



## Evaluation of different types of isolation techniques in dentistry - Overview

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### **Abstract:-**

**Background:** In dentistry, it is well known that the main cause of procedure failure is inadequate tooth isolation. Even though it's been a staple of modern dentistry for decades, isolation remains a pesky but critical step particularly in endodontic and restorative procedures. It's not just one aspect of isolation that makes it difficult but tooth isolation by nature isn't easy, specifically when you add in the patient's comfort, it can be a challenging task. Any operative procedure needs adequate space over the operating field. There must be proper control of moisture, good accessibility and visibility as well as spacious for instrumentation around the working area. For easy manipulation this kind of environment is necessary. The aim of this review is to evaluate the different types of isolation techniques in dentistry.

**Materials and Methods:** Study design:- We included systematic reviews and meta-analyses. Articles were taken from PubMed-Medline, Scopus, LILACS, The Cochrane Database of Systematic Review. No. of articles:- 5. Study selection:- Four systematic reviews met the inclusion criteria and were included in the analysis. Two review authors independently screened the results of the electronic searches, extracted data and assessed the risk of bias of the included studies. Population:- Patients who require dental treatments involving isolation to prevent contamination. Outcome:- The authors have graded the overall evidence for the outcomes as moderate, although no individual study quality assessment is presented for the reader to consider.

**Result:** Rubber dam isolation was found to be the most effective and convenient isolation technique. Studies have shown that there are successful retention rates of adhesive restoration when a rubber dam is used rather than any other isolation technique. The judicious use of rubber dams ensures greater patient comfort and delivery of high-quality dental care to patients.

**Conclusion:** The application of rubber dams in dental techniques may result in a successful outcome compared to cotton rolls, according to some low-certainty evidence revealed in this research. Other times, the evidence is really ambiguous. It is necessary to conduct additional, high-quality studies investigating how rubber dam use affects various restorative procedures.

**Keywords:** Cotton roll; Isolation; Isolite; Operating field; Rubber Dam

### **Introduction:**

Dental isolation techniques play a pivotal role in ensuring precision, cleanliness, and patient safety during various dental procedures. Effective isolation is essential for maintaining a dry operating field, preventing contamination, and enhancing overall treatment outcomes. Dental restoration procedures are used to fix tooth damage brought on by trauma or caries.[1] Direct



restorative dentistry procedures, also referred to as “fillings,” restore teeth by employing amalgam or resin composite materials. Indirect methods use the lab prepared restorations.[2] Controlling moisture and microbes are likely the two most crucial variables for successful repairs. In addition to reducing the danger of infection or re-infection, it helps adhere to the restorations. Secondary cavities or poor bonding could jeopardise the restoration’s success or durability.[2,3]

Cotton rolls in conjunction with saliva ejector aspiration are a typical technique for moisture control and isolation in restorative dentistry. This method is commonly used and inexpensive, but it has the drawback that the dentist must often swap wet cotton rolls out during the procedure to keep the operating region dry.[4] Other prominent methods employed in dentistry for isolation are the traditional rubber dam technique and modern Isolite systems. The rubber dam, a time-tested isolation approach, involves placing a thin latex sheet around the tooth or teeth being treated.[5] This creates a physical barrier, isolating the designated area from the oral environment. Rubber dam isolation offers optimal moisture control, visibility, and protection against contamination, making it a preferred choice for many dental procedures. In contrast, Isolite systems represent a contemporary advancement in dental isolation technology.[6] These systems integrate illumination, suction, and retraction into a single device. By combining these functions, Isolite enhances visibility for the practitioner and provides a more comfortable experience for the patient. The illuminated isolation provided by Isolite aids in precise treatment and facilitates efficient evacuation of fluids, debris, and aerosols. The choice between rubber dam and Isolite depends on various factors, including the nature of the dental procedure, practitioner preference, and patient considerations. While rubber dam isolation remains a gold standard for certain treatments, Isolite systems offer a modern, multifunctional alternative that addresses some of the limitations associated with traditional methods.[6,7]

