

A Clinical-Radiographic Evaluation of Crown and Non-metal Post Restoration in RSGM-UMY Yogyakarta

Erma Sofiani¹, Jihan Nadhirah Natasya²

1 Department of Endodontics, Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta, Yogyakarta – Indonesia

2 School of Dentistry, Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta, Yogyakarta – Indonesia

ABSTRACT

Background: *The failure of endodontically treated teeth restoration evaluation is caused by periapical lesion and inadequate post. It showed that comprehensive evaluation such as clinical and radiographic evaluation are needed to observe the healing of endodontically treated teeth and intra-radicular post condition. Purpose:* *The aim of this research is to evaluate clinical and radiographic success of endodontically treated teeth restored with single crown restoration using non-metal post. Methods:* *This study was designed conducted as a cross sectional descriptive observation of evaluating endodontically treated teeth. 72 samples were collected from medical records and radiographs of endodontically treated patients, then scoring was done to categorized the treatment outcome using modified Strindberg criteria. Results:* *Endodontically treated teeth 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 suggest that longer follow up period will be needed to achieve more stable evaluation result.*

Keywords: *Endodontically treated teeth, fiber post, FRC post, Strindberg criteria*

Correspondence: Erma Sofiani, Department of Endodontics, Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta, Yogyakarta – Indonesia. Email: e_sofiani@yahoo.com

INTRODUCTION

Post-endodontic treatment tooth structure could alterate¹. This causes post-endodontic tooth to require crown restoration which can protect the rest of the tooth structure. 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 when compared to teeth without post.

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 dentine so that it is expected to be able to properly support the crown jacket restoration to be used³.

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. This shows that there is a need for a thorough evaluation both clinically and radiographically which is important to see the development of teeth after restored PSA and post condition in the tooth restoration.

Evaluation of the success of treatment with post-tooth restorations after root canal treatment can be done based on the results of clinical and radiographic examinations. 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) evaluation of teeth after root canal treatment with a post, aspects that can be assessed are (1) root canal conditions such as spacing between the post and lateral wall of the root canal due to improper filling, (2) post condition and (3) periapical area conditions such as the presence of periapical lesions seen as radiolucent images on radiographs⁴.

The purpose of this study was 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.

MATERIAL AND METHODS

The method of this study was descriptive observational with cross-sectional design. 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. care. The data was 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, doubt, and failure. The data from the research results are presented with descriptive statistics, namely frequency distribution.

RESULTS

Table 1 contains data on treatment outcome of non-metal post for 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%).

Table 1. Treatment outcome of non-metal post for fixed single crown restoration of endodontically treated teeth.

Treatment outcome	FRC N (%)	<i>Fiber</i> N (%)	Total N (%)
Succes	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 2 demonstrates the treatment outcome of fixed single crown restoration with non-metal post based on teeth, gender and age.

Table 2. Treatment outcome of non-metal post for fixed single crown restoration of endodontically treated teeth based on teeth, gender and age.

Kategori	Treatment outcome			Total N (%)	
	Success	Uncertain	Failure		
	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)
	Maxillary second premolar	0	1 (1.4)	0	1 (1.4)
	Mandible first premolar	1 (1.4)	0	0	1 (1.4)
	Mandible second premolar	4 (5.6)	4 (5.6)	0	8 (11.1)
Gender	Male	10 (13.9)	24 (33.3)	0	34 (47.2)
	Female*	16 (22.2)	22 (30.6)	0	38 (52.8)
Age	12-16 years old	2 (2.8)	0	0	2 (2.8)
	17-25 years old *	15 (20.8)	29 (40.3)	0	44 (61.1)
	26-35 years old	6 (8.3)	11(15.3)	0	17 (23.6)
	36-45 years old	2 (2.8)	4 (5.6)	0	6 (8.3)
	46-55 years old	1 (1.4)	1 (1.4)	0	2 (2.8)
	>65 years old	0	1 (1.4)	0	1 (1.4)
Total		26 (36.1)	46 (63.8)	0	71 (100)

*most dominant

DISCUSSION

Post PSA teeth with single crown restoration with non-metal posts in this study were evaluated clinically and radiographically using the modified Strindberg criteria by adding criteria for the post. This criterion divides the assessment into 3 categories, namely success, uncertain and failure⁴.

Clinical evaluation is done by looking at the results of subjective and objective examination of the patient's medical record. The clinical criteria used to determine the success of treatment are the absence of symptoms of spontaneous pain, pain during palpation and percussion and pain when biting after treatment is carried out³.

A radiographic evaluation is done by looking at the radiograph before and after treatment. The radiographic criteria used to determine the success of treatment are normal lamina dura, normal periodontal ligament, no periapical radiolucency, hermetic post and no distance between the post and guttapercha or the root canal wall⁴.

