VOLUME - 10, ISSUE - 04, APRIL- 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Dental Science

A REVIEW OF THE EVIDENCE FOR THE PROVISION OF ROUTINE POLISHING FOR PERIODONTAL HEALTH - AN UPDATE FOR DENTAL SURGEONS

Dr. Neelam Das*

M.D.S., Assistant Professor Department of Periodontology Rama Dental College, Hospital & Research Centre, Kanpur (UP)- 208024 *Corresponding Author

ABSTRACT

Healthy teeth and gums make a person feel confident and fit. As people go about their daily routines and with different eating and drinking habits, the tooth enamel turns yellowish or gets stained. Polishing traditionally has been associated with the prophylaxis procedure in most dental practices, which patients know and expect. However, now-a-days, polishing is not advised as a part of routine oral prophylaxis procedure but is done selectively based on the patients' need. The purpose of this review is to provide a comprehensive overview of recent advancements in polishing. In addition to this, evidence for routine polishing treatments for healthy adults and specific recommendations for dental practioners are prescribed.

KEYWORDS : Abrasives, Polishing, Prophylaxis agents, Tooth staining.

INTRODUCTION

Periodontal diseases are multi-factorial in nature and are caused by microorganisms that colonize the tooth surface at or below the gingival margin.[1] Its treatment necessitates thorough supra- and subgingival calculus and biofilm removal which is also the central part of the periodontal maintenance therapy. For debridement purposes, hand instruments, sonic or ultrasonic scalars may be used.[2] Even if instrumentation is performed by well trained and proficient clinicians, the use of these instruments periodically may render surfaces of the teeth rough apart from leaving stains on them. This gives rise to the need for polishing the tooth surfaces, which can be accomplished by the conventional rubber cup prophylaxis and air polishing.[2] The conventional rubber cup prophylaxis and the air powder polishing system are both effective professional techniques for plaque and stain removal.[3]

HISTORICAL PERSPECTIVE

Though, the history of tooth polishing was mentioned in the Roman and Greek writings, it was only with Pierre Fauchard, who introduced it for removal of dental stains with the use of finely ground coral, egg shells, ginger, or salt.[4] The techniques and modalities for tooth polishing have evolved over the years. Dr. Fones, the Founder of Dental Hygiene, started training his auxiliaries to provide coronal tooth polishing in the last century. It was observed that stains were not the etiologic factor for any destructive process and hence, removal of stains was for esthetic, not for health reason.[5] Hence, polishing was then used as a selective process by Wilkins.[5] However, the concept of full mouth polishing is still used in many dental hygiene practices as a standard protocol.

The ***American Dental Hygienists Association position paper*** on polishing procedures sufficiently distinguishes between these closely related terms- defining ***"cleansing"*** as "the ability to remove debris and extraneous matter from the teeth," and ***"polishing"*** as "the implementation of making the tooth surface smooth and lustrous." The ***American Academy of Periodontology*** defines ***tooth polishing*** as "the removal of plaque, calculus and stains from the exposed and unexposed surfaces of the teeth by scaling and polishing as a preventive measure for the control of local irritational factors."[6,7]

RATIONALE BEHIND POLISHING

Protocol was first reported in the 1960s, with assumptions that *materia alba*, plaque and other natural coatings on tooth surfaces acts as a barrier to fluoride uptake, thus reducing the efficacy of topical fluoride application. So, this logical step made by many clinicians, initiates the removal of the substances adherent to the enamel by professional prophylaxis will enhance the efficacy of professionally applied topical fluoride, and is also expected to reduce the incidence of caries.[8]

OTHER TERMS, WHICH ARE COMMONLY USED ARE:

1. Therapeutic polishing
2. Coronal polishing
3. Superficial polishing
4. Selective polishing

Today the focus of tooth polishing is to give a highly polished and aesthetic appearance by removing bacterial plaque biofilms and extrinsic stains. But, before we do polishing, one needs to identify the type of stains and also understand the contraindications for tooth polishing.

