INTRODUCTION
The preservation of healthy tooth structure using non invasive treatment techniques is one of the primary goals of modern dentistry. Dr. Miles Markley deserves much of the credit for bringing to the profession the concept of “minimal intervention.” The concept of minimal invasive dentistry” also called as the “Microdentistry” can be defined as the maximum preservation of the healthy tooth structure. It is a philosophy of professional care concerned with first occurrence earliest detection and earliest possible treatment of disease on micro (molecular) levels followed by the most minimally invasive and patient friendly options to irreversible damage caused by such disease. G.V. Black’s 1891 idea of “Extension for prevention today” changed leading to emergence of new idea i.e. Prevention of Extension.”

CONCEPT OF MINIMAL INVASIVE DENTISTRY
Minimal operative dentistry is based on a refined model of care and includes the following concepts i.e. Early caries diagnosis, Assessment of individual caries risk, Classification of caries depth and progression using radiograph, Reduction of cariogenic bacteria to decrease the risk of further demineralization and cavitation, The arresting of active lesions, Placement of restoration in teeth with cavitated lesion using minimal cavity design, minimum intervention tooth prepration, and assessing disease management outcomes at pre established level.

MINIMAL INTERVENTION TOOTH PREPARATION
Various minimally invasive tooth preparation techniques involve 1) mechanical rotary including burs, 2) mechanical non rotary including air abrasion, air polishing, ART, ultrasonics and sono-abrasion, 3) Chemo- mechanical including carisolv, caridex and enzymes 4) Photoablation including lasers.

BURS
FISSUROTOMY KIT: (SS WHITE)
Fissurotomy bur is a new approach to ultraconservative dental treatment. The shape and size of the three unique burs; Original fissurotomy Micro STF and fissurotomy Micro NTF are designed specifically for the purpose of treating pit and fissure lesions. The head length of the fissurotomy original and fissurotomy micro NTF burs 2.5 mm, allowing the dentist to limit the bur tip to the tooth structure just below the DEJ and not further into dentin. Length of fissurotomy micro Stf is 1.5 mm which make it suitable for use in the primary teeth, adult premolars and enameloplasty. The tapered shape of the bur allows cutting tip to encounter very few dentinal tubules at any given point of contact and this minimizes heat buildup and vibrations.

The comparison of a fissurotomy bur to a traditional cutting bur demonstrates the lessened invasiveness of this newly design bur. Traditional cutting burs remove far more enamel at any depth and are designed to access cavities which are progressed well beyond the DEJ; while the fissurotomy bur has been anatomically designed to enlarge the fissure and eliminate small caries without removing excessive healthy enamel or dentin.

MICRO DIAMOND PREP SYSTEM (BRASSELER USA):
It is a set of eight burs which are designed for minimally invasive dentistry.

The No. 889m 007 of the kit is used in narrow pit and fissures and it allows initial preparation with minimal tooth
Disadvantages of air abrasion include:

- Resin restoration placement
- Minimal cavity preparation and fissure sealant / preventive applications within the field of restorative dentistry
- Dental drill. Air abrasion has been used for several different relatively pain free procedures when compared with the vibration and other mechanical stimulation result in dramatically reduce the problems of heat generation, this method of cutting teeth seemed to be greatly favoured by the patients and dentists alike.

Polymer Cariess Removal Burs (Smart Burs):

Recently smart burs which are caries removal burs have been introduced. They are used for removal of carious lesion with conservation of sound tooth structure. Instead of metal body and cutting blades, these burs have a metal shaft and polymer blades. Disease dentin has a knoop hardness number of 0-30. Healthy dentin has a knoop hardness number of 70-90 and enamel has 360-430 KHN. Polymer burs have a knoop hardness of 50; therefore only diseased dentin will be removed, leaving a healthy tooth structure that will effectively resist the action of a polymer cutting instrument.

Smart burs are available in the most popular round shape for caries removal that RA no. 2, no. 4 and no. 6. They are used in slow speed rotary handpiece at 500-800 rmp, using a light touch with a slow speed hand piece and a latch contra angle attachment.

