Advances in Health Sciences Research, volume 32
Proceedings of the 1st Aceh International Dental Meeting (AIDEM 2019), Oral Health
International Conference On Art, Nature And Material Science Development 2019

Endodontic Retreatment and Restoration Using Fiber Post and Lithium Disilicate Crown

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ABSTRACT
This case report aims to inform the results of the Lithium Disilicate crown restoration which is reinforced with fiber reinforced composite post on the maxillary right central incisor after root canal treatment. Case report. A 33-year-old male patient came to the the Clinic of Conservative Dentistry Dental Hospital of Universitas Gadjah Mada with complaints of a crown on maxillary right central incisor which felt unsteady and didn't pain. The patient treated his teeth 7 years ago and received endodontic treatment with post and crown. Percussion and palpation tests showed periodontal tissue is normal. Periapical radiographs showed non-hermetic root canal treatment, crown with short post and periapical area were radiolucent. A diagnosis of tooth 11 was previously treated with asymptomatic apical periodontitis. Tooth 11 were treated retreatment with a step back and vertical warm obturation technique. The choice of the final restoration was a lithium disilicate crown with fiber reinforced composite post. Conclusion. Evaluation of treatment results was carried out three months after the insertion of the crown. Subjective and objective evaluation results the teeth can function properly and patients are satisfied with the aesthetic improvements.

Keywords: *Root canal treatment, Retention, Resistension*

1. INTRODUCTION

The goal of restorative dentistry and endodontics is to retain the natural teeth with maximal function and pleasing esthetics. Restoration post endodontics such teeth often require additional support from the root canal by means of a post and core restoration [1]. Post-endodontic restoration is necessary to prevent fracture of the remaining tooth structure, to prevent reinfection of the root canal and to replace the missing tooth structure [2]. The endodontically treated tooth has to be restored to both form and function [3].

The failure of endodontically treated teeth is usually not a consequence of endodontic treatment, but inadequate restorative therapy or periodontal reasons.2 Excessive removal of tooth structure during mechanical instrumentation of the root canal system, mechanical pressures during obturation, lack of cuspal protection, and large restorations can weaken the tooth[4].

The aim of this case treatment was to analyze lithium disilicate crown restoration with post-fiber intracanal retention reinforced composite post endodontic retreatment, to restore tooth function, especially the aesthetic function of maxillary anterior teeth.

2. CASE REPORT

A 33-year-old male patient came to the the Clinic of Conservative Dentistry Dental Hospital of Universitas Gadjah Mada with complaints of a crown on maxillary right central incisor which felt nsteady and didn't pain. The patient treated his teeth 7 years ago and received endodontic treatment with post and crown. Percussion and palpation tests showed periodontal tissue was normal. Periapical radiographs showed non-hermetic root canal treatment, crown with short post and periapical area were radiolucent (**Figure 1**). After subjective and objective examination tooth #11 was diagnosed previously treated with asymptomatic apical periodontitis.

Porcelain Fused to Metal (PFM) crown on tooth #11 was removed by crown remover and gutta perca in pulp chamber cleaned with heat plugger and ekskavator (Osung). Obtained obturation material in the root canal

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using H-File # 30 and # 35 with reaming movements and irrigation with EDTA solution. Each file change was irrigated using 2.5% NaOCl and saline. Periapical radiographs were taken to see the cleanliness of the root canal wall from obturation material (**Figure 2**).Tooth #11 was isolated with rubber dam and root canal treatment was done by step-back method. Measurement of work length by direct observation method. Root canal treatment starts from K-file #30 with 19.5 mm and ends with #70 along 15.5 mm, each change of instrument was irrigated with 2.5% NaOCl and EDTA irrigation.

The obturation technique used the vertical warm obturation technique. The working length of Gutta perca #45 was 19.5mm. Gutta percha was cut with the Heat Plugger (Freefill, Denjoy) and downpack gradually with the thickness of each stage 2-3mm with extruder gutta percha (Freefill, Denjoy) to reach 2 mm below the orifice, until the working length of the Heat Plugger was 14.5mm (a marker of the working length of the Rubber Stop). The working length of the root canal was 15mm. The cavity was cleaned from the remaining siler, the base material was applied with modified glass ionomer cement (Fuji II LC, GC) and covered with a temporary fixture (Caviton, GC), then the rubber sheet was removed and take a radiograph(**Figure 3**). The radiograph showed hermetic filling. The root canal was filled with a temporary cavit, then a temporary crown was inserted.

Figure 1. Pre-operative diagnostic radiograph

Figure 2. Result removal old gutta percha

Figure 3. Periapical radiograph immediately after obturation

Figure 4. Periapical radiograph fitting fiber post

At the second visit, no complaints were noted. The temporary crown was removed and preparation for the root canal. Removing guta perca using peeso Reamer, leaving a 5 mm guta perca in the apical root. Selected fiber post with a diameter of 1.83 mm (Denstply). The canal was prepared using the appropriate precision drill. The Ferrule width was formed 1 mm and the height was 2 mm. Fiber post were tried in the canal and the radiograph was taken (**Figure 4)**. Fiber posts outside the root canal are left up to 2/3 of the length of the clinical crown to support the core. The excess fiber post are cut using a carborundum disc.

