

Dental Dam Compatibility with Chloroform

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INTRODUCTION:

Dental dam isolation during endodontic procedures is an essential standard of care to prevent contamination of the root canal system from oral bacteria, prevent aspiration of dental materials and provide a clean operating field. One common procedure for retreatment of root canal treatment (RCT) involves chemically softening gutta percha placement using a chemical agent such as chloroform. A common complication with the use of chloroform is the incompatibility with the materials used in dental dam sheets which are essential for isolation as chloroform contact with human soft tissues must be avoided. The incompatibility can result in distortion causing leakage around the isolated tooth, or weakening of the sheet resulting in tearing of the placed rubber dam. As chloroform is toxic at high doses, any use should be limited to as small a volume as possible.

In this study, we tested the dental dam compatibility with chloroform of a latex dam (**BIODAM**, 4D Rubber), a non-latex thermoplastic elastomer dam (TPE) (**Flexi Dam**, Coltene), and several non-latex polyisoprene dams with medium and heavy gauge thicknesses (**ISODAM**, **True Dental Dam**, **EdgeDam**). We tested the dental dams in a simulated use case on a first molar RCT, and examined the surface changes after short and long exposures.

RESULTS SUMMARY:

All polyisoprene dental dams survived both exposure during a simulated endodontic procedure on a first molar and long-term immersion. The latex and non-latex TPE dam immediately failed during a simulated procedure and after long term immersion. The polyisoprene dams which included **ISODAM**, **True Dental Dam**, and **EdgeDam** all were shown to be very compatible with the use of chloroform.

MATERIALS:

Polyisoprene:



ISODAM® Medium
(FourD Rubber)



ISODAM® Heavy
(FourD Rubber)



True™ Dental Dam Medium
(Clinician's Choice)



True Dental Dam Heavy
(Brasseler)



EdgeDam™ Medium
(EdgeEndo)

Latex:



BIODAM® Medium
(FourD Rubber)

Non-latex TPE:



Flexi Dam Medium
(Coltene)



Chloroform is a clear, colorless liquid commonly used as a powerful solvent for resin, rubber, oil and gutta percha. When used in clinical dentistry, all precautions should be followed to prevent accidental exposure including high volume suction, syringing as little as possible, removing pressure from the syringe away from the patient before use to prevent any leakage before use. Chloroform should only be used if mechanical removal is unsuccessful or for more complete removal of difficult to reach canals, with care to prevent apical extrusion. Use of absorbent points are a good option to remove excess before mechanical removal of gutta percha.

SIMULATED DENTAL DAM CHLOROFORM EXPOSURE:

To simulate use of chloroform during a root canal retreatment, we placed dental dams on a lower right first molar, and syringed undiluted chloroform on various sides of the dental dam. Starting with a small volume, and increasing the amount until the entire area around the tooth was exposed, the procedure was recorded, and the dams removed to examine the integrity of the punched hole.



Flexi Dam (TPE)



BIODAM (Latex)

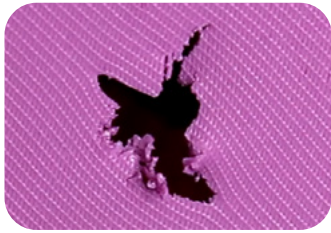


ISODAM (Polyisoprene)



True Dental Dam (Polyisoprene)

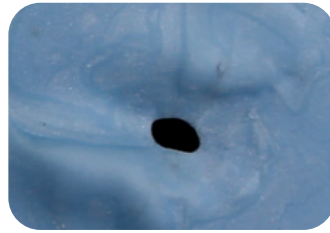
Both the latex dam and thermoplastic elastomer dam immediately tore after minimal exposure. All polyisoprene dams showed no evidence of tearing, even after excessive contact around the entire perimeter of the tooth.



Flexi Dam (TPE)



BIODAM (Latex)



ISODAM (Polyisoprene)



True Dental Dam (Polyisoprene)

Representative samples of dental dams after removal immediately after exposure, the polyisoprene dams had much more exposure to chloroform without significant distortion of the punched hole. There was no visible difference between medium and heavy gauge dams in performance. Small distortions of the shape of the hole seen with the Polyisoprene dams are not due to chloroform exposure, and relax into a round smooth hole within minutes.

