

Evaluation Of Commonly Treated Mandibular Teeth With Preventive Resin Sealant Among Children With Mixed Dentition

Research Article

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Abstract

Aim: To evaluate the prevalence of commonly treated mandibular teeth with preventive resin sealant among children with mixed dentition.

Introduction: Dental caries is a complicated disease triggered by change in the composition of the bacterial biofilm, which causes an imbalance in the demineralization and remineralization cycles, resulting in cavitation. Dental sealants could be an effective protective measure for pit and fissure caries whether it can be used as part of a holistic solution to caries prevention on an individual basis or as a public health measure for at-risk communities.

Materials and Method: Case sheets of patients treated with preventive resin sealant were obtained for analysis. Children within the age group 6 to 12 who had treatment with preventive resin sealant in the mandibular arch were selected and the sample size was found to be n = 6209 pediatric patients. The collected data was then tabulated for statistical analysis using SPSS. Descriptive statistics and chi square tests were performed with the comparison of gender and teeth number for the commonly treated mandibular teeth with preventive resin sealant was done.

Result: Preventive resin sealant treatment was most predominantly done in the permanent first molars in the right and left side. Male children were treated more when compared to females, which was statistically significant (p-value=0.001).

Conclusion: Within the limitations of the study it can be concluded that permanent first molars were commonly treated by preventive resin sealants particularly, in conjunction with other prevention measures to avoid severe complications to the teeth.

Keywords: Preventive Resin Sealant; Mixed Dentition; Mandibular Teeth; Innovative Technique.

Introduction

Dental caries is a complicated disease triggered by change in the composition of the bacterial biofilm, which causes an imbalance in the demineralization and remineralization cycles, resulting in cavitation [1]. Dental caries is a common oral disease in children, particularly in the first permanent molars, and the disease's incidence is related to economic and social disadvantages. Pits and fissures are among the most vulnerable locations to caries because of their peculiar morphology and lack of mechanical teeth brushing [2]. In Pedodontics, this is especially important for distinguishing caries prone areas in deciduous teeth and first permanent molars. The pit created by the intersection of developmental

grooves on the molar occlusal surface is a fascinating anatomical feature that is more prone for dental caries because of its plaque retentive nature. The mesiobuccal groove is a unique feature of mandibular first molars. It's a kind of sulcus that runs from the occlusal to buccal surfaces and is often unnoticed during dental examinations. This narrow groove, though often shallow, can host a small but active bacterial population that can easily cause cavitation [3]. According to data from the National Health and Nutrition Examination Survey (NHANES) 2011-2012, 21% of children aged 6 to 12 years had tooth decay in their permanent teeth. In children and adolescents, pit and fissure caries contribute for about 90% of dental decay in permanent posterior teeth and 44% of caries in primary teeth [4].

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Prevention at the initial phase of dentistry is a wonderful option, particularly in paediatric dentistry. Although the use of prevention measures plays such an important role in early screening treatment, this knowledge must be extended to practice dentistry. To secure pits and fissures, more efficient steps are needed, such as the use of pit and fissure sealants. Sealant application is a protective conservative technique that involves introducing sealants into the pits and fissures of caries-prone teeth; the sealant then micro mechanically binds to the tooth, creating a physical barrier that holds bacteria apart from their nutritional supplement [5]. Regardless of the fact that the effectiveness and caries preventive effect of pit and fissure sealants have been well reported in the literature, they are still perceived to be underused globally. Majority of the public health programme are supplying free pit and fissure sealant for the first permanent molar of school-aged children and this plan was launched in 2011 to reduce the prevalence of dental caries in children. When appropriate patient choice and application techniques are followed, pit and fissure sealants can eliminate occlusal caries [6]. Sealant retention rates should be improved over time, which necessitates effective adaptation and deep sealant penetration.

