

Comparative Evaluation Of Marginal Leakage Of Ssc And Zirconia Crowns In Primary Teeth

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Abstract:

Aim: The purpose of this in-vitro study was to compare the degree of Microleakage of Zirconia crowns with Stainless steel crowns in primary molars.

Methods: 40 primary teeth were cemented with either SSCs or Zirconia crowns using Type 1 GIC. The specimens were placed in Dulbecco's Phosphate Buffered Saline solution at 37 degrees Celsius for 1 day and were then thermocycled between five degrees Celsius and 55 degrees Celsius for 6,000 cycles. The specimens were then stained with 2% basic fuchsin, sectioned, and viewed under microscope. The microleakage was assessed on a four-point scale. Data were statistically analyzed using chi-square test, ($P < .05$).

Results: Microleakage was noticed in all the specimens irrespective of the crowns used, however the degree or extent of Microleakage was more with Zirconia crowns and this difference was statistically significant ($p=0.008$).

Conclusion: Zirconia crowns shows significantly more micro-leakage compared to SSCs in primary molars.

Introduction:

Full coverage restoration of carious primary teeth serves to be challenging for a paediatric dentist. For decades, SSCs have outperformed the other restorative materials in terms of cost, durability and longevity. (1,2,3) But the metallic unaesthetic appearance of the crown is the greatest disadvantage with SSCs. (1,2) With increase in demand for aesthetic crowns, use of Zirconia crowns for primary teeth started evolving. A systematic review published in 2020 stated that Zirconia crowns are better in terms of gingival, periodontal health, aesthetics and fractures. (4,5)

In primary teeth, the retention of the crown majorly depends on the luting cements used and if any defective seal can result in involution of the bacteria and fluids causing recurrent caries, pulpal involvement and failure of pulpectomy procedure. In short, marginal leakage decides the durability of the crown.(6,7,8) Hence, determining the marginal-leakage of the crown is essential to determine its overall success rates for use in practice.

Zirconia crowns requires more tooth reduction and also it cannot be crimped to provide a good marginal seal. Also these crowns are more expensive and thus evaluating its durability is more important before implementing into practice. (9) Hence, the aim of this in-vitro study was to determine the micro leakage of the 2 different pre-fabricated crowns - SSCs and Zirconia crowns in primary teeth.

Materials and Method:

The present in-vitro study was conducted after obtaining approval from the ethical committee, Saveethauniversity. Intact Retained deciduous molars indicated for extraction due to orthodontic purposes were collected and stored in sterile water. A total of 40 teeth was obtained and was divided into 2 groups (20 per group), with each group receiving either SSCs or Zirconia crowns (EZ PEDO crowns). Each tooth was wiped with gauze and if any caries present was removed in both the groups. Tooth preparations were done using diamond burs according to the manufacturers instructions and the crowns were cemented using Glass ionomer cements.

The restored teeth, after cementation with either SSCs or Zirconia crowns were placed in DPBS solution at 37 degrees for 24 hours and was then placed in the thermocycler for 6000 cycles between 5-55 degrees Celsius. After thermocycling, acrylic varnish was used to paint the teeth within 1 mm of the crown margin and were then placed in 2% basic fuchsin solution for 24 hours. The specimens were then sectioned buccolingually and viewed under stereo-microscope and was scored according to the scoring criteria depicted in Table 1.

