ISOLATION IN PEDIATRIC DENTISTRY

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ABSTRACT
Successful dental treatment in pediatric patients depends largely on the effective control of moisture and microbes during the procedure. Anything that obscures the operative field negatively impacts operator efficiency and effectiveness. The purpose of this paper is to review the need for proper tooth isolation during dental procedures.

KEYWORDS: isolation, saliva, rubber dam.

BACKGROUND
In paediatric dentistry, challenges for access to visualize and manipulate instruments are more, as the oral cavity is a difficult area to treat because of the constraints of the lips, tongue, cheeks, which if improperly managed, bleed. Also in pediatric dentistry child is sometimes a difficult task to handle and to add on, saliva becomes a dreadful situation. Pediatric patients are also more prone to accidental swallowing and aspiration of instruments. Thus isolation of dental working field is one of the most important, and yet sometimes most underappreciated aspects of pediatric dentistry within our control.

AIM
Thus the main objectives of this review is to focus on different isolation methods in pediatric dentistry to control moisture, prevent any type of harm to the patient and for retraction and better access.

Isolation is basically provided from moisture and soft tissues. Isolation from moisture include direct and indirect methods. Direct methods involve placement of the materials directly in contact with the oral cavity e.g. Absorbent Systems, Oral Evacuation System, Cheek Retractor, Air Jet, Gingival Retraction Cord and Rubber Dam, whereas indirect methods involve comfortable position of the patient and relaxed surroundings, Local anaesthesia and Drugs such as Anti-sialogogues, Anti-anxiety drugs and Muscle relaxants.

A) Direct Methods
1) Absorbent systems: a) Cotton rolls: Their action is mainly by absorption and hence they have a limited service life and must be replaced frequently when saturated. The typical requirements for any posterior tooth in a supine patient are three rolls; one in the upper buccal sulcus, one in the lower buccal sulcus and one in the lower lingual sulcus, in order to cope with salivary duct outflow and to collect pooling fluids. These are acceptable in procedures like sealant and topical fluoride application, cementation of the restoration etc. Cotton rolls can be prefabricated roll or manually rolled. Ito K et al (2012) in a study to evaluate the effects of moistened techniques on the patients’ discomfort and the operators’ ease stated that when using dental instruments and removing cotton rolls, moistening increases both the subject’s comfort and operator’s treatment ease as compared to when left dry.

b) Cotton pellets: These are available in a range of sizes and are useful for drying and cleansing but they have the same limitation of service life and cross infection risk as cotton rolls.

c) Cellulose Wafers: These are sheets of absorbent material, which can be adapted to the mucosa, and are arguably more stable than cotton rolls. It is important to note that all absorbents can produce painful after-effects, termed as cotton burns, if they adhere to dry mucosa and are then forcibly removed. Where such
adherence occurs they should be first soaked with water and then gently peeled off.

d) Gauze pieces and Throat shield: They can be used to prevent accidental ingestion or aspiration of small instruments. These are particularly important when treating teeth in the maxillary arch. A gauze sponge (2×2 inch) is unfolded and spread over the tongue and the posterior part of mouth, which prevents aspiration of small objects.\[5\]

2) Oral Evacuation Systems

a) Saliva Ejector: It is a small, straw like oral evacuation system that is used during many types of dental procedures. It is not sufficiently strong vacuum to be used solely during a restorative dental procedure. The evacuator tip can be of stainless steel or plastic.\[6\]

The purpose of this evacuator is to
1. Help keep a dry field for short procedures, such as the sealants or fluoride treatments and coronal polishing.
2. Help control saliva and moisture accumulation under the dental dam.
3. Help to keep the patient from swallowing accumulated water.

It can be bend into the shape of a candy cane and placed lingually under the tongue. It is a good idea to have cotton roll positioned for the saliva ejector to rest on so as to not impinge any tissue.

b) High-Volume Oral Evacuation: The high-volume oral evacuator (HVE) is used as moisture control to remove saliva, blood, water, and debris from the mouth of the patient during a dental procedure.

The purpose of this evacuator is to
1. Keep the mouth free of saliva, blood, water, and debris.
2. Retract the tongue and cheek away from the field of operation.
3. Reduce the bacterial aerosol caused by the high-speed hand-piece.