Studies on whether bur preparation of pits and fissures improves sealant retention by increasing adaptation and penetration are still ambiguous. Preventive resin sealant is used to repair minor exploratory cavities in enamel, while localized carious lesions are eliminated without enlargement into the adjacent normal tooth [7]. Resin-based sealants and glass ionomer cement-based sealants are the two most common varieties of sealant products on the market today. The carious lesions are filled with more fillers containing resins, but for a pit and fissure caries, as well as for an intact tooth, are sealed with a preventive resin sealant. Nowadays, a variety of commercially produced sealant products on the market, including resin-based sealants such as bisphenol A-glycidyl methacrylate monomers or urethane dimethacrylate, which are polymerized using either a chemical or a light activation mechanism [8]. When contrasted to controls without sealants, sealants were efficient in avoiding occlusal and proximal dental caries in children's molars, according to a study [9]. Another research found that sealants were more efficient than fluoride varnishes in reducing occlusal caries in children's molars, although the proof was of poor quality [10]. Our team has extensive knowledge and research experience that has translate into high quality publications [11-23, 24-30].

The main purpose of our study was to assess the prevalence of

most commonly treated mandibular teeth with preventive resin sealant in 6 to 12 year old pediatric patients with mixed dentition.

Materials and Methods

With the approval of the Institutional ethical committee, this retrospective study was conducted in a private university setting. About 5,00,000 case sheets were obtained from June 2019 to March 2020. Informed consent was obtained from the parents or guardian regarding usage of the clinical data for research purposes.

Inclusion criteria of this study was the pediatric population within the age group of 6 to 12 years who had treatment with preventive resin sealant in their mandibular arch within the time period extending from June 2019 to February 2021. The patients who had preventive resin sealant treatment in their maxillary arch as well as patients of other age groups having only primary and permanent dentition were excluded in the study. The sampling bias was minimised by a simple random sampling method. A third examiner reviewed the case records of the collected data to confirm the validity of the data with post-operative photographs. If any error in data entry or patient details or clinical data were noticed, that case sheet was excluded from the study.

The collected data was then tabulated for statistical analysis using SPSS. Descriptive statistics and chi square tests were performed with the level of significance at 5% (p<0.05). The independent variables of the study were gender and geographic background. The dependent variables were the age of the patient and mandibular teeth treated with preventive resin sealant.

Results

A total of 6209 case sheets were analysed for this study. Most of the treated children are likely to be in the age of 12 years (19.99%), 18.56% were 11 years old, 15.89% were 10 years old, 14.83% were 9 years old , 14.04% were of 8 years old, 12.09% were 7 years old and only 4.6% were 6 years old (Figure 1). Nearly more than half of the study population who are treated with preventive resin sealant in their mandibular teeth (54.86%) were males and only 45.14% of the population were females (Figure 2). The left and right first Mandibular molars were commonly treated (36.82% and 35.90% respectively) compared to other mandibular teeth (Figure 3). Males were more commonly treated for resin sealant in mixed dentition period when compared to females which was statistically significant (Figure 4). (p-value = 0.001).

Figure 1. This bar chart represents the age distribution of the children whose mandibular teeth were treated with preventive resin sealant. Most of the treated children are likely to be in the age of 12 years (19.99%). 18.56% were 11 years old, 15.89% were 10 years old, 14.83% were 9 years old , 14.04% were of 8 years old, 12.09% were 7 years old and only 4.6% were 6 years old.

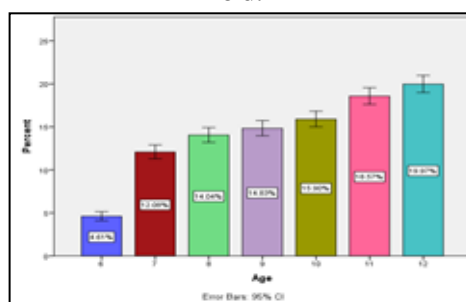


Figure 2. This bar chart represents the gender of the children whose mandibular teeth are treated with preventive resin sealant. Dark green colour in the chart represents female and light green represents male. Nearly more than half of the study population who are treated with preventive resin sealant in their mandibular teeth (54.86%) were males and only 45.14% of the population were females.

