Pulpectomy in Maxillary 1st Primary Molars with Mesial Caries - A Retrospective Analysis

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ABSTRACT

Pulpectomy is a root canal procedure in which irreversibly infected, or necrotic pulp tissue are debrided and root canals are shaped, dried and obturated with a material. Primary 1st molar which is infected due to caries reaches its pulp tissues, pulp therapy is indicated in most of the cases rather than the extraction to preserve the integrity of primary dentition. Hence, aim of the study was to assess the pulpectomy cases in maxillary primary molars with mesial caries among 4 to 10 years old children. The present study consisted of 87 patients from the OP of a private dental institution, Chennai were randomly selected. Retrospective data collected from 89,000 case records from June 2019 to March 2020 were taken for the study. They were segregated according to their age and gender and this data was entered into excel sheets and transferred into SPSS software for statistical analysis and chi square test was performed. Age group of 4 to 6 had high frequency of pulpectomy and males underwent more pulpectomy procedures in maxillary 1st molars when compared to females. Children of both genders are more prone to caries that led to pulp therapy at a very young age.

INTRODUCTION

The main goal of modern dentistry for children is to maintain the integrity of the primary dentition until normal exfoliation because retaining primary tooth is important because it is a functional component in the dental arch which allows proper mastication, speech, swallowing and preservation of the space which is required for eruption of permanent teeth. The treatment of severely infected primary teeth can be challenging and there are few options for treating such teeth and Subramanian, 2017. American Academy of Pediatric Dentistry (AAPD) defines pulpectomy as a procedure which

involves removal of the roof of the pulp chamber in order to gain access to the root canals which are debrided, enlarged, disinfected and filled later with a resorbable material. Consequently, the tooth can be maintained in the arch without vital pulp tissue, but not compromising the function of the tooth. A high success rate of pulpectomy in primary teeth has led pediatric dentists to prefer pulpectomy over extraction and space maintainer. (Somasundaram et al., 2015; Christabel and Linda Christabel, 2015; Govindaraju et al., 2017b; Jeevanandan, 2017; Jeevanandan and Govindaraju, 2018).

The indications, and type of pulpal therapy depend on whether the pulp is vital or nonvital, based on the clinical diagnosis of normal pulp (without symptoms and normally responsive to vitality testing), reversible pulpitis (pulp is capable of healing), symptomatic or asymptomatic irreversible pulpitis (vital inflamed pulp is incapable of healing), or necrotic pulp (American Association of Endodontists. Nomenclature Committee, 1973). Pulpectomy is a root canal procedure for pulp tissue that is irreversibly

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infected or necrotic due to caries or trauma. The root canals are debrided and shaped with hand or rotary files. Since instrumentation and irrigation with an inert solution alone cannot adequately reduce the microbial population in a root canal system, disinfection with irrigants such as one percent sodium hypochlorite and/or chlorhexidine is an important step in assuring optimal bacterial decontamination of the canals (Govindaraju et al., 2017; Panchal et al., 2019; Lakshmanan et al., 2020).

Pulpectomy is a conservative treatment approach which prevents the premature loss of primary teeth that can result in loss of arch length, insufficient space for erupting permanent teeth, impaction of premolars, and mesial tipping of molar teeth adjacent to the lost primary molar. Dental caries is a chronic disease affecting the children and adults caused by genetic and environmental factors. Dental caries is a multi-factorial infectious microbial disease of the teeth which results in localised destruction and destruction of the calcified tissues which often results in cavitation. It is a dental public health problem which interferes with normal food intake, speech, self-esteem, and routine activities affecting the overall health status of the children. Good attitude of parents reflects good oral health in children and vice versa (Deeley et al., 2008; Gurunathan and Shanmugaavel, 2016; Ravikumar et al., 2017).

Grossly decayed primary teeth which are extracted before exfoliation causes space in the dental arch which causes malocclusion if space maintainer was not given. Fluoride use has been recommended to prevent the dental caries. Decreased concentration of fluoride also results in increased incidence of dental caries. Chewable toothbrushes can be used to remove dental plaque and are more effective than manual brushing in children. In children aged between 4 to 10 years are highly prone to dental caries due to improper oral hygiene and dietary factors (Govindaraju, 2017; Packiri et al., 2017; 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018; Subramanyam et al., 2018; Panchal et al., 2019).

