



Use of Minidam for Isolation in Restoration of Proximal Carious Lesion

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Abstract

Introduction: Resin-based composites are an integral part of pediatric restorative dentistry. Complete isolation during the procedure is critical for longevity of the restoration. Rubber dam isolation has been a gold standard for several years. However, general dentists and specialists may not use rubber dam owing to the difficulty in placement and cost.

Aim: To compare the isolation efficacy against the seepage of gingival crevicular fluid and blood between two isolating materials: Rubber dam and Minidam.

Methods: This randomized controlled study included 30 children between the age of 6 and 14 years requiring restoration of a proximal carious lesion in a posterior tooth. Children were randomly allocated to either of the two groups (Rubber dam group- Control group and Minidam group- Test group). Various outcome measures like efficacy of isolation against gingival crevicular fluid and blood, time required for placement, child's behaviour rating score, and child's pain perception were recorded.

Results: The results showed that the time required to place Minidam was significantly less as compared to Rubber dam. Isolation efficacy, behaviour rating score and child's pain perception scores were found to be statistically similar in both the groups.

Conclusion: Results show that Minidam could offer effective isolation in limited treatment procedures like restoration of proximal carious lesion or resin infiltration technique.

Keywords: Proximal Caries; Minidam; Rubber Dam; Isolation Efficacy, Child's Behaviour, Primary Molar

Introduction

Dental caries is an infectious microbiological disease affecting the primary dentition making it the most common oral diseases in children [1]. Broader proximal contact areas observed in primary teeth are likely to increase caries susceptibility, due to reduced ability for self-cleansing and greater plaque accumulation [2].

It is seen that untreated carious lesion on proximal surface of a primary molar may lead to development of caries on the adjacent proximal surface [3,4]. Early diagnosis and restoration of a proximal lesion is important before it progresses to the pulpal tissue causing further problem to the child and the parent.

Various materials are used for restoration of proximal carious lesions in primary molars. Various materials like dental amalgam, resin based composites, glass ionomer, resin reinforced glass ionomer, compomer or stainless steel crowns can be used to restore a proximal lesion in the primary tooth [5]. Resin-based composites are integral part of pediatric restorative dentistry [6]. Complete isolation during the procedure is critical for longevity of the restoration and therefore this material is the choice where isolation can be achieved [7].

Rubber dam isolation has been a gold standard for several years as it offers various advantages including antisepsis, moisture

control [8], retraction and protection of soft tissues [9], protection against aspiration of endodontic instruments or toxic materials [10], prevents cross infection [11] and protects the operator from legal responsibility, if any accidents occur [12]. In addition, it improves the treatment efficacy by reducing pooling of the oral cavity with fluids, especially those with unpleasant taste and facilitating the practice of four-handed dentistry [13].

A Cochrane review in 2016 concluded that there was very low quality evidence that the use of rubber dam might increase the survival time of dental restorations compared to the use of cotton rolls as an isolation method [14]. However, it is seen that dentists do not use rubber dam routinely, more so in children [15]. The reasons for refraining from the use of rubber dam are multifold. Sanghvi, *et al.* reported factors such as time consuming, patient compliance, inexperience with rubber dam usage and cost as reasons for dentists not using the rubber dam frequently [16]. Similar factors were reported by Whitworth, *et al* [17]. Dental students as compared to general dentists or pediatric dentists experience more stress during placement of rubber dam [18].

Although cotton rolls and saliva ejectors in cooperative children may offer fair isolation, it does not prevent contamination from gingival crevicular fluid or especially blood [19].

Gingival bleeding due to gingival inflammation is a common occurrence during restoration of deep proximal lesions [20].

Newer isolation techniques and materials are being explored that would reduce the difficulty to the operator and the patient and at the same time offer satisfactory isolation. Minidam (DMG America LLC) was introduced recently to aid in isolation in restoration of proximal lesions [21]. It is a two-tooth slot system, latex free and is stabilized without the use of clamps.

The aim of this preliminary study was to compare the isolation efficacy against the seepage of gingival crevicular fluid and blood between two isolating materials: Rubber dam and Minidam.

Materials and Method

Study design

This study was designed as a randomized controlled clinical trial with two arms: 1. Isolation with Minidam along with cotton rolls and saliva ejectors and 2. Isolation with Rubber dam. The Institutional Ethics Committee of DY Patil University-School of Dentistry approved this randomized controlled clinical trial.

