# Microabrasive Technology for Minimal Restorations

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***Abstract-*** With the development of new dental restorative materials, advances in adhesive dentistry, better understanding of the caries process, the tooth's potential for remineralization and changes in caries prevalence and progression; the management of dental caries has evolved from G.V. Black's "extension for prevention" to "minimally invasive." This concept includes early detection of lesions; individual caries risk assessment; nonsurgical interventions; and a modified surgical approach that includes smaller tooth preparations with modified cavity designs and adhesive dental materials to repair rather than replacement of failing restorations. The goal is preservation of natural tooth structure.

Microabrasive technology for minimally invasive dentistry is based on a large body of scientific evidence that has been summarized and discussed. The future promises further evolution toward a more primary preventive approach, facilitated by emerging technologies for diagnosis, prevention and treatment. However, there are technical, cultural and economic obstacles that must be overcome for this to be fully realized in clinical practice.

***Index Terms***- microabrasion, caries, restoration, minimal.

## I. INTRODUCTION

During the past few decades, scientific developments in cariology, dental materials and diagnostic systems have changed dentistry's approach to diagnosis and management of dental caries. Dental adhesives and restorative materials, new understanding of the caries process and remineralization, and changes in caries prevalence have catalyzed the evolution in caries management from G.V. Black's[1] "extension for prevention" to "minimally invasive preparation".

Mechanical instruments, such as a round bur or a hand excavator, have generally been used for caries removal. The micro air abrasion technique has recently been introduced as an alternative to these conventional mechanical techniques. Rotary instrumentation is a form of mechanical energy where as air abrasion is a form of kinetic energy. Kinetic energy applied in the form of micro air abrasion follows the path of least resistance seeking out unsound teeth structure and exposing the underlying decay. This method hinges on the principle of abrading or preparing tooth structure with powder particles expelled at a high speed[2].

Air abrasion is a fine gentle spray of an air and powder mix that removes decay. It is so fine and accurate that it allows to target only the decay, leaving healthy tooth structure intact as well as eliminates objectionable heat, sound and vibrations associated with high speed instrumentation. Need for local anesthesia is also eliminated. An additional benefit is the elimination of the recognized side effect of micro-fracture and micro-crazing of enamel margins. Preparations achieved with air abrasion exhibit uniform roughness of enamel without the sharp internal line angles characteristic of drill preparations.

Air abrasion technology has the potential to prepare both dentin and enamel surface to provide superior bond strength to restorative materials thus paving the way for futuristic minimal preparations[3].

## II. DEVELOPMENT OF AIR ABRASIVE TECHNOLOGY

The father of concept of air-abrasive micro dentistry is an American Dentist, Dr. J. Tim Rainey, from Refugio, Texas, USA[2]. He was a student and friend of late Dr. Robert Black, who actually invented and unsuccessfully introduced the first air abrasive machine in the 1950's. Dr. Rainey was able to improve and combine this technology with the use of modern adhesive restorative material.

The instrument was first developed in the 1940's by Dr. Robert Black. In 1951- S.S. White technology introduced Air-Dent the first commercially available unit for preparing cavities in teeth with air abrasion[4].

New technology for the 1990's - Air abrasion resurfaced as an exciting "new technology" that acts in synergy with rapid evolution of adhesive dentistry, which has changed tooth preparation requirements and eliminated the need for mechanical retention.

## III. BASIC PRINCIPLE[5]

Air abrasion is based on the formula for KINETIC ENERGY

$$E = \tfrac{1}{2} mv^2$$

M = mass
V = Velocity

Essentially this equation underscores the fact that the cutting capability of air abrasive is attributable to the energy of mass in motion unlike conventional mechanical methods that depend on friction.

