

Rubber Dam Isolation for Endodontic Treatment in Difficult Clinical Situations.

Mithra N Hegde, Priyadarshini Hegde, and Ashwith Hegde*.

Department of Conservative Dentistry and Endodontics, AB Shetty Memorial Institute of Dental Sciences, Mangalore 575018, Karnataka, India.

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*For Correspondence

Department of Conservative Dentistry and Endodontics, AB Shetty Memorial Institute of Dental Sciences, Mangalore 575018, Karnataka, India.

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ABSTRACT

The concept of using rubber dam to isolate the tooth dates back to almost 150 years. Rubber dam application is considered mandatory in root canal treatment. The Quality Assurance Guidelines of the American Associations of Endodontists says that cleaning, shaping, disinfection and obturation of all canals are accomplished using an aseptic technique with dental dam isolation “whenever possible”. Root canal treatment without rubber dam has a negative impact on the treatment outcome, influences decision of the choice of root canal irrigant and also patient’s safety. This paper emphasizes the application of rubber dam in various difficult clinical situations.

INTRODUCTION

Isolation of teeth using rubber dam was first proposed by Sanford Christie Barnum in 1864. In the year 1882 Dr. Delous Palmer introduced clamps specific for each tooth [3]. Rubber dam has been known to serve various advantages [1-7] such as protection of patient against aspiration of instrument, prevents laceration of soft tissue from rotary or hand instrument, improves accessibility and visibility, retraction of soft tissue to some extent, and also precludes cross infection. It prevents transmission of infectious diseases such as hepatitis and AIDS by reducing the number of microbial content and blood contamination during operative procedure. It has also been proved advantageous in the diagnosis of occult caries [8] (caries present under an intact enamel surface) which might otherwise be difficult to detect without the color contrast of the rubber dam.

Rubber dam kit contains rubber dam sheets, rubber dam frame, clamps, rubber dam punch and forcep. Rubber dam sheets are available in various thickness and colors. Medium thickness sheets are mainly used for endodontic purpose because of its fewer tendencies to tear and also retract the soft tissue. Rubber dam frames are also available in 2 types – metal (young’s frame) and plastic (nygaard ostby or starlite frame). For endodontic treatment plastic frames are preferred as they need not be removed before x ray taking because they appear radiolucent and do not hinder the diagnosis. There are foldable plastic frames that help sensor placement. Also a dam with flexible outer ring (Quick Dam) are available, therefore no additional frame is required. Rubber dam punch is used to make holes in the dam. They have a rotating metal table with six holes of varying sizes. Holes should follow the dental arch; in case of malpositioned or missing teeth adjustments should be made accordingly. Rubber dam forceps are used to place and remove the clamp from the tooth. Rubber dam clamp help anchor the dam to the tooth [2, 9, 10].

The most commonly used clamps are [2]:

Anterior teeth

Ivory # W9 (universal double bowed anterior clamp) (Fig 1)

Ivory # 212s (It has a double bow, hatch type design, used in case of gingival lesion or full coverage preparation on anterior teeth and premolars, also used for endodontic treatment on anterior teeth.



Figure 1

Premolars

Ivory # 1

Ivory # 2 (universal mandibular bicuspid clamp)
(Fig 2b)

Ivory # 2A (universal maxillary bicuspid clamp)



Figure 2

Molars that are completely erupted or covered by full crowns:

Ivory # 7 (universal mandibular molar clamp) (Fig 3a)

4 (small maxillary molar clamp) (Fig 3b)

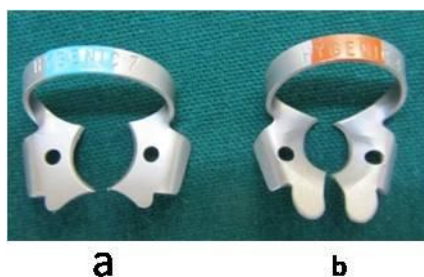


Figure 3

Molars that are incompletely erupted or already prepared for a full crown:

Ivory # 14

Ivory # 14A (Fig 4)

Ivory # 7A



Figure 4

Asymmetrical molars, in particular second and third
Ivory # 10
Ivory # 11
Ivory # 12A (fig 5a)
Ivory # 13A (fig 5b)



Figure 5

Wingless, to be used when the wings obstruct the working field: (Fig 6)
Ivory # w8A
Ivory # 26N



Figure 6

Rubber dam application is one of the primary steps in the endodontic therapy. Single tooth isolation with clamp making four point contact with the sound tooth structure is considered as an ideal isolation [11], but many a times endodontists are faced with challenges in isolating the tooth with rubber dam in situation where it is difficult to retain the clamp in position [12]. This article emphasizes the use of rubber dam in various difficult clinical situations during endodontic treatment.