Hence, Previously our team has a rich experience in working on various research projects across multiple disciplines (Gheena and Ezhilarasan, 2019; Ke et al., 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Samuel et al., 2019; Sharma et al., 2019; Varghese et al., 2019; Venu et al., 2019; Vignesh et al., 2019; Jain et al., 2019; Jose et al., 2020; Krishnaswamy et al., 2020; Muthukrishnan et al., 2020; Samuel et al., 2020; Sathish and Karthick, 2020). Now the growing trend in this area motivated us to pursue this project. The aim of the study was to assess the pulpectomy cases in maxillary primary molars with mesial caries among 4 to 10 years old children.

MATERIAL AND METHODS

The study was conducted with the approval of the Institutional ethical committee (SDC/SIMEC/2020/DIASDATA/0619-0320). The study consisted of one reviewer, one assessor and one guide. The study was designed to include all children aged between 4 to 10 years who underwent pulpectomy procedures in

maxillary 1st primary molars with mesial caries. Data collection was done using the patient database with the time framework of 1st June 2019 to 31st March 2020. In 280 pulpectomy cases, radiographs of the children aged from 4 to 6 years were reviewed, and those children underwent pulpectomy in maxillary 1st primary molars with mesial caries (86 children) were only included. Cross verification of data was done by a reviewer. The cross verification of data was done by a reviewer. The collected data was done by a reviewer. The collected data was tabulated on the following parameters. Patients demographic details. Tooth number (54/64). Surface involved (Mesial). The variables were coded and data was imported to SPSS software. Using the SPSS Version 20.0 categorical variables were expressed in terms of frequency and percentage and bar graphs were plotted. The statistical significance of associations was tested using the Chi-square test.

RESULTS AND DISCUSSION

A total of 86 patients were seen during the study period. Male children were more commonly affected than females and the upper right first primary molar was highly prone for mesial caries among our study population. Age group of 4-6 years had a high incidence of mesial caries that led to pulpectomy. Figure 1 represents the gender distribution in which 55 of male and 31 of female children underwent pulp therapy for mesial caries in primary maxillary first molars. Figure 2 represents 79.07% of the study population belonged to the age group of 4-6 years, 15.12% belonged to the age group of 7-8 years and 5.81% belonged to the age group of 9-10 years. The age group between 4-6 yrs being the most vulnerable for mesial caries. Figure 3 shows that 27.91% of females belonged to the age group of 4-6, 6.98% of females belonged to the age group of 7-8 and 1.16% belonged to the age group of 9-10. 51.16% of males belonged to the age group of 4-6, 8.14% of them belonged to the age group of 7-8 and 4.65% belonged to the age group of 9-10. Figure 3 shows $p = 0.342$ ($p > 0.05$).

Figure 4 shows that 41.86% of the study population aged between 4-6-year-old underwent pulpectomy in 54, 37.21% of the study population aged 4-6-year-old underwent pulpectomy in 64. 9.30% of the study population aged between 7-8-year-old underwent pulpectomy in 54 and 5.81% of the study population underwent pulpectomy in 64. 3.49% of the study population aged between 9-10-year-old underwent pulpectomy in 54 and 2.33% of the study population underwent pulpectomy in 64. Figure 4 shows $p = 0.388$ ($p > 0.05$) which shows insignificant association between age and teeth involved. Figure 5 shows that 20.93% of female and 33.72% of male study population underwent pulpectomy in 54, 15.12% of female and 30.23% of male study population underwent pulpectomy in 64. Figure 5 shows $p = 0.010$ ($p < 0.05$) which shows significant association between teeth and gender.

Primary tooth pulp therapy is performed to restore the health and function of primary teeth in children with

severe caries. When caries is confirmed to approximate the pulp, any definitive treatment plan must address treatment of the pulp, directly or indirectly. In the present study, pulpectomy done in maxillary primary 1st molars with mesial caries were collected, analyzed and correlated with gender, age and tooth involved. All the pulpectomy cases done due to mesial caries occurring in right and left upper first primary molars were segregated according to age and gender. In the present study, 55 male children and 31 female children were treated for pulpectomy in maxillary 1st primary molars due to mesial caries. Study conducted by Santa Maria et al reported that 82% of male children underwent pulpectomy and 15% of female children underwent pulpectomy. This shows that a higher number of male children underwent pulpectomy when compared with female children (Caries Management Strategies for Primary Molars, 2014; Rawson et al., 2019).

