Restorative Treatment Option Patterns for Carious Primary Posterior Molars and Factors that Influence Provider Treatment Decision

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Introduction

Early Childhood Caries (ECC) is a major public health problem and is defined as the presence of one or more decayed (non-cavitated or cavitated), missing (as a result of caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger.[1]

Lesions in the primary dentition deemed large and spanning multiple surfaces indicate the use of a full-coverage restoration, such as a crown.[3] They can be made completely of stainless steel (known as 'preformed metal crowns' or PMCs), or to give better aesthetics, may be made of stainless steel with a white veneer cover, made wholly of a white ceramic material,[4] or made of a high impact hybrid resin polymer.[5]

Over the past 70 years, stainless steel crowns (SSCs) have been placed on primary molars to restore teeth with multi-surface caries in patients with high caries risk, after pulp therapy and to restore teeth that are brittle and prone to fracture. Some advantages of SSC's are their low cost, durability, and reliability when interim full-coronal coverage is needed.[6] In spite of these benefits, the notable pitfall to the SSC is the metallic appearance which can compromise the aesthetics of teeth.

The increasing demand from parents for a more aesthetic restoration led to the introduction of the zirconia crown. Advantages of preformed zirconia crowns are that they mimic tooth color and have no component of the crown that might de-bond.[8] However, zirconia crowns are more expensive and have a more technique sensitive preparation compared to SSCs which can pose difficulties for children with behavioral challenges.

In May of 2022, NuSmile created a tooth colored, biocompatible, high-impact resin polymer crown called BioFlx.[5] This resin polymer crown combines the less aggressive preparation of an SSC with the aesthetics of a zirconia crown.[5] The advantage of BioFlx is that if the occlusion of the crown is high, it will progressively self-adapt and develop a dimple in that location rather than wearing.[5]

There are a number of elements to take into account when considering which material and treatment to choose for posterior restorations. These include the location and size of the caries, aesthetics, properties of the restorative material, age of the patient, socioeconomic status of the patient, and the clinician's experience. While many studies have compared the clinical and radiographic success between stainless steel crowns and zirconia crowns, no study has included the new BioFlx crowns. Additionally, past studies have not discussed the elements that influence the provider's treatment choice of crowns for primary posterior caries.

Objectives/Hypothesis

The goals of this study are:

• To assess the treatment patterns for carious primary posterior teeth and the frequency of use for stainless steel crowns, zirconia crowns, and BioFlx crowns by members of the American Academy of Pediatric Dentists.

• To assess if demographics, years in practice, and type of reimbursement influence US pediatric dentists' treatment decision on selection of full coverage restorations for carious posterior primary molars.

Hypotheses:

•Recent graduates are more likely to offer and utilize zirconia and BioFlx crowns for carious primary posterior molars.

•Zirconia and BioFlx crowns will less likely be offered compared to stainless steel crowns where the primary reimbursement is government funded insurance (Medicaid) versus private insurance.

Study Design and Methods

This was a cross-sectional national study in which data collection occurred over a period of two months, from February 2024 to March 2024. The target population was pediatric dentists and pediatric dental residents currently in clinical practice. A survey was sent out via email to active American Academy of Pediatric Dentistry (AAPD) members who are either currently practicing pediatric dentistry or in a pediatric dentistry residency program. Study personnel collected data on the dental health care providers' demographics, their practice characteristics and treatment decisions/restorative technique preference for carious primary posterior molars. Questions on what influences practitioner's decisions were also included.

Results

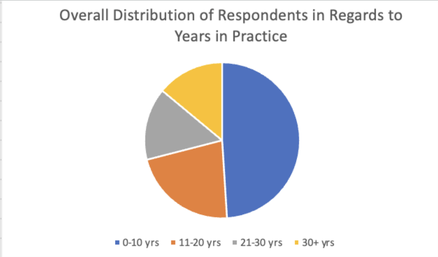

Figure 1 Overall Distribution of Respondents in Regard to Years in Practice

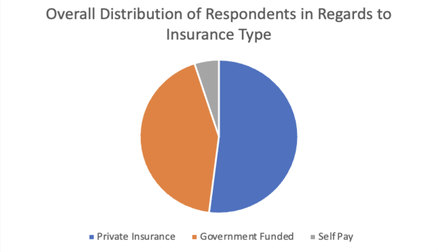

Figure 2 Overall Distribution of Respondents in Regard to Insurance Type

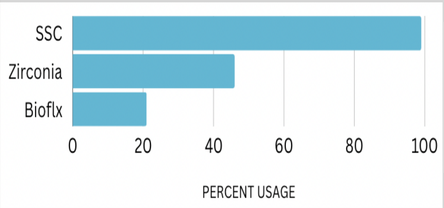

Figure 3 Provider Comfort Levels for Usage of SSC, Zirconia, and BioFlx Crowns

Variable	N = 466[1]	95% CI[2]
SSC	437 (99%)	(97%, 99%)
Unknown	23	
ZIRCONIA	203 (46%)	(41%, 51%)
Unknown	25	
BIOFLX	94 (21%)	(18%, 26%)
Unknown	27	

