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Original Research

Comparative evaluation between zirconia, luxa andstrip crowns: A randomised controlled trial

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ABSTRACT:

Background: To evaluate the gingival health and secondary caries associated with zirconia, luxa and strip crowns at 3-, 6- and 9-month intervals. **Materials & methods:** A total of 30 subjects of 4 to 9 years of age were enrolled in this study. 30 deciduous anterior teeth were included after fulfilling the inclusion criteria and were randomly divided into 3 groups with 10 in each group; Group 1: deciduous anterior teeth were restored with zirconia, group 2: deciduous teeth were restored with luxa crowns and group 3: deciduous teeth were restored with strip crowns. Patients were recalled after 3,6 and 9 months to evaluate the gingival health status and secondary caries. Data was collected and result was analysed using chi- square test and SPSS (Statistical Package for the Social Sciences 2016) software. **Results:** A total of 30 deciduous teeth were included in this study. Gingival health was measured using WHO probe and bleeding on probing was recorded. At the 6-months follow-up also more teeth in the strip crown group were bleeding. However, at the last follow-up visit at 9 months all the groups showed no bleeding. Secondary caries of zirconia crowns, luxa crowns and resin strip crowns were compared and astatistically significant difference was found between them at 9 months. No secondary caries was seen in zirconia crown and luxa at 3-, 6-, and 9-month intervals. **Conclusion:** Zirconia and luxa crowns were found to be best full coronalesthetic restoratives to be used for primary deciduous teeth.

Keywords: full coronalesthetic restorationzirconia, luxa crowns, strip crowns, early childhood caries, deciduous teeth.

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INTRODUCTION

Early childhood caries(ECC) is defined as "the presence of one or more decayed (non-cavitated or cavitated lesion), missing (due to caries) or filled tooth surface in any primary tooth in children less than 71 months of age or younger (AAPD). Primary teeth with two or more decayed surfaces should be restored with full coronal restorations. So, conservation of the decayed primary anterior teeth is of utmost importance until their exfoliation as they act as a natural space maintainer**.** Early childhood caries often results in loss of the clinical crown structure in primary maxillary anteriors. [1] Early loss of these teeth has deleterious effects, viz. space loss, speech problems, tongue thrusting habit, and psychological effects. To restore such severely damaged teeth with pulpal involvement is always a challenging task for the dentist. With the advancement of dental materials and techniques in conservative dentistry, a multitude of esthetic treatment modalities has been introduced for the management of dental caries and trauma in the primary dentition. [2]

Full-coronal esthetic restorations are advocated for restoration of primary anterior teeth, such as resin composite strip crowns, [3] ready-made crowns like pre-veneered stainless-steel crowns (PVSSC),[4] and the recently introduced prefabricated primary zirconia crowns[5].Stainless steel crowns were the choice of full coronal restoration, as they were easily available as preformed, pretrimmed and pre-contoured crowns with wide range of sizes and with proven clinical efficiency.[6]Stainless steel crowns, introduced by "Rocky Mountain" company were later improved by various manufacturers. The only disadvantage of SSC was its unesthetic appearance[7]as well as non-availability of anterior stainless steel crowns in Indian market. More recently, zirconia aesthetic crowns for pediatric patients appeared in the market. Zirconia is a

crystal-like dioxide of zirconium that possess a metal like mechanical properties and a tooth like color, 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.[8]The technological advances in material science led to the evolution of preformed zirconia crowns for primary teeth, so as to fulfil the esthetic demands, at the same time promise good durability. Zirconia crowns are known as "Ceramic Steel" as it provides strength close to available metal crowns as well as color similar to that of natural teeth. Pediatric zirconia crowns were introduced by EZ-pedo and became commercially available in 2008. Later preformed zirconia crowns were popularized by companies like Nusmile, Kinderkrowns, Cheng crowns, Signature crowns, kids-e-crowns and many more. These preformed crowns differed with respect to size, shape, shade, and pattern of retention component[9]. Also, a new self-curing temporizing material (DMG Luxa, U.S.A) has been added to the esthetic restorative materials. Luxa crowns are a bis-acrylate composite resin restorative.The resin/celluloid strip crowns are commonly used in dental practice but is technique sensitive and requires a favorable amount of tooth to be present for rehabilitation(Figure1,2,3). Hence, this study was conducted to evaluate the zirconia, luxa and strip crowns.

