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Rubber Dam Usage For Endodontic Treatment: A Review

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Abstract:
The dentistry has had access to rubber dam for more than 140 years. Over this time, rubber dam use has been refined, widely taught, and endorsed by organizations representing professionals. Unfortunately, many in the profession have rejected its consistent use. However, dentists do not frequently utilize rubber dam for root canal therapy. Its lack of utilization has been attributed to a number of baseless factors, such as patient acceptance issues, application time requirements, material and equipment costs, inadequate training, treatment fees that are low, and treatment difficulties. It has been demonstrated that not using rubber dam affects the choice of root canal irrigant, negatively affects the course of treatment, and puts the patient at danger of aspirating or swallowing debris.

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I. Introduction

Sanford Christie Barnum first promoted the use of rubber dams nearly 150 years ago. Even during that early period of dentistry, the advantages of isolating a tooth to achieve a dry, saliva-free working area were recognized. The European Society of Endodontology's guidelines recommend the regular use of rubber dams for all nonsurgical endodontic procedures.(1) However, despite being a key part of the endodontic curriculum in undergraduate dental programs, the widespread use of rubber dams in general dental practice remains uncommon. The primary reasons cited by dentists for not using rubber dams include cost, difficulty of use, and patient comfort. These misunderstandings have contributed to the low adoption of the technique in general practice.[2]

The rubber dam safeguards the patient's oropharynx from the potential aspiration or ingestion of instruments, medicaments, irrigating solutions, and tooth or material debris (Ingle et al., 2002; Glickman & Pettiette, 2006). This protection also shields the operator from legal liability in the event of such accidents (Cohen & Schwartz, 1987; Cohen, 1989; Peters & Peters, 2007). Additionally, it retracts and shields the soft tissues (gingival tissues, tongue, lips, and cheeks) from rotary and hand instruments, medicaments, and the possible trauma caused by repeated manual manipulation (Ingle et al., 2002; Glickman & Pettiette, 2006).[3]

Advantages of using rubber dam during endodontic procedures:

1. Ensures a dry and clean operating field.
2. Improves access and visibility to the working area.
3. Protects patients from the potential aspiration or swallowing of endodontic instruments, medicaments, irrigating solutions, and debris.
4. Retracts and shields the soft tissues (gingival tissues, tongue, lips, and cheeks) from possible trauma caused by rotary and hand instruments and endodontic medicaments.
5. Significantly lowers the microbial content of air turbine aerosols produced during endodontic procedures, reducing the risk of cross-infection.
6. Enhances the properties of dental materials by preventing moisture contamination of restorative materials.
7. Boosts operating efficiency and productivity. Patient management is simplified as there is no need to rinse the mouth of debris.
8. Protects dentists and dental assistants from infections transmitted through the patient's saliva.
9. Reduces patient conversation during root canal treatment and encourages them to keep their mouth open.
10. Eliminates the need for repeated changes of cotton rolls due to saliva or root canal irrigant flooding.[4]

Contraindications for Using Rubber Dam:
1. Asthmatic patients
2. Patients with a latex allergy
3. Psychological reasons

Reasons to Use Rubber Dam:
1. Safety and medico-legal considerations
2. Aseptic working environment
3. Improved access and visualization
4. Enhanced efficiency
5. Reduction of aerosol contamination
6. Increased patient comfort

How to Use a Rubber Dam

The rubber dam kit comprises the following components:
- Rubber dam material
- Rubber dam clamps
- Rubber dam clamp carrying forceps
- Rubber dam punch
- Rubber dam frames (Young's metal frame, U-shaped plastic frame, hinged dental dam frame, and HandiDam)
- Rubber dam template
- Wedget cord
- Dental silk floss
- Rubber dam napkin
- Flowable block-out materials

A. Rubber Dam Material
- **Description**: Available in heavy, medium, and light thicknesses, and various colors and standard sizes. Medium thickness is usually recommended for endodontic purposes.
- **Sizes**: Readymade sheets come in sizes 5 × 5 and 6 × 6 inches. Rolls are also available and can be cut to the needed size.
- **Material**: Typically latex, but non-latex options should be available for patients with allergies.

