Evaluation of Primary Central Incisors Requiring Restoration and Pulpectomy in 2 to 6 Year Old Children-An Observational Study

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Abstract

One of the first teeth to get affected by early childhood caries are the primary central incisors thereby esthetics is a main concern in restorations related to primary anterior teeth. In this study the severity of carious lesions are identified by the type of treatment performed. It is a retrospective study analyzing the need for a restoration as compared to a pulp therapy in primary central teeth. This is a private hospital based retrospective study. This is a hospital based retrospective study. All data of the patients visiting Saveetha Dental College and hospitals from June 2019 to March 2020 located in Chennai were retrieved manually. Children who were diagnosed with early childhood caries between 2-6 years who had caries in at least one of the primary central incisors (51, 61 ,71, 82) indicated for restorations or pulpectomy were included. A total of 832 teeth were treated out of which 476 were of males (57.21%) and 356 were of females (43.89%). The highest number of treatment procedures was done in 3-4 year olds – 244 procedures (58.53%). The most commonly treated tooth was primary maxillary left central incisor – 389 procedures (45.67%). Only 31.25% of the teeth underwent pulpectomy procedures. We can conclude restorations were performed in 3-4 year old common among male children in the primary maxillary left central incisor when compared to pulpectomy.

Keywords: *Pediatric restorations, Strip crowns, Composites, Glass ionomer cements, Pulpectomy*

Introduction

Esthetics is of main concern in restorations related to primary anterior teeth for parents and caretakers and children[1–4]. Treatment is usually based on opinion and clinical observation. Treatment is usually based on opinion and clinical observation.

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According to American Academy of Pediatric Dentistry usually primary maxillary central incisors erupt at 6 to 10 months and primary mandibular central incisors at 5 to 8 months of age [5] this being the initial teeth to erupt and have to face the full bacterial load and which leads to fce the full bacterial load and which leads to caries. A study shows 50% children suffered from caries involving primary maxillary anterior teeth[6].

The treatment plan shall include, development state of the dentition, caries risk assessment, patient's oral hygiene, anticipated parental compliance[7], likelihood of recall and patient's ability to cooperate for treatment, and this includes reviewing the caries risk especially in rural populations where it's high. Factors like dental trauma [8], pathologies in the oral cavity [9–11] etc can affect patient cooperation. Tooth preparation must involve removal of all caries to establish proper outline, resistance and convenience form compatible with the restoration [12].

Restorations in primary teeth need to be carefully considered due to the anatomy of the primary teeth. The mesiodistal diameter of the primary incisor crown is smaller compared to the permanent successors. They have larger pulp chambers but relatively smaller teeth [12,13].

Demineralization of primary teeth is significantly faster than that of permanent teeth, leading to requirement for early treatment[14]. Although primary incisors are among the first to exfoliate they do have a very significant lifespan and begin to naturally exfoliate at the age of 7 and 8 years for central incisors at 8 to 9 years for lateral incisors [15].

Patient cooperation plays an important role in the success of any treatment, thus age and maturity can influence treatment outcomes and changes in the clinical approach and management [16,17]. Various treatment of primary anteriors ranging from simple restorations to extractions.

The ultimate goal to restore teeth is to allow the patient to maintain it until natural exfoliation. Various treatment procedures are available for class III, class IV, class V cavities [18].

Very small cavities can be restored by using restorations, compomers or glass ionomer cements .[19]Bonded resin composite strip crowns introduced in the 1970's helped dentists provide esthetics and a promising version of restoration for primary teeth [20]. Many studies formed strip crowns to be very successful and durable [21,22].

A significant problem faced by dentists in mandibular central incisors is restoration of interproximal caries. Extremely short crowns can cause pulpal exposure. Disking the inter- proximal surface to open contacts and increase access to salivary flow. Severe caries can be restored with GIC as there are no strip crowns for lower anteriors[23].

When there is chronic irreversible inflammation or necrosis of radicular pulp pulpectomy is done. Materials like zinc oxide eugenol paste were introduced [23] but overfilling was not acceptable due to formation of mild foreign body reaction. Iodoform pastes are currently used and are successful in treatment [24].

In this study the severity of carious lesions are identified by the type of treatment performed like restorations or pulp therapy[8,25–32]. The aim of this retrospective study was to analyze the need for a restoration as compared to a pulp therapy in primary central teeth.