When that rapidly moving mass strikes its target, most of its energy is transferred to that material, if that material is hard the results is removal of small amount of material. If, on the other hand the material is soft, the energy is mostly absorbed by the material and then the mass rebounds. When the highly energized

abrasive particles are directed at healthy enamel, dentin the kinetic energy is absorbed by the substrate and cuts or abrades rapidly. That is why the modality is sometimes referred to as

KINETIC CAVITY PREPARATION (KCP)[6].

## IV. AIR ABRASION SYSTEMS AND FEATURES

Air abrasion devices include cart, table top and handheld models. Hand held devices are used to prepare tooth, metal, composite or porcelain surfaces for bonding. Some models have built in features and accessories, such as additional compressor, evacuation system and high intensity curing light. Operator controls are either mechanical or digital. Some systems (eg. AIR-FLOW Prep K1) capture the aluminum oxide powder stream in water spray to reduce the pollution which increases comfort of operation.

Two different types of machines are available

- Continuous mode without exhaust
- Continuous mode with exhaust

**Continuous mode without exhaust.**

These machines work in on/off mode and provide a continuous flow of abrasive particles. The machines will effectively cut for several seconds after the power is turned off. This continuous cutting causes peripheral collateral damage to sound tooth structure and increased hydraulic pressure within the dentinal tubules. This results in pain. It may also cut areas within the preparation without the operator's anticipation. So the practitioners should avoid these machines. The continuous mode without exhaust is recommended only for extra oral procedures, such as preparing crowns for cementation.

**Continuous mode with exhaust.**

These machines provide a continuous flow of abrasive particles alongwith high volume evacuation system to remove particles. The continuous mode with exhaust is recommended only for intra oral procedures.

**Commercially Air abrasive Equipment** available are PrepMaster or EtchMaster (Groman Inc.), Airbrator (North Bay/Bioscience, LLC), PrepStart and PrepAir (Danville Engineering), or CrystalMark (CrystalMark Inc.) all of which work on the same principle. Some like the RONDOflex plus (KaVo) work on the principle of air abrasion technology with water spray.

**Optional accessories for the air abrasion system[7]**

In addition to the different grades of the powder particles and the various tip diameter sizes and tip angulations for the air abrasion handpiece, there a few more accessories which will provide the clinician a better working environment:

1. Air abrasion resistant intraoral mirror: Majority of air abrasion operative dentistry procedures "eat up" an average of two to three mirrors per procedure, particularly when indirect vision is used. In an effort to conserve mirrors, the dentists will have a tendency to migrate towards direct vision, which in turn leads to obvious long-term deleterious effects on one's back. This mirror designed by CrystalMark Dental Systems, Inc. can withstand the indirect blasts of abrasive powder that are part and parcel of air abrasion dentistry. These mirrors come gold-plated for ease of identification by the staff and fit the standard no. 5 cone socket handle.
2. Sand trap: These are soft plastic spheres that slip onto office suction and have a top opening through which the air abrasive system tip is introduced. This device traps the abrasive particles within the sphere from where they can be evacuated through the suction. This prevents the abrasive particles from entering the patient's oral cavity Sandtrap placed on mandibular molar demonstrating ease of debris evacuation
3. Power plus booster: Available as an accessory to the Prep Start (Danville Engineering) recompresses the compressed air up to 135 psi to increase the air pressure to allow for faster cutting thus reducing the patient chair-time.
4. Disposable air abrasion handpiece: The Airbrator® (North Bay/Bioscience, LLC) is a single-use air abrasion handpiece that connects to your existing air-line. It is a direct alternative to traditional, expensive, self-contained air abrasion units. The Airbrator comes in three grades.

High Performance – For small incipient lesions and cavity preparations.
Medium Performance – For sealants, etching, bonding, and heavy stain applications.
Light Performance – (Sodium Bicarbonate Powder) For removing stains, cleaning, and polishing.
Others like the EtchMaster and PrepMaster® (Groman Inc.) are pre-filled disposable air abrasion systems that can adapt to your handpiece connection for etching and intra-oral cavity preparations, respectively.

