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Comparative study of the gingival trauma with Proph- Jet and rubber-cup polishing techniques using aluminium trihydroxide as polishing agent

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Abstract

Background: The conventional rubber cup prophylaxis and the air powder polishing system are both effective professional techniques for plaque and stain removal.

Aim: To compare the gingival trauma with the two polishing techniques viz., Prophy-Jet and rubber-cup polishing techniques using aluminium trihydroxide as polishing agent.

Methods: Thirty study subjects with gingivitis were studied. After scaling, Prophy-Jet and rubber-cup polishing techniques were applied on either side of the mouth using aluminium trihydroxide as polishing agent and the gingival trauma was assessed immediately after, 7 days and 21 days posttreatment using trauma index.

Results: Mean Trauma index scores immediately after the rubber-cup polishing technique was 0.27 ± 0.14 and after Prophy-Jet polishing technique was 0.50 ± 0.15 . A reduction in the mean Trauma index scores was seen at 7 and 21 days after treatment after both the techniques with the mean Trauma index score of 0.02 ± 0.01 with rubber-cup and 0.03 ± 0.02 with Prophy-Jet technique at 21st day of evaluation.

Conclusion: No significant difference in gingival trauma between by Prophy-Jet and rubber-cup polishing techniques using aluminium trihydroxide at 7 and 21 days post-treatment was observed despite of higher gingival trauma immediately after air polishing using aluminum trihydroxide.

Keywords: Trauma index, Prophy-Jet, rubber-cup

Introduction

Periodontal diseases are multi-factorial in nature and are caused by microorganisms that colonize the tooth surface at or below the gingival margin. The conventional rubber cup prophylaxis and the air powder polishing system are both effective professional techniques for plaque and stain removal [1, 2]. For over half a century, the use of rubber cup and paste has been the most common method of prophylaxis [3].

Air polishers have overcome conventional rubber cup polishing paste systems for supragingival plaque removal as it reaches surfaces which are inaccessible to a rotary device [4]. Various abrasives used in air polishers are aluminium trihydroxide, calcium sodium phosphosilicate, calcium carbonate and glycine. Aluminium trihydroxide is an alternative air polishing powder for patients on sodium restricted diets. Its particles are harder and comparable in size to sodium bicarbonate [5].

During polishing, these agents are known to inevitably affect the gingival epithelium surrounding the tooth. Hence, some amount of gingival trauma occurs inadvertently during the procedure. But whether the degree of gingival trauma depends on the technique of polishing is still under investigation [6]. Therefore, we planned this study to compare the gingival trauma with the two polishing techniques viz., Prophy-Jet and rubber-cup polishing techniques using aluminium trihydroxide as polishing agent.

Methods

This investigation was conducted at Department of Periodontology and Oral implantology of a dental college located in northern India. Convenient sampling technique was adopted. Thirty patients suffering from gingivitis were investigated. Study subjects aged >18 years, having a minimum of 20 teeth, patients with probing depth of ≤ 4 mm, patients having slight to moderate generalized gingivitis were included for this study.

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Edentulous patients, those using orthodontic and prosthetic appliances smokers or who used any form of tobacco product, with history of allergy to abrasives, with history of any uncontrolled systemic disease were excluded.

Study subjects were subjected to atraumatic supragingival calculus removal one week before the commencement of this study. Any stain, if observed was left intact. The patients were instructed to discontinue the use of mouthwash until the study was to be over and to practice routine oral hygiene. Prophy-Jet and rubber-cup polishing techniques with aluminium trihydroxide were randomly allocated to either side of the mouth. The effects on gingiva were scored by a single examiner, immediately after, 7 days and 21 days post-treatment on the facial and lingual side of each quadrant using trauma index [7].

For air polishing, a slow speed hand piece and prophy angle was used with aluminum trihydroxide polishing powder. The tip of the Prophy-Jet was kept 4-5 mm from the tooth surface and the spray was centered on the middle third of the tooth. A constant circular motion was used, and care was taken not to direct the spray into the sulci. The spray was directed at an 80° angle toward the gingiva, in a slightly distal direction, for cleaning molars and premolars, and at a 60° angle toward the gingiva for cleaning cuspids and incisors. All teeth were polished, whether stain and plaque were present or not, as is

routinely done during standard prophylaxis procedures

For rubber-cup and paste technique, the paste used was a plain, fine, aluminum trihydroxide and water mixture, which was filled in the cup and was also spread over the teeth in the area to be polished. Finger rest was established and the cup was placed in contact with tooth. The stroke was from the gingival third toward the incisal third of the tooth. Using the slowest speed, the revolving cup was applied lightly to the tooth surface for 1-2 s with a patting, wiping motion and an overlapping stroke [8, 9].

Written and informed consent was obtained from study subjects. Permission of ethical committee was obtained from the Institutional Ethics Committee. All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 21 (IBM, Chicago, USA). The results were expressed using appropriate statistical variables.