Materials and Methods

This is a private hospital based retrospective study. It was done by two examiners. Simple random sampling was done to reduce sampling bias. This was a hospital based retrospective study. Dental records of 832 patients who had visited a private dental hospital from June 2019 to March 2020, located in Chennai, Tamil Nadu, India were retrieved manually and analysed. All information including patient ID, treatment done, age, gender teeth treated were retrieved. Children who were diagnosed with early childhood caries between 2-6 years who had caries in at least one of the primary central incisors (51, 61 ,71, 82) indicated for restorations or pulpectomy were included. Children with systemic disorders, special children who had primary central incisors indicated for extraction and caries free children were excluded.

All the procedures were done by only a single operator for a specific patient. A full mouth examination with intraoral periapical radiographs of the teeth indicated for restoration or pulpectomy was taken before the start of the clinical procedure. After confirmation of the diagnosis for GIC restoration the tooth was isolated using rubber dam (GDC Marketing, Hoshiarpur, Punjab, India). Using a round carbide bur (MANI Inc., Japan) in a high-speed handpiece (NSK, JAPAN), all the caries were removed. The glass ionomer cement type 2 (Shofu, Shofuinc. Japan) was used to restore the cavity. For composite restoration the prepared cavity was etched using 37% phosphoric acid gel (Dtech, Pune, Maharashtra) washed, dried and cured with bonding agent (Te Econom Bond; Ivoclar Vivadent; Schaan, Liechtenstein) and then sealed using composite resin (Ivoclar Vivadent; Schaan, Liechtenstein). Light curing was done and the restoration was finished and polished.

For strip crown the tooth was prepared on all surfaces etchant and bonding agent was applied. The strip crown(3M, ESPE, USA) of suitable size was taken and a small vent hole was made on the lingual surface for the flow of excess material. The crown was filled with packable composite resin placed on the tooth and light cured. The plastic crown was then removed and the restoration was finished and polished.

For pulpectomy local anesthesia was administered using 2% lignocaine with 1:200,000 adrenaline (LOX* 2% ADRENALINE, Neon Laboratories limited, India) followed by rubber dam placement.Access cavity was made using no 4 round carbide bur (MANI Inc., Japan) which was followed by working length determination using no 15 hand K-file (Dentsply Maillefer, OK, USA). The working length was determined using the radiographic method and was kept 1-mm short of radiographic apex and rotary instrumentation was preceded by initial hand instrumentation up to no 20 K-file. The rotary instrumentation was done using the Kedo-S rotary files (Reeganz dental care Pvt. Ltd, India) for primary anterior teeth with U1. After complete instrumentation and irrigation, the canals were dried using no. 30 paper points (Dentsply Maillefer, OK, USA) and canals were obturated using calcium hydroxide iodoform paste (Metapex, META Biomed Co, PA, USA). The excess of coronal filling is removed, and initial entrance filling was given using glass ionomer cement (Shofu, Shofuinc. Japan).

The patient and the parents were blinded regarding the treatment protocol. The evaluator of the treatment procedure was blinded about the treatment protocol for each group. Since the type of treatment provided was known to the operator, the operator could not be blinded.Cross verification for incomplete and inaccurate data was cross checked with radiographs and intraoral photographs and verified. The sample was representative with specific inclusion and exclusion made it internally valid. This study had validity externally limited to the South Indian population due to limited geographic inclusion.

Ethical aspect:

This study was conducted with ethical approval from the Institutional Review Board (Ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320 of Saveetha Institute of Medical And Technical Sciences.

Statistical Analyses

The collected data was entered into Microsoft office Excel 2013 datasheet transferred to SPSS version 26.0 software (SPSS software Chicago, IL, USA) for statistical analysis. The independent variables: gender, age. The independent variables: total number of procedures, cost of procedures, treatment done. They were put to descriptive analysis and chi square test was done to assess the significance of association between the categorical variables.

Results and Discussion

A total of 832 teeth were treated out of which 476 were of males (57.21%) and 356 were of females (43.89%). Chi square test was done and the association was found to be not significant (p value = 0.517) [Figure 3]. The distribution across various age groups 1 year: 0.72%, 2 years: 10.70%, 3 years: 29.21%, 4 years: 29.33%, 5 years: 22.60%, 6 years: 7.45% [Figure 1].

