

Treatment of Anterior Teeth Discolorization Post-PSA Using Porcelain Crown: Case Report

Badi Soerachman¹, Levina Azzahra Rachman²

¹Departemen Konservasi Gigi Fakultas Kedokteran Gigi Universitas Jenderal Achmad Yani.

²Mahasiswa Program Profesi Pendidikan Dokter Gigi Fakultas Kedokteran Gigi Universitas Jenderal Achmad Yani.

Email: badi_soerachman@yahoo.com

Pulp necrosis is a pathological condition caused by the death of pulp tissue, often due to untreated dental caries. Pulp necrosis can lead to tooth discoloration, which is a major aesthetic complaint for patients. Root canal treatment (ROT) is an essential procedure to remove necrotic tissue and restore tooth function. Crown restoration is necessary to improve the structural strength and aesthetics of teeth that have undergone ROT. This case report discusses a 22-year-old woman who complained of discoloration of her anterior teeth. Clinical and radiographic examinations revealed a diagnosis of pulp necrosis in the left maxillary central incisor. Treatment was performed using conventional techniques, irrigation with 2.5% sodium hypochlorite (NaOCl) solution, intracanal application of calcium hydroxide (Ca(OH)₂) medication, and obturation with gutta-percha and sealer. The final restoration was performed with a fiber post and a full porcelain crown (zirconia) to improve retention, strength, and aesthetics of the tooth. This combination of PSA treatment and restoration has been proven effective in maintaining function, preventing fractures, and improving the aesthetics of non-vital teeth, thus providing good long-term results for patients.

Keywords : Tooth discoloration, Fiber post, Porcelain crown (Zirconia).

This is an open access article under the [CC BY-NC](#) license



Corresponding Author:

Badi Soerachman

Departemen Konservasi Gigi Fakultas Kedokteran Gigi Universitas Jenderal Achmad Yani.

badi_soerachman@yahoo.com

1. Introduction

Discoloration that occurs in teeth that experience necrosis pulp caused by Because product degradation blood and tissue necrotic pulp enter to dentinal tubules so that give color dark on the crown teeth, and often become problem significant aesthetics, especially on anterior teeth¹.

Tooth with necrosis pulp need maintenance channel root (PSA) to remove factor irritants such as bacteria and products its metabolism, as well as clean channel root from network necrotic². However, the tooth post PSA are generally more fragile compared to vital teeth because decrease water content and elasticity network hard teeth, as well as disappearance part big structure consequence extensive caries. As a result, the teeth lost optimal ability to distribute burden functional so that increase risk of fracture³.

Therefore, in this case it is necessary rehabilitation with the use of crown reinforced with a post to enhance retention, resilience restoration to pressure mastication, and aesthetic improvement in a way comprehensive.

2. Case Report

A woman A 22-year- old man came to RSGMP Unjani with complaints aesthetics consequence tooth front the upper teeth that have changed color. Based on the anamnesis, the teeth the has experience damage since more than ten years ago and it has been done patching eight years ago, but now the filling has changed color. The patient confess have you previously consulted a dentist ? general at another Clinic one

month ago and did maintenance channel root. However the treatment not finished yet. Patient want to continue treatment at RSGMP Unjani. Condition general patient in a state physically healthy, and show attitude cooperative and communicative during inspection.

Inspection extraoral does not show existence swelling facial and enlargement gland lymph. On intraoral examination, tooth 21 shows obvious discoloration compared to surrounding teeth. Palpation test, mobility test, and vitality test pulp with Chlor Ethyl (CE) and Electric Pulp Test (EPT) shows results negative. Percussion test vertical show results negative, while the horizontal percussion test shows results positive.



Figure 1. (a) Clinical picture tooth 21. (b) Radiography periapical tooth 21.

Supporting examination by taking picture radiography periapical show description radiopaque on the crown tooth 21 on the mesial and distal parts resembles results restoration, overview radiolucency surrounding root resemble widening of the periodontal ligament, as well as description radiopaque in the canal root resemble results maintenance channel roots that look non-hermetic.