B. Rubber Dam Clamps
- **Types**: Different clamps are used based on the tooth being isolated.
  - **Winged clamps**: Facilitate faster and more efficient work.
  - **Wingless clamps**: Used for posterior teeth where winged clamps may be difficult to place or may impinge on the patient's cheek.
  - **Plastic clamps**: Available in large and small sizes from Moyco Union Broach, designed to avoid overlapping radiograph shadows.[5]

C. Rubber Dam Clamp Carrying Forceps
- **Brands**: Available from companies like Ash, Ivory, and Hu-Friedy.
- **Purpose**: Used to place the rubber dam clamp onto the tooth.

D. Rubber Dam Punch
- **Function**: Punches the rubber dam for application on specific teeth.
- **Design**: Features a moving table with holes of different diameters, ranging from the smallest for lower anterior teeth to the largest for posterior teeth.

E. Rubber Dam Holder or Frame
- **Preference**: The type used is based on individual preference, but it should not interfere with the endodontic operation.
- **Common Designs**:
  - **Young's frame**: Metal frame.
  - **Nygaard-Ostby frame**: Plastic frame, contoured facially, transparent, and does not need to be removed for radiographs.

F. Rubber Dam Template

- **Purpose**: Helps the clinician make an exact punch on the tooth in question for both upper and lower teeth.
- **Usage**: Holes should be punched approximately over the center of the incisal or occlusal surface of the teeth using the template beneath the rubber dam sheet.

G. Wedget Cord

- **Function**: Stabilizes the interproximal area of the rubber dam.
- **Material**: Flexible elastic that can be passed over the dam interproximally below the contact area.
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H. Dental Silk Floss

- **Usage**: Essential for rubber dam application, especially in endodontic procedures or during nonvital or vital bleaching.
- **Safety**: Additional holes are provided for securing the rubber dam clamp by passing the silk floss through and holding the free end outside the patient's mouth, acting as a safety measure while removing the clamp if it snaps.

Techniques of Rubber Dam Application

Using a rubber dam with high-power suction and sterile instruments can significantly enhance infection control. Here are the methods used for applying a rubber dam on different teeth:

- **Anterior Tooth Isolation**: Place the rubber dam over the tooth first. Stretch it over the tooth with the thumb and index finger of the left hand while adjusting the clamp with the right hand.
- **Molar Tooth Isolation**: Insert the clamp halfway into the punched hole in the rubber dam. Spread the clamp arms with clamp forceps, hold the rubber dam to avoid obstruction, and slip the clamp over the tooth with the right hand. Disengage the forceps and slip the dam under the anterior clamp arms.
- **Isolation of Multiple Teeth**: Apply the clamp first, then the rubber dam.
- **OptraDam Application**: Follow the specific application method for OptraDam.[6]

For anterior teeth, slip the rubber dam over the tooth first. Stretch the dam between the thumb and index finger of the left hand while adjusting the clamp with the right hand. For posterior teeth, insert the clamp halfway into the punched hole, spread the arms with forceps, hold the dam with the left hand, and place the clamp with the right hand. Disengage the forceps and slip the dam under the clamp arms. If using a wing clamp, insert the wing into the hole, apply the clamp to the tooth, remove the forceps, and slip the dam under the clamp arms.

Recent Advances in Rubber Dam

Rubber Dam Sheets

- **Hygenic Dental Dam (Coltène/Whaledent, OH, USA)**: Non-latex, powder-free synthetic dam for latex-allergic patients. Medium gauge, 6 × 6 inches, shelf life of 3 years, with the same tensile strength as latex dams.
- **Derma Dam (Ultradent Products Inc., USA)**: Non-latex, powder-free dam with low surface protein content, reducing the risk of dermatitis, allergic reactions, and offering greater tear resistance.
- **Flexi Dam (Coltène/Whaledent)**: Elastic non-latex dam made from plastomer, can elongate more than 1000% before tearing, more durable than latex, and easy to place.