Out of 832 teeth treated the distribution was namely maxillary left central incisor: 380 teeth, maxillary right central incisor: 368 teeth, mandibular left central incisor: 42 teeth and mandibular right central incisor:42 teeth. Chi square test was done and the association was found to be not significant (p value = 0.418) [Figure 2].

Out of type of procedure done the number of tooth treated by each procedure was class 3 composite (mesial): 108 teeth, class 3 composite (distal): 13 teeth, class 4 composite (mesial): 22 teeth, class 4 composite (distal): 10 teeth, class 5 composite:42 teeth, class 1 GIC: 191 teeth, class 5 GIC: 6 teeth, pulpectomy (single visit): 258 teeth, pulpectomy (multi visit): 2 teeth, strip crowns: 180 teeth. Chi square test was done and the association was found to be significant (p value = 0.000) [Figure 4].

The highest number of treatment procedures was done in 3-4 year olds with 244 procedures (58.53%). The most commonly treated tooth was primary maxillary left central incisor with 389 procedures (45.67%). Only 31.25% of the teeth underwent pulpectomy procedures.

Early childhood caries begins soon after eruption and progresses rapidly affecting infants and toddlers [18].Most of the treatment done to the children restorations(68.75%) [Figure 4]. From this we can come to the finding that though the prevalence of caries in Tamil Nadu is high (55.73%) [33]. The severity of caries is comparatively low as most of the teeth treated only required restorations.being the 1st teeth to get affected in ECC i.e maxillary central incisors and the last tooth get affected being mandibular central incisor [18] we can say that this correlated with existing studies. This is further supported by the data found in this study where the restorative rate difference between the maxillary and mandibular central incisors is highly significant.

This study shows that proximal surfaces of teeth demonstrated the highest caries rate being the majority of the restorations being class 3 and class 4 carious lesion restorations. This was consistent with previous study where maxillary teeth were more susceptible as compared to mandibular teeth. Approximal surfaces of incisors, canines have higher caries rate than other sites. The carious teeth are more common in young patients and tend to decrease with age [18,34].

We see that Figure 4 also reveals that the most preferred material was composite followed by GIC followed by strip crowns. This data was the combined data of treatments done by both undergraduates (general dentists) and postgraduate (pediatric dentists). Compared to all materials full coverage restorations are considered most durable and reliable, the earliest used being stainless steel crowns [35].

Though the procedure is very well described, it is technique sensitive and any lapses in patient selection, moisture and hemorrhage control, tooth preparation, adhesive application and resin composite placement can lead to failure [36]. This difficulty in application is reflected in a study that only 21% general dentists surveyed performed strip crowns as compared to pediatric dentists which were 73% [37].

This choice of composite also reveals that patients and caregivers concern for esthetics in anterior region. Newer materials could be used further on to give protective effect over caries, improve strength and retain esthetics like compomer which is more fluoride releasing and more moisture tolerant [38].Resin modified GIC could also be used more like normal GIC, less moisture sensitive and better strength than normal GIC [19,39].

Giomers are also bioactive materials that release and recharge fluoride similar to composite with pre reacted glass particles [40–42]. They can also resist plaque formation due to a film, the giomer filler forms on the surface when it contacts with saliva and prevents bacterial adhesion [43] and causes remineralization to adjacent surfaces [44].

The study by coll et al states that success rates of pulpotomy and indirect pulp therapy is higher compared to pulpectomy although not statistically significant[45]. Endodontic treatment is considered the last option for keeping a primary tooth that has irreversibly affected due to caries in a child [46].Early intervention can be done to prevent extensive pulp therapy.

It must be remembered that preventive measures like periodic topical fluoride therapy[47,48] or fluoride varnishes 4 times a year [49] have shown effect in remineralization of early carious lesions [50,51].

There were some limitations for the study like restricted geographic location limited to the South India population.

