with group 2 custom made trays 2.03 and the difference was statistically significant with p=0.0001*

Table 3: comparison of decayed teeth among the group 1 at various intervals

	Mean	SD	t-value	p-value
Before	1.5	1.35	---	---
After 12 months	1.5	1.35		

Paired t test p<0.05 significant*

The mean decayed teeth among the study population in group 1 foam trays at before and after 12 months of treatment was 1.5 and 1.5 respectively and there was no change in the mean decayed teeth score .

Table 4 : comparison of decayed teeth among the group 2 at various intervals

Group1	Mean	SD	t-value	p-value
Before	1.8	1.14	---	---
After 12 months	1.8	1.14		

Paired t test p<0.05 significant*

The mean decayed teeth among the study population in group 2 custom made trays at before and after 12 months of treatment was 1.8 and 1.8 respectively and there was no change in the mean decayed teeth score

Figure 1: Amount of material used in two groups (mean)

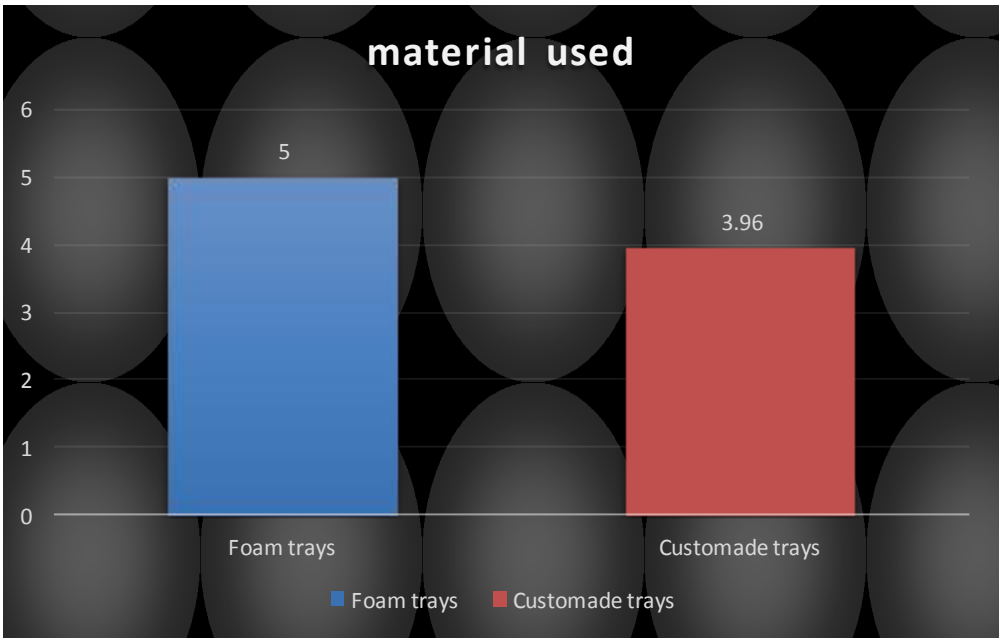


Fig 2: Comparison of decayed teeth among the group 1 at various intervals (mean)