Rubber Dam Frames

Older frames had several disadvantages such as requiring more time for positioning, covering the patient's nose and mouth, causing a sensation of suffocation, and not retracting lips or cheeks. Newer frames have addressed these issues:

- **Articulated Frame (IRED, France)**:
  - Made of non-irritant polysulfone plastic.
  - Double hinge allows vertical folding.
  - Bottom brace creates a reservoir for compresses or an aspiration device.
- **Safe T-Frame (Sigma Dental Systems)**:
  - Two hinged frame members with a snap-shut locking mechanism that securely clamps the rubber dam sheet.
  - Retains traditional U-formed frame geometry and dimensions.
  - Raised edges provide a barrier to prevent fluid escape, enhancing patient comfort.[7]

Pre-Framed Dental Dams Overview

a) Insti Dam (Zirc)

- **Material**: Translucent natural latex

- **Features**:
  - Built-in flexible radiolucent nylon frame
  - Pre-punched off-center hole; customizable by adding more holes
  - Compact size fitting outside the patient's lips
- **Advantages**:
  - No need for a separate frame
  - Tear-resistant and stretchable
  - Radiographs can be taken without removing the dam
  - Minimal pull on the clamp
  - Single-use, eliminating sterilization

b) Handi Dam (Aseptico)

- **Material**: Rubber
- **Features**:
  - Pre-framed
- **Advantages**:
  - Quick and easy to place
  - Provides easy access to the oral cavity during root canal procedures

c) Dry Dam

- **Material**: Rubber sheet with absorbent paper
- **Features**:
  - No frame required
  - Fits like a face mask with elastics passing over the ears
  - Available in medium and thin varieties
- **Advantages**:
  - Patient comfort with absorbent lining
  - Reduced risk of allergic reactions
- **Disadvantages**:
  - Not useful for isolating posterior teeth
  - Not suitable for bleaching procedures due to the absorbent paper[8]

d) Framed Flexi Dam (Coltène/Whaledent)

- **Material**: Non-latex, plastic frame
- **Features**:
  - Built-in flexible frame
  - Working size of 100 mm x 105 mm
  - Good tear resistance
  - Latex allergy-free and odorless
  - Smooth surface for patient comfort
- **Advantages**:
  - Easy placement without limiting access
  - Comfortable against the skin

e) Opti Dam (Kerr)

- **Material**: Rubber
- **Features**:
  - 3-dimensional shape with nipple design
  - Anatomical frame shape matching mouth contours
  - Available in anterior and posterior versions
- **Advantages**:
  - Greater access and visibility to the working area
  - Reduced tension, easier application, and low clamp displacement risk
  - Less preparatory work: no marking or hole-punching needed
  - Maximum patient comfort with no nasal pressure

f) Optra Dam (Ivoclar Vivadent, USA)

- **Material**: Soft, flexible material

- **Features**:
  - Combines lip and cheek retractor with rubber dam isolation
  - Anatomical shape with high flexibility and patented inner-ring design
  - No need for clamps or a separate frame
  - Available in regular and small sizes

Advantages:
- Easy placement and patient comfort
- Full jaw mobility maintained
- Optimum isolation
- Larger treatment field and complete isolation of both arches possible

