

## The effects of different application techniques and orifices on the amount of dentifrice

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*The purpose of this study was to evaluate three different methods (ST: Standart technique; PS: Pea-size; TT: Transverse technique) for dentifrice use in children between 5 to 7 years of age, as well as to compare the amount of dentifrice dispensed by using tubes with different orifices (moon or round shaped).*

*One hundred children who dispensed the dentifrice themselves were asked to apply the quantity of dentifrice they usually used (ST or TT) (Phase-I). In Phase-II, they were instructed to apply a pea-size amount (PS) and finally they were demonstrated to use the transverse technique (TT) in Phase-III. Statistical analysis was obtained by using Anova and t-test.*

*As a result, most of the children (82 patient) preferred to use ST rather than TT (18 patient). A decrease in the amount was obtained with both of the shaped orifices after the instruction of PS or demonstration of TT ( $p < 0.05$ ). It was observed that the amount of dentifrice dispensed decreased generally when a moon shaped orifice was used.*

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### INTRODUCTION

Fluoride-containing dentifrices are well accepted for effectiveness in caries prevention.<sup>1</sup> There is compelling evidence that early, substantial use of fluoride dentifrice is an important risk factor for dental fluorosis.<sup>2</sup> Recent concerns over the positive association between fluorosis and dentifrice ingestion by young children have resulted in recommendations to use minimal amount of dentifrice, thus reducing the amount of dentifrice that may potentially be ingested.<sup>1</sup>

Usually, dentifrices for children contain 1000-1100 ppm F. Because use of higher concentration fluoride dentifrices by preschool children are considered to be avoided,<sup>3,7</sup> further development and testing of lower concentration fluoride dentifrices are encouraged, and small quantities of dentifrice are used with parental direction and supervision.<sup>7,8</sup> Dentifrices containing 250-500 ppm F are also available in developed countries.<sup>9</sup>

Reducing the amount of dentifrice may also be an efficient way to maintain efficacy while decreasing the risk of fluorosis.<sup>1</sup> In these ways, use of fluoride dentifrice will continue to be an important caries preventive tool, while minimizing its role in the etiology of dental fluorosis.<sup>7</sup>

Pendry<sup>10</sup> observed that using more than a "pea-size" amount of dentifrice throughout the first eight years of life contributed to more than 70% of fluorosis in children, who grew up in optimally fluoridated communities. With a desire to educate the population in regard to the appropriate use of fluoride, it is recommended that children under 7 years of age use smaller quantities of dentifrice with fluoride.<sup>11</sup> Recommendations such as using 0.3 g, 0.5 g, a small quantity, or a "pea size" amount have appeared in scientific studies, however, due to cultural factors, nutrition, and translation, there has been difficulty in transmitting these recommendations. "Pea size" recommendation also creates a confusion due to the great variety of peas and beans found in food markets.<sup>9</sup>

Dentifrice placed in a transverse direction to the bristles of the toothbrush and not in a longitudinal direction is commonly recommended. Villena<sup>9</sup> evaluated a method of placing dentifrice in a transverse relation to the bristles (TT) and compares it to the standard technique used (ST) and to the "pea size" (PS) recommendation and concluded that TT could be recommended for young children to decrease the amount of fluoride dentifrice dispensed, minimizing inadvertent dentifrice ingestion and the risk of developing dental fluorosis. In the same study, it was also reported that the PS

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Figure 1. Application of standard technique (ST) preferred by children.



Figure 2. Application of transverse technique (TT).



Figure 3. Dentifrice tubes with different orifices.

recommendation can create confusion with a lot of individual variability, whereas TT was easy to be standardized.

Recently, dentifrice tubes with different orifices are produced in order to reduce the amount of the dentifrice dispensed. However, there are only two studies including the effectiveness of the orifices on the amount of dentifrice.<sup>9,12</sup>

The purpose of this study was to evaluate three different methods (ST, PS, TT) for dentifrice use in children between 5 to 7 years of age, as well as to compare the amount of dentifrice dispensed using two dentifrice tubes containing 500 ppm F with different orifices.

#### MATERIALS AND METHODS

One hundred children who dispense the dentifrice themselves (5 to 7 years old) were selected. Children with appropriate informed consent from their parents were recruited from the Department of Pediatric Dentistry, Faculty of Dentistry, Gazi University. Initially, children were given a toothbrush and asked to

apply the quantity of dentifrice, which they usually used (ST or TT) (Phase-I). Figure 1 shows the application of ST preferred by children. Later, they were instructed to apply a small "pea-size" amount (Phase-II). Finally children were demonstrated to use the transverse technique (Phase-III) as shown in Figure 2. Three toothbrushes were used by each child, the same that were weighed before and after each measurement. The same brand of toothbrush (Oral-B manual toothbrush) and two dentifrice tubes (Oral-B and İpana) containing 500 ppm F with different orifices (Oral-B, moon-shaped orifice and İpana, round orifice) were used (Figure 3). All children received orientation about oral hygiene when they completed the study.

The statistical significance of the differences among the three methods and of the differences between the two dentifrice tubes were evaluated using Anova test and t test, respectively.

