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Original Research Article

Endocrowns: a retrospective study among Riyadh Elm university dental clinics

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ABSTRACT

Background: Endocrowns are created from mono-block porcelain containing the invaded coronal portion of the apical projection that fills the space of the pulp chamber, and probably the entrances of the root canal. This makes restoring endodontically extensive damaged teeth challenging and difficult.
Methods: This is a retrospective chart review study essentially compiling and analyzing records from all patients consecutively treated with endocrowns which was performed by residents and students, carried out in Riyadh Elm university in Riyadh.
Results: Out of 41 endo-crown cases 65.9% were successful according to follow up time and radiographic examination, and 34.1% is still under investigation. Furthermore, 51.2% were male patients while 70.7% were in the age group of 22 to 49 years. About 63.4% had treatment for the lower teeth and all the cases teeth were posterior. The period of longevity was 6 to 24 months in 51.2% of subjects.
Conclusions: Additional scientific studies and clinical examination on a larger sample size are needed to assess the long-term efficacy of endocrown. However, it appears to be a conservative and an aesthetic treatment with long-term survival benefits.

Keywords: Endocrowns, Endodontically treated teeth, Conventional crowns

INTRODUCTION

Among the rehabilitative treatments proposed in the literature for the restoration of severely damaged coronal hard tissue due to caries, physical trauma, abrasions, erosion and endodontically treated teeth that may be subjected to intense stress under functional forces; fractures in these teeth are often observed.[1] Pissis performed the first study published on endocrown in 1995 and he described the ceramic mono-block technique for teeth with significant loss of coronal structure.[2] But in 1999 it was Bindl and Mormann who defined the endocrown procedure as a restorative operation.[3]

Endocrowns are created from a mono-block porcelain containing invaded coronal portion of apical projection that fills the space of the pulp chamber, and probably the entrances of the root canal. Restoring endodontically extensive damaged teeth is challenging and the most commonly used restoration procedure performed for most of the cases is the post retained restoration.[4] Meanwhile, post impedes inside the root gives only one benefit which increases the retention of the core foundation conversely and weakens the tooth by removing more sound tissue to fit the post inside the root and increase the risk of its fracture.[5] The use of coronal cusp coverage like endocrowns preserves and protects the remaining tooth

structure by reducing fracture resistance and improves the outcome of treatment with a less chair time needed.[1]

The longevity of endocrowns for molars proved to very acceptable results over 12 years.[6] In case of premolars, many studies showed that it can be used as conservative and high aesthetic restoration which results in same longevity in comparison with conventional restoration.[1,7]

METHODS

Study design

This is a retrospective chart review study compiling and analyzing records from all patients treated with endocrowns which was performed by dental residents and students at Riyadh Elm university (REU) dental clinics in Riyadh, Saudi Arabia. Registration and ethical approval were obtained from the ethical committee of the college before conducting the study and approved by the institutional review board (IRB) of Riyadh Elm university on the 1st of March 2020. Consent forms declaring that the patient's examination records belonged to the university and could be used for research studies were signed by patients during their first visit to the Riyadh Elm university dental clinics. Patients' data were kept secure, and confidentiality was preserved. Data collection took place over three months from February 2020 to April 2020. Therefore, a comprehensive database was obtained from the personal records and the clinical radiographs of the patients that had been treated with endocrowns at REU dental clinics from 6 to 24 months. We included patients that were treated with endocrowns, molars that was evaluated in REU dental clinics for at least 4 months. We excluded premolars, follow up period less than 6 months or more than 24 months and treatment with no post-operative radiographs. Data from clinical radiographs were collected and examined on each patient and evaluated on specially designed checklist (Figure 1).

Gender:	[ ] Male	[ ] Female		
Age group	[ ] Less than 21	[ ] Less than 21 y.	[ ] 22–49 y.	[ ] 50 y. and above
Tooth location	[ ] Upper	[ ] Lower		
Tooth type	[ ] Anterior	[ ] Premolar	[ ] Posterior	
Longevity:	[ ] Less than 6 months	[ ] 6–24 months	[ ] 24 month or more	
Oral hygien:	[ ] Good	[ ] Fair	[ ] Poor	
Periodontal disease:	[ ] absent or stabilized	[ ] Present		
Stress distribution:	[ ] widely distributed (Full dentition or few missing teeth)		[ ] stress concentrated (duo to single or few teeth or malocclusion)	
Type of restorative material:	[ ] Lithium disilicate ceramic	[ ] Leucite–reinforced ceramic	[ ] Zirconia	[ ] Other.
Type of Bonding material:	[ ] Conventional cement		[ ] Adhesive cement (Resin cement)	
Type of Resin Cement used: (Skip if conventional cement was used)	[ ] Conventional resin cement		[ ] Self adhesive resin cement	
Depth of the pulp chamber:	[ ] less than 3 mm	[ ] 3–5 mm	[ ] more than 5 mm	
Ferrule prepration	[ ] 0 mm Ferrule	[ ] 1 mm Ferrule	[ ] 2 mm Ferrule or more.	
Vertical Clinical Crown Height:	[ ] Less than 3 mm	[ ] 3–7 mm	[ ] more than 7 mm	
Butt margin thickness	[ ] Less than 1 mm	[ ] 1–1.5 mm	[ ] 1.5 mm and more	

Figure 1: Designed clinical checklist.

