



Success and Survival Rates of Teeth Restored With Cast Post and Core among National Guard Health Affairs Patients, Riyadh, Saudi Arabia

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Abstract

Purpose: To determine the success and survival rates of endodontically treated teeth restored with cast post and core among NGH A patients in Riyadh, Saudi Arabia.

Materials and Methods: This retrospective study was conducted in King Abdulaziz Dental Centre (KADC) in Riyadh during November 2015 – April 2016. Fifty seven patients with 140 intraradicular cast posts were included. Patients were evaluated both clinically and radiographically according to the FDI criteria for the evaluation of direct and indirect restorations by two independent examiners, one examiner for the radiographic and another for the clinical examination, after obtaining a well-written and explained informed consent form.

Results: Of 140 endodontically treated teeth restored with cast post and core, 65 (46.4%) teeth showed one or more of the radiographic failure and 76 (54.3%) showed one or more clinical sign of failure. The accumulative failure rate was 72.9 % which include relative failure of 45.0% and absolute failure of 27.9%. The majority of the radiographic failure involve; periapical lesion 30.7% and recurrent caries 24.3%. The majority of the clinical failure involve; dental caries 19.3% and periodontal pocket of more than 4mm 19.3%. The survival and success rate were 27.1% and 72.1% respectively.

Conclusion: Numerous complications and high failure rate were noted among endodontically treated teeth restored with cast post and core. This raise a question about the validity of selecting cast post and core to restore endodontically treated teeth in the presence of other advanced and recent alternative intraradicular retention systems. However, retrospective nature and small sample size caution us to conclude our findings. Further randomized clinical trials are needed with long term follow up period to build upon the findings of this study.

Keywords: Gingival recession; Core debonding; Post and core restorations; Incisors; Premolars

Abbreviations: ASA: American Academy of Anesthesiology; NGH A: National Guard Health Affairs; KADC: King Abdulaziz Dental Centre

Introduction

Endodontically treated teeth usually require intraradicular restoration for retention aspects due to extensive loss of tooth structure resulting from caries, trauma and access cavity preparation. Post and core restorations are usually used in root canal treated teeth that require additional measures in order to receive optimum restorations that adequately serve both functional and aesthetic purposes. Post and core restorations with their different systems were suggested as a successful method to increase retention for the coronal restoration [1]. The most critical factor in avoiding complication with intraradicular retention is preserving tooth structure [2,3]. In the past, the most widely used post and core system was metal cast post and core [4,5]. Furthermore, according to some, cast post and core intraradicular

retention system is still considered the established technique or gold standard post system for restoring extensively damaged and endodontically treated teeth [6,7]. This treatment modality has maintained its popularity and credibility throughout the years. Custom-fabricated post and cores using a standardized fabrication technique have shown a good long-term prognosis with an average survival time of 7.3 years [8]. Despite its popularity, cast post and core still has many disadvantages such as root fracture, periapical lesion, and dislodgment [9].

Furthermore, the introduction of other post systems with comparable success and survival rates provides an alternative to cast post system for root canal treated teeth [5]. Multiple in vivo studies concluded low success rate and higher failure for cast

post and core such as in Ferrari et al in 1995, who found that cast post and core showed high percentage of failure 14% and low success rate 84% [9]. In 2007 found that failure rates of 8.82% were observed in the cast metal post after 4 years of clinical service [10]. Another study of GA Preethi et al. [11] found that the success rate of the cast post and core was 90% after only one year [11]. The range of survival rates of cast post and core - according to Fokingga et al. [3] was between 78-94% [3]. Also in a number of *in vitro* studies they found that the fracture resistance of cast post and core is not the highest as has been advocated by clinical expertise as demonstrated by Giovanni A et al. [12]. Abduljabbar T et al. [13] found that the average load required to fracture cast post & core systems was 541.2 N which is relatively comparable to other systems.

Concerning fracture patterns, variety of studies showed that most fracture patterns are usually unfavorable if they occur when using cast post & core where fractures occurred in the tooth structure [14]. In addition, Abduljabbar T et al. [13] concluded that 90% of fracture patterns of teeth restored with cast post and core were unfavorable (i.e. tooth is not restorable) [13]. In the same topic a study was done by Salameh Z et al. [15] concluded that teeth restored with cast post and core were significantly more associated with unfavorable fracture with a percentage of more than 50% of the study sample. Regarding the success rate in relation to the type of tooth, GA Preethi et al. [11] in 2008 found that cast post and core has the least success rate when used in single rooted upper anterior teeth. While in an *in vitro* study done by C.G. Castro et al. [16] studied if the type of tooth had any effect in the fracture resistance, He found that canines and molars had significantly higher values of fracture resistance than incisors and premolars. The aim of this study is to determine the survival and success rates of endodontically treated teeth restored with cast post and core among patients of National Guard Health Affairs, Riyadh, Saudi Arabia.