The selection of isolation techniques in dentistry is a critical aspect of ensuring procedural success. Practitioners may choose between the established rubber dam method and the innovative Isolite systems based on the specific requirements of the treatment, emphasising the importance of adaptability and a patient-centred approach in dental practice.[2] **This review aims on evaluating the different types of isolation techniques in dentistry.**



## Goals of Isolation

- 1. Retraction and Access:** Retraction and access give the operation site the best possible exposure. The lips, tongue, and cheeks are depressed or drawn back while keeping the mouth open. For this a rubber dam, mouth prop, and retraction cord can be used.[8]
- 2. Moisture Control:** Operative dentistry cannot be performed effectively if the amount of moisture in the mouth is not under control. Moisture control is the process of removing gingival sulcular fluid, saliva, and bleeding from the working area. Additionally, it stops the spray from the handpiece and the fragments of restorative material from being aspirated or ingested. Effective moisture control is made possible by the rubber dam, suction devices, and absorbents.
- 3. Harm Prevention:** A child may unintentionally aspirate small endodontic files, crowns or restorative debris. Isolation is employed to prevent injury, for patient comfort and operator efficiency.[9]

## The key departments where isolation techniques are commonly employed include:

- 1. Restorative Dentistry:** In procedures such as dental fillings, crowns, and veneers, isolation techniques like rubber dam or Isolite systems are used to maintain a dry and clean field for accurate placement of restorative materials.
- 2. Endodontics:** During root canal treatments, effective isolation is crucial to prevent saliva and other contaminants from compromising the sterile environment within the tooth. Rubber dam isolation is often applied in endodontic procedures.[9,10]
- 3. Prosthodontics:** Whether it's the fabrication of crowns, bridges, or dentures, dental isolation is vital to ensure the accuracy of impressions and the precise fitting of prosthetic devices.
- 4. Periodontics:** In various periodontal procedures, maintaining a clean and dry field is essential. Isolation techniques assist in procedures such as scaling and root planing, as well as during periodontal surgeries.
- 5. Orthodontics:** While not as commonly associated with isolation, certain orthodontic procedures, such as bonding of brackets, may benefit from the use of isolation techniques to enhance the bond strength and accuracy of placement.[11]
- 6. Paediatric Dentistry:** Children may find it challenging to control saliva flow during dental procedures. Isolation methods help in managing moisture and enhancing the efficiency of treatments in paediatric patients.[12]



**7. Oral Surgery:** In surgical procedures, maintaining a clear surgical field is crucial for precision. Isolation techniques may be employed during extractions, implant placements, and other oral surgical interventions.

Isolation techniques are utilised across various departments in dentistry to ensure a controlled and contamination-free environment during different procedures. The choice of isolation method often depends on the specific procedure, the practitioner's preference, and the patient's comfort. Overall, the consistent use of effective isolation techniques contributes significantly to the success and quality of dental treatments across various specialties.

### **Different types of isolation techniques:**

#### **1. Rubber Dam:**

A rubber dam is a thin, flexible sheet made of latex or non-latex material used in dentistry to isolate and protect the tooth or teeth being treated. This technique provides a dry and controlled environment, preventing contamination from saliva and blood during various dental procedures.[12]

**Materials:** Latex or non-latex rubber dam sheets, Rubber dam frame and clamps, Dental floss or clamps for stabilisation, Hole punch for creating perforations.

**Procedure:** Select and place the appropriate rubber dam clamp on the tooth. Punch a hole in the rubber dam corresponding to the tooth being isolated. Stretch and secure the rubber dam onto the frame, ensuring a snug fit around the tooth. Stabilise with dental floss or additional clamps as needed. Use a dental dam napkin to protect the patient's face and clothing.

**Advantages:** Excellent Isolation; Provides a highly controlled and dry operating field. Contamination Prevention; Effectively prevents saliva and blood from interfering with dental procedures. Improved Visibility; Enhances visibility for the practitioner during treatments.

**Considerations:** Patient Comfort; Proper placement and securing of the rubber dam are essential for patient comfort. Latex Allergies; Consider non-latex alternatives for patients with latex allergies. Training; Proficiency in rubber dam placement requires training and practice.