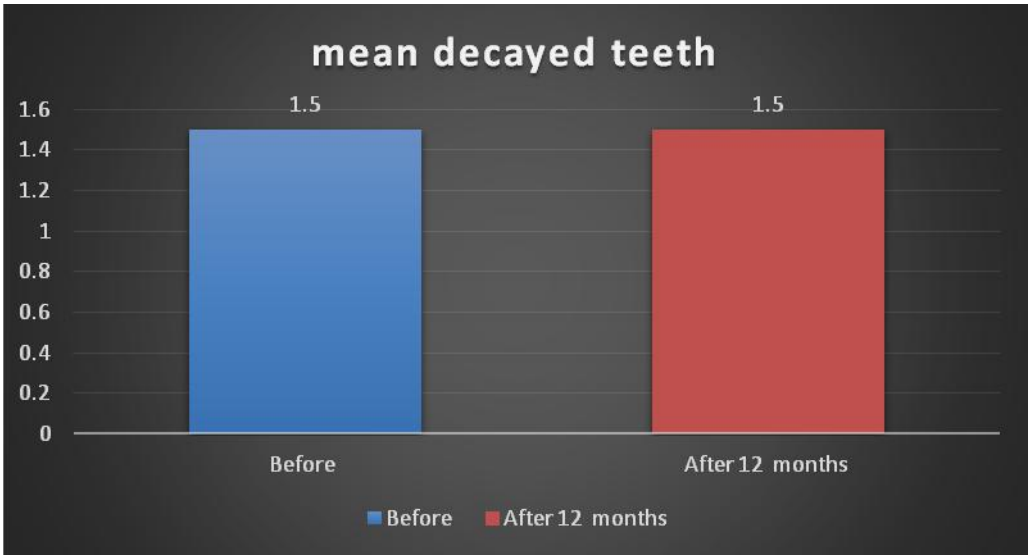
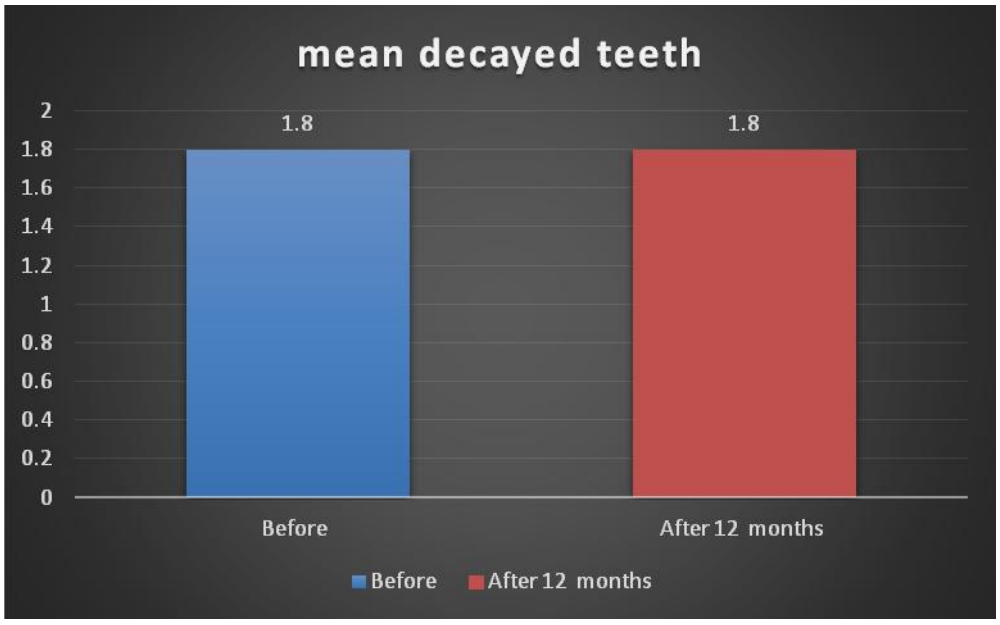


Figure 3: comparison of decayed teeth among the group 2 at various intervals (mean)



Discussion

The fluoride agents in professional topical application are available in liquid, gel, and foam types. Currently, the fluoride agents in professional topical application are available in liquid or gel types in Japan. Accompanying documentation specifies that the amount of professional topical application to be used is 2 mL or less using the paint-on technique. This applies when a liquid or a gel is used but does not apply to foams.[9] In an experiment conducted by Whitford et al. in 46 children between the ages of 8 and 12 years, the appropriate amount of APF foam or APF gel used to cover the dentition without leaking into the oral cavity was one-third the depth of the tray, which was 0.89 ± 0.02 g of foam and 3.86 ± 0.06 g of gel. With these results, the amount of foam needed to sufficiently cover the dental surface was 23.1% that of gel.[10] Moreover, in another study using APF gel, the amount of gel used with a deciduous dentition study model was 2.13 ± 0.77 g and that for a permanent dentition study model was 3.94 ± 1.38 g, while the amounts of residual gel on the dental surface after wiping away gel that had leaked from the dentition study models were 0.06 ± 0.03. this was contradictory to the present study where 5 ml of gel in foam trays but there is significant difference in the ml used for the custom made trays where 3.9 ml of fluoride gel was used and this was less compared to the ml used in foam trays.

The amount of fluoride recovered was more in foam trays 4.03 when compared with the custom made trays 2.02 that is the amount of fluoride retained was high in custom made trays. And there is no gag reflex in the patients this shows that the custom made trays are far better in fluoride retention and comfort when compared to foam trays

There was no increase in dental caries in both the study groups at 12 months follow up period

Limitation: the limitation of present study was that it cannot be done in the camps and outreach programs and the cost effectiveness of the intraoral scanner is more

Conclusion

This study concludes that the foam trays needed more amount of material when compared to the custom-made trays and even the retainment was high in custom made trays.

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The study was approved by the Institutional Ethics Committee

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