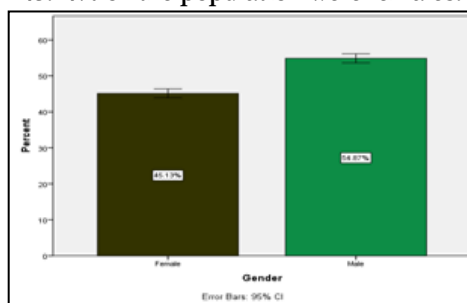


Figure 3. This bar chart represents the count of each tooth number of the mandibular arch treated with preventive resin sealant. The left and right first Mandibular permanent molars were commonly treated (36.82% and 35.90% respectively) compared to other mandibular teeth (0.5-5.3%).

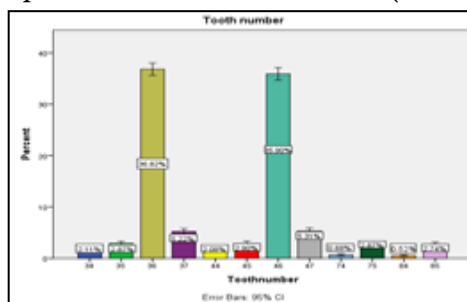
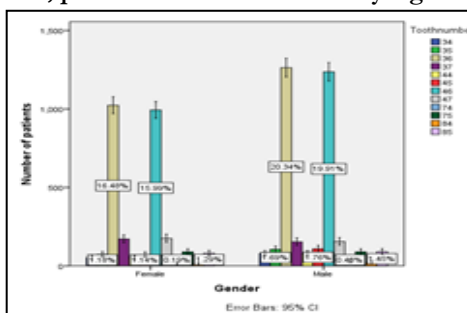


Figure 4. This bar chart represents the comparison of gender with the tooth treated with preventive resin sealant. X-axis represents the gender and Y-axis represents the count of teeth treated with sealant with regards to tooth number. The count of tooth number 36 Y treated with sealant was found to be higher in case of males (20.34%) than the females (16.48%), secondly the males with tooth number 46 treated were found to be 19.91% while the count of female for the same tooth was found to be 15.99%. 2.82% of females had treated tooth number 47, 2.75% in females with tooth number 37 and 2.50% of males with tooth number 47 were treated with preventive resin sealant. From the graph we can interpret that the tooth number 36 of the males are the ones which are mostly treated followed by the tooth number 46 of males. (Pearson Chi square = 30.533a ; p value of 0.001 - statistically significant).



Discussion

Fissure sealants have been shown to be successful in caries prevention and management in both individual and community based approaches for children in the literature. From our study results we found that the preventive resin sealant application in mandibular arch within the age limits was found to be more prevalent in males (54.86%) when compared to females which was 45.14% (figure 2). According to a study, Northern Appalachian females have more protection against dental caries during infancy than males, but not during puberty or adulthood, so male children might need sealants to avoid the caries risk [31]. However, other research shows that females have higher caries risk factors due to differences in salivary composition and flow rate, eating preferences, and genetic variants. Systemic disorders linked to car-

ies have also been correlated to female gender. It has not been proved that prolonged exposure to the oral cavity or a more cariogenic oral microflora indicates higher chance of carious lesions in women [32]. A study reveals the same results that the sealants are placed more in males (53%) against females [33]. In contrast, just 0.8 percent of the male children in Riyadh, Kingdom of Saudi Arabia had a fissure sealant introduced to their permanent first molar, according to a study [34].