Methods of placement of rubber dam in unusual tooth shapes and positions

Partially erupted teeth or teeth with short clinical crown

- Modified clamps:
 - Clamps with prongs inclined apically, this will help in engaging the tooth subgingivally [10]. (Fig 7)
 - Clamps with serrated jaws are available called as tiger clamps, these serrations help in stabilization of the clamp [9]. (Fig 8)
- Self curing resin beads can be placed on the cervical area of the tooth; this will help in stabilizing the clamp in position during treatment [13, 14]. (Fig 9)
- Since a partially erupted tooth lacks undercut to retain the clamp, one can also place small acid etched composite lips on the teeth, which serves as an artificial undercut and remain on the teeth between appointments [2, 14]. (fig 10)

John Mamoun fabricated a prosthesis to retain the rubber dam especially in a distal molar with short clinical crown. The prosthesis was customized with a light-cured denture base material on the diagnostic model of the patient. The material was adapted to the gingiva around the tooth in question and 2 teeth mesial to it. It does not cover the clinical crown of the problem tooth; rather forms a continuous ring around the gingiva of the concerned tooth and 2 teeth mesial to it. Prosthesis was held in place with a rubber dam clamp placed on a tooth mesial to the concerned tooth. The purpose of the prosthesis was to distribute the force of the mesially placed clamp towards the distal aspect, so that it can hold the rubber dam around the tooth in question. Prosthesis covered the clinical crown of the tooth mesial to the clamped tooth that act as rest¹⁵.



Figure 7



Figure 8

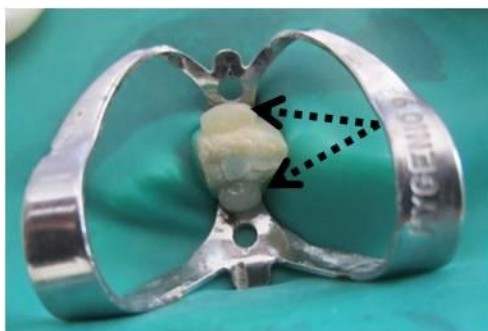


Figure 9: Rubber dam clamp has been stabilized on the central incisor with short clinical crown with the help of composite resin beads placed on the labial and the lingual surface.



Figure 10: Severely broken down teeth wrt 1st molar with 2 wall missing, composite lip placed to stabilize the clamp

Severely broken down teeth

- **Modified clamps:** Similar to those used for partially erupted tooth that is clamps with prongs inclined apically and tiger clamps. Apart from these there is S-G (Silker Glickman) clamp that can be used for severely broken down teeth. It has an anterior extension that allows retraction of the rubber dam around the tooth in question with the clamp placed on the adjacent tooth ^[10]. (Fig 11)
- Also may consider clamping of the alveolar process through attached gingival, but is usually not recommended as it causes bleeding and pain ^[11].
- **Double clamp technique:** Occasionally it might be possible to place the clamp in position, but due to inadequate tooth structure the elasticity of the dam might interfere in the stabilization of the clamp, in such circumstances one clamp is placed on the distal tooth that will take up the elasticity of the dam, whereas the second clamp is gently positioned on the tooth in question ^[2].
- Orthodontic bands can be cemented over the remaining clinical crown. This will not only allow clamp to be held on to the tooth but also serves as a seal for the retention of intracanal medicament and the temporary filling material between appointments ^[16], but it requires sufficient supragingival tooth structure for it to be retained on to the tooth ^[17,18].
- **Split dam technique:** In this technique two holes are punched in the dam that corresponds to teeth anterior and posterior to the teeth in question. The dam is then stretched over the clamped tooth and to the anterior tooth where the dam is stabilized with the widget. The dam between the holes is then cut with iris scissors ^[9]. (fig 12)
- **Use of copper band:** In this method a copper band is either pre-annealed or heat softened. It is then trimmed such that it adapts to the gingival contour of the tooth. The band is closely and passively placed over the remaining supraosseous tooth structure. Because of the flexibility of the softened copper band, it can be pressed over the supraosseous tooth structure and pushed subgingivally with minimal trauma ^[17].
- **Temporary crowns:** can be cemented over the remaining tooth structure. Access cavity preparation is then made through the crown ^[17, 18].
- **Provisional restorations:** Sometimes there is so little remaining tooth structure that even orthodontic band or crown placement is not feasible. In such cases it becomes necessary to replace the missing tooth structure to allow placement of the rubber dam clamp and prevent leakage into the pulp cavity ^[18, 19]. It can be accomplished by means of pin retained amalgam build up ^[12, 20], composite, glass ionomer ^[11, 21] or dentin bonding systems.