**Applications:** Restorative Dentistry; Used in procedures like dental fillings, crowns, and veneers. Endodontics; Commonly employed during root canal treatments. Operative Dentistry; Facilitates precision in various operative procedures.



Rubber dam isolation remains a cornerstone in dental practice, providing a reliable and effective means of achieving a clean and controlled operating environment. Its versatility makes it a valuable tool across different dental specialties, contributing to the overall success of various treatments.

## 2. Isolite Systems:

The Isolite system is an advanced dental isolation technology designed to provide illumination, suction, and retraction in a single, ergonomic device. It enhances the efficiency of dental procedures by improving visibility, patient comfort, and moisture control.

**Materials:** Isolite device with built-in illumination, suction, and retraction functions, Properly sized mouthpiece for patient comfort, Sterile barriers or disposable components as needed.

**Procedure:** Insert the Isolite mouthpiece into the patient's mouth, ensuring proper positioning and comfort. Activate the device to provide continuous illumination and suction during the procedure. Adjust the flexible mouthpiece to retract soft tissues, maintaining a clear field of view. Monitor and adjust suction levels as needed.[13]

**Advantages:** Multifunctional; Combines illumination, suction, and retraction functions in one device. Enhanced Visibility; LED light source improves visibility for precise dental treatments. Patient Comfort; Provides a more comfortable experience for the patient compared to traditional methods. Moisture Control; Efficiently evacuates fluids, debris, and aerosols, contributing to a dry operating field.

**Considerations:** Initial Setup; Familiarise yourself with the Isolite system setup for optimal performance. Patient Selection; Consider patient comfort and factors like the duration of the procedure when using the Isolite system.[13,14]

**Applications:** Restorative Dentistry; Particularly useful in procedures requiring a clear and dry field for dental fillings, crowns, and veneers. Operative Dentistry; Aids in various operative procedures where enhanced visibility and moisture control are critical. Prosthodontics; Facilitates accurate impressions and placement of prosthetic devices. Periodontics; Useful during scaling and root planing procedures and other treatments requiring moisture control.

The Isolite system represents a modern and versatile approach to dental isolation, offering a streamlined solution to enhance visibility, patient comfort, and procedural efficiency. Its multifunctional design makes it applicable across a range of dental specialties, contributing to improved treatment outcomes.[15]



### 3. Dental Napkins and Saliva Ejectors:

Dental napkins, also known as bibs or napkin chains, are essential tools in dentistry for maintaining a clean and dry environment during dental procedures. They serve to absorb saliva, protect the patient's clothing, and contribute to overall infection control.[16,17]

**Materials:** Disposable Dental Napkins; Typically made of paper or a poly-backed material. Adhesive Strips; Secure the napkin around the patient's neck for stability. Napkin Holders; Some setups use clips or holders to keep the napkin in place.

**Procedure:** Patient Placement; Position the napkin around the patient's neck, ensuring coverage of the chest area. Securing; Use adhesive strips or clips to secure the napkin in place. Absorption; The napkin absorbs saliva and provides a barrier to prevent fluids from contacting the patient's clothing. Disposal; Dispose of used napkins properly after each patient.[16]

**Advantages:** Patient Comfort; Enhances patient comfort by keeping them dry during the procedure. Hygiene; Aids in maintaining a clean and sanitary working environment. Protection; Protects the patient's clothing from fluids and debris.

**Considerations:** Disposable vs. Reusable; Disposable napkins are common, but some practices may use reusable options with proper sterilisation. Sensitivity; Be mindful of patient sensitivity and potential allergies to materials used in napkins.[18,19]

**Applications:** General Dentistry; Used in various dental procedures to manage saliva and maintain cleanliness. Paediatric Dentistry; Particularly useful for managing saliva flow in younger patients.

Saliva ejectors, or saliva ejector tips, are suction devices used to remove saliva, blood, and other fluids from the patient's mouth during dental procedures. They contribute to maintaining a dry and clear operating field.