From figure 1, it was also found that the prevalence of sealant application in mandibular arch was more frequent in the age of 12 (19.99%). In contrast, another study reveals that the 12 year old patients who went to the dentist because they felt they wanted a restore had a non-statistically relevant (37%) higher risk of getting a sealant than those who went for protection [35]. It was found that the prevalence of sealant treatment was most common in mandibular first molars (36.82% in 36 and 35.90% in 46)

when compared to other teeth (figure 3). Most commonly treated teeth in mandibular arch are molars due to deep pit and fissures as they are more prone to food lodgement and have predisposing risk of developing caries [36]. Preventive resin restoration (PRR) can be used on molars against the pit and fissure sealants provided the practitioner is mindful about achieving optimum seal of restoration on tooth structure. Sealants and PRRs are the common prophylaxis used to improve the oral hygiene status of the patients. On comparison between gender and tooth number, it was revealed that most commonly 20.34% males were treated with sealants in tooth number 36 and the second most commonly 19.91% of males were subjected to sealant application in 46, even among females tooth number 36 (16.48%) and 46 (15.99%) are most commonly treated with sealants (figure 4). In our study, premolars were treated rarely in males and females in comparison to mandibular molars. Other studies also reveal that the mandibular molars of the male population are more likely to be treated with preventive resin sealant in comparison with females [37].

The main advantage of conducting the study in the university setting is that it aids as a single centre for multiple people from different localities at the same time. The limitations of the study are minimum external validity as it does not represent the general population and also the validity cannot be extended by encompassing subjects of a wider range. This study was retrospective and doesn't record success of sealants treatment. This study may enable the necessity for prophylactic management in mandibular molars of mixed dentition particularly in male population.

Conclusion

Within the limitations of the study it can be concluded that permanent first molars were commonly treated by preventive resin sealants particularly, in conjunction with other prevention measures to avoid severe complications to the teeth. Male children were treated predominantly when compared to females.

