JOURNAL OF CLINICAL CASE STUDIES, REVIEWS & REPORTS

Research Article

Volume 2 | issue 2

Evaluation And Comparison of Two Different Polishing Systems on Enamel Surface Roughness-An in Vitro Study

Manisha Mishra[1], Arpan Aash[2*], Sachin K Malagi[3], Sakshi P Teware[4], Dennis V Abraham[5] and Shruti Trivedi[6]

[1]*Dr. Manisha Mishra, MDS, Consultant Periodontist & Implantologist*

[*2]*Dr. Arpan Aash, MDS, Consultant Oral Physician and Radiologist*

[3]*Dr. Sachin K. Malagi, Professor, Department of Periodontics, Maitri College of Dentistry and Research Centre, Old G. E. Road, Dist Durg, GE Rd, Anjora, Chhattisgarh, India*

[4]*Dr. Sakshi P. Teware, Senior Lecturer, Department of Periodontics, R.R, Kambe Dental College & Hospital, Akola Maharashtra, India*

[5]*Dr. Dennis V. Abraham, Professor, Department of Periodontics, Maitri College of Dentistry and Research Centre, Old G. E. Road, Dist Durg, GE Rd, Anjora, Chhattisgarh, India*

[6]*Dr. Shruti Trivedi, Senior Lecturer, Department of Periodontics, Maitri College of Dentistry and Research Centre, Old G. E. Road, Dist Durg, GE Rd, Anjora, Chhattisgarh, India*

***Corresponding Author:** Arpan Aash, Consultant Oral Physician and Radiologist, India. Phone number: +7987222164.

Submitted: 21 Dec 2023 **Accepted:** 05 Feb 2024 **Published:** 10 Feb 2024

Citation: *Manisha Mishra, Arpan Aash, Sachin K Malagi, Sakshi P Teware, Dennis V Abraham and Shruti Trivedi (2024). Evaluation And Comparison of Two Different Polishing Systems on Enamel Surface Roughness-An in Vitro Study. J of Clin Case Stu, Reviews & Reports 2(2), 1-4.*

Abstract

Background-*Tooth polishing act as smoothening the tooth surfaces to make it glossy and lustrous.*

Aim- *The study was conducted to evaluate and compare the efficacy of two different polishing systems on enamel surface roughness by an optical profilometer (quantitative analysis)*

Methodology- *Total 60 freshly extracted teeth from healthy adults were selected and stored at room temperature in artificial saliva. All the teeth were cleaned using ultrasonic scaler and crown portion of each tooth was cut at CEJ. Tooth sections were randomly categorized into 2 groups and their pre and post polishing values were measured. Group I included the tooth sections polished using traditional air polisher with sodium bicarbonate powder and the values were measured with the help of prophy-jet. Group II included tooth sections polished using the aqua care handpiece with sodium bicarbonate powder. The quantitative analysis was done using an optical profilometer and qualitative analysis using a scanning electron microscope to check the surface roughness. Then the samples were mounted on metal stage and pin-point light of optical profilometer was focused on the middle 3rd of the crown and examined*

Result- *The statistical analysis is carried out using paired 't' test. The significant difference was determined in enamel surface roughness in the group used aqua care handpiece with sodium bicarbonate powder as compare to the group used traditional air polisher with sodium bicarbonate powder.*

Conclusion- *Aqua care hand piece with sodium bicarbonate powder may be an effective polishing method to reduce the enamel surface roughness.*

Keywords: Enamel Roughness, Optical Profilometer, Aquacare, Polishing Materials, Tooth Polishing

Introduction

Tooth polishing is a prophylactic procedure that is carried out to smoothen the tooth surface to make it glossy and lustrous. The most commonly used polishing materials are rotary rubber cup, prophylactic paste and pumice [1]. The abrasive particles used in commercial prophylaxis polishing pastes include aluminium oxide (alumina), silicon carbide, aluminium silicate, silicon dioxide, carbide compounds, garnet, feldspar, zirconium silicate, zirconium oxide, boron, and calcium carbonate [2]. Others include the emery, silica, and perlite [3]. The purpose of all these abrasive agents is to clean and to make the tooth surfaces smooth, thus ensuring minimal accumulation and retention of dental plaque and calculus, thereby reducing the incidents of gingival disease. Irregularities and roughness are causes of enamel staining and plaque accumulation5. Hence post scaling polishing procedure is carried out and there are lots of materials that are

available in market to achieve the desired results. The question here arises about the roughness that still is left over the tooth surface after polishing and also the ones caused by the polishing agents the most. Despite the emergence of newer advances in polishing most Indian dentists still follow the traditional method of tooth polishing which is rubber cup and pumice powder [2]. which again is time taking and the efficiency as compared to the newer alternatives can be questioned, hence to reduce the chair-side timing an air polisher containg sodium bicarbonate along with compressed air and water is used and Aquacare which has sodium bicarbonate along with dryair has been used as a new device [3].

Therefore, the aim of the present study was to evaluate and compare the efficacy of two different polishing systems on enamel surface roughness by an optical profilometer.