5. Super high volume evacuation systems: Like the RapidVac or Union Medical Evacuation System is the ideal companion for all air abrasive systems. Delivering super high volume suction, these devices completely eliminate the chances of contamination of the dental operatory with abrasive particles.
6. MicroVibe: Mechanical vibrations of the MicroVibe tip helps resin penetrate narrow gaps. It also improves the flow of pit and fissure sealants by increasing the contact between the sealant and tooth structure for effective restoration of cavities prepared using the air abrasives.

## V. AIR ABRASION VARIABLES[8-10]

Air abrasive units allow the clinician to focus a stream of aluminum oxide particles on a specific area of the tooth. The restorative capabilities of these techniques are wide ranging and dependent on how the operator controls the following variables.

**Air Pressure**

The dentist should always use the lowest air pressure necessary to perform a procedure. Most available units operate between 40-140 psi (pounds per square inch).For fissure cleaning

prior to sealant application, a brief exposure of 40 psi is sufficient. While more extensive decay removal may require a nozzle pressure of 80 psi or more. Caution should be exercised when using air pressure higher than 80 psi.

**Nozzle diameter**

Several nozzle designs are available. Nozzle range in diameter from 0.011 to 0.032 inch and are available in 458, 678 and 908 angles. The larger the nozzle the larger the hole it creates. To remove large lesions and existing restorations, use a 0.018 inch nozzle. For most small lesions a 0.014 inch nozzle is recommended. For precise cutting, diagnosis of occlusal pits and fissures, small class II and III lesions or for refining class IV and V restorations, use 0.11 inch nozzle.

Choose an angulation that provides the best access. Air abrasion handpieces and nozzles are removable to facilitate sterilization and have working angles ranging from 0° to 120°. For precision cutting, as might be required for a preventive resin restoration, the 80° tip is more appropriate than the 45° tip. When shallow preparations are needed, as in the case of cervical erosion, the cutting patterns of the 45° tip are more appropriate.
For facial and lingual preparations, a 60° angle produces a shallower preparation and allows for evacuation of reflected spray.

**Particle Type and Size.**

Standard sizes used are

- 27 micrometers – more comfortable, less effective cutting
- 50 micrometers – more aggressive cutting, but more discomfort.

The 50 micro meter white aluminum oxide particles are suitable for coarse surface finishing and are primarily used in extra oral micro etching procedures.If discomfort is encountered in deeper preparations, the use of smaller particle size and lower pressure is more comfortable for the patient. The smaller tip sizes are also more effective for decay removal.The unit performs a cutting action by impinging sharp edged powder particles against a surface. A cylindrical powder and air stream converges from the nozzle for a short distance (approximately 0.5 to 1.6 mm) and then diverges into a cone shape. The point of maximum convergence provides the maximum effect.

The dentist should have good magnification to diagnose and visualize. A caries detection dye can be used to detect the lesion
Earlier it was thought that the anatomy of fissures is simple. It is now recognized that the fissure in teeth are complex structure, with areas of subsurface restrictions, hypo-calcification and restrictions with in the fissure that can effectively hide areas of subsurface hypo-calcification that may be the genesis of decay. Air abrasion has an unparalleled ability to expose and allow exploration of hypo-calcified internal characteristics of occlusal fissures. Unsound fissures are the focal point of the genesis of new decay

Cavity preparation design there for should be based on the anatomy of the occlusal surface with the optimal conservative approach.

**Cutting rate**

The order of ease in cutting of tooth structures is hypo-calcified enamel of the pit, fissures and grooves, enamel, dentin and caries. The cutting rate increases as the nozzle approaches the tooth surface more closely. The cutting rate also may be varied by adjusting the powder flow or airflow using different pressure settings and powder and by changing the nozzle diameter.