Air ABRASION

Air abrasion was originally developed by R.B. Black in 1945 who instigated preliminary investigations into an alternative semi-mechanical method for dental tissue removal which involve bombarding the tooth surface with high velocity particles carried in a stream of air. This technique has the ability of abrading efficiently both sound dentin and enamel.

There are several parameters that can be altered in order to adjust the cutting characteristics of the instrument; the type and size of abrasive particle, speed of particles, air pressure, the distance between nozzle and tooth surface, length of cutting time etc. The first unit to be commercially manufactured were the Airdent machines. Early patient surveys indicated that this technique was greatly favoured by the patients and dentists alike.

This method of cutting teeth seemed to dramatically reduce the problems of heat generation, vibration and other mechanical stimulation result in relatively pain free procedures when compared with the dental drill. Air abrasion has been used for several different applications within the field of restorative dentistry including the removal of external stains and calculus, minimal cavity preparation and fissure sealant / preventive resin restoration placement.

Disadvantages of Air Abrasion Include:

- The total loss of tactile sensation because the nozzle does not touch the surface of the tooth.
- The operator must be able to envisage the position of the cavity boundaries prior to cutting, leads to the significant risk of cavity over preparation.
- Clinically soft carious dentin is not removed due to the reduced hardness of the carious substrate when compared with the alumina particles themselves.
- Potential of inhalation problems, with studies showing evidence of chronic granulomatous reactions, patchy atelectasis and emphysematous changes in lungs. Therefore, contraindicated in cases involving asthma dust allergy, chronic obstructive lung disease etc.
- After 40 years of dormancy period air abrasion was reintroduced as micro air abrasion. Recent advances in modern dentistry led to the investigation of alternative abrasive mixtures that indicated that softer particles, e.g. polycarbonate resin or alumina hydroxyapatite mixtures might be more selective in carious dentin removal as they are only capable of removing tissue of equivalent hardness, leaving healthier, sound tissue virtually unscratched.
- Also the use of protective rubber dam, barrier masks for the clinical team, more efficient suction units to expel the unwanted dust and rapid progress in the development of adhesive restorative materials with consequent changes in cavity design might allow air abrasion to make a comeback in the dental surgery of the future.

Currently dental practitioners are also using air abrasion as an aid in diagnosing suspected carious lesions. Removing stains and organic debris allow better visualization of the depth of the pits and fissures and aids in detecting decay.

Fissures in teeth are complex structures, with areas of subsurface restrictions, within the fissures that can effectively hide areas of subsurface decalcification that may be the genesis of decay. Air abrasion has an unparalleled ability to allow and expose and allow the exploration of the hypo calcified internal characteristics of occlusal fissure.

Chemo-Mechanical Caries Removal

Chemomechanical caries removal (CMCR) involve, the chemical softening of carious dentin followed by its removal by gentle excavation. The reagent involved is generated by mixing amino acid with sodium hypochlorite the resulting N monochloroaminoacid so formed selectively degrade demineralised collagen in carious dentin.

Action of CMCR

Action of CMCR is based on studies of Goldman and Kronman who studied the effect of sodium hypochlorite, which is a nonspecific proteolytic agent, on removal of carious material. Sodium hypochlorite used however was too corrosive for use on healthy tissue so, sorenson's buffer (which contains glycine, sodium...
Nielsen et al. indicated the possibility of using an ultrasonic instrument to cut tooth surface. He designed a magnetostrictive instrument with a 25 kHz oscillating frequency. It was found that the harder the tissue, the easier it was to cut. Soft carious dentin apparently could not be removed.

Nielsen attempted to analyze the result from altering the pressure applied, the length of use of instrument, the powder: water ratio in the slurry, the nature of the material cut and the type of abrasive used due to the erratic and unpredictable performance of the instrument, his results were inconclusive.