Based on results inspection subjective, objective, and radiographic support, a diagnosis of necrosis was established pulp caused by deep caries of tooth 21 accompanied by apical periodontitis symptomatic. The treatment plan in this case includes maintenance channel non-vital roots, and restoration end porcelain crown (zirconia) with fiber post.



Figure 2. PSA Procedure for Tooth 21.

PSA was performed in 3 visits for 1 month (December 5, 2024 – January 2, 2025). During the visit fourth (January 13, 2025), carried out control and evaluation after procedure filling channel root. Based on results inspection subjective, patient No report existence painful or discomfort in the teeth that have been treated. Examination objective show results percussion and palpation negative, and no there is mobility, signifying that maintenance has walk with good and bad There is signs inflammation or failure care. As stages end maintenance will done porcelain crown (zirconia) restoration with peg fiber.



Figure 3. Preparation remainder crown.

On a visit fifth (February 25, 2025) started procedure preparation and restoration peg. The action begins by doing preparation remainder unnecessary crown.



Figure 4. Preparation and restoration peg.

Stages furthermore is measure working length of the dowel and the required dowel diameter. Working length of the dowel obtained from $\frac{2}{3}$ length root added to the length remainder crown clinical. Measurement long root obtained result 25 mm so $\frac{2}{3}$ of long root which is 16 mm. The remaining length crown clinical obtained The result is 3 mm. The working length of the post in this case is 19 mm, which is obtained from $\frac{2}{3}$ length 16 mm root and remainder crown clinical 3 mm. After done measurement working length of the dowel furthermore done gutta-percha reduction and preparation channel peg. Gutta-percha reduction using peeso -reamer number 1 or 2 measured according to the working length of the dowel namely 19 mm, carried out subtraction until leaving one third of gutta-percha long roots or at least 8 mm. After that, it is carried out insertion fiber post and core build-up with composite resin.



Figure 5. (a) Preparation crown. **(b)** Temporary crown.

On a visit sixth (February 27, 2025) was carried out preparation crown and molding double impression using Polyvinyl Siloxane to make restorations indirect in the form of porcelain crown (zirconia) previously has done crown color selection with A2 color results. Done isolate the work area using thread retraction to the cervical border teeth are more visible to get results good preparation and printing. After done preparation, the patient was given a temporary crown to maintain his appearance. during porcelain crown (zirconia) is being made.



Figure 6. (a) Clinical picture post insertion crown. **(b)** Radiography periapical post insertion fiber post and crown.

On a visit seventh (March 12, 2025), two weeks later, was carried out insertion porcelain crown (zirconia) with cementation using resin cement. After the cementation process, the remaining cement is cleaned off, and the crown is held in place. until the setting process is perfect.

3. Discussion

Non-vital teeth often experience discoloration consequence death pulp that causes accumulation product degradation of hemoglobin, iron, and tissue pulp necrotic pigments that enter the dentinal tubules. These pigments causes intrinsic color changes tooth become dark or hard gray removed.⁴

This discoloration is very affecting aesthetics especially on visible anterior teeth clear when smiling or talking. Care discoloration non-vital teeth include a number of choice, namely internal bleaching, veneers, and full crowns. Internal bleaching is choice effective conservative for discoloration light to moderate with structure coronal which is still quite intact, because This treatment only requires access to the room pulp to apply agent bleaching and avoiding preparation network wider teeth.⁵ Veneers offer results good aesthetics with reduction minimal network so it can be used for cases with moderate discoloration and without lost network significant coronal discoloration. ⁶However, in cases with discoloration heavy consequence necrosis old pulp and damage network coronal is quite wide, full crown becomes a more appropriate choice because it can cover dark colors at a time give protection better structural integrity. In this case, a full porcelain zirconia crown was chosen. Because his abilities covers dark colors well as well as strength high mechanical strength, that is, it does not crack or break easily although used in areas that receive burden mastication big so it is very effective for restoration anterior teeth with optimal aesthetic and functional needs.⁷