Most preparation procedures can be easily accomplished with approximately 40-60 psi and 2.5g/min powder flow. Sensitivity is dependent on many factors, especially air flow, procedure flow and dwell time. A setting of 80 psi is the threshold for sensitivity. Pulsing the stream with the foot pedal also helps to decrease dwell time and sensitivity. It may take 1 – 2 minute to complete class I preparations on a molar, 5 seconds to complete a class V preparation on a pre molar.

Soft carious dentin absorbs and scatters the particle stream. The use of small round bur is recommended for soft decay.

**Directing the Particle stream.**

The particle stream exits the end of the tip making it an end cutting device. For cutting efficiently it is best to hold the nozzle tip at a $30^0$ to 608 angle approximately 1 – 3 mm from the surface to be modified. This nozzle position will direct the flow of particles away from field instead of deflecting back into the oncoming stream. Scatter is also reduced. Directing the stream in to open pulp chamber and sulcus should be avoided as it can lead to an embolism.

**Patient comfort.**

The most important variable in patient discomfort is the depth of preparation. With deeper penetration in to vital dentin, patients are more likely to report sensations of coldness or pain. About 10% of preparations will require anesthesia. Patient should be informed about the amount of powder that ends up in the mouth. Most cavity preparations take between 30 sec to 15 minutes. Using a high volume evacuator and a 4x4 gauge placed in the operative field will help in controlling the powder entering the patient mouth.Stream intensity or particle flow rate is variable from 0-8g/min. A good standard approximation is 28g/min

## VI. MAIN INDICATIONS[11]

**Class I.** The most popular current use of Micro air abrasion cutting teeth that have suspicious occlusal grooves but are not overtly carious. If a tooth shows radiographic evidence of significant dental caries in the occlusal area, air-rotor cutting is faster, easier and probably better than Micro air abrasion, because Micro air abrasion does not cut leatherlike caries well. However, Micro air abrasion is especially fast and effective and relatively painless when Class I areas donot show radiographic evidence of significant caries, and teeth have many potentially fissured occlusal grooves. In such cases, conservative tooth preparation can be made easily.

**Class III.** Small Class III preparations are one of the most important indications for Micro air abrasion. Small Class III lesions, barely observable on a radiograph, can be penetrated easily and rapidly from the lingual or facial tooth surfaces,

usually without anesthetic. Of course, non carious adjacent teeth must be protected from being cut at the same time by placement of a piece of rubber dam or a 0.002- inch thick (50 μm) metal matrix band between the teeth.

Larger Class III lesions, especially those containing moderately soft leatherlike caries, may be prepared more efficiently with burs.

**Class V.** Small Class V lesions on enamel, dentin or both can be prepared easily and painlessly with Micro air abrasion Larger lesions with leatherlike dentin can be prepared faster and more easily using burs and spoon excavators. Rubber dam placement makes Class V preparations simple. Use of Micro air abrasion without a rubber dam stimulates blood presence, because Micro air abrasion cuts gingiva, causing significant bleeding.

**Class VI**. Incisal potholes sometimes are called Class VI lesions. These preparations can be cut successfully with Micro air abrasion if meticulous care is taken and overcutting is avoided.

**Margin repairs.** Many intracoronal restorations—including amalgams, composite resins, cast gold inlays and onlays, and ceramic inlays and onlays—develop margin imperfections after a few years of service. Micro air abrasion is ideal for cutting away defective tooth structure, developing tooth preparations, and cleaning and roughening tooth and restoration surfaces. Micro air abrasion provides a conservative preparation that accommodates margin repair with an appropriate low-wear bonded composite resin restoration or a flowable resin.

Repair of larger defects containing significant dental caries may be accomplished more easily after an air rotor and bur are used to remove defective tooth structure and old restorative material.