Figure-1: Bar graph shows the gender wise distribution of study population. X-axis represents the gender and Y-axis represents the number of patients with mesial caries. Higher number of males (green) underwent pulpectomy procedures when compared to females (blue).

A study conducted in Alaska children aged from two-year-old to 13-year-old reported that 52.6% of the male children underwent pulp therapy and 47.4% of the female children underwent pulp therapy. This is in accordance with our study. A study conducted by de Souza et al, single visit endodontic treatment is carried out in 59.5% of pulpectomy cases. In our study multi visit and single visit endodontic treatment was done in pulpectomy cases. A study conducted by Velvart et al., 72.53% of pulpectomy was done in periapical lesion cases. In our study, pulpectomy was carried out in cases with mesial caries (Velvart and Spoerry, 1992; (Caries Management Strategies for Primary Molars, 2014; de Souza Netto et al., 2014).

In present study, the highest percentage of the age group was 4-6 years and right first primary molars were treated the maximum when compared to the left first primary molars for the same age group. The highest percentage was for the age group of 6-10 years. The total percentage

of male children in this study population was 55% male children and female children was 31%. Generally male children were more than female children in the total sample. Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc et al., 2018; Ramesh et al., 2018; Ezhilarasan et al., 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree, 2019; Mathew et al., 2020). We hope this study adds to this rich legacy.

Figure-2: Bar graph shows the age wise distribution of study population. The X-axis represents the age and Y-axis represents the number of patients with mesial caries. 79.07% belonged to the age group of 4-6 years (purple), 15.12% belonged to the age group of 7-8 years (dark pink) and 5.81% belonged to the age group of 9-10 years (dark blue).

Figure-3: This graph represents the association of age and gender. The X-axis represents the age and Y-axis represents the number of patients with mesial caries. Chi-square test was done and association was found to be statistically insignificant. P value - 0.342 (P value > 0.05), which is statistically insignificant. From this graph we can infer that 51.16% of males (green) belonging to the age group of 4-6 underwent larger numbers of pulpectomy in 1st primary maxillary molars followed by 27.91% of females (blue) of the same age group

Figure-4: This graph represents the association of age and teeth. The X-axis represents the age and Y-axis represents the number of patients with mesial caries. Chi-square test was done and association was found to be statistically insignificant. P value - 0.388 (P value >0.05), which is statistically insignificant. From this graph we can infer that 41.86% of tooth 54 (grey) belonging to the age group of 4-6 underwent larger numbers of pulpectomy in 1st primary maxillary molars followed by 37.21% of tooth 64 (orange) of the same age group

Figure-5: This graph represents the association of teeth involved and gender. The X-axis represents the gender and Y-axis represents the number of patients with mesial caries. Chi-square test was done and association was found to be statistically significant. P value - 0.010 (P value <0.05), which is statistically significant. From this graph we can infer that 33.72% of boys underwent pulpectomy in tooth 54 (grey) and 30.23% of them underwent pulpectomy in 64 (orange).

Limitations of the present study was that this was a unicentric study with geographic limitations, limited sample size and has lower external validity. Future scope for this study includes larger sample size which is not confined to a particular geographic area and direct method of clinical observation.

CONCLUSION

Children with age groups of 4-6 years were highly prone to dental caries. If dental caries is left untreated, it will progress to pulp causing reversible and irreversible pulpitis which require pulp therapy (pulpectomy/Pulpotomy) to the children. Male children underwent higher pulpectomy procedures than female children. Maxillary right 1st primary molars (54) are highly treated with pulpectomy than maxillary left 1st primary molar (64). This study will help the pediatric dentist to know the prevalence of pulpitis among children and can explain to parents to get them a clear idea about the importance of retaining and restoring the primary tooth. Regardless of the decision concerning the primary tooth and to the different treatment modalities, attention should be directed to the prognosis of the tooth in question, by restoring its health and function.

