Case Report

A CASE REPORT ON DENTIN POST: CONTENDER FOR COMMERCIALLY AVAILABLE POST

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ABSTRACT

Dentin posts, obtained from extracted teeth, offer a promising alternative to commercially available prefabricated posts in restorative dentistry. Their composition resembles natural dentin, allowing better adaptability, stress distribution, and long-term success than metal and fiber posts. The therapeutic application of a dentin post to restore a severely damaged endodontically treated tooth is detailed in this case study. A 42-year-old female patient presented with a fractured maxillary left canine requiring post-endodontic rehabilitation. Instead of using a prefabricated post, a dentin post was fabricated from an extracted premolar of the same patient. The extracted tooth was cleaned, sterilized, and shaped to fit the prepared post space. It was then cemented using an adhesive resin cement and a composite core build-up. A zirconia crown was placed to restore function and esthetics. The post-treatment evaluation showed excellent adaptation of the dentin post, with good retention and no signs of microleakage or failure. Using a dentin post provided a better fit, reduced stress on the root, and improved bonding with the surrounding dentin. The patient was followed up for 12 months, and no complications were observed. This case highlights the potential of dentin posts as a biocompatible and cost-effective alternative to conventional posts. Their use can be particularly beneficial in cases where a custom fit is required. Further clinical studies are needed to establish their long-term effectiveness in restorative dentistry.

Key words: Dentin post, Post-endodontic restoration, Biomimetic dentistry, Autogenous post, Tooth restoration.

Introduction

Root canal-treated tooth restoration is important because it affects the entire prognosis of the teeth [1]. Extraction was previously the preferred treatment for severely decayed teeth; however, the aim of dental therapy has changed to a more conservative approach [2]. When a substantial amount of the clinical structure of the crown has been destroyed due to injury, obtaining a suitable restoration anchorage in the remaining dentin can be difficult. As a result, posts are commonly used in endodontically treated teeth to avoid fracture of the remaining tooth structure and tooth loss [3]. In order to restore the tooth's function and appearance, the post and core's main objective is to adequately replace the lost coronal tooth structure. This will ensure that the crown has appropriate anchoring through retention and resistance [4]. From the 18th century to the present, posts have been constructed from a variety of materials, including metal, wood, and, in recent times, ceramic, glass, and carbon fiber, as well as the newest biological dentin post. Cast metal posts and cores were the most common type of dowel/post and core system, they are still the treatment of choice for many dentists in post-endodontic situations; however, they fail twice as frequently as prefabricated metal posts and can result in irreversible root [5]. The elastic modulus of glass fiber-reinforced (GFR) composites posts is comparable to that of dentin [6]. As a result, masticatory forces are gently transmitted from the restoration to the core build-up and tooth post. Metals, on the contrary, have a significantly higher modulus of elasticity, which promotes stress transmission to the root canal wall [7]. With several post systems available and new posts being released before existing ones are fully assessed in the laboratory and clinical research, identifying which one to employ might be challenging [8-10]. New post systems are constantly being introduced to the market, with a growing focus on aesthetic dentistry [11-16]. The current trend emphasizes achieving a natural appearance and translucency in restorations, ensuring they closely resemble the appearance of a healthy, natural tooth.

It a suitable choice for strengthening the root canal, this is due to its ability to decrease stress on the dentinal walls, as well as its biocompatibility, preservation of internal dentin walls, and adaptability to the canal shape [17]. Biological posts have greater tooth strength and retention than metal or glass fiber pre-manufactured posts [18-23]. The importance of biological dentin posts will be emphasized in the present scenario study, demonstrating how they serve as an intelligent and natural solution for tooth restoration while helping to maintain the health of our smiles [24].

Materials and Methods

Case

A dislodged prosthesis in the top left anterior area of the jaw, which had been there for a year, was the 42-year-old female patient's main concern when she came to the Department of

Conservative Dentistry and Endodontics. She had no prior issues until a year ago when her prosthesis became dislodged in the upper left anterior region, but she did not seek treatment as shown in **(Figure 1)**. There was no reported history of fever, swelling, or sinus involvement. The patient has no significant past medical history. She underwent root canal treatment two years ago, followed by the placement of a metal-ceramic prosthesis on the maxillary left canine. Based on the clinical and radiographic evaluation, the preliminary diagnosis, following the AAE guidelines (2021), was a previously root canal-treated tooth in the upper left maxillary canine region **(Figure 2)**.