Furthermore, the canal irrigation using 2.5% NaOCl, rinsed with distilled water, irrigated with cavity cleanser, then rinsed again using distilled water, then dried using a sterile paper point. The walls of the post canal were applied with 35% phosphoric acid, left for 15 seconds, then rinsed thoroughly and dried with a sterile paper point. The fiber post was cleaned and disinfected with 70% alcohol then first smeared with silane, let the post dried. After that the fiber post was smeared with bonding material and cured for 20 seconds. Cement resin Rely X (3M ESPE) applied to cementation the fiber post and then activated by light for 20 seconds. Then the core formation was carried out using composite packable premisa dentin A3,5 (Kerr) (**Figure 5**). After preparation, the impression was done using the double impression technique and using gingival retraction. Color recording was done using the shade guide Ivoclar and the color of the teeth were A1(**Figure 6**).

Figure 5. Core post

Figure 6. Shading match tooth colour #11

The third visit, the temporary crown was removed and cementation of the lithium disilicate crown using resin cement (Rely X, 3M ESPE). The maxillary right central incisor was smeared with bonding material, wait for a moment then the lightcure are activated. Inside of the crown etched using hydrofluoro acid and smeared with silane material, wait for a moment then bonding material was applied and activated by light for 10 seconds. The resin cement was mixed to the inside surface of the lithium disilicate crown and then inserted, then activated the resin cement with light for 20 seconds. The excess resin cement was cleaned, an occlusion check and articulation were carried out using

an articulating paper and check proximal contact with dental floss (**Figure 7**).

Figure 7. Final result

Evaluation of treatment results was carried out three months after the insert of the lithium disilicate crown. Subjective examination, the patient said there were no complaints of pain, and the treated teeth could be used for mastication. Percussion examination, the patient did not respond to pain, palpation of the buccal mucosa did not provide pain, no mobility from the maxillary right central incisor. The mucosal tissue around the lithium disilicate crown look healthy, there is no gingival inflammation (**Figure 8**) and the radiographic evaluation was showed healing in the apical tissues (**Figure 9**).

Figure 8. Evaluation of the treatment

Figure 9. Periapical radiograph evaluation

3. DISCUSSIONS

The success of root treatment must be supported by the rebuilding of damaged crowns. Returning the crown of the tooth with good retention, will be able to support teeth that have been treated with root canals to function for a long time. Making and choosing restorations on teeth that have been treated by the root canal depends on the remaining teeth and the chewing load that the tooth will receive [5].

The primary purpose of a post is to retain a core in a tooth that has lost its coronal structure extensively [6]. Posts are used to provide retention for the core material and to replace missing tooth structure. The residual amount of tooth structure will determine its stability for restoration [4].

Several main causes of failure of post-retained restorations have been identified, including: recurrent caries, endodontic failure, periodontal disease, post dislodgement, cement failure, post-core separation, crown-core separation, loss of post retention, core fracture, loss of crown retention, post distortion, post fracture, tooth fracture, and root fracture. Also, corrosion of metallic posts has been proposed as a cause of root fracture [7]

Ideal properties for the post material include physical properties like modulus of elasticity, compressive strength, flexural strength and thermal expansion, similar to that of dentin. It should esthetically resemble and bond efficiently to the dentine.Due to the difference in the modulus of elasticity of the dentin and the selected post, there are possible areas of stress concentration in the dentin, as in the case of metal post. Many laboratory researches show that carbon and glass fiber posts have modulus of elasticity (about 20 GPa) similar to that of dentin(about 18 GPa). Similar modulus of elasticity thus provides with a similar physical properties of fiber post to that of the natural dentin [8].

Fibre Reinforced Composite (FRC) posts require minimal preparation of the root canal as the post utilizes the undercuts and surface irregularities to increase the surface area for bonding. This conservation of tooth structure is beneficial as it reduces the chances of eventual tooth fracture. Also, the mechanical properties of the post ensure that in case of pathological loading, the post will fracture prior to the root, thus protecting the tooth from catastrophic root fracture. The FRC posts also display an excellent biocompatibility and are easy to retrieve [9].

Some provisions that must be considered for core and post preparation are use of non-end-cutting rotary instruments, minimal canal enlargement, diameter one-third root width or less, length at least equivalent to crown height, minimum 4-5 mm gutta percha remaining from apical seal [10]. Also, the post should be as long as two-third the length of the canal [2]. These provisions are the reason for the endodontics retreatment in this case.

The term ferrule probably originates from the Latin word ferrum meaning iron and viriola meaning bracelet (Brown 1993). It is also defined as a metal band or ring used to fit the root or crown of a tooth [11]. A ferrule height of 2 mm or more and ferrule width of minimum 1 mm are predictive of improved outcomes [6]. In the absence of an adequate ferrule, failure will occur and the debate centres on whether it is better to have re-

restorable failures in the short term or unrestorable failures after a long time in function or at high stress levels [10]. The ferrule will protect the endodontically treated tooth against fracture by counteracting and better distributing the stresses generated by the post. The strength of the remaining tooth has been directly related to the remaining bulk of dentin and fracture resistance has diminished with a decrease in remaining dentin [11].

Crowns are indicated only on endodontically treated anterior teeth when they are structurally weakened by the presence of large and/or multiple coronal restorations [3]. Several factors restorative treatment planning for endodontically treated teeth should be taken into consideration are amount of the tooth structure present, occlusal forces and the anatomic position of the tooth, restorative requirements and esthetic requirements.These factors determine the type of restoration that will be made so that it can protect the rest of the treated endodontic teeth and so that the teeth can function as before [2].

4. CONCLUSION

Post-endodontic restoration must consider the provision for core and post, such as fiber post. A fiber post helps in distributing the stresses through the radicular dentin to the root apex so the risk of post-endodontic restoration failure can be minimized.

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