Participants

Participants were selected from the Outpatient clinic of the Department of Pedodontics and Preventive Dentistry, D.Y. Patil School of Dentistry, Navi Mumbai. Children between the ages of 6-14 years; having good systemic health and with at least one proximal carious lesion in the mandibular posterior tooth that required a restoration were selected in the study. Medically compromised children and children with Frankl's rating negative and definitely negative were excluded from the study. Parents were explained regarding the purpose and scope of the research and informed consents were obtained if they were willing to allow their child's participation in the study.

Sample size and randomization

Sample size was calculated as the minimum required to detect a significant difference between the two groups tested based on a pilot study. The data from the pilot study was not included in the main study. Sample size of 15 children per group was determined according to sample size calculations. Selected children were randomly assigned to the two groups using block-randomization method (Microsoft Excel 2010, RAND formula) as follows:

- Treatment group: Minidam, (n=15, Males=6, Females=9)
- Control group: Rubber dam, (n=15, Males=6, Females=9)

Outcome measures

Efficacy of isolation

This was a primary outcome of the study. Isolation efficacy was evaluated as a measure of adequate isolation or protection against seepage of gingival crevicular fluid and blood. Isolation efficacy was measured visually by the operator. Adequate isolation was achieved if there was no seepage of gingival crevicular fluid or blood and was graded as 1, inadequate isolation was graded as 0 if there was presence of gingival crevicular fluid or blood.

Time required for placement

The time in minutes required for placement of the isolating material was recorded in minutes by the trained assistant with the help of an electronic stop watch.

Child's behaviour during treatment

Child's behaviour was evaluated using modified behaviour rating scale (Taddio, *et al.*) by a trained assistant during placement of the isolating material, during treatment procedure and restoration. Scores for facial expression, movement and oral resistance were

recorded as 0 to 3 whereas cry was scored as 0 to 4. The scores were added to obtain a total behaviour rating score for each child, ranging from 0 to 13. The lesser the score, the better was the child's behaviour.

Child's pain perception

Child's pain perception was recorded using Wong Baker's FACES pain rating scale. It is a 10-point Likert scale, where 0 = no hurt and 10 = hurts worst. Each child in both the groups was asked how he/she felt during the treatment procedure by pointing out to the image that he/she felt.

Procedure

Parents were asked to fill a self-reported questionnaire on socio-demographic data and the child was appointed for the restorative procedure. With the help of the template, a hole was punched on the rubber dam sheet (Hygenic® Dental Dam Kit, Coltene, Switzerland). A clamp of a suitable size was selected and placed onto the sheet. The sheet and clamp were placed in the child's mouth by the simultaneous placement of the rubber dam and clamp. The rubber dam frame was placed around the sheet. After completion of the restorative procedure, the rubber dam frame, clamp and sheet were removed with the rubber dam forceps.

Local anesthesia was not used for children from the Minidam group. The Minidam was stretched over the tooth to be treated and dental floss was placed interdentially to allow proper seating of the material. Saliva ejectors and cotton rolls were used as an adjunct to obtain optimum isolation. After completion of the restorative procedure, the Minidam was removed.

In both the groups, the teeth were restored using composite resin (Z100 Restorative Pedo Shade, 3M ESPE, USA) using a T band matrix system (Pulpdent Corporation, USA).

Statistical analysis

Collected data were analyzed using SPSS version 24.0 (SPSS Inc. Chicago, IL, USA). Descriptive statistical analysis was used for characteristics of the sample. Mann-Whitney test was used for comparison of continuous variables, as they were found to be not normally distributed with Shapiro-Wilk test. Fisher's exact test was employed to compare the categorical variables.

Results

Sample characteristics

No differences were found in the characteristics of children (age, sex) and teeth (tooth type) between the two groups (Table 1). All teeth in both the groups received composite restorations in proximal carious lesions.

Characteristics	Rubber dam group (n=15)	Minidam group (n=15)	Test statistics	p value
Age in years (mean ± SD)	8.8 ± 2.00	8.53 ± 2.16	Mann-Whitney z=0.442	0.659
Gender				
Males	6(40%)	6(40%)	Fisher's exact test χ²=0	1.00
Females	9(60%)	9(60%)		
Tooth type				
First primary molar	9(60%)	5(33.4%)	Fisher's exact test χ²=3.567	p=0.312
Second primary molar	5(33.3%)	6(40%)		
First permanent molar	1(6.7%)	2(13.3%)		
Primary canine	0	2(13.3%)		

Table 1: Sample characteristics of the Rubber dam and Minidam groups.