The results of the evaluation of the success of non-metal crown restorations in post-endodontic teeth at RSGM UMY based on medical records showed uncertain results (63.9%). Teeth in this uncertain category are clinically normal and no complaints found from the patient, but radiographically show the condition of periapical radiolucency, widening of the periodontal ligament and disrupted or disconnected lamina dura.

Factors that influence the results of this radiographic evaluation can be derived in terms of the quality of the source of the radiographic data used and the operator's ability to interpret the data. Interpretation of radiographic data is often biased because of the operator's ability to interpret the radiograph so that interpretation must be carried out carefully and thoroughly. The quality of radiographic data used should also have maximum density and contrast and minimal distortion so that the results of interpretation are more accurate⁹.

Teeth with an uncertain condition when viewed radiographically there is a radiolucency in the periapical region. This is caused by the guttapercha factor in the apical post that is less hermetic, causing a non-adequate apical seal⁵. This condition is in line with previous research where if the quality of root canal filler material is bad then the success rate of final treatment will decrease even though the quality of restoration is favorable¹⁰.

Post-endodontic teeth in this study were restored with 2 types of non-metal posts, namely 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 dentine, which allows the distribution of pressure to the root canal

better than metal posts. These considerations are important because the post-endodontic teeth tend to have a 9% decrease in dentinal moisture which makes it vulnerable to fractures. A better aesthetic value is also a consideration for the selection of non-metal posts for post-endodontic restoration¹¹.

Evaluation data shows that fiber and FRC posts are mostly uncertain. FRC posts in uncertain categories when viewed radiographically show 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 can lead to the formation of microleakage¹². This microleakage if entered by bacteria could delay the process of recovery of the periapical tissue of the teeth after treatment.

Microleakage formed when using FRC customized posts are almost as large as fiber posts. The gap can be formed due to cementation materials used. 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 not suitable, the effect of ferrule is not reached and the masticatory pressure is too large².

The teeth that have been carried out root canal treatment in this study have been restored to Porcelain-fused-to-metal crown within an average period of less than 30 days, and according to the patient's subjective examination results, it is known that there are no complaints regarding dental jacket crown restorations. The statement is by previous studies which say that if the post-endodontic teeth within 60 days are restored to full crown, then the success rate of treatment will be better when compared with teeth that are not directly restored to the crown¹⁴. This is caused by pressure due to mastication, parafunctional habits, and trauma that can weaken the tooth structure post PSA which is not directly restored to the crown.

This study showed that the most non-metal restorations were 62 anterior teeth and 10 premolar teeth. 54% of all teeth are maxillary central incisors. Many anterior teeth such as the maxillary central incisor are given crown restoration with a post because when the tooth loses a lot of crown tissue due to PSA, the restoration is needed to maintain pressure due to friction and lateral forces during mastication¹⁵. This study does not explain the differences in the success of anterior and posterior teeth, but previous studies showed that there were no significant differences in the success rates of post-endodontic dental restorations between anterior and posterior teeth⁶

The results of this study also revealed that female patients had more post-endodontic dental restorations with single fixed crowns and non-metal posts than male patients although

the difference was not significant. Most female patients show treatment results in an uncertain category, as do male patients. Previous research showed that gender did not significantly influence the success rate of post-endodontic dental restoration¹⁶. This result is slightly different from the study that showed a significant difference between the success of post-endodontic dental care in male patients who were lower than female patients¹⁷. This can be caused by higher pressure of mastication in males and a tendency to eat foods that are harder than women¹⁸.

Data from the results of this study indicate that patients who most did dental aesthetic restoration were patients with an age range of 17-25 years, with a total of 44 patients (61.1%). These data are in accordance with previous studies that patients with a 12-25 year age range are the ones who do the most dental restorations because this age group attaches much importance to dental preservation⁷. Other studies have shown that the success rate of post-endodontic dental care can decrease with age because the ability of the tissue to recover in young patients is better than patients at older ages⁸. These results are different from previous studies where age is not a factor that influences the prognosis of endodontic treatment¹⁹.

The follow-up period carried out by the operator in this study was less than 6 months. Evaluation of the success of post-endodontic restoration performed in the 6th month has not shown accurate results because the periapical tissue has not fully recovered, especially in the case of post PSA teeth with extensive periapical lesions²⁰. This can be one of the factors that influence the evaluation results to be less than optimal because the follow-up time is not long because the ideal follow-up period is up to 1-5 years.