IDENTIFYING STAIN

It is very important to identify the type of stain so as to determine which stains can be removed and which product to use. Stains can be broadly classified into - endogenous and exogenous stains. Endogenous stains can be further divided into developmental, drug induced, environmental or due to enamel hypoplasia. The exogenous stains are due to various foods and harmful habits and are usually seen as different colors: Green, orange, brown and black. The endogenous stains cannot be removed by simple polishing. However, the exogenous stains can be removed by scaling and polishing.

CONTRAINDICATIONS FOR THE USE OF POLISHING PASTE [9,10]

1. Absence of extrinsic stains
2. Acute gingival and periodontal infection
3. Esthetic restorations
4. Allergy to paste ingredients
5. Dental caries
6. Decalcification
7. Enamel hypoplasia
8. Exposed dentin or cementum
9. Hypomineralization
10. Newly erupted teeth
11. Patients with respiratory problems
12. Recessions
13. Tooth sensitivity
14. Xerostomia.

GUIDELINES OF TOOTH POLISHING[7]

1. Use proper technique to reduce unnecessary abrasion on the exposed enamel and dentine surfaces.
2. Select a least abrasive polishing agent that will remove plaque biofilm and stain.
3. Control the time, speed and pressure during the procedure.
4. When polishing a restorative material, care has to be taken to use a softer abrasive particle than the restorative material.

CHOOSING A PROPHYLAXIS PASTE

The factors that contribute to the overall efficiency of stain removal from the tooth surfaces include:[11]

1. Rotations per minute (rpm) of the rubber cup polisher.
2. Prophy paste coarseness.
3. Rubber cup-to-tooth pressure or load.
4. The time spent polishing each stained area.[12]

CLEANSING AND POLISHING INSTRUMENTS

Rubber Cups: It consists of rubber shell with or without webbed configurations in hollow interior. These are used in hand pieces with special prophylaxis angle. It should be sterilized after every patient or disposable rubber cup and prophylaxis angle may be used. Good cleansing paste containing fluoride must be used and kept moist to minimize frictional heat. Polishing pastes are available with different grits i.e. fine, medium and coarse.[13]

Rubber Polishing Points: These rubber points screws up into the prophylaxis angle. These are made up of natural rubber. It is flexible in nature so that tip adapts to proximal surfaces, embrasures and around orthodontic bands and brackets.[14]

Dental Tape: Used with the help of polishing paste and used in areas which are inaccessible to other polishing methods i.e. proximal surfaces. The tape is passed inter-proximally with firm labio-lingual motion.

Bristle Brush: It is available as wheel and cup shapes. The bristle is used in the prophylaxis angle with a polishing paste. As bristles are stiff so usage should be confined to the crown to avoid injury of the cementum and the gingiva.[13]

Air Powder Polishing: This device Prophy Jet is very effective in removing extrinsic stains and soft deposits. The slurry removes stains rapidly and efficiently by mechanical abrasion and provides warm water for rinsing and lavage. Air powder polishing can be used safely on titanium implant surfaces. Patients with infectious diseases should not be treated with this device because of the large quantity of aerosol created.[13]

DIFFERENT ABRASIVE AGENTS IN DENTISTRY

Abrasive agent is used to clean and smoothen the tooth surfaces. Abrasive agents present in the polishing paste are same as those in dentifrices. Prophylaxis polishing pastes available are in combination of a binder, humectants, coloring agent, preservative, and flavoring agent. Various particle sizes are available ranging from coarse, medium to fine. Hard and rough-shaped particle size compounds produce more abrasive action than soft and smooth.[15]

The most commonly used abrasives in polishing pastes are flour of pumice and calcium carbonate. Other abrasive particles used in commercial prophylaxis polishing pastes include aluminum oxide (alumina), silicon carbide, aluminum silicate, silicon dioxide, carbide compounds, garnet, feldspar, zirconium silicate, zirconium oxide, boron, and calcium carbonate. Others include the emery, silica, and perlite.[15]

Air-polisher

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.[15]

DIFFERENT POWDERS USED AS ABRASIVE AGENTS

Sodium bicarbonate–based powder ($NaHCO_3$) was the first powder to be used in air polishing. $NaHCO_3$ powders are processed to form a powder with a particle size of up to 250μm. This is a concern for use of $NaHCO_3$ on many patients including those with sodium–restricted diets and hypertension. Recent developments include various powders glycine, calcium sodium phosphosilicate, calcium carbonate and aluminum trihydroxide.[16]

Calcium sodium phosphosilicate powder, ($CaNaO_6P$-Si) is a bioactive glass developed specifically air polishing procedures. It is a chemical compound of naturally occurring elements including calcium, phosphorus, silica and sodium.