SURFACE EXAMINATION AFTER EXPOSURE:

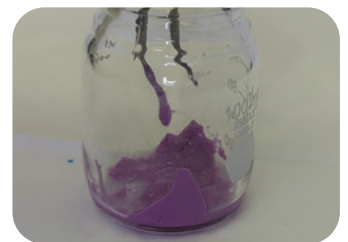
Dental dams were also exposed to chloroform for 2 minutes and one-hour immersions to test the limits of chemical compatibility.

TPE Dental Dam:

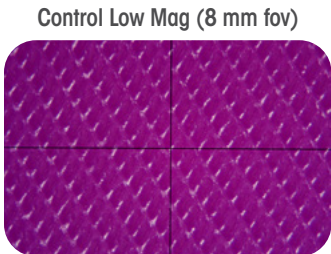
After less than a minute of exposure, the **Flexi Dam** showed physical distortion of the surface, with near instantaneous melting as demonstrated by transferring material to a wipe. The **Flexi Dam** completely dissolved in less than 30 minutes of immersion. The **Flexi Dam** initially has channels which both cause any chloroform exposure to take longer to evaporate, and the surface shows complete loss of the features after a short exposure.



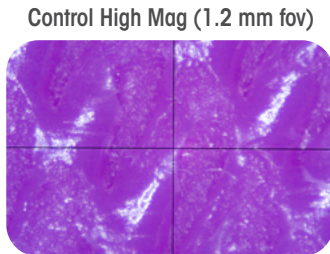
Flexi Dam after short exposure transfers material to a wipe.



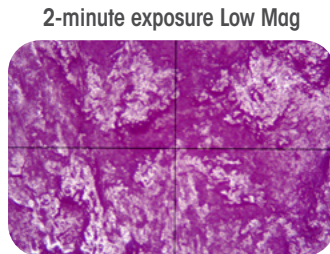
Flexi Dam after one hour immersion dissolved into a formless gel.



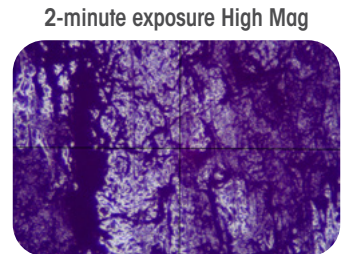
Control Low Mag (8 mm fov)



Control High Mag (1.2 mm fov)

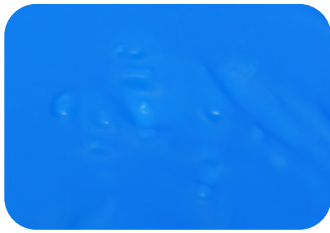


2-minute exposure Low Mag

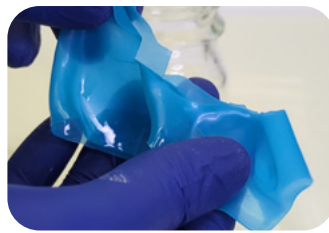


2-minute exposure High Mag

The surface of TPE **Flexi Dam** melts after short exposures to chloroform causing significant damage to the surface.



The latex dam shows localized distortion when contacted with chloroform which persists for over 10 minutes.

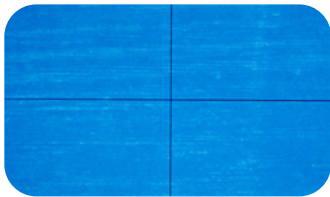


The latex dam after 1 hour immersion falls apart.

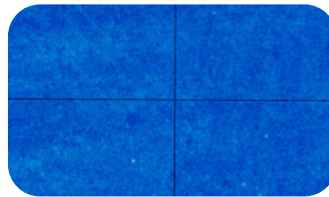
Latex Dental Dam:

The latex dam fared a little better in the short contact test, though it showed a significant distortion where chloroform made contact resulting in a bubbling appearance which persisted for several minutes. After a longer immersion, the latex dam lost all physical strength, and would fall apart with minimal contact. The distortion combined with the loss of physical strength helps explain the results of the clinical simulation, as the immediate area around the tooth, which is already under tension, stretches while also weakening the material leading to an immediate tear after chloroform exposure.