Jacks ME et al\[7\] (2002) concluded that utilizing either form of hand free high-volume evacuation (HFHVE) during ultrasonic instrumentation significantly reduced the number of aerosolized particulates that reached the breathing space of the patient and clinician.

3) Cheek Retractor: It is a simple, inexpensive, disposable tool which helps in accurate impressions and retract the lips and cheeks for digital photographs. Specialized lip and cheek retractors have been introduced around for decades. They are used to expand the mouth opening more in the vertical rather than horizontal direction. This makes them ideal for use when working on the gingival border of upper and lower front teeth and for the adjustment of orthodontic bands.

4) Air Jet: This is usually applied via an air–water syringe (3-in-1 or triple syringe). It acts merely by forcibly displacing the fluid layer. If applied longer to achieve evaporation effect this technique can result in desiccation of the dentine, which may be injurious to the underlying pulp.\[8\]

5) Gingival retraction cords: These are readymade cotton or synthetic fibres woven in form of cords. They provide improved visibility and access and also protects gingiva from abrasions. The gingival retraction method is conducted using a retraction cord soaked in epinephrine or in an astringent agent. In addition to retracting the tissues laterally to permit impression taking of the tooth preparation finish line, the use of a retractor cord promotes a dry, clean gingival crevice, eliminating blood and/or gingival crevicular fluid.\[9\]

According to Jockstad knitted gingival retraction cords were ranked better than twined cords and cords containing epinephrine performed clinically no better than aluminium sulfate cords. The commonly used chemicals are 8% racemic epinephrine, aluminium chloride, Alum (aluminium potassium sulfate), aluminium sulphate, ferric sulphate.\[10\]

Proper isolation with the above mentioned techniques is difficult, because these traditional methods doesn’t provide complete isolation. Also they are unable to completely protect the patient from aspirating dental instruments. Moreover, they need frequent replacement due to saturation.

To overcome these disadvantages Rubber dam has been introduced in the market allowing the clinician to work in a proper isolating dental field for more efficient results.

6) Rubber Dam: The need to work under dry conditions, free of saliva, has been recognized for centuries, and the idea of using a sheet of rubber to isolate the tooth dates almost 150 years. The introduction of this notion is attributed to a young American dentist from New York, Sanford Christie Barnum, who in 1864 demonstrated for the first time the advantages of isolating the tooth with a rubber sheet. It has various advantages like it increases the accessibility, helps in retraction of tissues and provide dry and clean operating area.

It is available in a kit which includes: Rubber dam template, Rubber dam sheets, Rubber dam punches, Rubber dam clamps, Rubber dam clamp forceps, Rubber dam frame, Lubricant, Rubber dam napkins, Dental floss, Assistant.

1. Rubber Dam Template: It is a useful way to determine exactly where to punch the rubber dam hole based on
tooth location. It is placed on the dental dam and appropriate tooth position is located followed by punching the hole on the respective location.

2. Rubber Dam Sheets: It is made from natural latex rubber and is available as
- Continuous rolls in two widths (125 mm or 150 mm)
- Pre-cut from such rolls into squares (5x5", 6x6")
- For paediatric patients 5x5" is used.

The rubber dam has two surfaces - shiny & dull. The dull surface should face occlusally, as it causes less reflection. To improve its acceptability to patients, scents are added to these dams. A rubber dam sheet has a limited shelf life of about 9 months at room temperature. Shelf life is reduced in warm storage conditions; so refrigeration is required for prolonged storage. These are disposable and do not require any sterilization.

3. Rubber Dam Punches: It is a precision instrument having a rotating metal table (disk) with 6 holes of varying sizes and a sharp pointed plunger, used to produce the clean-cut holes in the rubber sheet through which teeth can be isolated. Two types of punches available: Single hole punch and Multi-hole punch.

4. Rubber Dam Clamp Forceps: Forceps are needed to stretch the jaws of the clamp open in a controlled manner during placement and removal. The designs of forceps available: Ash or Stokes pattern, Ivory pattern, University of Washington pattern.