Statistical analysis

Data were analyzed using SPSS 24.0 version statistical software (IBM Inc., Chicago, USA). Descriptive statistics (frequencies and percentages) were used to describe the categorical study variables. Non-parametric Chi-square statistical test was used to compare the distribution of observed frequencies with expected frequencies of categorical study variables. A $p \leq 0.05$ was used to report the statistically significant of results.

RESULTS

Out of the 41 cases which were studied retrospectively, 51.2% were male subjects and 70.7% were in the age group of 22 to 49 years. About 63.4% had treatment for the lower teeth and all the included teeth were posterior. The period of longevity was 6 to 24 months in 51.2% of subjects. Only 31.7% of them had maintained good oral hygiene and 36.6% of them had periodontal disease. A high proportion of them (95.1%) were widely disturbed (Table 1).

Table 1: Distribution of demographic and clinical characteristics of study subjects, (n=41).

Characteristics	N (%)
Age group (years)	
Less than 21	8 (19.5)
22-49	29 (70.7)
≥50	4 (9.8)
Gender	
Male	21 (51.2)
Female	20 (48.8)
Tooth location	
Upper	15 (36.6)
Lower	26 (63.4)
Tooth type	
Anterior	--
Posterior	41 (100)
Longevity (months)	
Less than 6	14 (34.1)
6-24	21 (51.2)
>24	6 (14.6)
Oral hygiene	
Good	13 (31.7)
Fair	23 (56.1)
Poor	5 (12.2)
Periodontal disease	
Absent or stabilized	26 (63.4)
Present	15 (36.6)
Stress distribution	
Widely disturbed	39 (95.1)

The comparison of the distribution of clinical characteristics showed a statistically significant difference in the distribution of observed frequencies for the characteristics, longevity, oral hygiene and stress distribution. That is a higher proportion of cases, more than 50% had the longevity of 6 to 24 months, 34.1% had less than 6 months and 14.6% had >24 months which is statistically significant (p=0.016). The oral hygiene which was assessed as 'fair' in 56.1% is high when compared with, as good in 31.7% and 12.2% as poor and was statistically significant (p=0.003). A significantly higher proportion of cases (95.1%) were widely disturbed when compared with only 4.9% who were only observed as stress concentrated which is statistically significant (p<0.0001). Other characteristics (tooth location, periodontal disease) distribution was not statistically significantly different.

Table 2: Comparison of distribution of clinical characteristics of study subjects, (n=41).

Characteristics	N (%)	X^2 value	P value
Tooth location			
Upper	15 (36.6)	2.951	0.086
Lower	26 (63.4)		
Tooth type			
Anterior	--	--	--
Posterior	41 (100)		
Longevity (months)			
Less than 6	14 (34.1)	8.244	0.016
6-24	21 (51.2)		
>24	6 (14.6)		
Oral hygiene			
Good	13 (31.7)	11.902	0.003
Fair	23 (56.1)		
Poor	5 (12.2)		
Periodontal disease			
Absent/stabilized	26 (63.4)	2.951	0.086
Present	15 (36.6)		
Stress distribution			
Widely disturbed	39 (95.1)	33.3	<0.0001
Stress concentrated	2 (4.9)		

The comparison of the distribution of the treatment characteristics showed a statistically significant difference in the distribution of observed frequencies for the characteristics, type of bonding material, type of resin cement, depth of pulp chamber, vertical clinical crown height, butt margin thickness and treatment success. For the type of bonding material, adhesive cement was used in 87.8% of cases when compared with conventional cement in 12.2% of cases which is statistically significant (p<0.0001). Also, for the type of resin cement, in 82.9% of cases, adhesive cement was used when compared with conventional cement in 17.1% of cases which was statistically significant (p<0.0001). Towards the depth of the pulp chamber, in 53.7% of cases 3-5 mm was used, when compared to less than 3 mm in 26.8% and >5 mm in 19.5% of cases it was statistically significant (p=0.019). For the vertical clinical crown height, in 80.5% of cases 3-7 mm was used, when compared to less than 3 mm in 4.9% cases and 7 mm and above in 14.6% cases it was statistically significant (p<0.0001). For butt margin thickness it was observed that in 61% of cases 1

to 1.5 mm was used when compared with less than1mm in 12.2% and 1.5 mm & above in 26.8% of cases which is highly statistically significant (p<0.0001). The treatment success which was categorized as 'successful', 'under investigation' and 'not successful' also statistically significant where 65.9% of cases were successful, which was statistically significant (p=0.042).

Table 3: Comparison of distribution of treatment characteristics and its outcome of study subjects.