[1]n (%)
[2]CI = Confidence Interval

Figure 4 Overall use of SSC, Zirconia, and BioFlx Crowns

Results Continued

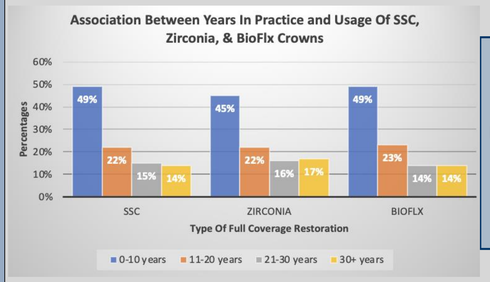

Figure 5 Association Between Years in Practice and Usage of SSC, Zirconia, and BioFlx Crowns

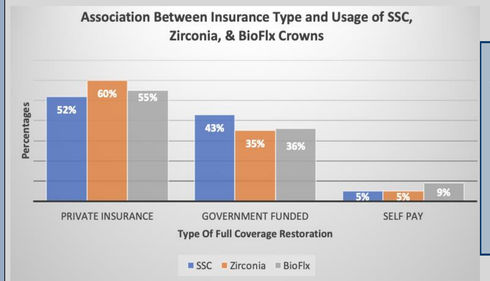

Figure 6 Association Between Insurance Type and Usage of SSC, Zirconia, and BioFlx Crowns

Discussion

A total of 464 responses were received for the survey. The results show that there is an appreciable difference in usage patterns by practitioners between SSC, zirconia and BioFlx crowns for carious primary posterior molars. SSC is the most frequently used at 99% (95% CI: 97%, 99%), followed by Zirconia at 46% (41%, 51%) and BioFlx is the least used at 21% (18%, 26%) (see figures 3 and 4). These results reveal that stainless steel crowns are more commonly used than zirconia and BioFlx for carious primary posterior molars.

When asked about type of pediatric dental residency completed, 11.04% completed a university-based program, 38.74% completed a hospital-based program, and 50.23% completed a combined university-hospital based program. In regard to ABPD certification status, 69.16% stated they are Board certified, 12.93% are not Board certified, and 17.91% are Board eligible. 48.53% of responders graduated pediatric dental residency 0-10 years ago, 21.67% graduated 11-20 years ago, 15.35% graduated 21-30 years ago, and 14.45% graduated 30+ years ago. When asked about practice setting, 29.18% are in a solo practice, 51.53% are in a group practice and 11.53% are in a university affiliated practice. When asked about practice location, 9.91% stated rural, 59.01% stated suburban and 31.08% stated urban.

Descriptive statistics, frequencies and percentages were employed to summarize data. Proportions along with 95% confidence interval (CI) are presented for each treatment option.

Discussion Continued

An exploratory analysis looking at association between treatment choice/utilization with years in practice and treatment choice/utilization with insurance type were carried out using Chi-squared test or Fisher's exact test, in the case of sparse data. The analysis dealing with association of usage with provider characteristics are exploratory. Therefore, corresponding results need to be interpreted with caution in all analyses, statistical significance is claimed at a computed p-value ≤ 0.05.

There is not a statistically significant association between years in practice and type of full coverage restorations (SSC's, Zirconia and BioFlx- see figure 5). There is no evidence of association between the use of SSC and type of insurance (see figure 6, p=0.8). However, there is evidence of association between the use of Zirconia crowns and type of insurance (see figure 6, p=0.01). Zirconia crowns are more frequently offered when the primary reimbursement is private insurance (60%) as compared to government funded (35%) and self-pay (5%). The results show that BioFlx crowns are more frequently offered with private insurance (55%) as compared to government funded (36%) and self-pay (9%). However, this did not reach statistical significance (see figure 6, p=0.12). These results are consistent with the hypothesis that Zirconia and BioFlx crowns are less likely be offered compared to stainless steel crowns where the primary reimbursement is government funded insurance versus private insurance.

Limitations of the study include a short period for data collection (2 months), small sample size, unanswered questions, and possible author error in entering data. Despite these limitations, it is apparent that providers are more comfortable utilizing stainless steel crowns compared to zirconia and BioFlx. Because BioFlx is new to the market, further research is needed on its use.

Conclusions

Stainless steel crowns are more commonly used than zirconia and BioFlx crowns for carious primary posterior teeth. This could be because SSC's have a low cost, are durable, and are less technique sensitive than zirconia crowns. There is no association between years in practice and usage of SSC, zirconia and BioFlx crowns. Zirconia crowns are less likely to be offered when the primary reimbursement is government insurance as compared to private insurance. This may be because zirconia crowns are more expensive and more technique sensitive.

References

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