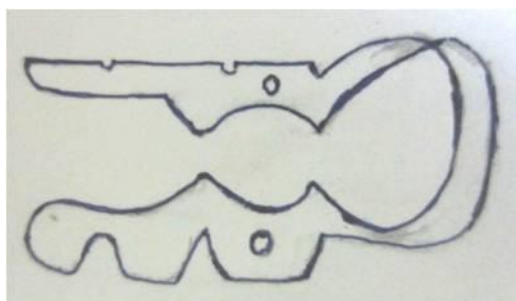


Figure 11



Figure 12: Severely broken down tooth wrt lateral incisor, therefore dam is placed on the central incisor and the canine to allow endodontic therapy in the lateral incisor.

For the build up with composite restoration, the point of the wedge is coated with separating medium and placed into the canal parallel to the long axis of the tooth. For proper adaptation of the restoration, matrix is placed

around the tooth with wedges interproximally. Tooth is etched, washed and dried prior to application of bonding agent and then flowable composite material is injected around the wedge to build up the missing tooth structure followed by thorough curing of the restoration [12, 20].

Similarly glass ionomer (a reinforced type II glass ionomer cement such as miracle mix or ketac silver) can also be used. In this method instead of wedge, cotton is placed in the access cavity [11].

Crowded teeth

In case of crowded teeth there is not enough space to place the clamp in position, in such a situation rubber dam is placed on to the tooth which is teased beneath the contact area with the help of a floss and is stabilized by two fragments of the dam instead of the clamp [2]. Widgets can also be used in place of dam.

Teeth with orthodontic wire

Orthodontic wire prevents tight sealing of the rubber dam sheet. Tight seal can be achieved by the use of Oraseal, Orabase, periodontal dressing, mixture of dentin adhesive and zinc oxide powder (PGZ) [4]. Oraseal being the material of choice. Other method is to position the clamp above the orthodontic attachment [2].

Isolation of third molar

Modified bow clamps: In the standard clamp the bow interferes with the ramus of the mandible. Modified bow clamps are so designed that the bow lies on to one side i.e. palatal side and thus it does not interfere with the ramus.

CONCLUSION

Use of dental dam for non-surgical endodontics is the standard of care [11, 22]. Its routine use will enhance every aspect of endodontic therapy. Rubber dam is obligatory in Endodontics [23], it should never be performed without a dam. Inadequate isolation will greatly compromise routine endodontic therapy. Isolating badly broken down teeth and teeth with unusual shapes and position has long been a challenge to the dentist's creativity [11]. Dam eliminates saliva and provides a dry, clean and disinfected operative field. Since many of the teeth which need endodontic treatment present deep carious lesions and massive destruction of the hard tissues of the tooth, placing rubber dam is sometimes difficult or may even be impossible. In such cases the first step before starting routine endodontic therapy is to eliminate all the carious tissue and to reconstruct the lost hard tissue of the tooth in order to get proper isolation and a good access cavity with four surrounding walls [21].

Several methods have been implicated to deal with dam placement problems such as use of modified clamps [24] and placement techniques, placing resin beads, use of orthodontic brackets, copper bands, provisional restoration etc. One must select appropriate method according to the tooth to be treated; doing this will save time and also enhance the treatment quality.

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