MATERIALS & METHODS

The research was carried outin the Department of pediatric and Preventive Dentistry, Guru Nanak Dev Dental College and Research Institute, Punjab, India after obtaining an approval from the ethical committee of Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India.A total of 30 subjects, 4 to 9 years of age were enrolled in our study. 30 deciduous teeth that fulfilled the inclusion and exclusion criteria, were included in this study. The crowns were randomly divided into 3 groups with 10 teeth falling in each group.Group 1: zirconia(Kids-e-crown, India), group 2: luxa crowns (DMG Luxa, Germany) and group 3: strip crowns(3M ESPE). Medical and dental history was taken. The teeth that were to receive zirconia crowns were prepared with 2 mm reduction of incisal edge, interproximal contacts - 1–2mm, Labial and lingual reduction- 0.5–1mm, margins were kept feather edge- 1–2 mm sub-gingivally. The teeth that were to receive luxa crowns, a reduction of 1.5 mm from all sides was done, strip crown of appropriate mesio-distal width was selected and loaded with the luxa material using automix syringe. Loaded strip crowns: placed on the prepared tooth and removed while its elastic stage. Crown was allowed to set extraorally, and strip crown was peeled.Finished crown was cemented over the prepared crown using the resin-modified glass ionomer Cement. The teeth that were to receive strip crowns were prepared with1.5mm reduction ofIncisal edge – 1.5 mm, Interproximal contacts – 0.5 – 1 mm, Labial and lingual reduction- 0.5 - 1mm, and Feather edge margins- 1–2 mm sub-gingivally.

Patients were recalled after 3,6 and 9 months to evaluate the gingival health and secondary caries. Data was collected and result was analysed using chi-square test and SPSS software.

INCLUSION CRITERIA

- Healthy 3-6 years old children.
- Minimal two surfaces of caries in primary deciduous teeth.
- Two-thirds of root structure present radiographically and one-third crown structure.
- Traumatic fracture/discoloration of anterior deciduous teeth
- No periodontal involvement of tooth/teeth.
- Co-operative patients (Frankl 1 and 2).

EXCLUSION CRITERIA

- Teeth with proximity to exfoliation and resorption of root (more than half).
- Presence of single surface caries with no proximal lesions.
- Non-cooperative patients.

Figure 1 (Zirconia crowns)

Figure 2 (Luxa crowns)

Figure 3 (Strip Crowns)

RESULTS

A total of 30 deciduous crowns were included. Gingival health as measured by bleeding with probing was recorded. As the data of all parameters did not follow normal distribution pattern, the non-metric test (chi-square test) was used to analyse the data of these groups. It can be seen that at the 3-months follow-up significantly more teeth in the strip crown group were

bleeding compared to the zirconia group. At the 6-months follow-up also more teeth in the strip crown group were bleeding. However, at the last follow-up visit at 9 months all the groups showed no bleeding.

Table 1: Gingival health (bleeding on probing)

Gingival health (bleeding on probing)	Zirconia crown	Strip crown	Luxa crown
At 3 months	2 (20%)	4 (40%)*	2 (20%)
6 months	0 (100%)	2 (20%)	0 (100%)
9 months	0 (100%)	0 (100%)	0 (100%)

Chi-square test (*p <0.05 significant, p>0.05 non-significant NS)

Table 2: secondary caries

Groups	3 months	6 months	9 months	
	No caries	No caries	No caries	Caries present
Strip crown	10 (100%)	10 (100%)	6 (60%)	4 (40%)*
Zirconia	10 (100%)	10 (100%)	10 (100%)	-
Luxa crowns	10 (100%)	10 (100%)	10 (100%)	-

Chi-square test (*p <0.05 significant, p>0.05 non-significant NS)

Secondary caries of zirconia crowns, luxa crowns and resin strip crowns were compared. Statistically significant difference (pValue<0.040) was found between them at 9 months. No secondary caries was seen in zirconia crown, luxa and stainless-steel crown at 3-, 6-, and 9-month intervals. But resin strip crowns showed 40% of cases with secondary caries. The drawback for stainless steel crown was the visibility so not preferably used as anterior crown.