Comparison of outcome measures

Table 2 describes the comparison of the outcome measures between the two groups. Time of placement of the Minidam was significantly lesser than that of rubber dam (p=0.036).

Outcome measures	Rubber dam group (n=15)	Minidam group (n=15)	Test statistics	p value
Time for placement (Mean ± SD)	3.89 ± 3.29	2.42 ± 1.66	Mann-Whitney z=02.097	0.036
Seepage of gingival blood or fluid				
Present	1(6.7%)	2(13.3%)	Fisher's exact χ²=0.358	0.549
Absent	14(93.3%)	13(86.7%)		
Behaviour rating score Mean ± SD	3.07 ± 3.37	3.67 ± 3.68	Mann-Whitney z= 0.313	0.754
Pain perception (Mean ± SD)	2.4 ± 2.8	3.3 ± 3.3	Mann-Whitney z=0.851	0.395

Table 2. Comparison of the outcome measures between the Rubber dam and Mini dam groups.

Efficacy of isolation was evaluated by recording presence or absence of seepage of gingival blood or fluid. Seepage was absent in 93.3% of the teeth in the Rubber dam group, whereas, this percent was found to be 86.7% in the Minidam group. This difference was not found to be statistically significant ($p=0.549$).

Child's behaviour was seen to be statistically similar (Behaviour rating score of 3.07 in Rubberdam and 3.67 in Minidam, $p=0.754$). Patient-evaluated Pain perception score was found to be marginally worse in the Minidam group as compared to that in the Rubber dam group, however, this difference did not reach statistical significance ($p=0.395$).

Discussion

This randomized-controlled study was unique as to our knowledge no such study has been published evaluating or comparing Minidam isolation till date. Only one publication, a case report, reported to use this isolation material in resin infiltration technique of proximal incipient carious lesion [22]. However, there was no mention of how effective it was.

In our study, the time taken for placement of Minidam was less as compared to Rubber dam. Rubber dam placement involves considerable time [23] and skill needs to be acquired with practice. With repeated use, isolation with Rubber dam was found to be less stressful for children and adolescents as well as operating dentists than isolation with cotton rolls, and reduced treatment time for pit and fissure sealant procedure by 12% [24]. Similar finding was reported by Amman, *et al* [25].

The primary finding from our study was that the anesthetic efficacy of Minidam along with salivary ejector and cotton rolls was statistically similar to that achieved with rubber dam. Minidam successfully minimized seepage of gingival blood and fluid, comparable to the rubber dam.

In our study, children exhibited better behaviour and less perceived pain (although statistically not significant) with the use of Rubber dam as compared to those with the use of Minidam. The reason could be repetitive change of cotton rolls and use of saliva ejector in Minidam group.

Treating children with minimal pain and discomfort is an important requirement in pediatric dentistry. Improper fitting of rubber dam clamps can cause impingement of gingiva, discomfort and leakage of saliva, which can lead to poor cooperation of children [26]. Thus, necessitating the use of local anesthesia. Wright, *et al.* found that 65% of children exhibited little or no pain

after administering infiltration anesthesia in mandibular primary molar region for rubber dam placement and restorative treatment [27]. In our study, most children in the Rubber dam group required infiltration local anesthetic use, and only one child in the Minidam group required it. Clamp-free isolating technique like Minidam would reduce the discomfort considerably.

Although Minidam was found to be effective in isolation, its use would be limited to restoration of proximal lesions and in resin infiltration of incipient proximal lesions. Whereas rubber dam offers a wide range of indications for treatment procedures.

Our findings should be viewed through certain limitations of the study. Blinding could not be achieved of the outcome assessors due to the nature of the study and therefore possibility of bias in assessment cannot be rejected. Subjective nature of the most of the outcome measures needs to be considered. Strength of the study was its uniqueness, as we could not find any published literature on Minidam. Pediatric dentists are always on the lookout for an adequately effective isolating technique that will reduce the patient discomfort and anxiety. And such study will offer better insight into the use of this material.

Conclusions

Within the limitations of this study, we found that Minidam was as effective as Rubber dam, required significantly less time for placement, in isolation of posterior tooth requiring a resin composite restoration in children between age 6 and 14 years. Similar behaviour of a child during placement and similar pain perception score indicated discomfort caused by Minidam was statistically similar to that of Rubber dam.

Conflict of Interest

The authors declare that they have no conflict of interest.

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