Calcium carbonate ($CaCO_3$) consists of spherically agglomerated crystals of particle size 45 μm. Usage of this mass of uniformly shaped round crystals will minimize surface abrasion as comparing to the irregularly shaped particles.

Aluminum trihydroxide ($Al(OH)_3$) is an alternative air polishing powder for patients on sodium restricted diets. Its particles are harder and comparable in size to sodium bicarbonate.[16]

Glycine (greek: sweet) is a non-essential amino acid and an important component of most polypeptides. Glycine powder is commercially available and it is produced by milling glycine crystals in an agate disc grinder. Glycine powder particle size is approximately four times smaller than sodium bicarbonate powder.[17]

Erythritol powder: Recently, a new abrasive erythritol powder (EPAP) with very low abrasiveness as comparable to glycine was introduced for subgingival air polishing. Erythritol is non-toxic in nature and chemically neutral. It is a water soluble polyol used widely as an artificial sweetener and as a food additive. Its promising chemical characteristics allow its binding of antiseptic substances, thus suggesting it to be suitable for subgingival biofilm removal. Recently it has been demonstrated that erythritol has an inhibitory effect to some periodontopathogenic bacteria such as Porphyromonas gingivalis.[18]

ADVANTAGES AND DISADVANTAGES OF VARIOUS TECHNIQUES

1) Porte polisher: Hand-held device with an orange-wood point uses abrasive agent to polish tooth surfaces.

Advantages

1. It is portable
2. Malpositioned tooth surfaces can be easily cleaned.
3. It generates minimal thermal heat.
4. Does not produce noise like rotary instruments so more comfortable to patient.
5. Doesn't produce microbial aerosols.[7]

Disadvantages

Its time consuming and hand strength for instrumentation takes a longer time for polishing.[15]

2) Engine-driven polishers

These are widely used for their efficiency and efficacy. Polishers are attached to the appropriate hand piece or prophy-angle, which are either straight or contra-angled shanks. A rubber cup or brush is attached to the prophy-angle. Hand-piece should always be used at a steady slow pace of 2500-3000 rpm.[19]

Advantage

They can be used easily as patient compliance and acceptance are high.

It was reported by Miller and Hodges that it took 10 min (3.4 sec per tooth) to treat the entire mouth so time consumed is less.[20]

Disadvantage

It is contraindicated in patients having allergies to latex as

rubber cups are made up of latex.

3) Air-powder polisher

These air polishers use slurry of distilled water and various powders. Air polisher hand-piece is attached directly to the air/water connector or as a separate unit or in combination with ultrasonic scalers.[15] It has overcome conventional rubber cup polishing paste systems as it is more convenient for subgingival plaque removal and it reaches surfaces that are inaccessible to a rotary device.[21]

Advantages

1. Air polishing reduces the operator and patient fatigue.
2. Air polishing requires less time.
3. It removes plaque from inaccessible areas that are otherwise difficult for rotary instruments to reach like furcations, flutings and close root proximities. [21]

Disadvantages

1. It cannot be used in patients with respiratory, renal or metabolic disease, infectious disease, children, diuretics or long term steroid therapy.
2. Aerosols generated by air-polishing may present an infection control hazard. Hence, a pre procedural rinse is always recommended along with aerosol reduction devices.[21]

COMPARISON OF TWO TECHNIQUES

Various studies 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.[22] Although both methods were reported to cause some gingival trauma. [22] Sawai *et al* reported that air polishers are more effective for plaque and stain removal in pits and fissures.[15]