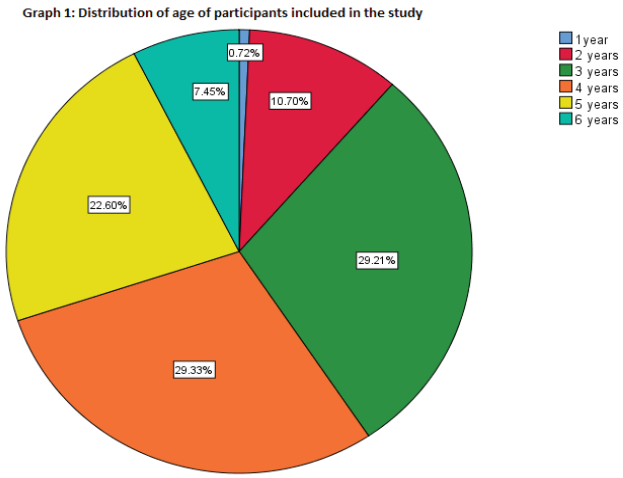

Figure 1: Pie chart showing the distribution of teeth treated across various age groups. Blue color represents 1year olds, red color represents 2 year olds, green color represents 3 year olds, orange color represents 4 year olds, yellow color represents 5 year olds, pale green color represents 6 year olds. From this chart it is seen that the 4 year olds were the most treated (29.33%).

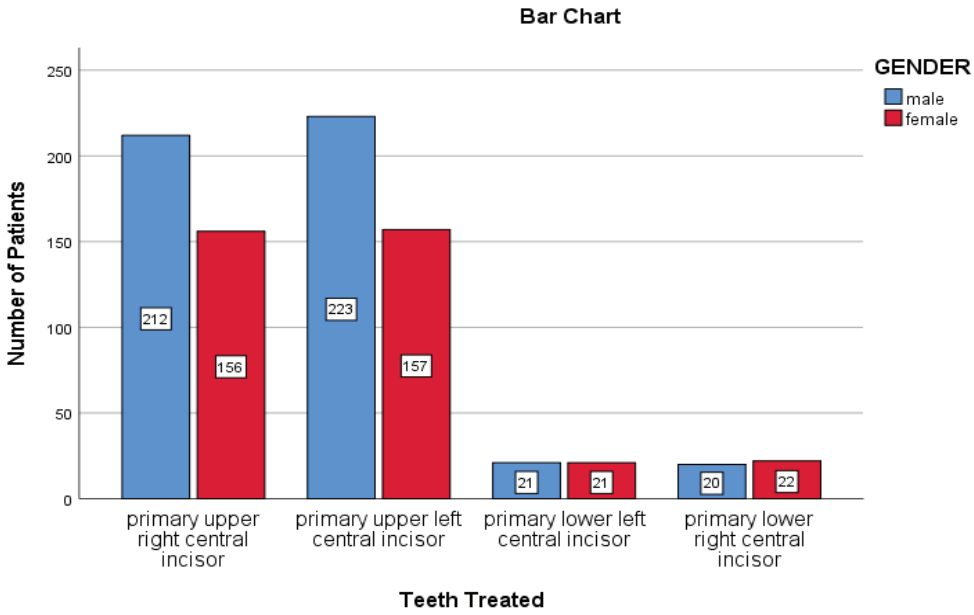

Figure 2: Bar graph showing association of gender of participants included in the study for each tooth treated. Red color represents female and blue color represents male. X - axis represents the type of tooth treated and y - axis represents the number of patients based on gender. This graph shows that the primary upper left central incisor was the most treated and this was higher in males (212) than females. Chi-square test was done and the association was found to be not significant (p value = 0.418).