Methodology

This retrospective study was conducted in King Abdulaziz Dental Centre (KADC) in Riyadh during November 2015 to April 2016. All medical record numbers for patients who received cast post and cores were obtained from dental lab in KADC. Five hundred and forty files were chosen using a simple random sampling. Patients' records were reviewed after obtaining the permission from medical records department in KAMC. Based on our inclusion and exclusion criteria sample size was 169 patients.

We excluded all those patient files which had insufficient information about the demographic data or contact information, pregnant females and those who had other types of cement. Fifty seven patients with 140 intraradicular cast posts were included in this retrospective study. During the review of the included files, information of age of the post, number of treated teeth, type of cement, type of coronal restoration and whether the treatment provider is a specialist or a resident were recorded using special

form. The selected patients were contacted by phone and invited to participate in the study. The patients were provided with the details of the evaluation. Subjects were invited to KADC clinics for examination. Patients were evaluated both clinically and radiographically according to the FDI criteria for the evaluation of direct and indirect restorations by two independent examiners after obtaining a well-written and explained consent form [17].

Every endodontically treated tooth with intraradicular cast post and core system was evaluated both radiographically and clinically. Radiographically by an intraoral periapical radiograph taken by paralleling technique and interpreted for any recurrent caries, periapical lesions, root fracture and furcation involvement. Clinical examination done by using an explorer, periodontal probe (William's probe) and mouth mirror. Moreover patients were investigated about any episodes of pain, pain on percussion, discomfort or bleeding related to the tooth of interest and patients' oral hygiene was evaluated by using Silness and Loe plaque Index on Ramjford teeth. The assessment sheet included information on patient's age, gender, American Academy of Anesthesiology (ASA) classification, tooth number and type and time the restoration had been in clinical service. All outcomes were categorized as relative or absolute failure. Any radiographic and clinical sign of failure was considered as absolute failure. While presence of either radiographic or clinical sign considered as a relative failure. Success was defined as absence of absolute and relative failure. Survival was defined as the absence of absolute failure [18,19]. Patients with failed post and cores were referred to the dental clinics for further management. The data were analyzed using SPSS software. A P value of 0.05 and less was considered statistically significant.

Results

In this study 140 teeth, of whom 91 (65%) belonged to female patients and 49 (35%) to male patients, were examined at the dental center of King Abdulaziz Medical City (Table 1). The age of the patients ranged between 17 to 82 years old with a mean age of 40 years. Eighty four (60%) patients claimed they do not have any medical condition, while 56 (40%) claimed to have at least one medical condition. Of the total teeth the majority of the teeth were molars and premolars - 103 (73.6%) - while 37 (26.4%) were incisors and canines. The posterior teeth have higher failure rate comparing to the anterior teeth with the difference being statistically not significant ($P=0.071$). Treatment was provided by either a specialist 92 (65.7%) or resident 48 (34.3%). The failure rate was higher among teeth which had been treated by resident however the difference being statically insignificant ($P=0.348$). Regarding smoking, 10 (17.6%) of the patients were smokers while 47 (82.4%) were nonsmokers. The failure in smokers was not statistically significant ($P=0.193$) when compared to non-smoker patients. One of the major factors for having healthy dentition was good oral hygiene practice. The patients in this study had different oral hygiene status ranging from excellent 2

(3.5%), good 20 (35.1%), fair 28 (49.1 %) and poor 7(12.3%). The result showed that the difference in oral hygiene status had no significant effect in relation to the failure (P =0.999). The post were cemented using GIC, resin cement and zinc phosphate cement with a percentage of 79.3%, 4.3%,and 16.4% respectively. The difference among the different types of post cement in relation to the failure was not statistically significant (P=0.42). Ninety eight (70%) of the total teeth were restored with Porcelain Fused to Metal for single crowns while 9 (6.4%) were used as abutments for fixed partial denture. The other 33 (23.6%) teeth were left without a final restoration (Table 2). The final restoration showed insignificant difference (P =0.058) in relation to failure. The radiographic failure includes presence of one or more of the following: recurrent caries, periapical lesion, root fracture, and furcation involvement (Table 3). Sixty five (46.4%) of the teeth showed at least one of the radiographic failure signs. Thirty four (24.3%) of teeth have radiographic recurrent caries while 43(30.7%) have radiographic periapical lesion. Radiographic root fracture and furcation involvement was in 1(0.7%) and 2(1.4%) teeth respectively Seventy six (54.3%) of the teeth showed one or more signs of the clinical failure which include: spontaneous pain, tenderness to percussion, caries, periodontal pocket of more than 4 mm, gingival recession, post and core debonding, post and core fracture, furcation involvement, mobility of post (Table 4). Only 3(2.1%) of the teeth had spontaneous pain while 4(2.9%) teeth were tender to percussion while 27(19.3%) teeth showed signs of recurrent caries clinically. Regarding periodontal problems, 27(19.3%) teeth have periodontal pocket more than 4mm while 17(12.1%) teeth have gingival recession. Nine (6.4%) of the post were debonded where 16(11.4%) of the post were mobile. Neither post and core fracture nor furcation Involvement was seen. The total failure rate which includes both absolute and relative failure was in 72.9 % of the teeth.