Teeth that have been underwent PSA previously often considered more vulnerable to fracture. This is usually associated with loss of moisture and changes to the structure dentin collagen. However, recent studies have shown that that improvement vulnerability This is more due to the loss of network crown teeth and their disturbances integrity structural consequence cavity access preparation. In anterior teeth, if after crown core preparation Still there is enough network remaining hard, use peg actually not necessary Because the pegs do not serve to strengthen teeth or roots in a way significant. ⁸However, in cases where the remaining network coronal is very little and unable withhold direct load from restoration, use fiber pegs are needed to improve retention core build up and crown. Fiber post selected because its elastic modulus is similar to dentin, reducing risk of root fracture and repair distribution burden more physiologically compared to peg metal. ⁹In addition, the presence of ferrule of at least 1.5-2 mm is crucial for distribution style and prevent failure mechanical restoration term length. In this case, the structure limited coronal force use fiber pegs at once ensure existence sufficient ferrule for restoration Can long lasting.¹⁰

Crown materials used in restorations teeth vary greatly and must be chosen based on functional, aesthetic and condition needs Clinical. Full metal crowns have the highest strength and durability. wear out best However very poor aesthetics so it doesn't fit used for anterior teeth. ¹¹PM (porcelain fused to metal) crowns offer combination good strength and aesthetics, but the metal line at the gingival margin may decrease appearance aesthetics especially if the gingiva is thin or occurs recession. ⁸All-porcelain crowns, such as lithium disilicate (E.max), offer superior aesthetics with a high level of translucency tall so that the color and shine are more similar tooth natural, suitable for restoration aesthetics in the case discoloration light to moderate. However, because level high transparency, E.max not enough capable cover dark colors so that less than ideal in discoloration weight. ⁸Zirconia, has the strength very high mechanics, superior dark color masking capabilities, and excellent results satisfying aesthetics so that often selected for the case discoloration weight and restoration anterior teeth that have experienced burden chew moderately to high. Therefore, in this case it is chosen porcelain crown zirconia because optimal balance between the required strength and aesthetics.^{13,14}

The selection of impression material for crown restoration is also very important because accurate print determine margin precision and crown fit. Common impression materials used is alginate, polyether, and polyvinyl siloxane (PVS). Alginate is more economical but has accuracy low, stability dimensions bad, so not enough effective used for molding end preparation. ¹⁵Polyether offers good accuracy and stability but nature stiff and lacking elastic, so that difficult released and can cause absence comfort for patients, PVS is the most effective impression material because it has stability best dimensions, elasticity tall so it's easy to remove without distortion, excellent margin detail reproduction, as well as resilience to humidity and long-lasting storage. Therefore, in this case, PVS impression material was chosen to obtain precise and stable printing is very important for success restoration Porcelain zirconia crowns require very precise fitting.¹⁶

The cement used for crown cementation also has variations. Types and characteristics. Zinc phosphate is abundant used Because strength pressure and retention the mechanics good, but lacks adhesion chemical and nature acid during initial setting, so it can irritate pulp and dissolves easily, making it less than ideal for restoration aesthetics. ¹⁷Glass ionomer cement (GIC) has the ability adhesion chemical towards better enamel and dentin compared to zinc phosphate and capable releases fluoride so that play a role in prevention caries secondary, but strength the mechanics low and sensitive to humidity so it's quite difficult during the setting process. Resin-modified glass ionomer cement (RMGIC) is development from GIC with the addition of resin in its formula, so that produce stronger cementation material in a way mechanics, have longer working hours, and still maintain ability fluoride release but still has limitations in terms of Power adhesion and ability covering the base color (masking). In addition, the nature of expansion its hygroscopicity can cause risk cracks, especially if used in restoration made from all porcelain as used in this case. ^{17,18}While Resin cement is capable give adhesion strong chemical on zirconia and dentin structure, capable of covers dark colors well, is long lasting and the color is more stable so that increase aesthetics and strength restoration. For this reason, resin cement was chosen in this case to ensure strong bonds and results Optimal esthetics in porcelain zirconia crowns.^{17,19}

4. Conclusion

Maintenance channel roots in necrosis pulp aims to eliminate infection and maintain teeth in optimal function. After maintenance endodontics, proper restoration necessary to prevent fractures and restore aesthetics as well as Power stand teeth, especially to overcome discoloration. Fiber pegs are used to improve retention, while porcelain crown (zirconia) was chosen as the restoration end Because excellent strength, biocompatibility, and aesthetics. The combination This treatment allows Non-vital teeth continue to function well in the long run long, improving prognosis and quality life patient.