Methodology

Inclusion criteria-

1. Freshly extracted caries free teeth.
2. Teeth with intact crown structure
3. Teeth surface unaltered by extraction procedure wasting diseases

Exclusion criteria-

1. Previous history of periodontal treatment within 6 months of study.
2. Teeth that had undergone any restorative procedure/ RCT
3. Teeth with any pathologies affecting enamel

Total 60 freshly extracted teeth from healthy adults were selected. The teeth were extracted and stored at room temperature in artificial saliva. These teeth were randomly categorized into 2 groups having 20 teeth in each group. They were cleaned thoroughly to remove all debris, tissue tags and calculus from the surface with an ultrasonic scaler. The instruments and material used in the study were prophyjet with sodium hydroxide bicarbonate powder, Aquacare hand piece, quantitative surface roughness measured by optical profilometer. The ultrasonic scaler was used at a medium power setting and tip angulation close to zero degrees with the tooth. The crown portion at the cementoenamel junction of each tooth was cut with a metallic sectioning disc under copious irrigation and then the cut section of the crown was focused under the laser pin-point light of the optical profilometer on the middle 3rd of the crown to check for the roughness.

Group 1 included the tooth sections whose pre-polishing values were measured and also the post polishing values were measured after using traditional air polisher with sodium bicarbonate powder with the help of a prophy-jet and Group 2 included the tooth sections whose pre-polishing values were measured and post polishing values were measured using a novel equipment which is the aqua care handpiece with sodium bicarbonate powder.

The surface roughness was checked using quantitative analysis using an optical profilometer and the surface roughness is measured using the following parameters:

Profilometer measurements include Ra, Rq, Rz, Rmax and Rt values and surface graphics. These values are:

Ra: Arithmetic average of Ra values in roughness profile
Rq: Geometric average of the deviations occuring in roughness profile
Rz: Average height of peak-to-valley
Rmax: Maximum roughness depth
Rt: Roughness depth

Results

The study included total 60 freshly extracted teeth. The statistical analysis was carried out using paired‘t’ test. Table 1 showed the comparison of mean values of pre and post treatment of both the groups. Table 2 showed. There was a significant difference was found in group II (polishing with aqua care handpiece with sodium bicarbonate powder).

Table 1: Mean Values of Group I (Air Polisher) And Group Ii (Aqua Care Polisher)

		Mean	N	Std. Deviation	Mean Difference	P value
Air polisher(G1)	Pre	2.5500	20	.51042	0.75	0.001*
	Post	1.8000	20	.61559		
Aquacare (G2)	Pre	2.7000	20	.47016	0.90	0.001*
	Post	1.1000	20	.61559		

Table 2: Aquacare Difference in Values of Mean Rp, Rv, Rt, Ra, Rq, Rsk, Rkr

	Mean	N	Std. Deviation			
Aquacare	Pre-Mean	6.460000	20	.1569445	-3.685	0.001*
	Post Mean	10.145000	20	.1190975		
	Pre Rp	2.450000	20	.5462793	1.455	0.001*
	Post Rp	.994020	20	.2378810		
	Pre Rv	4.320000	20	1.1335088	0.030	0.925
	Post Rv	4.290000	20	.9694817		
	Pre Rt	6.760000	20	.9944054	1.430	0.001*
	Post Rt	5.330000	20	1.0657836		
	Pre Ra	837.805000	20	88.5686857	291.90	0.001*
	Post Ra	545.905000	20	97.1733853		
	Pre Rq	1.097950	20	.0942998	0.239	0.001*
	Post Rq	.858140	20	.1646028		
	Pre Rsk	-.995600	20	.6153080	1.246	0.001*
	Post Rsk	-2.241700	20	1.1369153		
	Pre Rkr	2.428800	20	2.9933701	-5.494	0.001*
	Post Rkr	7.922800	20	3.1214327		

Hence statistically significant reduction in surface roughness was seen in group 2 (aquacare) than in the group 1 (conventional air polisher) showing the least of surface roughness in group 2 than in group 1(Table 1) , among comparing the Mean Rp, Rv, Rt, Ra, Rq, Rsk, Rkr of the aquacare intra group analysis, it was observed that they also showed significantly statistical difference when compared in terms of pre polishing and post polishing values.(Table 2).

Discussion

The objective of the study was to evaluate and compare the efficacy of two different polishing systems on enamel surface roughness by an optical profilometer. In this study, we have evaluated the enamel surface roughness by comparing the two polishing methods i.e. the polishing using traditional air polisher containing sodium bicarbonate powder with compressed air and polishing with aqua care handpiece containing sodium bicarbonate powder with dry air. And we found that there was a significant difference occurred between group I and group II.

Today, the most widely used polishing material is rotary rubber cup, pumice or prophylaxis paste. This method often creates disappointment in settled colorations, it requires a long time and is tiring for the dentist so in order to be able to make the process faster and more efficient, the one of the devices developed is the air-flow polishing instrument ejecting compressed air, water and sodium bicarbonate that have its own advantages and disadvantages.