DISCUSSION

Child's oral health represents an important aspect of the overall health. Dental problems can cause alterations in child's general health status, growth, and quality of life. The most common oral health problem is dental caries. Dental caries can occur in any age group but when it affects very young children, it is referred as early childhood caries (ECC). Different stages of ECC have different treatment plans. The treatment option for initial white spots lesions (enamel demineralization) consistof topical fluoride applications, oral hygiene maintenance, and improving eating habits. When dental lesions invade into dentin, tooth restorations are needed. Endodontic treatment followed by full-coronal restoration is generally the treatment of choice when pulp is involved in damaged teeth.[10]Esthetic rehabilitation of deciduous teeth is one of the most challengingtasks in dentistry. Despite the abundant availability materials, selection of an ideal material for full coronal restoration in primary anterior teeth remains a hard task.In addition to prefabricated zirconia crowns, stainless-steel crowns, pre-veneered stainless-steel crowns, open-faced stainless-steel crowns, polycarbonate crowns, and resin composite strip crowns are available options as full coronal restoration materials for primary anterior and posterior teeth.None of these materials present, individually, good esthetic proprieties, durability, biocompatibility, and high resistance to occlusal loads, except zirconia crown. Hence, this study was conducted to evaluate the zirconia, luxa and strip crowns in anterior primary teeth.

In our study, a total of 30 deciduous crowns were included. Gingival health as measured by bleeding with probing was recorded. It can be seen that at the 3-months follow-up significantly more teeth in the strip crown group were bleeding compared to the zirconia group. At the 6-months follow-up also more teeth in the strip crown group were bleeding. However, at the last follow-up visit at 9 months all the groups showed no bleeding. A study by Nischal M et al, evaluated the surface texture, anatomical form, marginal integrity, marginal discoloration, and secondary caries of three different types of crowns in primary anterior teeth at different time intervals of 3, 6, and 9 months. Total 45 primary maxillary incisors were randomly selected and divided into three groups of 15 each: group I—strip crowns (3M, United States), group II—zirconia crown (kids-e-crown, India), and group III—luxa crown (DMG, Germany). Statistically non-significant difference was observed for most of the parameters except marginal integrity and secondary caries. Resin strip crowns showed maximum cases with distorted marginal integrity and secondary caries.[11]

In the present study, Secondary caries of zirconia crowns, luxa crowns and resin strip crowns were compared. Statistically significant difference was found between them at 9 months. No secondary caries was seen in zirconia crown and luxa crown at 3-, 6-, and 9-month intervals. But resin strip crowns showed 40% of cases with secondary caries.

Another study by Alaki SM et al, compared prefabricated primary zirconia with resin composite strip crowns on primary maxillary central and lateral incisors with regards to gingival health, plaque accumulation, recurrent caries, restoration failure, and opposing teeth wear over a period of 3, 6 and 12 months. A total of 120 teeth were treated; 60 with zirconia and 60 with strip crowns. Level of significance was set at ($\alpha = 0.05$) and level of confidence at (95%). Zirconia crowns showed

significantly less gingival bleeding at the 3- and 6-months follow up periods ($p < 0.006$, $p < 0.001$; respectively), less plaque accumulation at all follow up visits ($p < 0.001$), no restoration failure ($p < 0.001$), but more wear to opposing teeth ($p < 0.02$). No significant difference was found between the two crowns with regards to recurrent caries ($p < 0.135$).[12]

A retrospective study done in 2003 by Kupietzky et al.[13] included 112 composite resin strip crowns found that 43% of the restored teeth showed gingival irritations around the crowns. These findings could be explained as the gingival health of teeth restored with composite strip crowns can be affected by tooth preparation and finishing[14]. Unfortunately, upon reviewing the literature there were no sufficient data with regards to gingival response related to primary teeth restored by composite resin strip crowns. Padbury (2003), suggested placement of the strip crown margin supra gingivally to reduce gingival inflammation[15].

