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Dual Action Defense - An In Vivo Assessment of Salivary Fluoride Dynamics Post Fluoride Varnish-Povidone Iodine Application

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Abstract: ***Background: Fluoride varnish is widely used as a caries-preventive agent due to its ability to enhance enamel remineralization and inhibit demineralization. The adjunctive use of Povidone-Iodine (PVP-I), a broad-spectrum antimicrobial, may prolong fluoride retention in the oral cavity by reducing cariogenic bacterial activity. Aim: To estimate salivary fluoride concentration following topical application of fluoride varnish with Povidone-Iodine at different time intervals. Materials and Methods: Fifteen healthy children aged 7–10 years were enrolled. After baseline unstimulated saliva collection, PVP-I was applied for one minute and rinsed off, followed by application of fluoride varnish. Saliva samples were collected at baseline, 24 hour and 48 hours. Fluoride concentration was estimated using a fluoride ion-specific electrode. Data were analyzed using repeated measures ANOVA ($p < 0.05$). Results: Mean baseline fluoride level was 0.35 ppm. Following FV + PVP-I application, fluoride levels rose significantly at 24 hours (1.65 ppm), gradually decreased at 48 hours (1.32 ppm). The rise at 24 h and 48 h compared to baseline was statistically significant ($p < 0.05$). Conclusion: Application of fluoride varnish with Povidone-Iodine significantly elevated salivary fluoride concentration for up to 48 hours. This combination may provide dual benefits of antibacterial action and enhanced fluoride availability, supporting its use as a preventive strategy in Pediatric dentistry.***

Keywords: fluoride varnish, povidone-iodine, salivary fluoride concentration, enamel remineralization, pediatric dentistry

1. Introduction

Dental caries continues to be a major global public health problem, particularly among children. It is a multifactorial disease characterized by demineralization of tooth structure under the influence of cariogenic bacteria, fermentable carbohydrates, and time. Preventive dentistry which is gaining popularity in the new era therefore aims to reduce risk factors while enhancing protective mechanisms.

Fluoride has remained the cornerstone of caries prevention due to its well-documented ability to promote remineralization and inhibit acid-induced demineralization. Fluoride varnish, in particular, provides a slow and sustained release of fluoride, making it highly effective in children. Despite its benefits, fluoride does not directly address the bacterial component of caries. *Streptococcus mutans* and *Lactobacillus* species play a central role in cariogenesis. Povidone-Iodine (PVP-I), a well-established antimicrobial agent, has demonstrated efficacy in suppressing cariogenic bacterial load when applied topically. When used in combination with fluoride varnish, PVP-I may reduce bacterial activity while allowing fluoride ions to persist longer in the oral environment. Taking all these reasons into consideration, the present study aimed to estimate salivary fluoride concentrations following application of fluoride varnish with Povidone-Iodine at different intervals in children.

2. Materials and Methods

The present investigation was designed as a **prospective, single-arm, in vivo clinical study** involving a total of fifteen healthy children between **7 and 11 years of age**. Participants were included if they were medically healthy, free from systemic illness, exhibited no active carious lesions, and had not received professional fluoride application within the past six months. Only those children whose parents provided informed written consent were enrolled. Children were excluded if they had a known history of allergy to iodine or fluoride, had undergone systemic antibiotic therapy within the preceding month, or presented with xerostomia or any salivary gland disorder that could potentially interfere with salivary fluoride estimation.

3. Methodology

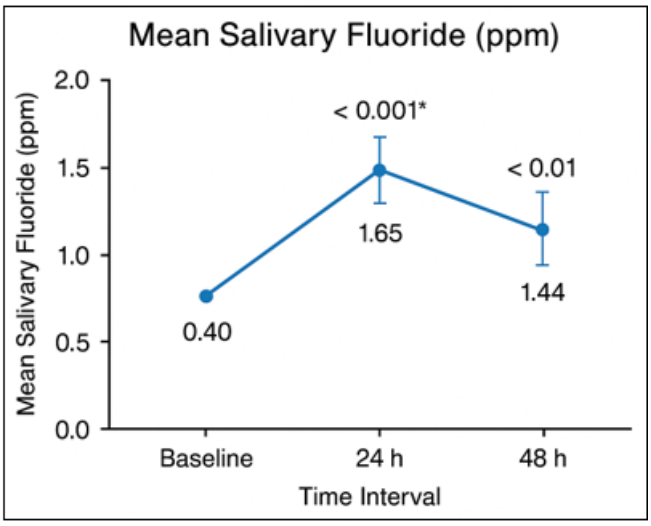
Prior to the intervention, baseline unstimulated saliva samples were collected from each participant using the passive drool method and labeled as B. Following isolation and gentle drying of the teeth with cotton rolls, the dentition was treated with 10% povidone-iodine for approximately 4–5 minutes. The solution was applied using a small sterile cotton ball held with locking cotton pliers, after which the teeth were briefly wiped with gauze to remove excess solution. Each application delivered approximately 0.20 ml, equivalent to 2 mg of iodine, which is considered safe for use in children. Immediately following the povidone-iodine application, fluoride varnish was applied to the teeth as per the standard protocol. Subsequent saliva samples were collected at 24 hours (I1) and 48 hours (I2)

Statistical Analysis: Data analyzed with repeated measures ANOVA. $p < 0.05$ considered statistically significant.

4. Results

Time Interval	Mean Salivary Fluoride (ppm)	SD	p-value vs Baseline
Baseline	0.40	0.05	–
24 h	1.65	0.12	< 0.001*
48 h	1.44	0.10	< 0.01*

*Statistically significant



Interpretation:

- Salivary fluoride concentration increased significantly at 24 h after FV + PVP-I.
- Levels remained elevated at 48 h.
- Peak fluoride bioavailability was observed at 24 h.

5. Discussion

Fluoride varnish application after povidone-iodine pre-treatment resulted in a marked rise in salivary fluoride concentration for up to 48 h. The observed peak at 24 h is consistent with previous literature on varnish substantivity, where fluoride is released slowly into saliva and plaque.

PVP-I contributes by:

1) Suppressing *S. mutans* and *Lactobacillus* activity, thereby reducing acidogenic challenge.
2) Altering biofilm matrix, enhancing fluoride penetration.
3) Providing a synergistic antimicrobial effect that may indirectly prolong fluoride retention.

Our findings are in agreement with prior studies reporting higher fluoride substantivity when antimicrobial pretreatments are used.

Clinical Relevance: This dual-action approach may be particularly useful in Pediatric populations with high caries risk, as it addresses both microbial and mineral components of caries aetiology.

6. Conclusion

- Application of fluoride varnish with povidone-iodine significantly increased salivary fluoride levels for up to 48 hours.
- Peak fluoride concentration occurred at 24 hours, with gradual decline thereafter.
- This combined protocol offers promise as a preventive tool in Pediatric dentistry by uniting remineralization and antimicrobial benefits.

7. Future Scope

Larger sample sizes and longer follow-up are recommended to validate long-term caries-preventive effects of FV + PVP-I combination.

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