**Defective pits.** Many teeth have defective facial or lingual pits, especially on lower molar facial surfaces and upper molar palatal surfaces, as well as upper lateral and central incisor palatal surfaces. When these pits contain only minimal caries, they may be prepared conservatively and ideally with Micro air abrasion. Congenitally defective, rough, unesthetic surfaces are also perfect candidates for Micro air abrasion. Minimal invasive tooth preparation on these surfaces with Micro air abrasion provides ideal conservatively cut surfaces for placement of either flowable resin or conventional filled restorative resin.

## VII. LESS-USED INDICATIONS FOR MICRO AIR ABRASIONTOOTH CUTTING[11]

**Class II.** For carious lesions deeper than minimal dentin penetration, Class II preparations with Micro air abrasion are possible, but difficult and unpredictable. Although some clinicians have mastered Class II tooth preparations with Micro air abrasion most would agree that cutting Class II preparations with an air rotor and bur is faster, more predictable and easier.

**Class IV.** Fractured anterior tooth angles or Class III preparations that have broken incisal
angles and have become Class IV situations require significant effort and considerable time
with Micro air abrasion. Rotary diamond or bur cutting is more appropriate.

Any larger tooth preparations requiring fine details— such as inlays, onlays, partial crowns and full crowns—are not suitable candidates for micro air abrasion.

## VIII. CONTRAINDICATIONS TO AIR ABRASION[11]

- Severe dust allergy
- Asthma
- Chronic pulmonary disease
- Recent extraction
- Oral surgery
- Any open wound, lesion, or sore, or sutures in the mouth
- Recent periodontal surgery or advanced periodontal disease with a compromised periodontal attachment
- Recent placement of orthodontic appliances with resulting oral abrasions
- Sub gingival caries removal
- Any condition that would place the patient at greater risk for emphysema by using compressed air in the mouth

## IX. CLINICAL PROCEDURE [2,3, 11-15]

Diagnosis is the first step before initiating treatment and is done by using a caries detecting dye or DIAGNOdent laser. With caries detecting dye, only stained tooth structure needs to be removed. DIAGNOdent laser gives an accuracy of 90% in detecting caries. Sodium bicarbonate prophylaxis is essential before using caries detecting dyes or DIAGNOdent laser for detecting caries.

There are two types of decay - non vital caries and vital caries. It is important to minimize invasion in to the vital caries areas of carious lesions. The vital carious portion of a lesion, although de-mineralized, retains the ability to re-mineralize (Massler's theory). Caries detection dyes allow the practitioner to differentiate between non-vital and vital structures.

**These are the typical steps in treating carious lesions with air abrasion**

1. Stain with caries- detection dye. Often in class V preparations the superficial layer contains oil which may not stain properly. It is always valuable to abrade a suspicious area lightly and restain.
2. Select a medium tip diameter (0.0014 inch) and select the correct angulation. Start with a fairly low air pressure ( < 60 psi) and low flow rate (< 2 g/sec)
3. If the suspicious area is carious, the moisture in the decayed area will pick up the aluminium oxide particles, and subsequent particles will bounce off, reducing the cutting effectiveness
4. Attempt to point the stream with in confines of decay to avoid cutting sound areas. The carious area will begin to desiccate, making it easier to cut
5. Remove decay
6. Restoration: If one is having trouble maintaining moisture control and esthetics is not important, base the tooth with auto cure glass ionomer. In deep cavities that

can be bonded, a compomer base is a good compromise because it is harder, adheres better, still imparts caries resistance to the tooth, and has a fluoride- re uptake capability