VECTOR-SYSTEM

Vector system uses a polishing fluid to polish teeth. Braun *et al*. suggested use of polishing fluid containing hydroxyapatite or an abrasive fluid containing silicon carbide with a resonating device that deflects vibrations towards the tooth surface, thereby minimizing the forces that remove tooth substance.[22]

EVALUATION OF COMPLETION OF POLISHING PROCEDURE

At the end of polishing procedure, the teeth have to be inspected thoroughly using a mouth mirror, intra-oral light, compressed air and disclosing solution.[7] Remaining biofilm or stains has to be removed by either re-instrumentation or re-polishing the surface. Finishing strips or dental tape rubbed with a small amount of prophy paste before flossing assists in the removal of residual inter-proximal stains.[7]

EFFECTS OF AIR POLISHING ON ENAMEL, CEMENTUM AND DENTIN

Literature reviewed effects of air polishing on enamel, cementum and dentin removal by $NaHCO_3$.Studies have found air polishing to be safe on enamel with no significant loss of enamel and less abrasive than rubber–cup polishing. Tada *et al*. studied the effect of nozzle distance which was placed at 6 mm at an angle of 45 degree and concluded that this angle and distance produced the shallowest defect depths.[23]

EFFECTS OF AIR POLISHING ON RESTORATIVE MATERIALS, SEALANTS, ORTHODONTIC APPLIANCES AND DENTAL IMPLANTS

Gutmann concluded that clinicians should follow manufacturer's recommendations when using air polishing on restorative materials. Petersilka *et al*. found that on nanohybrid composite resin with glycine powder producing smaller surface defects (1 to 2 μm wide) than $NaHCO_3$ (5 to 10 m wide).[17] A recent study by was conducted on patients with peri–implantitis and found glycine powder significantly reduced bleeding on probing 6 months after treatment as comparative to patients who were treated with mechanical debridement using currettes and chlorhexidine.[24]

HEALTH CONCERNS AND SAFETY

Very rare conditions that can arise from aerosols during air polishing include air emphysema, subcutaneous facial emphysema and pneumoparotitis. Graumann suggested universal precautions should be taken, using high–volume evacuation instead of a saliva ejector and pre-procedural rinse before treatment to prevent any potential health risks.[16] These protocols are still suggested today.

FUTURE RESEARCH

Erythritol-based powder may become the air–polishing powder of choice due to its low abrasiveness on gingival tissues, tooth structure, restorative materials and its potential to clean both supragingival and subgingival surfaces. Research certainly supports that patients are accepting this technology and prefer.[25]

CONCLUSION

Tooth polishing used to be a standard part of a dental cleaning appointment. However, it is now known that within 30 min, the bacteria colonize on the tooth surface irrespective of whether teeth are polished or not. Also, polishing removes the outer layer of tooth enamel, which takes a period of 3 months to rebuild the fluoride-rich layer. Hence, selective polishing is recommended. There is a need to understand the effectiveness of polishing to reduce the incidence of periodontal diseases. There is a necessity for guidance on the effectiveness and safety of newer polishing agents. Future research is needed to explore ways to reduce aerosol production, and thus improving safety for all restorative materials and all patients, regardless of their medical conditions and current COVID-19 scenario.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article.

