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Comparison of efficiency of different crowns in primary children an original research

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Abstract---Introduction: The restorations to anterior teeth in children is very significant. Hence in this study we compared efficiency of strip crowns versus primary anterior zirconium crowns in 3 to 6 year old children. Material and Methods: We selected 100 children of ages 3-6 years to receive the anterior crowns, attending the institution department of pedodontics. They were divided to 50 each of zirconia and strip crown groups. The various parameters were checked at 3,6 and 12 months. Values were compared keeping $p < 0.05$ as significant. Results: Zirconia crowns showed significantly lower plaque

accumulation, gingival bleeding restoration failure, at the 3- and 6-months no, but more wear to opposing teeth. With regards to recurrent caries no significant difference was found between the two crowns. Conclusion: Based on our data we conclude that overtime teeth covered with zirconia crowns show better gingival health and less bleeding, plaque accumulation as well as less loss of material. On the other hand, zirconia can cause more loss of opposing tooth structure.

Keywords---Primary anterior teeth, Strip crowns, Zirconia crowns.

Introduction

The children are more prone to caries than adults due to multiple reasons. Providing care to children who are considered to be at risk of caries, is to be done under specialist care. For the anterior primary teeth caries there are various restorations. Primary incisors with large or multi-surface caries can be restored with resin composite strip crowns if there is sufficient tooth structure after removing all carious tissues [1]. When remaining tooth structure is less or isn't enough for bonding, pre-veneered aesthetic crowns is a favorable solution. Stainless steel crowns with cosmetic facing have good aesthetics and good retention even with minimal remaining tooth structure. Moisture and hemorrhage control are not critical with these restorations which need minimal chair time and offer full coverage and protection.

Off late, zirconia aesthetic crowns for children appeared in the market. Zirconia has properties like metal and esthetics of the teeth, and the ready to use zirconia crowns are available for primary teeth. Although there is high acceptance of zirconia crowns, the literature lacks solid proof for their pediatric clinical performance [2-5]. There are limited clinical studies that are currently ongoing, however until the outcomes of adequate number of prospective researches with good long-term follow-up. Hence in this study we compared efficiency of strip crowns versus primary anterior zirconium crowns in 3 to 6 year old children.

Material and Methods

We selected 100 children of ages 3-6 years to receive the anterior crowns, attending the institution department of pedodontics. After obtaining the ethics clearance the consent was taken from the guardian of the children. We included both the genders for the study. Subjects with no major health issues, or bruxism were selected for the study. Any subjects with medical issues or problems were excluded.

The subjects were randomly divided to two groups to receive the zirconia and strip crown groups. The restorations were done according to the treatment protocols and the manufacturer's guidelines. The Gingival health, Plaque index, Secondary caries, Restoration failure, Tooth wear were evaluated. The subjects were followed up for a period of 3,6 and 12 months and at each visit the above parameters were

noted. These readings were compared using Chi square test keeping $p < 0.05$ as significant.

Results

We observed that significantly more teeth in the strip crown group were bleeding compared to the zirconia groups at the 3, 6-months follow-up. Table 1 We observed that that none of the teeth covered with zirconia crowns developed caries during the entire period of follow up. On the other hand, teeth that received strip crowns restorations had no recurrent lesions in the 3- and 6-months follow up but when it reached the 12-months follow up, 6.7% presented with recurrent caries. Table 2 We observed that at three months follow up, no failures was noticed in both groups. In the zirconia crown group, two crowns were lost completely in 6 and 12 months follow up due to trauma caused by falling of patients and hitting hard objects. On the other hand, failure was more in the strip crown group as 11.7% showed small but noticeable area of material marginal loss and 1.7% presented with large loss of crown during the 6 months follow up. Also, this loss increased with time to reach 30% small but noticeable area of loss of material and 8.3% large loss of restorations were clinically observed for crown by the 12 months follow up. Table 3 We observed that incisal and labial surfaces of the teeth opposing the full-coronal restorations were clinically observed for any sign of abrasion. 10 teeth opposing to zirconia crowns showed loss of enamel surface characteristics and minimal loss of contour. Table 4

Table 1: Comparison of the gingival status.

Chi-square test	Zirconia crowns	Strip crowns	p-value
<i>Gingival Health (assessed as bleeding on probing)</i>			
At 3 months	24 (40.0%)	40 (66.7%)	0.006 ^a
At 6 months	0 (100.0%)	28 (46.7%)	<0.001 ^a
At 12 months	0 (100%)	0 (100%)	N/A ^c
Friedman test	Mean rank		
	Total cases	Zirconia crown	Strip crown
Baseline	3.61	3.80	3.43
At 3 months	2.68	2.59	2.77
At 6 months	2.09	1.80	2.37
At 12 months	1.61	1.80	1.43
p-value	<0.001 ^b	* <0.001 ^b	<0.001 ^b

^a Significant using Chi-Square Test @ < 0.05 level

^b Significant using Friedman Test @ < 0.05 level

^c No statistics are computed because variable is a constant

Table 2: Comparison of the secondary caries

Chi-square test		Zirconia crowns	Strip crowns	p-value
<i>Recurrent caries</i>				
At 3 months	No caries present	60 (100.0%)	60 (100.0%)	N/A ^b
At 6 months	No caries present	59 (100.0%)	60 (100.0%)	N/A ^b
At 12 months	No caries present	58 (100.0%)	56 (93.3%)	0.135
	Caries present	0 (0.0%)	4 (6.7%)	
Friedman test	Mean rank			
	Total cases	Zirconia crown	Strip crown	
Baseline	2.48	2.50	2.47	
At 3 months	2.48	2.50	2.47	
At 6 months	2.48	2.50	2.47	
At 12 months	2.55	2.50	2.60	
p-value	0.007 ^a	N/A ^b	0.007 ^a	