**Materials:** Saliva Ejector Tips; Disposable, flexible tips connected to the dental chair's suction system. Tubing; Connects the saliva ejector tips to the dental unit's vacuum system.

**Procedure:** Tip Placement; Insert the saliva ejector tip into the patient's mouth, typically near the back of the oral cavity. Suction Activation; Turn on the dental unit's suction system to initiate saliva and fluid removal. Continuous Monitoring; Monitor the effectiveness of suction throughout the procedure, adjusting as necessary.[20]

**Advantages:** Continuous Suction; Provides ongoing suction to manage saliva and maintain a dry field. Patient Comfort; Assists in preventing excessive saliva buildup, enhancing patient comfort. Efficiency; Contributes to the efficient evacuation of fluids and debris.



**Considerations:** Proper Placement; Ensure correct placement to optimise suction efficiency. Regular Inspection; Periodically check and replace saliva ejector tips to maintain effectiveness.[20,21]

**Applications:** General Dentistry; Used in most dental procedures to manage saliva and maintain a clear field of view. Orthodontics; May be used during various orthodontic procedures where moisture control is important.

**Considerations:** Proper Placement; Ensure correct placement to optimise suction efficiency. Regular Inspection; Periodically check and replace saliva ejector tips to maintain effectiveness. Dental napkins and saliva ejectors are integral components in dental practice, collectively contributing to maintaining a clean, dry, and comfortable environment for both the practitioner and the patient. Their applications span various dental procedures, supporting infection control and procedural efficiency.[18]

#### **4. High-Volume Evacuation (HVE):**

High-Volume Evacuation (HVE) is a vital component of dental suction systems designed to remove excess fluids, debris, and aerosols from the oral cavity during various dental procedures. It plays a crucial role in maintaining a clear and dry operating field, enhancing visibility, and contributing to infection control.[22]

**Materials:** High-volume evacuation tips, HVE system connected to the dental chair.

**Procedure:** Utilise HVE tips to remove excess fluids, debris, and aerosols during the procedure. Adjust suction levels based on the specific requirements of the treatment.

**Advantages:** Efficient Aerosol Removal; Effectively removes aerosols generated during dental procedures. Debris Evacuation; Rapidly evacuates fluids, debris, and other materials, maintaining a clear field. Infection Control; Contributes to infection control by minimising the spread of potentially contaminated fluids.[22,23]

**Considerations:** Proper Positioning; Ensure correct placement of HVE tips for optimal suction efficiency. Adjustable Settings; Some dental units allow for adjustable suction settings; practitioners may adapt these based on the procedure.

**Applications:** Restorative Dentistry; Used during procedures like dental fillings and crown placements to control moisture. Periodontics; Helpful in scaling and root planing procedures for efficient removal of fluids and debris. Oral Surgery; Essential in oral surgical procedures to maintain a clear surgical field.



High-Volume Evacuation is a cornerstone in dental practice, particularly during procedures that generate aerosols or involve the use of fluids. It significantly contributes to maintaining a clean and controlled environment, supporting both procedural efficiency and infection control measures in dental care.[24]

### **5. Alternative Isolation Techniques:**

**Materials:** Gingival barriers, Cotton rolls or balls, Dental dams or other isolation aids, dry angles, Surgical Isolation Techniques.

**Procedure:** Employ gingival barriers to isolate specific areas or protect soft tissues. Use cotton rolls or balls to control moisture and maintain a dry field. Explore other isolation aids based on the unique needs of the procedure.[14]

**Considerations for Alternative Techniques:** Procedure-Specific; Choose the isolation method based on the nature of the dental procedure. Patient Comfort; Consider patient comfort and communication during the procedure. Infection Control; Ensure that any reusable items are properly sterilised between uses. Practitioner Proficiency; Adequate training and proficiency are essential for effective implementation.[13]

**Applications:** Restorative Dentistry; Alternatives can be used in various restorative procedures, depending on the specific needs. Orthodontics; Cotton rolls and isolation aids may be employed during orthodontic bonding procedures. Pediatric Dentistry; Techniques like cotton rolls are especially useful in managing saliva in paediatric patients.