Table1: Demographic details of study participants.

Variable		N	%
Gender	Male	49	35
	Female	91	65
ASA	I	84	60.0
	II	50	35.7
	III	6	4.3
	IV	0	0
Smoking	Yes	28	20
	No	112	80
Oral Hygiene	Excellent	2	1.4
	Good	37	26.4
	Fair	90	64.3
	Poor	11	7.9

Table 2: Frequencies of the local factors associated with the sample been selected.

	Variable	N	%
Treatment Provider	Specialist	92	65.7
	Resident	48	34.3
Type of Post Cement	Zinc Phosphate	23	16.4
	Gic	111	79.3
	Resin Cement	6	4.3
Type of The Tooth	Anterior	37	26.4
	Posterior	103	73.6
Type of Coronal Restoration	Pfm Crown	98	70.4
	Fpd	9	6.4
	No Coronal	3	23.6
	Restoration		

Table3: Frequency of radiographic sings of failure.

Variable		N	%
Radiographic recurrent caries	No	106	75.7
Radiographic PA lesion	No	97	69.3
Radiographic Root Fracture	No	139	99.3
Radiographic Furcation Involvement	No	138	98.6

Table 4: Frequency of clinical sings of failure.

Variable		Subject (N)	Percent (%)
Spontaneous Pain	No	137	97.9
Tenderness to Percussion	No	136	97.1
Caries	No	113	80.7
Periodontal Pocket >4	No	113	80.7
Gingival Recession	No	123	87.9
Post And Core Debonding	No	131	93.6
Post and Core Fracture	No	140	100.0
Furcation Involvement	No	140	100.0
Stability of Post	No	16	11.4

The absolute failure includes both clinical and radiographic failure and the rate was 27.9%. While the relative failure involves all teeth that have either clinical or radiographic failure the rate was 45.0%. On the other hand, teeth which did not show any sign of clinical and radiographic failure were consider succeeded. The success rate of the total sample size was 27.1% (Figure 1) while the survival rate was 72.1%.

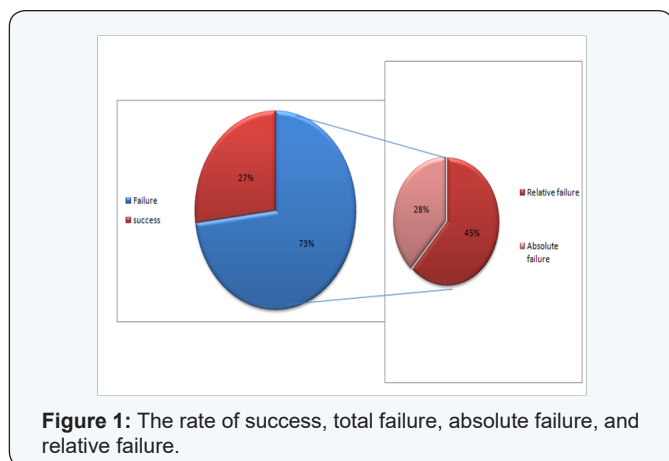


Figure 1: The rate of success, total failure, absolute failure, and relative failure.

Discussion

This retrospective study was conducted on 140 teeth belongs to both male and female subjects and aimed to determine the survival and success rates of endodontically treated teeth restored with cast post and core. The success rate was around one third of the total sample while the survival rate exceeded two thirds. Regarding the absolute and relative failure rates, they were observed among one third and half of the study sample respectfully. Failure rates due to caries and periodontal pockets were the highest among the teeth having clinical failure while periapical lesions were the most prevalent cause of radiographic failure.