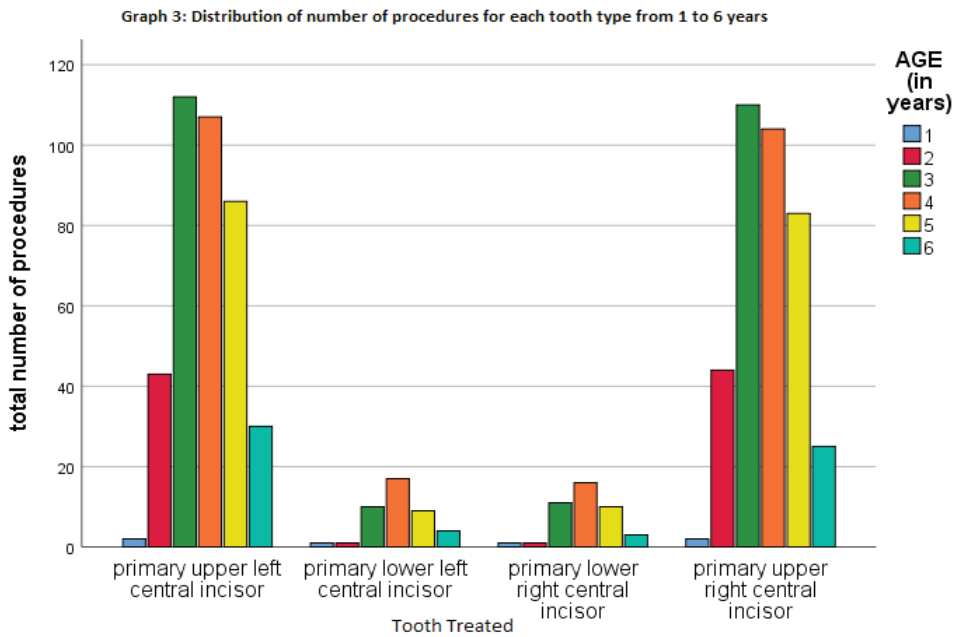

Figure 3: Bar graph showing association of number of procedures for each tooth type from 1 to 6 years. X - axis represents the type of tooth treated and y - axis represents the number of procedures done based on age. Most commonly treated tooth was the primary upper left central incisor and this was seen in 3 year old children. Chi-square test was done and the association was found to be not significant (p value = 0.517).

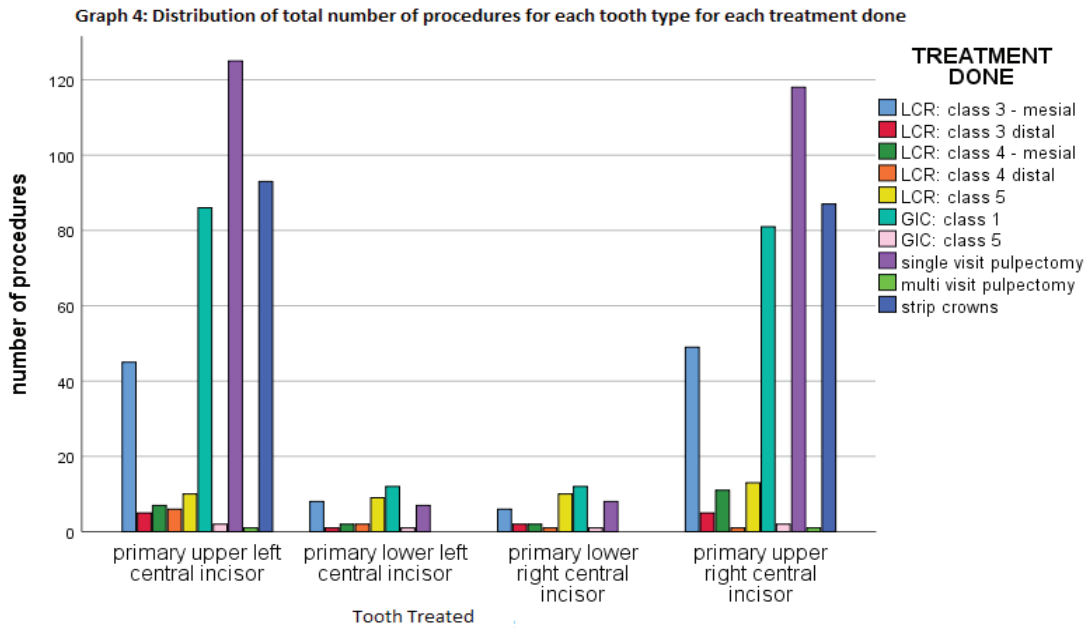

Figure 4: Bar graph showing association of total number of procedures for each tooth treated for each treatment done. X - axis represents the type of teeth treated and the y axis represents the number of teeth treated for each type of procedure. Single visit pulpectomy was the most commonly done treatment with the high frequency seen in the primary upper left central incisor. Chi square test was done and the association was found to be significant (p value = 0.000).

Conclusion

Within the limits of the study we can conclude that the most performed procedure were restorations as compared to pulpectomies with increase in restorative rate with increase in age. Adequate knowledge on the variations in tooth structure, awareness regarding the radiographic limitations and restorative technique is essential prior to commencement of any procedure. Though endodontic treatment in primary teeth has shown excellent clinical and radiographic success conservative treatment is still the most performed and most preferred choice of treatment as the pulp remains vital as the potential for recovery exists once the irritation has been removed. Also any fractures can be easily repaired by adding more material rather than repeating the entire procedure.

Conflict of Interest: There are no conflicts of interest.

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Ethical Clearance: It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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8.TABLES AND FIGURES