#### RESULTS

Of one hundred children participated in this study, 82 children used ST and 18 children used TT in the first phase. The results of the statistical analysis are shown Table 1 and 2.

When the three techniques were evaluated in 82 children, who used ST in the first phase, it was observed that there was a significant difference between ST (Phase I) and the other two techniques (PS, TT) in both of the round and moon-shaped orifices ( $p < 0.05$ ). No significant difference was found between PS (Phase II) and TT (Phase III) in the same group ( $p > 0.05$ ).

When the three techniques were evaluated in 18 children, who used TT in the first phase, it was observed that there was a significant difference between TT (Phase I) and the other two techniques (PS, TT) in both of the round and moon-shaped orifices ( $p < 0.05$ ). No significant difference was found between PS (Phase II) and TT (Phase III) in the same group ( $p > 0.05$ ).

**Table 1.** Amount of Dentifrice (grams) Dispensed by 82 Children Using the Standard Technique (ST), a Pea-Size Amount (PS) and the Transverse Technique(TT) With Different Shapes of Orifices (A: Round B: Moon shaped orifice).

Dentifrice shapes of orifice	N	Technique	Mean	Standard Deviation
A	82	ST*	0.3785	0.23001
		PS	0.2384	0.10742
		TT	0.2391	0.14442
B	82	ST*	0.2469	0.14747
		PS	0.1652	0.07254
		TT	0.1330	0.05856

\* Significant difference (p<0.05)

**Table 2.** Amount of Dentifrice (grams) Dispensed by 18 Children Using the Transverse Technique (TT), a Pea-Size Amount (PS) and the Transverse Technique (TT) With Different Shapes of Orifices (A: Round B: Moon shaped orifice).

Dentifrice shapes of orifice	N	Technique	Mean	Standard Deviation
A	18	TT*	0.3338	0.16645
		PS	0.2027	0.07494
		TT	0.2087	0.10712
B	18	TT*	0.3270	0.16404
		PS	0.2032	0.07274
		TT	0.2459	0.10406

\* Significant Difference (p<0.05)

The amount of dentifrice dispensed with the round and the moon shaped orifices were compared with the “t test”. When the amount of dentifrice dispensed by 82 children using ST in the first phase was evaluated, there was a statistically significant difference among the phases (ST, PS, TT) (p<0.05). But, when the amount of dentifrice dispensed by 18 children using TT in the first phase was evaluated, there was a statistically significant difference between Phase I and Phase II, and also between Phase I and Phase III (p<0.05), though there was no statistically significant difference between Phase II and III (p>0.05).

## DISCUSSION

In recent years, the prevalence of dental fluorosis has increased in both fluoridated and non-fluoridated communities.<sup>9,13-15</sup> Although dentifrice was not identified as a risk factor for dental fluorosis in many of the earlier studies,<sup>16,17</sup> nearly all studies reported in the last seven or eight years have demonstrated associations between dental fluorosis and use of fluoride dentifrices in early childhood.<sup>13,18-20</sup>

The risk of dental fluorosis has increased due to the fluoride-containing dentifrice ingestion by pre-school children. To prevent the possible over-dosage resulting in dental fluorosis, The European Academy of Pediatric Dentistry advises the use of a pea-sized amount of 500 ppm F<sup>-</sup> dentifrices twice daily.<sup>21,22</sup> However, a pea-size amount recommendation creates a confusion.

In the study, it was observed that the amount of dentifrice (with round or moon-shaped orifice) dispensed by the children using ST and the ones using TT in the first phase were within normal limits described as 0.25-0.50 gram. This amount is similar with the results described by Rock<sup>23</sup> and Bertly<sup>24</sup> where it was shown that the average weight of a “pea-size” was equivalent to 0.3 g and 0.22g. However, this result may be related to the inability of the pressing the tubes because of poor motor coordination rather than the acquired application technique at these ages.

When the results of the second (PS) and the third (TT) phases were evaluated, it was observed that the amount of dentifrice dispensed was below the recommended dose (<0.25 g). This may be due to the suspicion about the act of pressing after the instruction and demonstration.

As a result, in several studies,<sup>9,12</sup> it was reported that the amount of dentifrice dispensed decreased when dentifrice tubes with smaller orifices were used. In accordance, we have found similar results with the moon-shaped orifice. This decrease can be explained with the smaller orifice of the dentifrice tube.

An additional aspect that deserves comment is that, 82 children placed the dentifrice in a longitudinal direction on the bristles of the toothbrushes as in Standard Technique (ST). This is probably related to marketing campaigns of the manufacturers and could probably explain the quantity of dentifrice usually placed (ST) that on average proved to be high.

## CONCLUSION

1. Children usually preferred to use ST rather than TT before the instruction or demonstration by the operator.
2. A decrease was obtained with both of the round and moon shaped orifices, after the instruction of pea-size application and demonstration of TT in children who used ST or TT in the first phase ( $p < 0.05$ ).
3. The amount of dentifrice dispensed decreased generally when a dentifrice tube with a moon-shaped orifice was used.

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