**Non carious**

1. Determine major cause of the lesion : abrasion or abfraction
2. When abfraction is the major cause, the restoration should have higher degree of flexibility than that for abrasion – micro fill anterior composite. If abrasion is the major cause, the best thing is a posterior composite, because it has the greater resistance to abrasion.
3. If posterior composite with abfraction is used, it will likely pop out; if anterior composite with tooth brush abrasion is used, it will get worn away.
4. In non carious class V preparations, the tubules of the superficial dentin are often sclerotic, particularly in abfraction type lesions, making adhesion difficult.
5. The first goal is to remove any superficial contaminants
6. Any such lesion found to be hyper sensitive is treated with a dentin bonding priming agent. If the tooth becomes less sensitive, it can possibly be controlled just by bonding. If it continues to be sensitive, the problem may be some form of irreversible pulpal hyperemia, and the patient needs to be warned of a possible root canal treatment.
7. If hyperemia resolves with in 2 weeks, dyclone is applied to the tissue for a full 2 minutes. Use the smallest tip possible with low air pressure (40 psi) to abrade bio film and any bonding priming agent that was supplied previously, as a de sensitizing agent
8. Acid etch the tooth first and then place priming agent
9. Restoration: With abfraction, use flowable, flowable/ stackable or anterior micro fill (caries resistance less necessary, longevity more important). With abrasion, use a thick heavy posterior composite.
10. Trim and polish with a high speed drill
11. Polish
12. Place sealer over the composite

For class V preparations and desensitization by kinetic burnishing, start with a smaller particle size (27 micro meter), lower air pressure (40 psi) and a lower powder flow (2g/min) for more comfort and a more effective dental seal.

All class II and III preparations must have a matrix band or rubber dam segment and wood wedge in place before starting to protect the gingival and adjacent tooth.For inter-proximal caries, start with 60 psi aimed at the vertical axis of the tooth, approximately 1.5 mm from marginal rim contact and never aimed at the inter-proximal caries. The coronal cemento enamel junction tapes of the tooth will allow intersection of the caries. As the deeper recess is entered in the cavity preparation, reduce the pressure and particle size for comfort.

**Typical mistakes to avoid includes the following**

- Do not touch the surface of the tooth with the air abrasion tip
- Do not back up 2.5 mm from the surface
- Do not blast the whole surface from afar
- Do not sweep the tip like a brush

**The adhesive restorative materials of choice following kinetic cavity preparation include**

- Glass ionomers
  - Auto cures
  - Light cures
- Compomers
- Composites
  - Flowables
  - Stackables
  - Anterior micro fills
  - Posterior micro fills
  - Condensables

## X. ADVANTAGES OVER CONVENTIONAL METHODS[2-15.17,18]

- Reduced need for anesthesia
- Reduced patient apprehension.
- Rapid and efficient cutting.
- Precise controlled cutting.
- Less heat, noise and vibration,
- Better bond strength.
- Can work in all quadrants in the same appointment.
- Minimally invasive access, conserves tooth structure.
- No micro-fractures in tooth structure.
- Static electricity produced is disposed over a large area in contrast to the pin point production in the case of high speed drill.

## XI. DISADVANTAGES OF AIR ABRASION[2-15]

1. Ability to accomplish only some aspects of dentistry.
2. Lack of tactile sensation when using the air abrasion handpiece, because the nozzle of air abrasion instrument does not come in contact with the tooth.
3. Non contact based modality, leading to significant risk of cavity over preparation and inadequate carious dentin removal.
4. Mess and spread of aluminum oxide around the dental operatory.
5. Danger of air embolism and emphysema.
6. Impaired indirect view because abrasive particles collect on mirror rapidly blocking the viewing surfaces.
7. Damage to dental mirrors, optical devices like magnifying loupes, intraoral camera lenses or photographic equipment.

## XII. SAFETY ISSUES[16]

1. The particles inhaled are more than 10µm in size and cannot enter the alveoli, they are readily swept away by normal ciliary action. To reduce respiratory exposure, the clinical staff should always use surgical face masks and use dry vacuum systems to reduce patient exposure.

2. Use rubber dam, protective eye glass and dead soft metal matrix to protect adjacent tooth structure.
3. Use disposable mouth mirrors.
4. Rinsing instead of rubbing the optical surfaces helps prevent scratches.
5. High speed suction and an external vacuum system are necessary to capture the powder that escapes into the air and to enhance practitioner vision and patient comfort.