^a Significant using Chi-Square Test @ <0.05 level^b No statistics are computed because variable is a constant

Table 3: Comparison of the restoration failure

Chi-square test		Zirconia crowns	Strip crowns	p-value
<i>Restoration failure</i>				
At 3 months	Crowns appear normal, no cracks, chips, or fractures	60 (100.0%)	60 (100.0%)	N/A ^c
At 6 months	Crowns appears normal, no cracks, chips, or fractures	59 (98.3%)	52 (86.7%)	0.024 ^a
	Small but noticeable area of loss of material	0 (0.0%)	7 (11.7%)	
	Large loss of crown	0 (0.0%)	1 (1.7%)	
	Complete loss of crown	1 (1.7%)	0 (0.0%)	
At 12 months	Crowns appears normal no cracks, chips, or fractures	58 (98.3%)	37 (61.7%)	<0.001 ^a
	Small but noticeable area of loss of material	0 (0.0%)	18 (30.0%)	
	Large loss of crown	0 (0.0%)	5 (8.3%)	
	Complete loss of crown	1 (1.7%)	0 (0.0%)	
Friedman test	Mean rank			
	Total cases	Zirconia crown	Strip crown	
Baseline	2.37	2.49	2.24	
At 3 months	2.37	2.49	2.24	
At 6 months	2.5	2.49	2.51	
At 12 months	2.77	2.53	3.01	
p-value	<0.001 ^b	0.392	<0.001 ^b	

^a Significant using Chi-Square Test @ <0.05 level^b Significant using Friedman Test @ <0.05 level^c No statistics are computed because variable is a constant

Table 4: Comparison of the tooth wear

Chi-square test		Zirconia crowns	Strip crowns	p-value
Tooth wear of opposing				
At 3 months	No loss of enamel surface characteristics, no loss of contour	60 (100.0%)	60 (100.0%)	N/A ^c
At 6 months	No loss of enamel surface characteristics, no loss of contour	60 (100.0%)	60 (100.0%)	N/A ^c
At 12 months	No loss of enamel surface characteristics, no loss of contour	53 (88.3%)	60 (100.0%)	0.020 ^a
	Loss of enamel surface characteristics, minimal loss of contour	7 (11.7%)	0 (0.0%)	
Friedman test	Mean rank			
	Total cases	Zirconia crown	Strip crown	
Baseline	2.47	2.44	2.50	
At 3 months	2.47	2.44	2.50	
At 6 months	2.47	2.44	2.50	
At 12 months	2.59	2.68	2.50	
p-value	<0.001 ^b	<0.001 ^b	N/A ^c	

^a Significant using Chi-Square Test @ <0.05 level^b Significant using Friedman Test @ <0.05 level^c No statistics are computed because variable is a constant

Discussion

In assessment of gingival health, this study shows better gingival response in zirconia crowns which can be explained by the fact that zirconia is biocompatible and possesses a polished and smooth surface leading to less plaque accumulation and hence less gingival irritation [6–8]. This is similar to the study of Walia et al. [3] who evaluated anterior primary crowns for 129 patients. In agreement with our study, Walia et al. [3] also reported that zirconia crowns showed improved gingival health due to less plaque accumulation when compared to composite strip crowns and pre-veneered SSCs. Our data showed that none of the teeth covered with zirconia crowns showed recurrent caries during the entire follow up. In contrast, teeth restored with composite resin strip crowns showed that 6.7% developed recurrent caries in the 12-months follow up. Significant factors that influence development of caries are poor oral hygiene and high cariogenic diet.[9,10] A recent study by Holsinger et al. [4] reported results similar to our study's in their evaluation of 57 crowns treated with zirconia for primary anterior teeth in 18 patients. Their and other similar studies showed no recurrent caries after a follow-up period of 24 months. [6–10] The greater restoration failure of the composite strip crowns in this study may be explained by the fact that treatment was done under nitrous oxide sedation and physical restrains to manage the children behavior. Regarding the zirconia crowns, the success rate in this study was 98.3% by the end of the 12 months follow up. Only two crowns failed due to trauma. Current research on the clinical success of prefabricated primary zirconia crowns for primary incisors is still limited. Walia et al.[3] reported the retention rate of zirconia crowns as 100% after 6 months. These crowns have no facial upper structure, as they are made up of solid zirconia leading to no chance of facial veneer fracture. In our study seven teeth opposing to zirconia crowns

showed loss of enamel surface, minimal loss of contour compared to 100% no loss of enamel surface characteristics in strip crown group. This results is in agreement with Walia et al. [3] who found four opposing primary teeth out of 38 zirconia crowns having loss of enamel surface characteristics and minimal loss of contour. Although one of the inclusion criteria was selecting patients with positive behaviour, some children occasionally became uncooperative due to prolonged procedure. Another limitation was the high cost of Zirconia crowns. A longer follow-up studies on zirconia crowns is suggested.

Conclusions

We can conclude that zirconia crowns showed better gingival health and less bleeding, plaque accumulation as well as less loss of material. On the other hand, zirconia can cause more loss of opposing tooth structure.

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