While rubber dam and Isolite systems are widely used, alternative isolation techniques offer flexibility and adaptability in different clinical scenarios. The choice depends on factors such as the type of procedure, patient characteristics, and practitioner preference, showcasing the importance of a versatile approach in dental practice.[15]

### **6. Infection Control Measures:**

Infection control measures are integral to maintaining a safe and hygienic environment in dental practice. Adhering to these protocols protects both patients and dental healthcare providers, contributing to the overall well-being of the dental community.

**Materials:** Personal protective equipment (PPE), Sterilisation equipment for reusable items, Barrier covers for equipment and surfaces[25]



**Procedure:** Adhere to standard infection control protocols, including the use of PPE. Sterilise and disinfect reusable items according to established guidelines. Implement barrier covers on equipment and surfaces to prevent cross-contamination.

The choice of materials and methods should be tailored based on the specific dental procedure, patient characteristics, and practitioner preferences. Adherence to infection control measures is paramount to ensure patient safety and maintain aseptic conditions throughout the dental treatment process.[26]

### **Behavioural factors to take into account when employing different isolation systems**

Both rubber dams and other isolation devices, when used appropriately, can efficiently control moisture and safeguard the soft tissues of the oral cavity. Alternative isolation systems do not require the administration of local anaesthesia, although insertion of rubber dams frequently does. This may give operators the impression that the alternative system is more patient friendly than the rubber dam.[26,27] This observation might be particularly accurate for sealants and other procedures when a local anaesthetic wouldn't normally be employed. However, administration of a local anaesthetic is required for operative procedure. A rubber dam therefore appears to be relatively comfortable when local anaesthesia is used and frequently presents as a less bulky isolation approach.[28]

Additionally, research indicates that using rubber dams with paediatric patients may reduce stress when compared to cotton roll isolation. On the other hand, a sizable portion of kids claimed that the alternative isolation system's mouthpiece made them feel like it was stretching their mouths to the point where they felt like they might gag.[29] Further studies must be conducted on the effect of the alternative isolation devices on the behaviour of patients. Other things to think about include the fact that alternative methods produce more noise and that rubber dams make it easier to breathe via the nose, which can improve the sedative effects of nitrous oxide inhalation.[29,30]

### **Drugs used in dental procedure contributing to isolation**

Antisialagogues are medications that reduce salivary flow and can be used in dentistry to manage excessive saliva during certain procedures. However, it's important to note that the routine use of



antisialogogues in dental practice is somewhat limited, and their use should be carefully considered based on the patient's individual needs and the specific procedure.[31] Some examples are Scopolamine, Glycopyrrolate and Atropine. It's crucial to be aware of the potential side effects of antisialogogues, such as dry mouth, blurred vision, and increased heart rate. Additionally, patients with certain medical conditions or allergies may not be suitable candidates for these medications. The use of antisialogogues should be based on a thorough assessment of the patient's medical history, individual response to the medication, and the specific requirements of the dental procedure.[32]

Local anaesthesia, in addition to the vasoconstrictor in it, brings a reduction in pain and salivation. It is commonly used in dentistry to provide pain control and facilitate isolation during various dental procedures.[33] It helps create a comfortable experience for the patient while allowing the dentist to work without causing undue pain. The use of local anaesthesia can aid in isolation primarily by numbing the targeted area and minimising patient discomfort. The use of local anaesthesia in dentistry is a standard and well-established practice, contributing to effective pain management and creating a more conducive environment for dental procedures.[34] [35]