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REFERENCES

- American Association of Endodontists. Nomenclature Committee (1973). An Annotated Glossary of Terms Used in Endodontics.
- Caries Management Strategies for Primary Molars (2014). Sage Publications.
- Christabel, S. L. and Linda Christabel, S. (2015). Prevalence of Type of Frenal Attachment and Morphology of Frenum in Children, Chennai, Tamil Nadu. World Journal of Dentistry, pp. 203–207. doi: 10.5005/jp-journals-10015-1343.
- de Souza Netto, M. et al (2014). Endodontists perceptions of single and multiple visit root canal treatment: a survey in Florianópolis—Brazil. RSBO Revista Sul-Brasileira de Odontologia, 11(1), pp. 14–19.
- Deeley, K. et al. (2008). Possible association of amelogenin to high caries experience in a Guatemalan-Mayan population. Caries research, 42(1), pp. 8–13.
- Ezhilarasan, D., Apoorva, V. S. and Ashok Vardhan, N. (2019). Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells. Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology, 48(2), pp. 115–121.
- Gheena, S. and Ezhilarasan, D. (2019). Syringic acid triggers reactive oxygen species-mediated cytotoxicity in HepG2 cells. Human & experimental toxicology, 38(6), pp. 694–702.
- Govindaraju, L. (2017). Effectiveness of Chewable Tooth Brush in Children-A Prospective Clinical Study.

JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. doi: 10.7860/jcdr/2017/24238.9528.

Govindaraju, L., Jeevanandan, G. and Subramanian, E. (2017). Clinical Evaluation of Quality of Obturation and Instrumentation Time using Two Modified Rotary File Systems with Manual Instrumentation in Primary Teeth. *Journal of clinical and diagnostic research: JCDR*, 11(9), pp. ZC55–ZC58.

Govindaraju, L., Jeevanandan, G. and Subramanian, E. M. G. (2017a). Comparison of quality of obturation and instrumentation time using hand files and two rotary file systems in primary molars: A single-blinded randomized controlled trial. *European journal of dentistry*, 11(3), pp. 376–379.

Govindaraju, L., Jeevanandan, G. and Subramanian, E. M. G. (2017b). Knowledge and practice of rotary instrumentation in primary teeth among indian dentists: A questionnaire survey. *Journal of International Oral Health*, p. 45. doi: 10.4103/jioh.jioh_4_17.

Gurunathan, D. and Shanmugaavel, A. K. (2016). Dental neglect among children in Chennai. *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 34(4), pp. 364–369.

Jain, V. S. et al (2019). Evaluation of Three-Dimensional Changes in Pharyngeal Airway Following Isolated Lefort One Osteotomy for the Correction of Vertical Maxillary Excess: A Prospective Study. *Journal of maxillofacial and oral surgery*, 18(1), pp. 139–146.

Jeevanandan, G. (2017). Kedo-S Paediatric Rotary Files for Root Canal Preparation in Primary Teeth – Case Report. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. doi: 10.7860/jcdr/2017/25856.9508.

Jeevanandan, G. and Govindaraju, L. (2018). Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial. *European Archives of Paediatric Dentistry*, pp. 273–278. doi: 10.1007/s40368-018-0356-6.

Jose, J., Ajitha and Subbaiyan, H. (2020). Different treatment modalities followed by dental practitioners for Ellis class 2 fracture – A questionnaire-based survey. *The open dentistry journal*, 14(1), pp. 59–65.

Ke, Y. et al. (2019). Photosynthesized gold nanoparticles from *Catharanthus roseus* induces caspase-mediated apoptosis in cervical cancer cells (HeLa). *Artificial cells, nanomedicine, and biotechnology*, 47(1), pp. 1938–1946.

Krishnaswamy, H. et al. (2020). Investigation of air conditioning temperature variation by modifying the structure of passenger car using computational fluid dynamics. *Thermal science*, 24(1 Part B), pp. 495–498.

Lakshmanan, L. et al. (2020). Assessing the quality of obturation and instrumentation time using Kedo-S files,

Reciprocating files and Hand K-files. *Brazilian Dental Science*, 23.

Malli Sureshbabu, N. et al. (2019). Concentrated Growth Factors as an Ingenious Biomaterial in Regeneration of Bony Defects after Periapical Surgery: A Report of Two Cases. *Case reports in dentistry*, p. 7046203.

Mathew, M. G. et al. (2020). Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary. *Clinical oral investigations*. Available at: <https://link.springer.com/article/10.1007/s00784-020-03204-9>.