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References

- [1]. Lekic PC, Deng D, Brothwell D. Clinical evaluation of sealants and preventive resin restorations in a group of environmentally homogeneous children. *J Dent Child (Chic)*. 2006 Jan-Apr;73(1):15-9. Pubmed PMID: 16734308.
- [2]. Naaman R, El-Housseiny AA, Alamoudi N. The use of pit and fissure sealants-A literature review. *Dent. J*. 2017 Dec;5(4):34.
- [3]. Wright JT, Tampi MB, Graham L, Estrich C, Crall JJ, Fontana M, et al. Sealants for preventing and arresting pit-and-fissure occlusal caries in primary and permanent molars: A systematic review of randomized controlled trials-a report of the American Dental Association and the American Academy of Pediatric Dentistry. *J Am Dent Assoc*. 2016 Aug;147(8):631-645.e18. Pubmed PMID: 27470524.
- [4]. Liu W, Xiong L, Li J, Guo C, Fan W, Huang S. The anticaries effects of pit and fissure sealant in the first permanent molars of school-age children from Guangzhou: a population-based cohort study. *BMC Oral Health*. 2019 Jul 16;19(1):156. Pubmed PMID: 31311541.
- [5]. Papageorgiou SN, Dimitraki D, Kotsanos N, Bekes K, van Waas H. Performance of pit and fissure sealants according to tooth characteristics: A systematic review and meta-analysis. *J Dent*. 2017 Nov;66:8-17. Pubmed PMID: 28797916.
- [6]. Bhushan U, Goswami M. Evaluation of retention of pit and fissure sealants placed with and without air abrasion pretreatment in 6-8 year old children - An in vivo study. *J Clin Exp Dent*. 2017 Feb 1;9(2):e211-e217. Pubmed PMID: 28210438.
- [7]. Reddy VR, Chowdhary N, Mukunda KS, Kiran NK, Kavyarani BS, Pradeep MC. Retention of resin-based filled and unfilled pit and fissure sealants: A comparative clinical study. *Contemp Clin Dent*. 2015 Mar;6(Suppl 1):S18-23. Pubmed PMID: 25821368.
- [8]. Sanders BJ, Feigal RJ, Avery DR. Pit and fissure sealants and preventive resin restorations. *Dentistry for the child and adolescent*. 9th ed. St. Louis: Mosby. 2010 Apr 8:313-21.
- [9]. Dennison JB, Straffon LH, More FG. Evaluating tooth eruption on sealant efficacy. *J Am Dent Assoc*. 1990 Nov 1;121(5):610-4.
- [10]. Messer LB, Calache H, Morgan MV. The retention of pit and fissure sealants placed in primary school children by Dental Health Services, Victoria. *Aust Dent J*. 1997 Aug;42(4):233-9. Pubmed PMID: 9316310.
- [11]. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent*. 2018 Jan-Mar;12(1):67-70. Pubmed PMID: 29657527.
- [12]. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJL. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clin Oral Investig*. 2019 Sep;23(9):3543-50.
- [13]. Ramakrishnan M, Dhanalakshmi R, Subramanian EMG. Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry - A systematic review. *Saudi Dent J*. 2019 Apr;31(2):165-172. Pubmed PMID: 30983825.
- [14]. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. *Eur J Dent*. 2018 Jan-Mar;12(1):21-26. Pubmed PMID: 29657521.
- [15]. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. *Eur J Dent*. 2020 Dec;14(S 01):S105-S109. Pubmed PMID: 33321549.
- [16]. Saravanakumar K, Park S, Mariadoss AVA, Sathiyaseelan A, Veeraraghavan VP, Kim S, et al. Chemical composition, antioxidant, and anti-diabetic activities of ethyl acetate fraction of *Stachys riederi* var. *japonica* (Miq.) in streptozotocin-induced type 2 diabetic mice. *Food Chem Toxicol*. 2021 Sep;155:112374. Pubmed PMID: 34186120.
- [17]. Wei W, Li R, Liu Q, Seshadri VD, Veeraraghavan VP, Mohan SK, et al. Amelioration of oxidative stress, inflammation and tumor promotion by Tin oxide-Sodium alginate-Polyethylene glycol-Allyl isothiocyanate nanocomposites on the 1, 2-Dimethylhydrazine induced colon carcinogenesis in rats. *Arab. J. Chem*. 2021 Jun 3:103238.
- [18]. Gothandam K, Ganesan VS, Ayyasamy T, Ramalingam S. Antioxidant potential of theaflavin ameliorates the activities of key enzymes of glucose metabolism in high fat diet and streptozotocin - induced diabetic rats. *Redox Rep*. 2019 Dec;24(1):41-50. Pubmed PMID: 31142215.
- [19]. Su P, Veeraraghavan VP, Krishna Mohan S, Lu W. A ginger derivative, zingerone-a phenolic compound-induces ROS-mediated apoptosis in colon cancer cells (HCT-116). *J Biochem Mol Toxicol*. 2019 Dec;33(12):e22403. Pubmed PMID: 31714660.
- [20]. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. *Clin Oral Investig*. 2020 Sep;24(9):3275-3280. Pubmed PMID: 31955271.
- [21]. Sekar D, Johnsson J, Biruntha M, Lakhmanan G, Gurunathan D, Ross K. Biological and clinical relevance of microRNAs in mitochondrial diseases/dysfunctions. *DNA Cell Biol*. 2020 Aug 1;39(8):1379-84.
- [22]. Velusamy R, Sakthinathan G, Vignesh R, Kumarasamy A, Sathishkumar D, Priya KN, et al. Tribological and thermal characterization of electron beam physical vapor deposited single layer thin film for TBC application. *Surf Topogr: Metrol Prop*. 2021 Jun 24;9(2):025043.
- [23]. Aldhuwayhi S, Mallineni SK, Sakhamuri S, Thakare AA, Mallineni S, Sajja R, et al. Covid-19 Knowledge and Perceptions Among Dental Specialists: A