The strength of the present study include: the level to which inclusion and exclusion criteria were set to meet, the informed consent which was obtained from all subjects, both male and female participants were included with multiple diversities and variations, examination was done both clinically and radiographically according to FDI criteria, patients that required further treatment and management were referred to be treated per complaint and at the end, outcomes of the study were clearly defined and all predictors for failure were analyzed. Regarding the sample distribution, the majority of our sample belongs to a middle age group who are classified as ASAI due to the fact that our study is both clinically and radiographically based which requires the presence of the patient in dental office that may be a challenge to elderly and/or patients with serious medical problems. Furthermore, most of the samples were posterior teeth restored with PFM crowns which are because posterior teeth have relatively less esthetic demands and require load-bearing restorations [20].

The high survival rate shown in our study goes along with what was proven by other studies as in Balkenhol et al. [21] which concluded that the survival probability of cast post and cores reaches up to 7.3 years. Also, Heydecke et al. [1] in his literature review mentioned that survival of cast post and cores ranges from 87.2 to 88.1%. The failure rates which were observed more in female patients who constituted the bulk of the study sample contradicts what was mentioned in Hikasa et al. [22] where he

stated that failure rates of cast metal posts and cores are more associated with males rather than females. In the same study it was mentioned that the higher the age of the patient at the cementation of the cast post and core the higher the failure rates observed which is in accordance with our findings.

The relative high survival rate showed in this study in the posterior teeth restored with cast post and core has been noted by Mentink et al. [7] who reported high survival rated among posterior teeth. The relative high failure rates observed among teeth treated by residents can be due to the wrong case selection and treatment planning errors as shown in Sarkis et al. [23] who concluded that dentists without post-graduate training used cast post and core more frequently as their first choice.

Although it was not statistically significant, smoking was more associated with higher failure rates, this can be explained by Tomar et al. [24] and Jang Ay et al. [25] where they found that smoking constitutes a risk factor for periodontal disease which may affect the longevity and survival of affected teeth. All teeth-related and patient-related factors addressed in this study such as type of tooth, final restoration, type of cement used, oral hygiene status and the ASA classification of the patients showed no influence on the success and survival rates. This can be explained in one way or another by the small sample size of the study which was the result of our restricted inclusion criteria requiring meticulous details in the documentation of each case.

When comparing the failure rates between the different cements included in this study, GIC had the most failure rates which contemplates what was mentioned in Zheng et al. [26] where he concluded that using GIC cement significantly aggravates coronal microleakage. The low success rate can be attributed to the fact that teeth requiring intracranial retention are usually severely destructed with little or no coronal structures which further compromises their long term prognosis as shown in Ferrari et al. [19]. In fact, most of our sample had fair to poor oral hygiene and reported that there were no follow up appointments which indicates that there weren't any kind of maintenance that is recommended in complex treatments involving multidisciplinary interventions.

All teeth-related and patient-related factors addressed in this study such as type of tooth, final restoration, type of cement used, oral hygiene status and the ASA classification of the patients showed no influence on the success and survival rates. This can be explained in one way or another by the small sample size of the study which was the result of our restricted inclusion criteria requiring meticulous details in the documentation of each case. The resultant success and survival rates were influenced by the fact that different treatment phases were done by different providers from the endodontic treatment through prosthodontic procedures and restorations. However, the sample included only teeth treated according to standards protocol which were illustrated in the patient file. Nevertheless retrospective nature of study caution us to conclude our findings as there are many factors that could

have resulted in endodontic failure. As survival rates depend upon tooth structure, cause of RCT, operator technique, sourced of contamination, type and quality of post and coronal restoration. Many of these factors are not studied in this present study.

Moreover the method in which this study was conducted limits us in matters of sampling and insurance of optimum dental management throughout the different phases subsequent to and after cementation of the cast post and cores. So, a randomized clinical trial raising the same question with better sampling techniques and more involvement in all treatment steps would carry out highly reliable results and interpretations which can be of benefits in understanding the value of this treatment modality in relation to all alternatives and how it can be provided in high quality manner.

Conclusion

Numerous complications and high failure rate were noted among endodontically treated teeth restored with cast post and core. This raise a question about the validity of selecting cast post and core to restore endodontically treated teeth in the presence of other advanced and recent alternative intraradicular retention system. However, retrospective nature and small sample size caution us to conclude our findings. Many other factors are needed to be explore as failure rates are highly dependent on many vital factors related to the tooth structure, reason for RCT, time span, type of techniques used by clinician and many other factors that can confound study results. Nevertheless Further randomized clinical trials are needed with long term follow up period to build upon the findings of this study.

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