Results

Mean Trauma index scores immediately after the rubber-cup polishing technique was 0.27 ± 0.14 and after Prophy-Jet polishing technique was 0.50 ± 0.15 and this finding was statistically significant. (Table 1)

Table 1: Comparison of mean Trauma index with the Rubber-cup polishing and Prophy-Jet polishing at different intervals

Variable	Rubber-cup polishing (Mean \pm SD)	Prophy -Jet polishing (Mean \pm SD)	P value
Immediately after	0.27 ± 0.14	0.50 ± 0.15	<0.05 (Significant)
After 7 days	0.08 ± 0.09	0.14 ± 0.08	>0.05 (Non-Significant)
After 21 days	0.02 ± 0.01	0.03 ± 0.02	>0.05 (Non-Significant)

A reduction in the mean Trauma index scores was seen at 7 and 21 days after treatment after both the techniques with the mean Trauma index score of 0.02 ± 0.01 with rubber-cup and

0.03 ± 0.02 with Prophy-Jet technique at 21st day of evaluation. Trauma scores of either of the technique were also not found significantly different at 7 and 21 days. (Table 2)

Table 2: Mean changes in Trauma index at different intervals with the Rubber-cup polishing and Prophy-Jet polishing

Variable	Immediately after and 7 days	7 days and 21 days	Immediately after and 21 days
Rubber-cup polishing	0.18 ± 0.34	0.03 ± 0.04	0.19 ± 0.06
P value	<0.001	<0.05	<0.001
Prophy-Jet polishing	0.29 ± 0.08	0.09 ± 0.08	0.43 ± 0.10
P value	<0.001	<0.05	<0.001

Mean Trauma index scores were 0.17 ± 0.08 and 0.32 ± 0.10 immediately after and 7 days with rubber-cup and Prophy-Jet technique respectively. Reduction in Mean Trauma index

scores was found significant at immediately after and 7 days and at immediately after and 21 days. (Table 3)

Table 3: Mean changes in Trauma index at different intervals with the Rubber-cup polishing and Prophy-Jet polishing

Variable	Rubber-cup polishing (Mean \pm SD)	Prophy-Jet polishing (Mean \pm SD)	P value
Immediately after and 7 days	0.17 ± 0.08	0.32 ± 0.10	<0.05 (Significant)
Immediately after and 21 days	0.25 ± 0.10	0.39 ± 0.14	<0.05 (Significant)
7 days and 21 days	0.03 ± 0.02	0.11 ± 0.05	>0.05 (Non-Significant)

Discussion

Tooth polishing continues to be an integral part of clinical practice since the concept of selective polishing was introduced in the 1980s. Polishing essentially removes the removal of stains and plaque bio-film and provides a method for applying various medicaments to the teeth such as desensitizing agents. With passage of time emergence of more efficient and effective devices like jet abrasives have been introduced. Still the role of rubber cups with prophy angles cannot be overlooked as they are still being widely used and provide an economical alternative.

Over the years, professional dental prophylaxis has involved

the use of rubber-cup, bristle brush, and abrasive paste for coronal polishing. Although air polishing is an excellent alternative for removal of tooth stain and dental plaque, very few studies have compared their efficacy *in vivo*.

Our study evaluated and compared gingival trauma after Prophy-Jet and rubber-cup polishing techniques using aluminum trihydroxide polishing agent. Aluminum trihydroxide was the first air-polishing agent developed as an alternative to specially processed sodium bicarbonate for patients who are sodium intolerant. We observed that Mean Trauma index scores immediately after the rubber-cup polishing technique was 0.27 ± 0.14 and after Prophy-Jet

polishing technique was 0.50 ± 0.15 and this finding was statistically significant. Similar finding have been earlier reported by Mishkin *et al* [10] and Kontturi-Närhi *et al* [11] who showed an increased gingival bleeding and trauma immediately after air polishing which could no longer be detectable and clinically insignificant at 7 and 21 days of evaluation.

Another study from Punjab observed that one of the 15 subjects complained of peeling of the inner aspect of the lower lip after polishing, which again was not evident by 7th day of evaluation. It could be due to insufficient rinsing of the mouth during the procedures that allowed the abrasives to pool and cause irritation to the soft tissue in that area [12].

Although some initial soft tissue impact was observed but postoperative follow-up at 7 and 21 days showed that the relative trauma scores of either air polishing or rubber-cup treatment were not significantly different. Air polishing offers many advantages to clinicians and their patients and it has been reported that its less time consuming and effective in heavily stained surfaces (e.g., smoking and chlorhexidine stain), thus minimizing the operator and patient fatigue [13].

Various studies [14, 15] revealed that the effectiveness of air-polishing to the rubber cup polishing for bacterial plaque and stain removal demonstrate that both methods are equally effective. Although both methods were reported to cause some gingival trauma. Garcia-Godoy [16] have studied and reported that air polishers are more effective for plaque and stain removal in pits and fissures. Recent introduction of glycine powder air-polishing in removing sub-gingival biofilm abridge periodic sub-gingival instrumentation and serve as an alternative to conventional techniques that result in less gingival erosion along with 80% reduction in abrasiveness on root surface than hand instrumentation or sodium bicarbonate air-polishing.

Conclusion

This study observed no significant difference in gingival trauma between by Prophy-Jet and rubber-cup polishing techniques using aluminium trihydroxide at 7 and 21 days post-treatment despite of higher gingival trauma immediately after air polishing using aluminum trihydroxide. Both the techniques were found equally efficacious in our investigation.

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