A CLINICAL-RADIOGRAPHIC EVALUATION OF CROWN AND NON-METAL POST RESTORATION AFTER ROOT CANAL TREATMENT USING MODIFIED STRINDBERG CRITERIA IN ACADEMIC DENTAL HOSPITAL YOGYAKARTA

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ABSTRACT

Background: *Root canal treatment failure can be caused by periapical lesions and inadequate restorations such as post restorations. It showed that comprehensive evaluation, such as clinical or radiographic evaluation, is needed to observe the healing of endodontically treated dental and intra-radicular post-condition, especially fiber post and fiber reinforced composite (FRC). This research aims to evaluate the clinical and radiographic success of endodontically treated teeth restored with single crown restoration using a non-metal post.*

Methods: *This study is a cross-sectional design and descriptive observation of evaluating endodontically treated teeth. 72 samples were collected from medical records, and radiographs of endodontically treated patients; then, scoring was carried out to categorize the treatment outcome using modified Strindberg criteria.*

Results: *Endodontically treated dental restoration with non-metal post evaluation showed 63,9% teeth categorized as uncertain, followed by 36,1% teeth categorized as success and 0% in the failure category.*

Conclusion: *The result of this study suggests that a longer follow-up period will be needed to achieve a more stable evaluation result.*

INTRODUCTION

Post-endodontic treatment dental structure could alterate[1]. It causes a post-endodontic tooth to require crown restoration, which can protect the rest of the dental structure. The post-endodontic crown restoration also needs to be given additional retention in the form of adequate post to increase retention of the crown restoration. Teeth after root canal treatment that were given post-intra-radicular retention were significantly more retentive compared to teeth without a post[2].

The choice of material and type of stake also determines the success of the jacket crown restoration. One type of post material that can be used is a non-metal post that has a flexible nature and modulus of elasticity that resembles dentin, so that it is expected to be able to support the crown jacket restoration properly to be used[3].

The failed results obtained in the clinical evaluation of dental restorations after post root canal treatment were caused by the presence of periapical lesions and inadequate post-condition 2. It shows that there is a need for a thorough evaluation both clinically and radiographically, which is essential to identify the development of teeth after root canal treatment and post-restoration[4].

Evaluation of the success of treatment with post-tooth restorations after root canal treatment can be carried out based on the results of clinical and radiographic examinations4. Clinical aspects that can be seen are the results of percussion examination and palpation that do not show any abnormalities, as well as the presence or absence of symptoms that arise after treatment. Radiographic (periapical radiographs) evaluation of teeth after root canal treatment with a post, aspects that can be assessed are root canal conditions such as spacing between the post and lateral wall of the root canal due to improper filling, post-condition and periapical area conditions such as the presence of periapical lesions seen as radiolucent images on radiographs[5].

This study aims to determine the results of clinical and radiographic evaluation of crown and non-metal post crown restorations in teeth after root canal treatment at RSGM-UMY Yogyakarta.

METHODS

The method of this study was descriptive observational with a cross-sectional design. Furthermore, this research used inter-observer observations which carried out by general dentists and specialist dentists. The sample was 72 medical records and radiographs of post-restoration patients. The data medical records used were the results of subjective and objective examinations and patient radiographic data used, namely before and after periapical radiographs (see figure 1 & 2). The data were then categorized or scanned using Strindberg criteria that have been modified by adding criteria for the post. The category of clinical evaluation and radiography results consisted of categories of success, uncertainty, and failure (table 1). The data from the research results were presented with descriptive statistics, namely, frequency distribution.

Table 1. Criteria for clinical and radiographic examination

	Clinical	Radiographic			
	Chief Complaint	Periodontal Ligament	Lamina dura	Periradicular Radiolucency	*Spacing* between and root canal wall
Success	no	Contour and width periodontal ligament are normal	intact	Normal	No spacing
Uncertain	no	Contour and width periodontal ligament are consistent	Not clear/disrupted	Reduction of radiolucency /size < 1mm	Spacing one side of the canal and gutta-percha
Failure	yes	Contour and width periodontal ligament are consistent/increase	Discontinue or poorly defined lamina dura	No healing**	Spacing more than one side of the canal and gutta-percha

** Appearance of new rarefaction or an increase in the size of initial rarefaction

Figure 1. Radiograph features of fiber post

Figure 2. Radiograph features with FRC post

RESULTS

Table 2 contains data on the treatment outcome of non-metal posts for the fixed single crown restoration of endodontically treated teeth. Out of 72 teeth selected for the study, 46 teeth were categorized as uncertain (63.9%). It also showed that 44 of 72 teeth restored using fiber posts (61.1%).