## XIII. LATEST ADVANCEMENTS[17]

**Hydro abrasion:** The cornerstone of Minimally Invasive Dentistry has been the use of air abrasion for preparation and surface texturing for resin bonding or glass ionomer placement. Due to the messy nature of the process of accelerating aluminum oxide particles at a tooth, the concept has come and gone various times throughout history. Recently, a modified and more practical concept has been introduced and termed as hydro abrasion

The term hydro abrasion itself is as much a misnomer as the term air abrasion is. Neither one of them uses water or air to abrade a tooth. Aluminum oxide particle acceleration is the source of abrasion and compressed gas is the propellant. In the process of "hydro abrasion" the difference is that the particles are accelerated along with a spray of water. This combination of a spray of water and particles allows the user to not only keep the particles from bouncing all over the patient, operators and operatory but also keeps the surgical site free of extra debris. The handpiece has a circumferential water stream around the centered aluminum oxide particle stream which keeps water around the dry particles. Moisturizing the particle stream accomplishes multiple enhancements to the use of particle abrasion. Not only it keeps the scatter of dust down to a minimum but moisturizes the tooth during the delivery of the dry particles and keeps fluids within the open dentin tubules from being drawn out of the tubules and reduces the level of sensitivity.

The commercially available hydroabrasion unit is Danville's PrepStart $H_2O$ unit. Danville offers a conversion kit as well to change original PrepStart to a hydro-abrasion model.

**Bioactive glass air abrasion [19.20]**

The bioactive powders developed for air-abrasive use may be considered as innovative bioactive materials for therapeutic remineralization of dental hard tissues.

Bioglass removes healthy dentine at a higher rate than carious dentine - the difference however, being less than with equivalent alumina air-abrasion, thus making it a potentially more selective instrument for clinical caries excavation.The dentin treated with bioactive glass shows lower roughness, and most of the dentinal tubules are completely occluded. Unnecessary over-preparation of carious enamel often occurs clinically during operative caries management.

Bio-active glass abrasion removes completely the demineralised enamel from lesions with clinically insignificant over-preparation of sound tissue, indicating technique selectivity towards grossly demineralised enamel. Alumina air abrasion results in substantial enamel removal in both sound and demineralised tissues indicating the operator selectivity required to use the techniques effectively in clinical practice.

Polyacrylic acid-Bioglass 45S5 (BAG) particles and bioactive glass modified with soda-lime spherical glass[21] used for the abrasion procedures might be a suitable strategy to enhance the bonding durability.

Selective enamel powder (SEP) air abrasion[22]. SEP is different in its ablative properties towards caries with dentin involvement or no dentin involvement. In terms of dental treatment, SEP seems to have a diagnostic potential for enamel lesions before operative intervention in patients with high caries risk.

**Helium propelled air abrasion[23]**

Helium used as a propellant gas for air-abrasion produces greater cutting efficiency compared to the use of air as a propellant. Higher cutting rates, when desired, can reduce operative times. Helium air-abrasion is significantly more efficient in cutting the enamel at all pressures, with a 40% increase for 100PSI propellant pressure.

## XIV. SUMMARY

Researchers have conducted extensive studies using different abrasives to remove caries selectively. These adjuncts with convectional micro air abrasion are designed to allow the dentist to discriminate easily and selectively against unsound tooth structure. The goal of micro air abrasion is to allow the dentist to remove the unsound tooth structure discriminately. Kinetic energy applied in the form of micro air abrasion follows the path of least resistance, seeking out unsound tooth structure and exposing the underlying decay.

## XV. CONCLUSION

Microabrasive technology for minimally invasive dentistry is based on a large body of scientific evidence that has been summarized and discussed. The future promises further evolution toward a more primary preventive approach, facilitated by emerging technologies for diagnosis, prevention and treatment. However, there are technical, cultural and economic obstacles that must be overcome for this to be fully realized in clinical practice.

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