ABSTRACT
Patient apprehension towards dental treatment procedures is one the most commonly encountered problem faced by dentists in their day to day practice. Modern dentistry, therefore, focuses on minimizing patient discomfort and circumventing patient's fear of dental treatment. One such emerging practice is that of 'Microdentistry', which involves minimal invasive technique for the treatment of dental caries. Integration of prevention, remineralization and minimal intervention for the placement and replacement of restorations is its main motto. It mainly focuses on employing least invasive surgical approach so that minimum amount of healthy tissues are removed.

KEYWORDS Microdentistry, Remineralization, Dentistry

INTRODUCTION - 'Microdentistry' commonly termed as 'Drill free dentistry' is the philosophy and practice of finding and treating dental decay as early as possible, of removing as little tooth structure as possible, of making the smallest possible restorations and of assuring that those restorations are aesthetically pleasing and long lasting. It is one of the most significant advances in dentistry over the past few years. It involves minimal clinical cavity access with the least amount of enamel removal required to enable adequate access for visualization and removal of infected dentine, and is more comfortable, quieter and generally more acceptable to the patient.

Various 'Minimal Invasive Techniques' in caries management which form a part Drill free dentistry:

I. Air abrasion, II. Lasers, III Micropreparation and fissurotomy burs, IV. Sonic tooth preparation, V. Ozone, VI. Chemomechanical methods. Magnification is highly advantageous in the minimal invasive procedures in preserving tooth structure. Therefore, the use of binocular loupes is almost a prerequisite.

'Drill free dentistry', as the name suggests, means carrying out dental procedures without the use of a drill. It obtains similar results to drilling but without pain. It can be used in both adults and children.

Advantages of using drill free dentistry:
1. No drill pressure, less heat vibrations or sound as compared to high speed instrumentation.
2. More accurate as compared to the drill and can finish treatment within minutes rather than hours.
3. Generally requires no needles, so well tolerated.
4. Does not produce the burning smell associated with drilling.
5. More conservative.
6. Does not induce microfractures or microcrazing that follows high speed instrumentation. This has long term benefits since it can lessen the possibility of restorative failures.
7. Eliminates discomfort in the jaw since it is a quick procedure and does not require patients to keep their mouths open for long.
8. Young children and elderly or nervous patients are more comfortable and the risk of infection is reduced as well.
9. Useful in detecting early decay and treating with minimal invasion.
10. Particularly useful in patients who cannot have local anaesthesia.
11. Allows treatment of multiple lesions in one visit. Drill free dentistry can be used to manage caries, gum problems and also other dental treatments like cosmetic bleaching and root canal treatment which makes it a preferred dental treatment for many.

I. AIR ABRASION

Air Abrasion is also known as microabrasion 'Air abrasion' is 'particle abrasion' whereby thousands of
tiny sand like particles are directed at a decayed tooth so that the decay can be conservatively removed, thus eliminating the use of a drill. It allows for very small cavity preparations with the help of a gentle spray of air and powder mix. Air abrasion is a technology that is often associated with minimum intervention because it easily creates narrow preparation less expensively and more effectively than lesser. 4

**Air abrasion unit:** It resembles a small sand blaster. Using this instrument, a mixture of extremely fine particles of aluminum oxide (27 micrometer) are sprayed under the pressure ranging from 40 – 160 psi of compressed air or gas through the handpiece of the instrument.5

As the powered stream strikes the area, the decayed particles get sprayed off and are removed by suction after that, the surrounding healthy tooth structure is conserved. By controlling the speed and the intensity of both the powder and the air, the dentist can make the procedure virtually painless.5

**Restoration:** The cavity is filled with nearly invisible, nonmercury filling usually composites making it esthetically pleasing, long lasting and resistant to tooth decay.

**Indications :**

1. It is the instrument of choice for small, conservative preparations. It produces a very fine cut and selectively removes soft carious enamel over dentinal caries to allow access to infected dentin. It facilitates preparations of cavities of size 2-3 mm deep without the use of local anesthesia. 2. Removal of composite and glass ionomer restorations. It takes care of the problem usually associated with removal of composite fillings as due to their resemblance to tooth structure. Tooth restoration margins are indistinct leading to removal of healthy tooth structure along with while using conventional drills. 3. Cleaning occlusal surfaces prior to fissure sealing. 4. Selectively removing fractured porcelain and air abrading metal. 5. Can be used for removal of superficial stains on teeth. 6. Leaves the treated area of the tooth relatively dry, making sealants and fillings bond better.