REFERENCES

1. Lindhe Mombelli A. Antibiotics in Periodontal Therapy. 5th ed. Jan Lindhe, Niklaus P. Lang,Thorkild Karring. Clinical Periodontology and Implant Dentistry: Blackwell Munksgaard;2008.p.882-97.
2. Petersilka G, Faggion Jr CM, Stratmann U, Gerss J, Ehmke B, Haberlein. Effect of glycine powder air polishing on the gingiva. J Clin Periodontol 2008; 35: 324-32.
3. Ramaglia L, Sbordone L, Ciaglia R N, Barone A, Martina R. A clinical comparison of the efficacy and efficiency of two professional prophylaxis procedures in orthodontic patients. Eur J Orthod 1999;21: 423-28.
4. Ring ME. History of dental prophylaxis. J Am Dent Assoc 1967; 75: 892-5.
5. Barnes CM. Extrinsic stain removal. In: Wilkins EW, editor. Clinical Practice of the Dental Hygienist. Philadelphia: Lippincott Williams and Wilkins; 2009. p. 724-40.
6. American Academy of Periodontology. Glossary of Periodontal Terms. 4th ed. Chicago: American Academy of Periodontology; 2001. p. 42.
7. Francis B, Barnes CM. Cosmetic and Therapeutic Polishing. In: Daniel SJ, Harfst SA, Wilder R, editor. Mosby's Dental Hygiene: Concepts, Cases and Competencies. Missouri: Elsevier; 2008. p. 599-622.
8. Azarpazhooh A and Main PA. Efficacy of dental prophylaxis (rubber cup) for the prevention of caries and gingivitis: a systematic review of literature. bdj.2009:899.
9. Atkinson DR, Cobb CM, Killoy WJ. The effect of an air-powder abrasive system on in vitro root surfaces. J Periodontol 1984; 55: 13-8.
10. Augthun M, Tinschert J, Huber A. In vitro studies on the effect of cleaning methods on different implant surfaces. J Periodontol 1998; 69: 857-64.
11. Putt MS, Kleber CJ, Muhler JC. Enamel polish and abrasion by prophylaxis pastes. Dent Hyg (Chic) 1982; 56: 40-3.
12. Christensen RP, Bangerter VW. Determination of rpm, time, and load used in oral prophylaxis polishing in vivo. J Dent Res 1984; 63: 1376-82.
13. Carranza F, Newman M, Takei H and Klokkevold P. Carranza's Clinical Periodontology. 9th ed. St. Louis, Mo: Elsevier Saunders 580-81.
14. Wilkins E.M. Clinical practice of the dental hygienist:11th ed. Wolters Kluwerp 700.
15. Sawai MA, Bhardwaj A, Jafri Z, Sultan N, Daing A. Tooth polishing: The current status. J Indian Soc Periodontol 2015;19: 375-80.

16. Graumann S.J, Sensat M.L, Stoltenberg JL. Air Polishing: A Review of Current Literature. J of dent hygiene 2013; 87(4): 173-80.
17. Petersilka G.J. Subgingival air-polishing in the treatment of periodontal biofilm infections. J Periodontol 2011; 55: 124–42.
18. Hagi T, Hofmanner P, Eick S, Donnet M, Salvi E, Sculean A *et al*. The effects of erythritol air polishing powder on microbiologic and clinical outcomes during supportive periodontal therapy: Six month results of a randomized controlled clinical trial. Quintessence Int 2015; 46(1): 31-41.
19. Rethman J. Polishing angles, cups and pastes. Pract Hyg 1997;1:32-3. Retraction in: Madan C, Bains R, Bains VK. Tooth polishing: Relevance in present day periodontal practice. J Indian Soc Periodontol 2009;13: 58-9.
20. Hodges K. Concepts in Non-surgical Periodontal Therapy. New York: Delmar 1998; 345-66.
21. Boyde A. Air polishing effects on enamel, dentine, cement and bone. Br Dent J 1984; 156: 287-91.
22. Braun A, Krause F, Frentzen M, Jepsen S. Removal of root substance with the Vector-system compared with conventional debridement in vitro. J Clin Periodontol 2005; 32: 153-7.
23. Tada K, Wiroj S, Inatomi M, Sato S. The characterization of dentin defects produced by air polishing. Odontology 2012; 100(1): 41–6.
24. Sahm N, Becker J, Santel T, Schwarz F. Non–surgical treatment of peri–implantitis using an air–abrasive device or mechanical debridement and local application of chlorhexidine: a prospective, randomized,controlled clinical study. J Clin Periodontal 2011; 38(9): 872–8.
25. Banerjee A, Hajatdoost–Sani M, Farrell S, Thompson. A clinical evaluation and comparison of bioactive glass and sodium bicarbonate air–polishing powders. J Dent 2010; 38(6): 475–9.