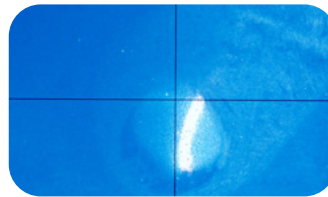
Control Low Mag (8 mm fov)



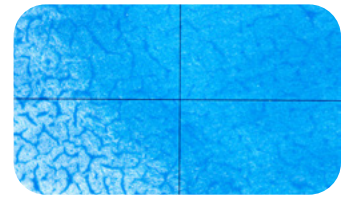
Control High Mag (1.2 mm fov)



2-minute exposure Low Mag



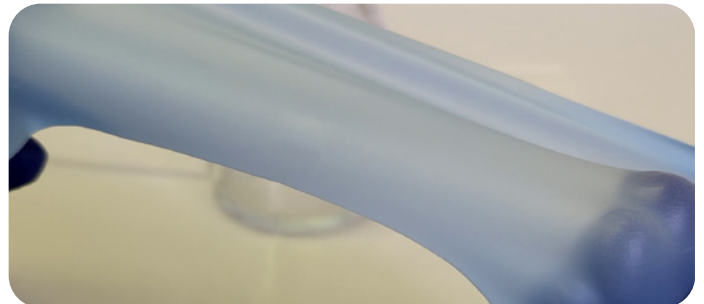
2-minute exposure High Mag



The surface of the latex dam is damaged after short exposures to chloroform.

Polyisoprene Dental Dam:

The polyisoprene dams **ISODAM**, **True Dental Dam**, and **EdgeDam** showed a small amount of bulging after contact with an excessive amount of chloroform which quickly relaxed back to the initial state when dry. Even after a one-hour complete immersion, all polyisoprene dams still retained enough strength to significantly stretch without tearing. These polyisoprene dams demonstrated a very high compatibility with chloroform with no significant difference when viewed under microscopy after chloroform exposure.

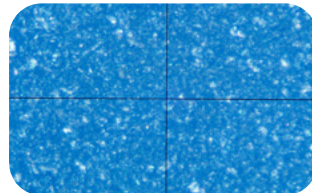


Polyisoprene **ISODAM** after 1 hour immersion survives stretching.

Control Low Mag (8 mm fov)



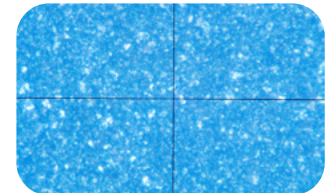
Control High Mag (1.2 mm fov)



2-minute exposure Low Mag

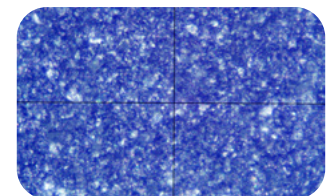
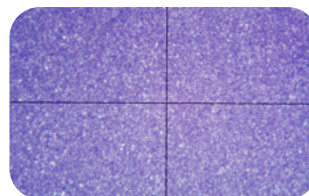
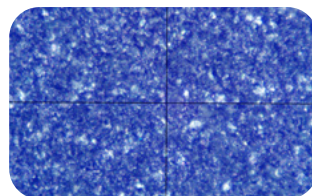
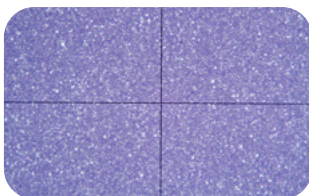


2-minute exposure High Mag



ISODAM
Medium

True Dental Dam
Medium



The surface of the polyisoprene dams including **ISODAM**, **True Dental Dam** and **EdgeDam** show no damage after exposure to chloroform under magnification. These dams are very compatible with chloroform exposure.

Research supported by FourD Rubber.