**Limitations** (1). It is not suited for (a) crown and onlay preparations (b) cavities that extend near the gum line. (c) deep cavities, where decay nears the pulp or where there is a chance of damaging neighbouring teeth. (2). The technique is more expensive. (3). The air or the abrasives used can cause some irritation. (4).Silver filling or amalgam filling cannot be done if a tooth is prepared by air abrasion, since these need drill based cuts. Only composite filling can be used when tooth is ready and dried by air abrasion as it sticks well to the resultant surface. (5). It is not well suited for removal of amalgam and gross caries.

**Safety measures while using this technique:**

Though air abrasion is absolutely safe, few things are to be taken care of: (a) Both the dentist and patient should wear protection eye cover to prevent the spray getting into the eye. (b) Rubber dam may be used to cover the gum and teeth around the area to be treated to guard them from spray. (c) Alternatively, a resin can be applied to the area of protection instead of using a rubber dam. (d) Dentist should have complete knowledge regarding the use of air abrasion unit e.g. correct speed control, intensity of both powder and air etc.

**II. LASERS**

It means Light Amplification by Stimulated Emission of Radiation. It is an amazing treatment modality because neither it has many side effects nor it takes much time to show effects. The application of lasers in dentistry opens the door for dentists to perform a wide variety of dental procedures they otherwise may not be capable of performing. They can be used for both hard and soft tissue procedures.6,7 The focused laser beam allows for precise tooth structure removal in the treatment of carious lesions of all sizes.8-12

**Benefits of Laser Dentistry:** (1). Procedures performed using soft tissue lasers may not require sutures. (2). Certain laser dentistry procedures do not require general anesthesia. (3). Laser dentistry minimizes bleeding because the high energy light beam aids in the clotting of exposed blood vessels, thus inhibiting blood loss. (4). Bacterial infections are minimized because the high energy beam sterilizes the area being worked on. (5). Damage to surrounding tissue is minimized. (6). Wounds heal faster and tissues can be regenerated. (7). It renders the cavity surface suitable for adhesive restorations.

**Application of Laser Dentistry:** Laser dentistry can be a precise and effective way to perform many dental procedures. The potential for laser dentistry to improve dental procedures rests in the dentist's ability to control power output and the duration of exposure on the tissues, allowing for treatment of a highly
specific area of focus without damaging surrounding tissues.

**Hard tissue laser dentistry procedures:**

(a) **Cavity detector:** Low intensity soft tissue dental lasers may be used for the early detection of cavities by providing a reading of the by-products produced by tooth decay.13-15

(b) **Cavity preparation for tooth restorations:** Until 1997, there was no laser option for treating cavities. On May 7, 1997, the FDA approved Erbium: YAG laser, the first laser for use in treating human dental cavities. This laser uses a method known as laser hydrokinetics, in which, water particles energized by the laser remove the tissue being treated.

Advances in laser thereby have shown laser preparation to be effective in cavity preparation esp. Er: YAG and Er, Cr : YSGG.16 These laser beams create an explosive subsurface expansion of the interstitially trapped water, with the rapid ejection of tooth particles in the opposite direction. The laser can rapidly and effectively remove carious tooth structure compared to the sound tooth, as the carious tissues have higher water content.17

**Disadvantages:**

1. Dental lasers are not appropriate for the replacement of amalgam fillings, onlays or crowns.
2. Rate of cutting of tooth structure may be slightly slower than with a high speed rotary bur depending on the material and type of laser.

**III. MICRPREPARATION AND FISSUROTOMY BURS**

These burs, though, of course, need the use of a drill, are employed under minimal invasive technique.13,18,19 They are available in small spherical, tapered or elliptical shapes. Employing magnification, these burs allow precise preparation of teeth.