Air powder polisher used for supragingival plaque removal as they reach the inaccessible areas where the rotary devices cannot reach like furcations, flutings, close root proximities. They used slurry of water and sodium bicarbonate under air and water pressure. Air powder polisher can also be used with an ultrasonic scaler or directly with the air/water connector or separately. Air powder polisher has the ability to remove biofilm, without harming the periodontal soft tissues and the hard tissue structures.

In many studies, it was shown that air-polishing devices became time-saving and effective in the application on normal enamel surface [6,7]. However, it does not generally lead to surface modification and loss of materials to be able to be detected clinically [7,8]. In contrast, spray may occur a significant amount of loss of material, if applied directly on root surface or dentin. As a rule, it is known that it should be certainly avoided to use these devices on dentin and cement [9]. Tissue loss caused by the technique is depends on application time, powder and water application as much as the probe distance and the application surface.

Air abrasion, unlike traditional handpiece and bur technique, does not directly contact with tooth structure. This minimally invasive approach can help put patients at ease, without the vibrations, noise, and heat that often experience with drills.

Aqua care uses technology to deliver a comfortable, quick and clean procedure by using a fine stream of AquaSol combined with wide range of prophylaxis powder. The multifunctional handpiece of Aquacare ensures comfort for both the patient and practitioners offering easy manoeuvrability, adjustable speed and power and allow the practitioner to focus on the success and quality of their treatment. The other uses apart from polishing are also said to be Easy and fast treatment of pits and fissures with zero discomfort for patient along with Preparation of small cavities without the need of local anesthetic,saving discomfort and time, Finishing the internal surfaces of large cavities texturing to increase bond strength, Pain free removal of white spot areas in tooth enamel for restoration, Removal and repair of composite filling materials. Effective in removal of cement after removal of brackets, treating tooth sensitivity with Sylc bioglass powder and improving the tooth whiteness at the same time also crown preparation with cementation [10].

In our study, Aqua care handpiece, the new material intended to be evaluated by comparing the efficacy was also reduced the enamel surface roughness in a statistically significant way. There was no sufficient study related to this material. Future studies with more critically designed protocols, larger sample size and inclusion of various other biochemical and microbiological examination are necessary to further explore the potential of this perspective of periodontal treatment.

Conclusion

Tooth polishing used to be a standard part of a dental cleaning appointment. The dentists use it to ablute the teeth so that plaque and bacteria which causes gingivitis, periodontitis or cavities do not stick to the tooth easily. the dentists and hygienists have varied options regarding the abrasive/polishing agents and type of polishers used. They can now use different polishers and abrasives based on the patients' acceptance and condition, thereby providing good care by selectively designing the treatment according to the patient's need and with minimum concern about the loss of tooth structure. Hence, the present study showed that polishing using Aqua care handpiece with sodium bicarbonate powder was significantly effective in reducing the enamel surface roughness as compared to the air polisher.

Acknowledgement

I acknowledge all the hospital staff of oral surgery department to collect extracted sample, Dr. Abhinav for for statistical help in completing the work successfully, AIIMS DELHI for allowing me to have access to the optical profilometer and my sincere gratitude to all the authors who gave their immense dedication towards completing this study successfully.

References

1. Sawai MA, Bhardwaj A, Jafri Z, Sultan N, Daing A (2015) Tooth polishing: The current status. J Indian Soc Periodontol 19: 375-380
2. uzcel KY, Narki V, Markkanens S, Markkanen H (2016) Effects of an air polishing system on dental plaque removal and hard tissue as evaluated by scanning electron microscopy. j periodontal 6: 1-5
3. Jones CL, Milsom KM, Ratcliffe P, Wyllie A, Macfarlane TV, et al. (2011) Clinical outcomes of single-visit oral prophylaxis: a practice-based randomised controlled trial. BMC Oral Health 11: 35.
4. Putt MS, Kleber CJ, Muhler JC (1982) Enamel polish and abrasion by prophylaxis pastes. Dent Hyg (Chic) 56: 38-40.
5. Mahledorff M (1989) Evaluation of the relationships between abrasion and surface alterations after professional cleaning. Deutsche Zahnärztliche Zeitschrift 44: 203-204.
6. Catherine J, Boyapati L,Sivaram G, Sivakumar B (2017) effectiveness of polishing after scaling and root planing: A profilometric analysis; annals of dental speciality 5.
7. sang YC, Corbet EF, Jin LJ (2018) Subgingival glycine powder air-polishing as an additional approach to nonsurgical periodontal therapy in subjects with untreated chronic periodontitis. J Periodontal Res 53: 440-445.
8. Nascimento GG, Leite FRM, Pennisi PRC, López R, Paranhos LR (2021) Use of air polishing for supra- and subgingival biofilm removal for treatment of residual periodontal pockets and supportive periodontal care: a systematic review. Clin Oral Investig 25: 779-795.
9. Flemmig TF, Arushanov D, Daubert D, Rothen M, Mueller G, et al. (2012) Randomized controlled trial assessing efficacy and safety of glycine powder air polishing in moderate-to-deep periodontal pockets. J Periodontol 83: 444-452
10. D-max imaging pvt. Ltd (2001) Sole distributors of velopex in india.