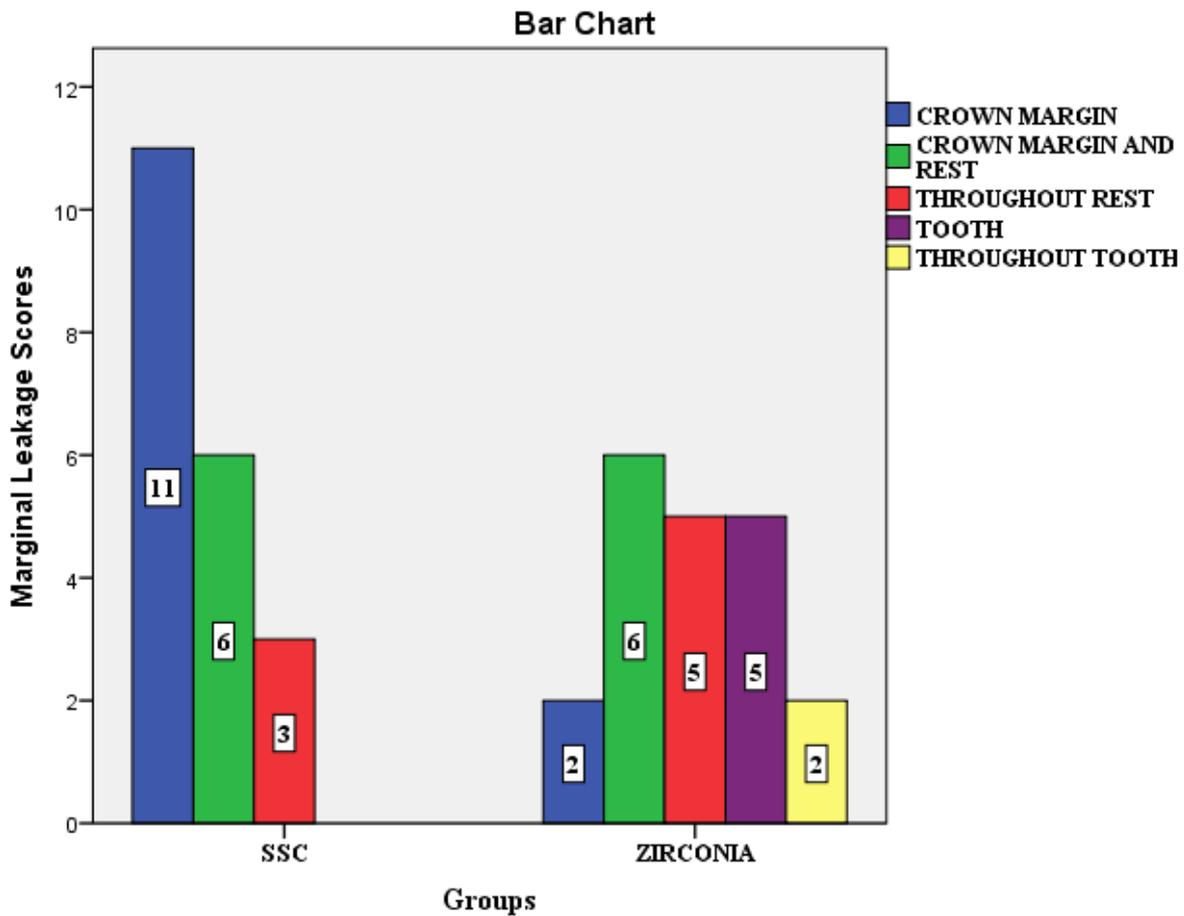
SCORING	DESCRIPTION
0	Microleakage at the margins of crown only
1	Microleakage at the margins of crown and around the cements
2	Microleakage at the margins of crown and throughout the cements
3	Microleakage to 1/3 of tooth structure

SCORING	DESCRIPTION
4	Microleakage throughout the tooth structure and pulp

Table 1 : Category of micro leakage scores

Results:

All the samples included in the study showed Microleakage. About 55% of the SSCs showed Microleakage at the margins of the crowns only and none of the SSCs showed Microleakage extending to the tooth and beyond it, whereas 25% of the Zirconia crowns showed Microleakage extending to the tooth and 10% of the Zirconia crowns showed micro-leakage involving throughout the tooth. The grade of Microleakage in each group is depicted in Graph 1 and the statistical significance is shown in Table 2.



Graph 1: Microleakage scores of SSCs and Zirconia crowns.

Variable		Marginal Leakage Scores					Chi-square value	P value
		SCORE 0-CROWN MARGIN n(%)	SCORE 1-CROWN MARGIN AND REST n(%)	SCORE 2-THROUGH OUT REST n(%)	SCORE 3-TOOTH n(%)	SCORE 4-THROUGH OUT TOOTH n(%)		
Groups	SSC	11(55)	6(30)	3(15)	0(0)	0(0)	13.73	0.008**
	ZIRCONIA	2(10)	6(30)	5(25)	5(25)	2(10)		

Table 2 : Microleakage scores of SSCs and Zirconia crowns , Chi square test, p<0.05 statistically significant.

Discussion:

With Zirconia crowns evolving into paediatric practice, assessing the micro-leakage of the same is equally important to determine its success owing to the following factors- 1. Zirconia crowns requires more tooth reduction, 2. Exfoliation of primary posterior tooth takes longer time, 3. Crimping of the zirconia crowns are not possible. In the present study EZ PEDO Zirconia crowns were used as the previous studies have reported that zirconia crowns have lesser retention rate. SSCs can be crimped, which provides mechanical retention but Zirconia crowns have passive fit and the margins are more open. Hence, EZ Zirconia crowns were selected as they have mechanical retention grooves in them that increases the retention of the crowns.(10) Also both the crowns were luted with the same type of cement (Type 1 GIC) as they have been recorded to have high clinical success rate. (11,12,13). Also the manufacturers of EZ PEDO crowns recommend the use of traditional glass ionomer cement for luting and SSCs show high success rate on luting with Glass Ionomercements.

In the present in-vitro study, Microleakage was noticed in all the specimens irrespective of the crowns used, however the degree or extent of Microleakage varied and this difference was statistically significant (p=0.008). With Zirconia crowns , about 25% of the crowns showed Microleakage throughout the restoration , 25% showed Microleakage extending to the tooth and 10% showed Microleakage throughout the tooth. But with stainless steel crowns all the specimens showed Microleakage confined to the restoration only , none of the specimen showed microleakage extending to the tooth. A previously published study shows that microleakage of Zirconia crown is similar to that of SSCs which is in complete contradiction to

the results of the present study.(14) However the zirconia crowns used in that study was Kinder crowns and no details on the luting cement used for both the group was mentioned.

Within the limitations of the present study, use of Zirconia crowns should be re-considered for use in primary teeth and search for more bio-active aesthetic materials should be continued to provide an alternative aesthetic option.

Conclusion:

Zirconia crowns shows significantly more micro-leakage compared to SSCs in primary molars.

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