Rubber Dam Clamps Overview

a) Clamp with Long Guard Extension
- **Features**:
  - Retracts and protects the cheek and tongue while providing isolation
  - Larger wing used for tongue retraction
  - Can be used with gauze or cotton rolls for additional retraction

b) Tiger Clamp
- **Features**:
  - Serrated jaws
- **Advantages**:
  - Increases stabilization on partially erupted or broken down teeth

c) S-G (Silker-Glickman) Clamp
- **Material**: Durable cast stainless steel
- **Features**:
  - Anterior extension for retraction around severely broken-down teeth
  - Placed on a tooth proximal to the one being treated
  - Autoclavable, corrosion-resistant, flexible, and long-lasting
- **Advantages**:
  - Ideal for molar isolation
  - Extended wings facilitate rubber dam placement around teeth with minimal structure [2]

d) Super Clamp (Dent Corp Research and Development, NY, USA)
- **Features**:
  - Facilitates isolation of an individual tooth without covering the entire mouth
  - Includes a "wing extension" for cheek and tongue retraction
- **Advantages**:
  - Protects tongue and cheeks
  - Provides security for treatment with rotary instruments
  - Eliminates need for a mouth mirror for tongue protection [9]

Recent Alternatives to Rubber Dam

1. Kool Dam (Pulpdent Corporation)
- **Features**:
  - Light-cured material applied on gingiva or tooth surfaces
  - Also used for blocking undercuts before impressions
  - Known as liquid rubber dam
  - Flexible after curing with good tear resistance
  - Moisture-friendly and easy to remove
- **Disadvantages**:
  - Resin-based, can produce heat when cured, causing discomfort
  - May displace and not stay in place [1]

2. Fast Dam

- **Features**:
  - Anatomically shaped for maintaining a dry quadrant field
  - 17 suction holes for continuous aspiration
  - Fits into standard saliva ejector valves
- **Advantages**:
  - Provides retraction and maintains a dry field
  - Suitable as an alternative to conventional rubber dams

3. Isolite

- **Features**:
  - Delivers continuous throat protection, illumination, retraction, and isolation
  - Soft, flexible mouthpiece isolates both maxillary and mandibular quadrants
  - Aspiration of fluids and protection from high-speed turbines
- **Advantages**:
  - Useful for young patients with incompletely erupted teeth
  - Allows for core buildup in a single step, reducing procedure time

Recent Accessories to Rubber Dam

1. Cushees

- **Material**: Soft thermoplastic
- **Features**:
  - Cashew-shaped nodules with grooved inner surfaces
  - Slipped over the tooth attachment blade of the clamp
- **Advantages**:
  - Increases patient comfort by eliminating steel clamp contact
  - Protects natural tooth structure and costly restorations
  - Enhances rubber dam seal and reduces clamp slippage
  - Sterilizable and reusable, available in yellow (anterior/bicuspid) and blue (molar) [3]

2. Wedjets (Hygenic)

- **Material**: Natural latex rubber
- **Features**:
  - Stretchable elastic stabilizing cords
  - Placed like dental floss in interproximal areas
- **Advantages**:
  - Faster and easier than conventional clamps
  - Reduces patient trauma and discomfort
  - Especially useful for isolating anterior teeth
  - Available in extra small, small, and large sizes[6]

II. Summary

A rubber dam is a dental tool used to isolate teeth during various dental procedures. It consists of a thin, stretchable sheet made from latex or non-latex materials like silicone. The dam is placed over the teeth and secured with clamps, creating a dry and isolated field around the treatment area.

The primary purpose of a rubber dam is to prevent contamination from saliva and oral fluids, which could compromise the success of dental treatments or increase the risk of infection. By isolating the teeth, it enhances visibility for the dentist, facilitates more precise procedures, and improves patient comfort by protecting soft tissues from contact with dental instruments.

Rubber dams are commonly used in restorative dentistry for procedures such as fillings and crowns, in endodontics (root canal treatments), and in cosmetic dentistry for treatments like teeth whitening and veneer placement. They also aid in preventive dental care by facilitating the application of fluoride treatments and dental sealants.

In summary, rubber dams are integral to modern dental practice, contributing to better treatment outcomes through their ability to maintain a clean, dry operating field and reduce the risk of contamination during dental procedures.

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