5. Rubber Dam Clamps (retainer): Rubber dam clamps were introduced by Hodson in 1870. Clamps are used to retain the rubber dam on teeth and also to retract gingival tissue. Clamps have four prongs & two jaws which is connected by a bow. Bow or spring helps in holding the jaws together and provides the force required which in turn helps to grip the neck of the tooth. The bow should be tied with dental floss (12 inch or 30.5cm) before application for added protection and it should pass through the holes present in the jaws. Floss allows retrieval of retainer or its broken parts if accidentally swallowed or aspirated.

According to the jaw design; clamps are divided into
- Bland
- Retentive

Bland clamps: These clamps are flat and point directly towards each other and are designed to grasp the tooth at or above the gingival margin with minimal gingival damage. These are generally preferred if they provide adequate retention.

Retentive clamps: These are directed more gingivally and grasp the tooth well below the gingival margin. These type of clamps are generally used in partially erupted tooth for additional soft tissue retraction.

6. Rubber Dam Frames and Harnesses: Frames support the edges of the rubber dam sheets which help in retracting soft tissues & improve access to isolated teeth. These are of 2 types metallic and plastic

Metallic frames: The Fernauld's frame which was used earlier and the Young's design which is the only available metal frame. The metallic frames have longer life span but corrosion can take place making them unesthetic.

Nygard Ostby: It is a plastic frame which is a complete circle. It supports the upper edge of the rubber dam sheets, but does not offer a real advantage as patients especially children do not like the rubber close to their nose causing discomfort and irritation.

7. Rubber dam harnesses
Rubber dam harnesses retract only the sides of the rubber dam.

8. Rubber Dam Accessories
(i) Dental floss
- They are used for making ligatures when they are needed.
- They also help in flossing the rubber dam through tight contact areas

(ii) Lubricants
- They are helpful when the rubber sheet is being applied to the teeth.

(iii) Rubber dam napkins
These are the absorbent material placed between the rubber sheet and the soft tissues and are used where chemicals are applied.

Recent alternatives to Rubber Dam
1. Kool dam (Pulpdent Corporation): It is a light cured material applied on the gingiva or tooth surfaces prior to power bleaching, sand blasting or other procedures requiring intraoral protection or isolation. It is also used to block out undercuts prior to taking impressions.

2. Fast dam: Anatomically-shaped fast dam is designed to provide a superior means of maintaining a dry quadrant field. It can be used in place of cotton rolls to retract the cheek and tongue while maintaining a dry field.

3. Isolite: The Isolite is a new dental device that simultaneously delivers continuous throat protection, illumination, retraction and isolation. It has a unique soft, flexible mouthpiece which isolates maxillary and mandibular quadrants simultaneously, retracts and protects the soft tissues from accidental damage from high speed turbines, delivers shadow less illumination and continuously aspirates fluids and prevents the aspiration of foreign object.
B) Indirect methods of isolation
I) Modifying anxiety levels of the patient- Increased anxiety levels increase salivation. So, the patient should be calm and relaxed.

II) Local Anesthetics- These control moisture by decreasing salivation. The vasoconstrictor also helps in reducing the hemorrhage at the operating site.

III) Drugs- Drugs can reduce salivation but are rarely indicated. These include antisialogogues, antianxiety agents, Sedatives etc.

Antisialogogues: Premedication may be indicated using an ant cholinergic agent to depress salivation. Atropine can be given half an hour before the appointment, but should be avoided in patients with high ocular pressure or with cardiovascular problems.

Antianxiety agents and barbiturate sedatives: Premedication with these drugs is quite helpful in apprehensive patients. e.g. Diazepam 5-10 mg. or Barbiturates, 24 hours before the appointment. Because of psychological dependence on these drugs, these should be given only for short periods and to selected patients. Muscle relaxants, such as baclofen may also be tried.

IV) Comfortable and relaxed position of the patient- The patient should be comfortably seated in the dental chair. Moreover, the surroundings should also be pleasant and relaxing. All these features as well as a comforting attitude of the dental staff reduce the anxiety levels of the patient and aids in reducing salivation. [3]

CONCLUSION
Any operative procedure requires the need for adequate control around the operating field. It is important that there should be proper moisture control, good accessibility, visibility as well as adequate room for instrumentation around the working area. Pediatric dentistry requires the attitude and the ability of the professional who can make quick changes. Therefore proper isolation of tooth and soft tissue during pediatric dental procedures is mandatory.

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