- Cross-Sectional Online Questionnaire Survey. *Risk Manag Healthc Policy*. 2021 Jul 7;14:2851-2861. Pubmed PMID: 34262372.
- [24]. Sekar D, Nallaswamy D, Lakshmanan G. Decoding the functional role of long noncoding RNAs (lncRNAs) in hypertension progression. *Hypertens Res*. 2020 Jul;43(7):724-725. Pubmed PMID: 32235913.
- [25]. Bai L, Li J, Panagal M, M B, Sekar D. Methylation dependent microRNA 1285-5p and sterol carrier proteins 2 in type 2 diabetes mellitus. *Artif Cells Nanomed Biotechnol*. 2019 Dec;47(1):3417-3422. Pubmed PMID: 31407919.
- [26]. Sekar D. Circular RNA: a new biomarker for different types of hypertension. *Hypertens Res*. 2019 Nov;42(11):1824-5.
- [27]. Sekar D, Mani P, Biruntha M, Sivagurunathan P, Karthigeyan M. Dissecting the functional role of microRNA 21 in osteosarcoma. *Cancer Gene Ther*. 2019 Jul;26(7-8):179-182. Pubmed PMID: 30905966.
- [28]. Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprakasam A. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. *Implant Dent*. 2019 Jun;28(3):289-295. Pubmed PMID: 31124826.
- [29]. Parimelazhagan R, Umapathy D, Sivakamasundari IR, Sethupathy S, Ali D, Kunka Mohanram R, et al. Association between Tumor Prognosis Marker Visfatin and Proinflammatory Cytokines in Hypertensive Patients. *Biomed Res Int*. 2021 Mar 16;2021:8568926. Pubmed PMID: 33816632.
- [30]. Syed MH, Gnanakkan A, Pitchiah S. Exploration of acute toxicity, analgesic, anti-inflammatory, and anti-pyretic activities of the black tunicate, *Phallusia nigra* (Savigny, 1816) using mice model. *Environ Sci Pollut Res Int*. 2021 Feb;28(5):5809-5821. Pubmed PMID: 32978735.
- [31]. Shaffer JR, Leslie EJ, Feingold E, Govil M, McNeil DW, Crout RJ, et al. Caries Experience Differs between Females and Males across Age Groups in Northern Appalachia. *Int J Dent*. 2015;2015:938213. doi: 10.1155/2015/938213. Epub 2015 May 27. Pubmed PMID: 26106416.
- [32]. Ferraro M, Vieira AR. Explaining gender differences in caries: a multifactorial approach to a multifactorial disease. *Int J Dent*. 2010;2010:649643. Pubmed PMID: 20339488.
- [33]. Lakshmanan L, Ravindran V, Ravindran V, Subramanian EM. Utilization of Sealants and Conservative Adhesive Resin Restoration for Caries Prevention by Dental Students. *Indian J. Forensic Med. Toxicol*. 2020 Oct 1;14(4):5865.
- [34]. S Aldossary M, A Alamri A, A Alshiha S, A Hattan M, K Alfraih Y, M Alwayli H. Prevalence of Dental Caries and Fissure Sealants in the First Permanent Molars among Male Children in Riyadh, Kingdom of Saudi Arabia. *Int J Clin Pediatr Dent*. 2018 Sep-Oct;11(5):365-370. Pubmed PMID: 30787547.
- [35]. Oulis CJ, Berdouses ED, Mamai-Homata E, Polychronopoulou A. Prevalence of sealants in relation to dental caries on the permanent molars of 12 and 15-year-old Greek adolescents. A national pathfinder survey. *BMC Public Health*. 2011 Dec;11(1):100.
- [36]. Kucukyilmaz E, Savas S. Evaluation of different fissure sealant materials and flowable composites used as pit-and-fissure sealants: a 24-month clinical trial. *Pediatr Dent*. 2015 Oct 15;37(5):468-73.
- [37]. Singh S, Pandey RK. An evaluation of nanocomposites as pit and fissure sealants in child patients. *J Indian Soc Pedod Prev Dent*. 2011 Oct-Dec;29(4):294-9. Pubmed PMID: 22016312.