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Predicting Sizes of Stainless Steel Crowns

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INTRODUCTION

Although the prevalence of tooth decay has decreased, nearly one in five children under the age of 5 has experienced dental decay. Children must visit the dentist to have caries removed. After caries are removed, common restorations include composite resin and stainless steel crowns. Stainless steel crowns (SSCs) are widely used in pediatric dentistry due to their durability and effectiveness in restoring primary teeth with extensive decay or structural loss. Crowns are selected based off of a crown fitting, completely covering the tooth with the most retentive fit.There are 6 different sizes for each tooth ranging from 2-7 and is differentiated by a D or E based on the tooth being a first molar or a second molar. Selecting the appropriate crown size often relies on clinical judgment and trial-and-error, which can lead to inefficiencies and increased chair time. By improving efficiency in crown selection, we can complete cases in less time and see more patients.

Figure 1. A. Single crown cemented on a lower first primary molar. B. Stainless steel crown sizes.

OBJECTIVE

This study assessed whether the sizes of stainless-steel crowns (SSCs) placed on second primary molars can predict the crown size for first primary molars. Additionally, it evaluated whether the presence of an adjacent SSC would affect crown size.

MATERIAL AND METHODS

Stainless steel crown sizes cemented on 972 teeth were collected from dental charts of 181 individuals aged 3 to 8 years who received treatment under general anesthesia from January 1 to December 31, 2024 at the University of Kentucky. Crown sizes, teeth numbers and the condition of adjacent tooth (single crown or grouped crowns) were collected, and the data was organized in a Microsoft Excel sheet. To ensure the privacy of charts reviewed, identifying information was not collected. Statistical analysis: Data was analyzed using Spearman's correlation test followed by simple linear regression to determine whether the size of the crowns cemented on the second molars can predict the size of the first molars. Multiple Mann-Whitney tests were applied to compare the crown sizes between "grouped" and "single" crowns and between the same type of tooth in different quadrants (a=0.05).

RESULTS

Table 1. General frequency distribution (%) of crown sizes.

Tooth	Crown Sizes						
	D1	D2	D3	D4	D5	D6	D7
1st molar	2 (0.2%)	13 (1.3%)	49 (5.0%)	130 (13.4%)	140 (14.4%)	102 (10.5%)	16 (1.6%)
	E1	E2	E3	E4	E5	E6	E7
2nd molar	0 (0.0%)	87 (9.0%)	154 (15.8%)	139 (14.3%)	87 (9.0%)	49 (5.0%)	4 (0.4%)

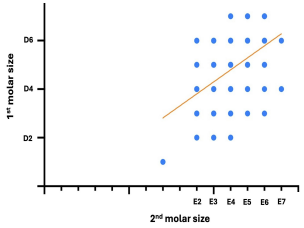

Figure 2. Simple linear regression. Equation: y=0.5894*x+8.

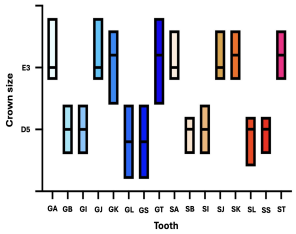

Figure 3. Crown sizes among different teeth. Boxes represent crown sizes for each tooth. Line at median.

Results: Of the crowns, 254 (26%) were placed without an adjacent crown (single), while 718 (74%) were placed in pairs (grouped). The most frequent sizes observed for first molars were D4-D6, with D4 being the most common (15.3%) for grouped crowns and D5 (15.7%) for single crowns. E3 and E4 were the most frequent sizes for second molars, regardless of crown grouping (Table 1). The data were not normally distributed (Anderson-Darling, $p<0.0001$). A moderate and statistically significant positive correlation was found ($r = 0.5537$, $p < 0.0001$) between the crown sizes of the second and first molars. Simple linear regression (Figure 2) indicated that for every 1-unit increase in the size of the second molar crown, the size of the first molar crown increases by 0.5894 units. About 30% of the variability in the size of the first molar crown can be explained by the size of the second molar crown ($R^2 = 0.2918$). When the crown sizes of the same tooth were compared when "single" or "grouped," no statistical difference was observed (Mann-Whitney, $p>0.05$). Homologous teeth in the same arch present similar crown sizes while differing when comparing arches.

DISCUSSION

This study included patients of all ages and ethnic backgrounds, both of which can influence crown size selection. Variations in tooth size among different ethnic groups may necessitate the use of larger or smaller crowns. Age is another significant factor; for example, children with primary dentition often exhibit increased spacing between teeth, which typically requires minimal to no interproximal reduction, allowing for the selection of a larger crown size. Additionally, the extent of carious lesions must be considered. Significant decay requiring extensive removal of tooth structure may result in the need for a smaller crown. All procedures in this study were performed in the operating room under general anesthesia, eliminating the need for behavior management. As a result, clinicians may feel more comfortable performing more aggressive tooth preparations to allow crowns to fit more easily.

CONCLUSIONS

Although the size of the second molar crown moderately predicts the size of the first molar crown, the relatively low predictive power indicates that other factors, such as tooth morphology, age, and individual patient characteristics, may play a significant role in determining the appropriate crown size. No difference was found between grouped and single crowns.

AUTHORS

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1. American Academy of Pediatric Dentistry. (2022). *The state of little teeth: Second edition*. American Academy of Pediatric Dentistry. 2. American Academy of Pediatric Dentistry. (2024). *Manual of pediatric dentistry: Definitions of oral health, policies, recommendations, endorsements, and resources (2024-2025)*. American Academy of Pediatric Dentistry. 3. American Academy of Pediatric Dentistry. (2023). *Handbook of pediatric dentistry* (5th ed.). American Academy of Pediatric Dentistry.