5. References

1. Coelho AS, dkk. Non-Vital Tooth Bleaching Techniques: A Systematic Review. *Coatings MDPI*. 2020;10(61):1-10.
2. Cahyani, Rahmahwati D. Perawatan saluran akar multivisit dengan teknik step back pada insisivus lateral. *J Ilmu Kedokt Gigi*. 2022;5(2):1-6.
3. Wiratama IP, Yolanda. Perawatan saluran akar satu kali kunjungan dengan restorasi mahkota PFM pada gigi premolar kedua kiri rahang bawah: laporan kasus. *Sound Dent (SONDE)*. 2021;6(1):34-44.
4. Nathanson D, Friedlander LT. Intracoronar bleaching of pulpless teeth: a review. *J Am Dent Assoc*. 2016;147(7):494-504.
5. Dianty F, Sukartini E, Armilia M. Bleaching internal untuk merawat perubahan warna gigi insisivus sentralis kanan atas (Laporan Kasus). *Dentofasial*. 2011;10(2):101-104.
6. Peumans M, Van Meerbeek B, Lambrechts P, Vanherle G. Porcelain veneers: a review of the literature. *JDent*. 2015;28(3):163-177.
7. Mavridou AM, Papathanasiou I, Papageorgiou SN, Papadopoulos MA. Management of Discolored Nonvital Teeth with Full-Coverage Crowns: A Review of Clinical Effectiveness. *J Prosthodont*. 2019;28(8):858-864.
8. Saputra DC, Nugraheni T. Restorasi mahkota jaket poselin fusi metal dan crown lengthening pada gigi 11 dan 21 pasca trauma. *MKGK*. 2015;1(2):140-146.
9. Ferrari M, Vichi A, Grandini S. The use of fiber posts in endodontically treated teeth: a literature review. *Int J Prosthodont*. 2018;31(1):22-27.
10. Sorensen JA, Engelman MJ. Ferrule design and fracture resistance of endodontically treated teeth. *J Prosthet Dent*. 2017;63(5):529-536.
11. Alharethi NA. The effectiveness of zirconia crowns versus metal crowns in anterior teeth: In vitro study. *Journal of Pharmacy and Bioallied Sciences*. 2024;16(3):2682-2684.
12. Guess PC, Kulis A, Witkowski S, et al. Performance and material properties of new all-ceramic crown systems. *Dent Clin North Am*. 2017;60(3):481- 507.
13. Sulaiman TA, Abdulmajeed AA, Donovan TE, et al. Three-unit monolithic zirconia fixed dental prostheses: effect of framework design and veneering porcelain on fracture load and failure mode. *J Prosthodont*. 2019;28(6):588- 595.
14. Zhang Y. Making yttria-stabilized tetragonal zirconia translucent. *Dent Mater*. 2017;33(8): 891-899.
15. Kulkarni MM, Thombare RU. Dimensional changes of alginate dental impression materials-an invitro study. *Journal of Clinical and Diagnostic Research*. 2015;9(8): 98-102.
16. Daou EE. Polyether vs. polyvinyl siloxane impression materials: dimensional accuracy and clinical performance. *J Prosthodont*. 2018;27(7):620-625.
17. Hill EE, Lott J. A clinically focused discussion of luting materials. *Australians Dental Journal*. 2011;56(1):67-76.
18. Eakle WS, Oesterle LJ, et al. Clinical performance of glass ionomer and resin-modified glass ionomer luting cements. *J Prosthet Dent*. 2016;96(1):26-33.
19. Inoue S, Vargas MA, Vargas HV. Adhesion of resin cements to zirconia ceramic surfaces: a systematic review. *Oper Dent*. 2017;42(3): 293-303.