The tooth most frequently performed with non-metallic post jacket crown restoration was the maxillary central incisor with 39 cases (54.2%). Based on gender, the number of female patients was 38 people (52.8%) and 34 male patients (47.2%) in restoring the jacket crown and non-metal posts. The age range of 20-29 years was dominant, 17 people (23.6%) were in the successful category, and 33 people (45.8%) were in the uncertain category. From the table 3, there are no failed categories of jacket crown restoration with non-metallic posts based on tooth type, gender, and age range (table 3).

Table 2. Treatment outcome of non-metal post for the fixed single crown restoration of endodontically treated teeth.

Treatment outcome	FRC	*Fiber*	Total
	N (%)	N (%)	N (%)
Success	9 (12.5)	17 (23.6)	26 (36.1)

Uncertain	19 (26.4)	27 (37.5)	46 (63.9)
Failure	0	0	0
Total	28 (38.9)	44 (61.1)	72 (100)

Table 3. Treatment outcome of non-metal post for the fixed single crown restoration of endodontically treated teeth based on teeth, gender, and age.

Category		Treatment outcome			Total
		Success	Uncertainty	Failure	
		N (%)	N (%)	N (%)	N (%)
Teeth	Maxillary central incisor*	12 (16.7)	27 (37.5)	0	39 (54.2)
	Maxillary lateral incisor	8 (11.1)	11 (15.3)	0	19 (26.4)
	Maxillary canine	1(1.4)	3 (4.2)	0	4 (5.6)

DISCUSSION

Restoration of endodontically treated teeth with single crown restoration and non-metal posts in this study were evaluated clinically and radiographically using the modified Strindberg criteria by adding criteria for the post. This criterion divided the assessment into 3 categories, success, uncertainty, and failure[4].

Clinical evaluation was conducted by scrutinizing the results of subjective and objective examination of the patient's medical record. The clinical criteria used to determine the success of treatment were the absence of symptoms of spontaneous pains, namely, pain during palpation and percussion and pain, which appeared upon the treatment[3].

Radiographic evaluation was carried out by looking at the radiograph before and after treatment. The radiographic criteria used to determine the success of treatment were such normal lamina dura, normal periodontal ligament, non-periapical radiolucency, hermetic post, and no distance between the post and guttapercha or the root canal wall[4,6].

The results of the evaluation of the success of non-metal crown restorations in post-endodontic teeth at Academic Dental Hospital based on medical records showed uncertain results (63.9%). Teeth in this uncertainty category were clinically normal, and no complaints were found from the patient. However, it radiographically showed the condition of periapical radiolucency, widening of the periodontal ligament, and disrupted or disconnected lamina dura[4].

Factors that influenced the results of this radiographic evaluation could be derived from the quality of the source of the radiographic data used and the operator's ability to interpret the data. Interpretation of radiographic data was frequently biased due to the operator's ability to understand the radiograph so that the interpretation must be carried out carefully and thoroughly. The quality of radiographic data used should also have maximum density, contrast, and minimal distortion; thus, the results of interpretation would be more accurate[7].

Teeth with an uncertain condition radiographically will show a radiolucency in the periapical region. The filling material factor causes it in the apical post that is less hermetic, causing a non-adequate apical seal[8]. This condition is in line with previous research revealing that if the quality of root canal filler material were bad, then the success rate of final treatment would decrease, even though the quality of the restoration was favorable[5].