Mehta, M. et al (2019). Oligonucleotide therapy: An emerging focus area for drug delivery in chronic inflammatory respiratory diseases. *Chemico-biological interactions*, 308, pp. 206–215.

Muthukrishnan, S. et al (2020). Support vector machine for modelling and simulation of heat exchangers. *Thermal science*, 24(1 Part B), pp. 499–503.

Packiri, S., Gurunathan, D. and Selvarasu, K (2017). Management of Paediatric Oral Ranula: A Systematic Review. *Journal of clinical and diagnostic research: JCDR*, 11(9), pp. ZE06–ZE09.

Panchal, V., Jeevanandan, G. and Subramanian, E (2019). Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 37(1), pp. 75–79.

Pc, J., Marimuthu, T. and Devadoss, P (2018). Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. *Clinical implant dentistry and related research*. Available at: <https://europepmc.org/article/med/29624863>.

Ramadurai, N. et al. (2019). Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clinical oral investigations*, 23(9), pp. 3543–3550.

Ramesh, A. et al. (2018). Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *Journal of periodontology*, 89(10), pp. 1241–1248.

Ravikumar, D., Jeevanandan, G. and Subramanian, E. M. G. (2017). Evaluation of knowledge among general dentists in treatment of traumatic injuries in primary teeth: A cross-sectional questionnaire study. *European journal of dentistry*, 11(2), pp. 232–237.

Rawson, T. H. et al. (2019). Longitudinal Study Comparing Pulpotomy and Pulpectomy Treatments for Primary Molars of Alaska Native Children. *Pediatric dentistry*, 41(3), pp. 214–220.

Samuel, M. S. et al. 2019. 'Efficient removal of Chromium (VI) from aqueous solution using chitosan grafted graphene oxide (CS-GO) nanocomposite. *International*

- journal of biological macromolecules, 121, pp. 285–292.
- Samuel, S. R., Acharya, S. and Rao, J. C. (2020). School Interventions-based Prevention of Early-Childhood Caries among 3-5-year-old children from very low socioeconomic status: Two-year randomized trial. *Journal of public health dentistry*, 80(1), pp. 51–60.
- Sathish, T. and Karthick, S. (2020). Wear behaviour analysis on aluminium alloy 7050 with reinforced SiC through taguchi approach. *Journal of Japan Research Institute for Advanced Copper-Base Materials and Technologies*, 9(3), pp. 3481–3487.
- Sharma, P. et al. (2019). Emerging trends in the novel drug delivery approaches for the treatment of lung cancer. *Chemico-biological interactions*, 309, p. 108720.
- Somasundaram, S. et al (2015). Fluoride Content of Bottled Drinking Water in Chennai, Tamilnadu. *Journal of clinical and diagnostic research: JCDR*, 9(10), pp. ZC32–4.
- Sridharan, G. et al. (2019). Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. *Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology*, 48(4), pp. 299–306.
- Subramanyam, D. et al. (2018). Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *European journal of dentistry*, 12(1), pp. 67–70.
- Varghese, S. S., Ramesh, A. and Veeraiyan, D. N. (2019). Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *Journal of dental education*, 83(4), pp. 445–450.
- Velvart, P. and Spoerry, U. (1992). Pulpotomy versus incomplete pulpectomy as an endodontic emergency treatment. *Journal of endodontics*. Available at: [https://www.jendodon.com/article/S0099-2399\(06\)81470-6/abstract](https://www.jendodon.com/article/S0099-2399(06)81470-6/abstract).
- Venu, H., Raju, V. D. and Subramani, L. (2019a). Combined effect of influence of nano additives, combustion chamber geometry and injection timing in a DI diesel engine fuelled with ternary (diesel-biodiesel-ethanol) blends. *Energy*, 174, pp. 386–406.
- Venu, H., Subramani, L. and Raju, V. D. (2019b). Emission reduction in a DI diesel engine using exhaust gas recirculation (EGR) of palm biodiesel blended with TiO₂ nano additives. *Renewable Energy*, 140, pp. 245–263.
- Vignesh, R. et al (2019). Management of Complicated Crown-Root Fracture by Extra-Oral Fragment Reattachment and Intentional Reimplantation with 2 Years Review. *Contemporary clinical dentistry*, 10(2), pp. 397–401.
- Vijayashree P. J (2019). In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *Journal of periodontology*, 90(12), pp. 1441–1448.