LASERS
A more conservative, less invasive treatment of the carious lesion has intrigued researchers and clinicians for decades. This has led to the introduction of lasers which stands for Light Amplification by Stimulated Emission of Radiations in dentistry. Laser research started in 1960's. Today many different lasers and treatment are available. In ordinary light, the photons travel in different wavelength in all directions, whereas the unique characteristics of the laser light are that it is mono chromatic, coherent and collimated laser light that has a single wavelength and all the light waves are in phase and in a precise beam in one direction, this allows concentration of tremendous amount of energy to a small area. Depending on the wavelength and the properties of the target tissue and material, the energy is absorbed, reflected, scattered or allowed to go through. The interaction plus time and power determines the results. Several types of lasers are available based on wavelengths. The lasers ranges from long wavelength(infrared) through visible wavelength, to short wavelength (ultraviolet), Excimers are special ultraviolet lasers.

The hard tissue lasers have wavelength in the infrared area of the electromagnetic spectrum and cuts enamel, dentin, decay and soft tissue. The hard tissue laser cleared for marketing by the FDA are erbium: yttrium, aluminium-garnet (Er,YAG) : Erbium(Er), and Chromium: Yttrium-Scandium-gallium-garnet (Cr:YSGG).

CAPABILITIES AND LIMITATIONS OF LASER
The hard tissue lasers have FDA clearance to do the following:
- Remove caries, enamel, Dentin, Cement, Composite, and ablate soft tissue with no haemostasis. Laser do not ablate Amalgam, Gold, Porcelain.

LASER CAVITY PREPARATION TECHNIQUE
Different laser parameter or settings are required for ablation of enamel, dentin and caries because of greater water content, in increasing order, for enamel, dentin and caries.

Because Er wavelength has an affinity for the water content of hard tissue, less energy is required to ablate caries than enamel or dentin as a result of its increased hydration.

The laser has dual feedback to the operator i.e tactile and auditory. Tactile feedback is due to the gentle touch of the contact tip against the tooth surface.

Cutting radiations comes out only from the distal end of the tip. The water air stream is directed on the cutting tip and onto the target tissue. The tip end should always be moved to provide effective ablation and better tissue contact.
cooling. For wide cutting the tip is moved constantly over the surface. The operator need not change the operating parameter during the cavity preparation. For example, using the laser parameters for ablating enamel, once in dentin the contact cutting tip can be repositioned in a non contact relationship to the surface of the tooth to decrease the energy density. A non contact mode is usually 1 mm from the surface of the tooth. The decreased energy causes a slower ablation effect. There is decreased requirement for anaesthesia with the use of the hard tissue laser.

For deep cutting the tip is moved up and down as in pumping action. The different tooth structures can be detected by hearing the sound of ablation, which is differentiated by tissue type. During interproximal tooth preparation, adjacent teeth can be isolated and protected with the use of a rubber dam or metal matrix. Laser energy is delivered to the tissue using fiber optics or wave guides. Disposable and reusable cutting tips of various diameters are coupled to the distal end of the delivery system. They are used in a contact or non-contact position on the tissue.

The laser is capable of ablating and preparing the cavity in an irregular fashion, which is ideal for the placement of a composite or glass ionomer restoration. The improved precision with lasers results in a minimally invasive procedure, which compromises little non-curious healthy tooth structure.

ENZYMES

Studies have examined the possibility that carious dentin might be able to be removed by using certain enzymes. In 1989 Goldberg and Kei successfully removed soft carious dentin using bacteria Achromobacter Collagenase, which did not effect the sound layers of dentin beneath the lesion. Recently enzyme Pronase, which is non specific proteolytic enzyme originating from streptomyces grisisens to help remove carious dentin.

CONCLUSION

With the development of new dental restorative materials and adhesive dentistry a better understanding of the caries process and the tooth's potential for remineralization and change in caries prevalence and progression the management of the dental caries has evolved from GV Black's “Extension for preservation” to “Minimally invasive”.

The future promises further evolution toward a more primary preventive approach facilitate by emerging technologies for diagnosis, prevention and treatment.

REFERENCES

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