This study's post-endodontic treatment were restored with two types of non-metal posts: Fiber reinforced composite (FRC) and fiber post. The most widely used non-metal posts in this study were 44 fiber posts, followed by 28 FRC posts. Non-metal posts generally have the advantage of modulus of elasticity that resembles dentin, which allows the distribution of pressure to the root canal better than metal posts. These considerations are essential as the post-endodontic teeth tend to have a 9% decrease in dentinal moisture, making them to fractures. A better aesthetic value is also a consideration for the selection of non-metal posts for post-endodontic restoration[9].

Data evaluation showed that fiber and FRC posts were mostly uncertain. FRC posts in uncertainty categories radiographically showed a gap between the post and the root canal wall. According to previous studies, inadequate adhesion between the post system and the root canal wall could lead to the formation of microleakage. This microleakage could delay the process of recovery of the periapical tissue of the teeth after treatment if the bacteria entered the microleakage[10].

Microleakage is formed when the use of FRC customized posts are almost as extensive as fiber posts. The gap can be formed due to the cementation materials used[2]. Another factor that can influence the results of evaluating the success of restoration with fiber posts is the length of the post. Success can decrease if the post length is unsuitable, the effect of ferrule is unreached, and the masticatory pressure is too large[3].

The teeth that underwent a root canal treatment in this study have been restored to the Porcelain-fused-to-metal crown within an average period of fewer than 30 days. According to the patient's subjective examination results, it is known that there were no complaints regarding full crown restorations. The statement is in line with previous studies revealing that if the post-endodontic teeth within 60 days were restored to the full crown, then the success rate of treatment would be better than to the teeth that were not directly restored to the crown[11]. It was caused by pressure due to mastication, parafunctional habits, and trauma that could weaken the root canal treatment tooth structure, which was not directly restored to the crown[6].

This study showed that most non-metal post restorations were 62 anterior teeth and ten premolar teeth, 54% of all teeth were maxillary central incisors. Many anterior teeth, such as the maxillary central incisor, were given crown restoration with a post because when the tooth lost a lot of crown tissue due to root canal treatment, the restoration was needed to maintain pressure due to

friction and lateral forces during mastication[12].This study did not explain the differences in the success of anterior and posterior teeth. However, previous studies showed that there were no significant differences in the success rates of post-endodontic dental restorations between anterior and posterior teeth[2].

The results of this study also revealed that female patients had more post-endodontic restorations with single crowns and non-metal posts than male patients, even though the difference was not significant. Most female patients showed treatment results in an uncertainty category, as did male patients. Previous research showed that gender did not significantly influence the success rate of post-endodontic restoration[13]. This result is slightly different from the study that showed a significant difference between post-endodontic treatment success in male patients, who were lower than female patients[14]. It could be caused by higher pressure of mastication in males and a tendency in food consumption that was harder than women[15]. Another studies showed women usually have more interest in health and beauty than men, who usually have more interest in science and technology[16].

Data from the results of this study indicated that patients who mostly underwent dental aesthetic restoration were patients with an age range of 17-25 years old, with a total of 44 patients (61.1%). These data are in line with previous studies showing that patients with a 12-25 year age range were mostly the ones who underwent dental restorations as this age group attached much importance to dental preservation[17]. Other studies showed that post-endodontic treatment's success rate could decrease based on age as the ability of the tissue to recover in young patients was better than patients at older ages[18]. In another study stated that patients aged 25-29 years old have a high prevalence of caries so that they require a lot of treatment[19] .These results were different from previous studies revealing that age was not a factor that influenced the prognosis of endodontic treatment[20].

The follow-up period carried out by the operator in this study was less than 6 months. The evaluation of the success of post-endodontic restoration performed in the 6th month did not show accurate results as the periapical tissue has not fully recovered, especially in restoration of endodontically treated teeth post with extensive periapical lesions[19]. It can be one of the factors that influence the evaluation results to be less than optimal because the follow-up period did not take a longer time. The ideal follow-up period is up to 1-5 years[20,21].

CONCLUSION

Restoration of endodontically treated teeth with non-metal post evaluation showed 63,9% teeth categorized as uncertain, followed by 36,1% teeth categorized as success and 0% in the failure category. The result of this study suggests that a longer follow-up period will be needed to achieve a more stable evaluation result based on teeth, gender, and age

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