REFERENCES

1. Cohen, S., & Hargreaves, K. (2016). *Cohen's Pathways of the Pulp, Eleventh Edition*. Missouri: Elsevier.
2. Baba, N. Z., & Goodacre, C. J. (2013). Treatment Options and Materials for Endodontically Treated Teeth. In N. Z. Baba, *Contemporary Restoration of Endodontically Treated Teeth* (pp. 33-60). China: Quintessence.
3. Pak, J. G., & White, S. N. (2011). Journal of Endodontics. *Pain Prevalence and Severity before, during, and after Root Canal Treatment: A Systematic Review*.

4. Chugal, N., Malya, S. M., Kahler, B., & Lin, L. M. (2017). Dental Clinics of North America. *Endodontic Treatment Outcomes*, 59-80.
5. Ng, Y.-L., Mann, V., Rahbaran, S., Lewsey, J., & Gulabivala, K. (2008). International Endodontic Journal. *Outcome of primary root canal treatment: systematic review of the literature - Part 2. Influence of clinical factors*.
6. Garcia, P. P., Wambier, L. M., Geus, J. L., Cunha, L. F., Correr, G. M., & Gonzaga, C. C. (2018). Journal of Prosthetic Dentistry. *Do Anterior and Posterior Teeth Treated with Post-and-Core Restorations have Similar Failure Rates? A Systematic Review and Meta-analysis*.
7. Windrawati, N. M., Mintjelungan, C., & Pangemanan, D. H. (2015). Jurnal e-Gigi. *Gambaran Perawatan Gigi dan Mulut pada Bulan Kesehatan Gigi Nasional Periode tahun 2011 dan 2014 di RSGM Unsrat*.
8. Song, M., Kim, S., Lee, S.-J., Kim, B., & Kim, E. (2013). Journal of Endodontics. *Prognostic Factors of Clinical Outcomes in Endodontic Microsurgery: A Prospective Study*
9. Basrani, B., & Kfir, A. (2012). Endodontic Radiology. In B. Basrani, *Endodontic Radiology* (pp. 1-17). John Wiley & Sons.
10. Tronstad, L., Døving, L., Asbjørnsen, K., Pedersen, I., & Eriksen, H. M. (2000). Influence of coronal restorations on the periapical health of endodontically treated teeth. *Endod Dent Traumatol*, 16(5):218-21.
11. Mohan, L., Gowda, C., & Shashidhar, S. (2015). Clinical Evaluation of the Fiber Post and direct composite resin restoration for fixed Single Crowns on Endodontically Treated Teeth. *Med J Armed Forces India*, 71(3):259-264.
12. Jung, S.-H., Min, K.-S., Chang, H.-S., Park, S.-D., Kwon, S.-N., & Bae, J.-M. (2007). Microleakage and fracture patterns of teeth restored with different posts under dynamic loading. *J Prosthet Dent*, 98(4):270-6.
13. Geramipannah, F., Rezaei, S. M., Sichani, S. F., Sichani, B. F., & Sadighpour, L. (2013). Microleakage of Different Post Systems and a Custom Adapted Fiber Post. *J Dent (Tehran)*, 10(1): 94-102.
14. Yee, K., Bhagavatula, P., Stover, S., Eichmiller, F., Hashimoto, L., MacDonald, S., dkk. (2018). Survival Rates of Teeth with Primary Endodontic Treatment after Core/Post and Crown Placement. *J Endod*, 44(2):220-225.
15. Schwartz, R. S., & Robbins, J. W. (2004). Post Placement and Restoration of Endodontically Treated Teeth. *J Endod*, 30(5):289-301.

16. Doyle, S. I., Hodges, J. S., Pesun, I. J., Baisden, M. K., & Bowles, W. R. (2007). Factors Affecting Outcomes for Single-Tooth Implants and Endodontics Restorations. *J Endod*, 33(4):399-402.
17. Marquis, V. I., Dao, T., Farzaneh, M., Abitbol, S., & Friedman, S. (2006). Treatment Outcome in Endodontics: The Toronto Study. Phase III: Initial Treatment. *J Endod*, 32(4):299-306.
18. Suksaphar, W., Banomyong, D., Jirathyanatt, T., & Ngoenwiwatkul, Y. (2018). Survival Rates from Fracture of Endodontically Treated Premolars Restored with Full-coverage Crowns or Direct Resin Composite Restorations: A Retrospective Study. *J Endod*, 44(2):233-238.
19. Shakiba, B., Hamedy, R., Pak, J. G., Barbizam, J. V., Ogawa, R., & White, S. N. (2017). Influence of Increased Patient Age on Longitudinal Outcomes of Root Canal Treatment: A Systematic Review. *Gerodontology*, 34(1):101-109.
20. Walton, R., & Torabinejad, M. (2009). *Evaluation of Endodontic Outcomes* (pp.376-390). Missouri: Saunders.