CONCLUSION

Zirconia and luxa crowns were the best esthetic crowns for primary anteriors.Resin strip crowns have lower success rate and high occurrence of secondary caries. Disadvantagesof zirconia and luxa being that a greater amount of tooth reduction and the cost percrown as compared to strip crowns.

REFERENCES

1. Lee JK. Restoration of primary anterior teeth: a review of literature. Pediatr Dent. 2002;;24::506—511.
2. Muhamad AH, Azzaldeen A, Mai A. Strip crowns technique for restoration of primary anterior teeth: case report. J Dent Med Sci. 2015;;14((12):):48—53.
3. Mendes FM, De Benedetto MS, Zardetto CG, et al. Resin composite restoration in primary anterior teeth using short-post technique and strip crowns: a case report. Quintessence Int. 2004;;35((9):):689—692.
4. Usha M, Deepak V, Venkat S, et al. Treatment of severely mutilated incisors: a challenge to the pedodontist. J Indian Soc Pedod Prev Dent. 2007;;25(Suppl:):S34—S36.
5. Walia T, Salami AA, Bashiri R, et al. A randomised controlled trial of three aesthetic full-coronal restorations in primary maxillary teeth. Eur J Paediatr Dent. 2014;;15((2):):113—118.. doi: 10.1007/s40368-013-0072-1. DOI:
6. Messer LB, Levering NJ. The durability of primary molar restorations: II. Observations and predictions of success of stainless steel crowns. Pediatr Dent. 1988;10(02):81–85.
7. Clinical AC. American Academy of Pediatric Dentistry. Guideline on pediatric restorative dentistry. Pediatr Dent. 2012;34(05):173
8. Bona AD, Pecho OE, Alessandretti R. Zirconia as a dental biomaterial. Materials (Basel). 2015;8(8):4978–4991. doi: 10.3390/ma8084978.
9. Tote J, Gadhane A, Das G, et al. Posterior esthetic crowns in peadiatric dentistry. Int J Dent Med Res. 2015;1(06):197
10. Kumar R, Sinha A. Restoration of primary anterior teeth affected by early childhood caries using modified omega loops- a case report. Annals of Dental. 2014;;2((4):):24—26
11. Nischal M, Gupta T, Mehra M, Sadana G. Clinical Comparison of Three Tooth-colored Full-coronal Restorations in Primary Maxillary Incisors. Int J Clin Pediatr Dent. 2020 Nov-Dec;13(6):622-629. doi: 10.5005/jp-journals-10005-1842. PMID: 33976486; PMCID: PMC8060937.
12. Alaki SM, Abdulhadi BS, AbdElBaki MA, Alamoudi NM. Comparing zirconia to anterior strip crowns in primary anterior teeth in children: a randomized clinical trial. BMC Oral Health. 2020 Nov 10;20(1):313. doi: 10.1186/s12903-020-01305-1. PMID: 33167954; PMCID: PMC7654025.
13. Kupietzky A, Waggoner WF, Galea J. The clinical and radiographic success of bonded resin composite strip crowns for primary incisors. Pediatr Dent. 2003;25(6):577–581.
14. Waggoner WF. Restorative dentistry for the primary dentition. 4. Philadelphia: WB Sounders Co; 2005.
15. Padbury A, Jr, Eber R, Wang HL. Interactions between the gingiva and the margin of restorations. J Clin Periodontol. 2003;30(5):379–385. doi: 10.1034/j.1600-051X.2003.01277.x.