Characteristics	N (%)	X^2 value	P value
Type of restorative material			
Lithium disilicate ceramic	41 (100)	--	--
Leucite reinforced ceramic	--		
Zirconia	--		
Other	--		
Type of bonding material			
Conventional cement	5 (12.2)	23.439	<0.0001
Adhesive cement	36 (87.8)		
Type of resin cement			
Conventional cement	7 (17.1)	17.780	<0.0001
Adhesive cement	34 (82.9)		
Depth of pulp chamber (mm)			
Less than 3	11 (26.8)	7.951	0.019
3-5	22 (53.7)		
>5	8 (19.5)		
Ferule preparation (mm)			
0	41 (100)	---	---
1	--		
2 and more	--		
Vertical clinical crown height (mm)			
Less than 3	2 (4.9)	41.610	<0.0001
3-7	33 (80.5)		
7 and above	6 (14.6)		
Butt margin thickness (mm)			
Less than 1	5 (12.2)	15.415	<0.0001
1 to 1.5	25 (61)		
1.5 and above	11 (26.8)		
Treatment success			
Successful	27 (65.9)	4.122	0.042
Under investigation	14 (34.1)		
Not successful	--		

The association of success of treatment with other clinical variables could not be carried due to the low number of cases, and further investigations will be conducted when there is enough number of cases to assess the success rate of endocrowns.

DISCUSSION

The objective of this retrospective study is to assess if endocrowns success rate will be similar to the conventional treatment in Riyadh Elm university dental clinics that have been done by students and residents according to radiographic assessment and follow-up time. The analysis showed that endocrown was a successful treatment according to follow-up time and the radiographic examination with a 65.9% of the forty-one cases and the rest of the cases that had less than six-months follow-up time, the analysis showed some deficiency due to the limited sample size but there was no association of success of treatment with the other clinical variables.

According to the available information and analysis there are no sufficient data that accept the research hypothesize, but the treatment success according to the follow-up time emphasize that endocrown can be an alternative to the conventional treatment. However, the overall clinical quality of the Cerec endocrowns was very good, and so far, the clinical concept appears feasible which goes along with the literature.[8]

The longevity of endocrown proved to be a very acceptable results over 12 years.[6] Endocrowns may perform similarly or better than the conventional treatments using intraradicular posts, direct composite resin or inlay/onlay restorations.[5] Endocrowns were shown to constitute a reliable approach to restore severely damaged molars and premolars, even in the presence of extensive coronal tissue loss or occlusal risk factors, such as bruxism or unfavorable occlusal relationships.[9]

Limitation of the study include the small sample size which does not represent the population size. Furthermore, it is file dependent and variation between the operator was not considered. A larger size multi-center study is recommended to assess the actual efficacy of the endocrown treatment and its relation to aesthetic and outcome.

CONCLUSION

Based on the high clinical success rates of endocrowns, and due to the limitations of this retrospective study, it may be inferred that endocrown is a conservative and esthetic treatment for restoring endodontically treated teeth, especially molars, with a very acceptable long-term survival and good biomechanical and functional efficiency. Despite a limited sample size, our results highlight several factors that need to be considered to achieve an excellent clinical outcome.

More scientific studies and clinical examination on a larger sample size will be performed to assess the long-term efficacy of endocrowns.

The results of this retrospective study should be interpreted with caution and cannot be considered to give definitive answers because of the limitation of the sample size.

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REFERENCES

1. Lin CL, Chang YH, Pa CA. Estimation of the risk of failure for an endodontically treated maxillary premolar with MODP preparation and CAD/CAM ceramic restorations. J endodontics. 2009;35(10):1391-5.
2. Pissis P. Fabrication of a metal-free ceramic restoration utilizing the monobloc technique. Practical periodontics and aesthetic dentistry;PPAD. 1995;7(5):83-94.
3. Hamdy A. Effect of full coverage, endocrowns, onlays, inlays restorations on fracture resistance of endodontically treated molars. J Dental Oral Health. 2015;5:2.
4. Baba NZ, White SN, Bogen G. Restoration of Endodontically Treated Teeth. In: Endodontic Prognosis. Springer. 2017:161-92.
5. Sedrez-Porto JA, Rosa WL, Da Silva AF, Münchow EA, Pereira-Cenci T. Endocrown restorations: A systematic review and meta-analysis. J dentistry. 2016;52:8-14.
6. Otto T, Mörmann WH. Clinical performance of chairside CAD/CAM feldspathic ceramic posterior shoulder crowns and endocrowns up to 12 years. Int J Computerized dentistry. 2015;18(2):147-61.
7. Lin CL, Chang YH, Chang CY, Pai CA, Huang SF. Finite element and Weibull analyses to estimate failure risks in the ceramic endocrown and classical crown for endodontically treated maxillary premolar. Eur J Oral Sci. 2010;118(1):87-93.
8. Bindl A, Mörmann WH. Clinical evaluation of adhesively placed Cerec endo-crowns after 2 years-preliminary results. J adhesive dentistry. 1999;1(3):255-65.
9. Belleflamme MM, Geerts SO, Louwette MM, Grenade CF, Vanheusden AJ, Mainjot AK. No post-no core approach to restore severely damaged posterior teeth: An up to 10-year retrospective study of documented endocrown cases. J dentistry. 2017;63:1-7.

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