### **Recent Advances in Rubber Dam Isolation**

3D Dam is a clear plastic form shaped like a hat without a top which is trimmed and fitted around the crown that cannot be clamped, to hold the rubber dam in place. Cushioning metal clamp jaw (Ferrite-N) can be pressed in the embrasure area and material is light cured over which clamp is seated. Fibre optic clamps are used for high intensity light transilluminates pulp chamber and canal orifices.[36] Non-latex rubber dam materials have gained popularity, catering to patients with latex allergies. Materials like polyurethane or nitrile provide alternatives without compromising isolation effectiveness. Some manufacturers have introduced coloured rubber dams, which can be especially helpful for practitioners and dental assistants to distinguish between different teeth or quadrants during procedures.[37] Advances in clamp and frame designs aim to enhance ease of use and patient comfort. Some designs feature ergonomic shapes and improved stability, making the application and removal of rubber dams more efficient. Advances in material technology have led to the development of thinner yet tear-resistant rubber dam sheets. Thinner materials can improve tactile sensation and reduce



discomfort for patients. Pre-punched rubber dams with standardised holes for different teeth have become available, streamlining the placement process and potentially reducing procedure time. Continuous advancements in techniques for placing rubber dams aim to make the process more intuitive and efficient, contributing to better isolation and overall treatment outcomes.[10] Rubber dam isolation is sometimes integrated with other isolation aids, such as auxiliary suction devices, to create comprehensive and effective isolation systems. Dental professionals are placing a greater emphasis on educating patients about the benefits of rubber dam isolation, addressing any concerns or misconceptions, and promoting its importance in maintaining a sterile environment during procedures. Manufacturers offer customizable rubber dam kits that may include a variety of dam sizes, clamps, and accessories, allowing practitioners to tailor their approach based on the specific needs of each procedure.[13]

### **Materials and methods:**

1. Study design:- We included systematic reviews and meta-analyses. Articles were taken from PubMed-Medline, Scopus, LILACS, The Cochrane Database of Systematic Review
2. No. of articles:- 5
3. Study selection:- Four systematic reviews met the inclusion criteria and were included in the analysis. To review authors independently screened the results of the electronic searches, extracted data and assessed the risk of bias of the included studies.
4. Population:- Patients who require dental treatments involving isolation to prevent contamination.
5. Outcome:- The authors have graded the overall evidence for the outcomes as moderate, although no individual study quality assessment is presented for the reader to consider.

### **Result:**

In dentistry, effective isolation techniques are paramount for successful clinical outcomes. Rubber dam isolation stands out as a gold standard, ensuring optimal visibility and moisture control during various procedures. This technique significantly reduces the risk of contamination, contributing to enhanced infection control. Complementing rubber dam usage, high-volume suction plays a pivotal role in minimising aerosols and fluid accumulation,



thereby maintaining a clean and aseptic working environment. The removal of contaminants through efficient suction not only promotes a safer clinical setting but also aids in the prevention of potential cross-infections. Additionally, isolation aids like dry angles and cotton rolls serve as valuable tools in achieving a dry operating field. These aids assist in moisture control and contribute to the overall success of restorative and endodontic procedures. The comprehensive evaluation of these isolation techniques underscores the need for a tailored approach based on the specific requirements of each dental procedure. Dentists must carefully consider the nature of the treatment, patient comfort, and personal preferences when choosing isolation methods. Ultimately, a judicious combination of rubber dam isolation, high-volume suction, and appropriate aids ensures not only clinical efficiency but also upholds the highest standards of infection control in dental practice.

### **Conclusion:**

The goals of isolation in dentistry are straightforward: avoid contamination of the restorative field and protect the patient against unwanted contact with products used in dental therapy. If the operative field is contaminated with saliva, the physical properties and ultimate success of the treatment may be compromised. Maintaining isolation throughout the entire procedure ensures the best possible outcome for dental procedures. Compared to cotton rolls isolation, rubber dams cause less anxiety in children and adolescents. In a rubber dam, isolation patients feel that the treatment is taking place outside of their mouth. The primary aim of dental treatment is to reduce the bacterial burden as much as possible. When done correctly, proper tooth isolation helps avoid additional bacterial contamination as well as the unwanted contact of rinsing solutions with healthy soft tissue. From all of the above isolating techniques, a rubber dam is the most convenient one. Studies have shown that there are successful retention rates of adhesive restoration when a rubber dam is used rather than any other isolation technique. The judicious use of rubber dams ensures greater patient comfort and delivery of high-quality dental care to patients.

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