**Fissurotomy burs:** It facilitates the clinician to conservatively explore and modify the fissures even when caries has spread laterally along the dentino-enamel junction. They enable conservative exploration and modification of fissures.

**Polymer burs:** Recently, a unique polymer instrument, the SMART BUR (SS white burs, Lakwood, New Jesay), has been introduced.20,21 These burs are made of a special polymer material which has a KHN 30-50, which is greater than that of infected dentin which has KHN 0-30, but less than that of uninfected dentin which has KHN 70-90, so that these burs selectively remove the infected dentin leaving the normal dentin intact.

**IV. SONIC TOOTH PREPARATION**

This technique employs vibration energy of ultrasonically vibrated metal tips instead of rotation. The advantage of this method is that it allows precise minimal cutting preparation using diamond coated tips. Sonic Sys system is a typical example of sonic tooth preparation. Super sonicscillation (SONIC Flex cariex) for tooth preparation is one of the recently used sonic tooth preparation for minimal invasive dentistry.22 This is usually used in proximal surface caries. Sonic says, inlay was used in conjunction with composite resin. These techniques are advantageous in terms of lack of pain, better aesthetic results, and safety of preparation.

**V. OZONE**

Ozone is also a strong disinfecting agent that has the power to kill 99% of bacteria, fungi and viruses very rapidly. It is of particular use in dentistry because tooth decay is caused by invasion of our teeth by some of the bacteria that live in our mouths. The bacteria produce acids which over time demineralize healthy tooth and eventually produce a cavity. Ozone, a potential oxidizing agent, can neutralize acids and their effect on cell structures, metabolism and microorganisms.23 Ozone elicits its antimicrobial property at concentration between 0.3-0.9 ppm by disrupting the cell walls of micro-organisms within seconds. The threat of microbial resistance is minimal due to the potential and rapid antimicrobial effect of ozone. Once all the harmful bacteria in the decayed area have been destroyed, mouthwashes are used for a few weeks to remineralize the decayed portion.24 Typically a tooth can be treated in 2-4 visits where ozone is applied to the tooth for about one minute each time.

**Disadvantage:** As ozone has the potential to oxidize biomolecules such as cysteine, methionine and histidine residues of proteins, caution is to be taken while using it.

**VI. CHEMOMECHANICAL METHOD**

It is a method wherein a chemical solution is applied to the infected carious dentin, which selectively softens the carious dentin through proteolysis and facilitates its removal with special hand instruments.
A system in example, is carisolv that uses a gel and special instruments to remove carious tissue and preserve healthy tissue.

**Composition:** The components of gel are provided in two separate syringes containing sodium hypochlorite and aminoacids respectively.

**Procedure:** The two components are mixed just prior to application to form a gel. Gel is applied to the carious dentin. Superficial softened carious dentin is removed by scraping out until gel no more becomes cloudy. Scrape with new gel in case carious tissue still visible. Once cavity is free from caries, gel should be removed and cavity wiped with moistened cotton pellet or rinsed with luke warm water. The gel contains chloramines that are prepared by mixing sodium hypochlorite and 3 amino acid lysine, leucine and glutamic acid. The gel soften only the outer layer of carious dentine without effecting the sound dentine. Addition of amino acids reduces aggressive effect of sodium hypochlorite on sound tissue. The chlorinated amino acid of different electric charge reacts to different moieties of carious dentin.

**Advantages:**
1. Does not affect sound non-carious dentin.
2. Does not usually require local anaesthesia.
3. Has found favourable outcomes in root surface caries and large cavitated coronal cavities.
4. It removes carious dentin at all sites and stages of carious lesions.
5. It is biocompatible with pulp tissue.
6. It has no effect on gingiva.
7. It has no effect on adhesive restorative materials.
8. It's caries removal efficacy increases sealant retention.

**Disadvantages:**
1. It is time consuming. Longer time is required for caries removal as compared to drilling.
2. Some cases may need additional drilling for complete caries removal.

**Conclusion**
Microabrasion has opened up a whole new method for the treatment of patients with dental caries. It has made possible to preserve far more tooth structure than was ever possible before. It is a boon for patient’s especially young patient and nervous/elderly patients who have more fear of the drill.

**References**