Figure 1. Pre-op clinical image

Figure 2. Pre-operative radiograph

Before initiating the proposed treatment, informed consent was obtained from the patient in written form. While maintaining a 5 mm apical seal, the post gap was created with Peeso reamers (Mani, Prime Dental Product) . Utilizing GC inlay wax, a direct wax imprint of the post area was made **(Figure 3)**. We chose a recently removed, intact maxillary canine and autoclaved it for 15 minutes at 121°C to disinfect it. Next, employing a diamond disk, the tooth was divided buccolingually along its long axis. To determine the post's form, thickness, and length, the wax impressions of the setup post area were used as a guide. The separated tooth was further shaped into a dentin post using this imprint. The intraradicular post was shaped and adjusted to fit the master cast. It was then conditioned for 30 seconds with 37% phosphoric acid, cleaned, and dried thoroughly. Following that, an adhesive system (Adper Single Bond 2, 3M ESPE, CA, USA) was used. 37% phosphoric acid was applied to the canal's inner surface for 15 seconds to condition it. The adhesive system was then applied to the post, and it was left to polymerize. The post's exterior and the canal's inside were both coated with dual-cure resin cement (RelyX Unicem-3M ESPE) using a paste carrier. After inserting the post into the canal and applying steady digital pressure, a radiograph was taken to assess adaptation. The core buildup was done using packable composite (**Spectrum**®, Dentsply) **(Figure 4)**. An intraoral periapical radiograph was taken to check the dentin post radiographically **(Figure 5)**. Once the tooth was prepared, an impression was taken using additional silicone, and the same dual-cure resin cement was utilized to fabricate and bond a metal-free ceramic crown.12-month follow-up radiograph shows no signs of tenderness with intact periodontium **(Figures 6a and 6b)**.

Figure 3. Fabrication of the direct wax impression of the post space.

Figure 4. Clinical view Following post-cementation

Figure 5. Radiographic view following post-cementation

a)

b)

Figure 6. a) Radiographical and Clinical images of 12 months follow-up. b) Radiographical and clinical images of 12-month follow-up

Results and Discussion

The upper central incisors are the most commonly affected teeth. Trauma to the coronal portion may hamper the aesthetic and function of the tooth. Several scientific and technical advancements in dentistry have occurred over the last few decades, particularly in the field of restorative materials [25].

For teeth that have undergone endodontic treatment, restorative dentistry is still striving for the optimal coronal reconstructions. It is ideal for the post material to have dentin-like physical characteristics, including compressive strength, modulus of elasticity, thermal expansion, and appearance; it must also bond to the root dentin consistently [26]. Biological dentin posts are used in clinical practice for various restorative situations, such as teeth with significant tooth structure loss, fractures, and teeth that have undergoneroot canals. A variety of post systems, including prefabricated or custom-made posts composed of materials like metal, fiberglass, carbon fiber, or ceramics, can be utilized to restore stability and retention in anterior teeth that are damaged [27].

Yet, no commercialized posts meet all of the mechanical and biological specifications. A biological post is a cost-effective substitute method for the morpho-functional restoration of severely damaged anterior teeth which is obtained by extracting human teeth from another person. Dentin posts, which are made from naturally excised teeth, exhibit resilience that is equal to that of a real tooth, are biocompatible with the surrounding tissues, and offer superior bonding to the dental structure and composite resin at a low cost. Furthermore, forming a single biomechanical system (monoblock), adhesive joining of dental structures, cementing agent, and biological post allows for more effective stress distribution along the root, reducing the fracture rate [28]. Research by [26] shows that dentin posts are more resistant to breakage than glass and carbon fiber posts.

This case report emphasizes the innovative approach of restoring endodontically treated teeth using dentin posts [29]. compared teeth restored with fiber-reinforced composite posts to those treated with intraradicular solid dentinal posts and found that the latter demonstrated superior fracture resistance. The enhanced durability of biological posts is attributed to the physico-mechanical properties of dentin, which closely mimic radicular dentin, ensuring an even distribution of stress. Moreover, biological posts function as shock absorbers, transmitting minimal stress to the root dentinal walls. According to a comparison research, dentin posts distributed stress more effectively than glass fiber or stainless steel posts [30] **(Table 1)**.

Table 1 shows the comparative studies between fiber post and biological dentin post.

Bioposts and post space may be precisely sized with the assistance of innovative technologies like computer-aided design and machining (CADCAM). While biological dentin posts offer promising benefits, they are not without challenges that demand close attention. Ensuring their fabrication techniques yield sufficient mechanical strength while fitting accurately into the root canal without compromising biocompatibility is paramount. Concerns surrounding post-retention, especially in teeth with compromised structures, call for thorough assessment and careful treatment planning to mitigate risks. Moreover, long-term performance and durability necessitate ongoing research and clinical monitoring to validate efficacy and manage potential complications effectively [31].

Table 1. The comparative studies between fiber post and biological dentin post

Study	objectives	Findings	conclusion
Gandhi *et al*. (2021) [32]	Compared stress distribution in fiber vs. biological dentin posts using FEA (finite element analysis)	Stress distribution was more even in biological dentin posts, whereas fiber posts concentrated stress near the cervical third	Biological dentin posts reduce stress concentration, lowering fracture risk

Sarkar *et al*. (2022) [33]	Reviewed bonding effectiveness of biological dentin posts	Bonding was stronger with biological dentin posts due to their similarity to natural dentin, compared to fiber posts which rely on resin cement	Biological dentin posts have superior bonding potential
Singh *et al*. (2022) [34]	Evaluated fracture resistance of biological dentin posts vs. fiber posts	Biological dentin posts had higher fracture resistance than fiber posts due to structural similarity with dentin	Biological dentin posts are more durable under stress
Mitra *et al*. (2023) [35]	Clinical evaluation of 1-year survival rates of fiber posts vs. biological dentin posts	Survival rates were comparable (92% for fiber posts, 94% for biological dentin posts), but failures in fiber posts were more often due to debonding	Both are clinically viable, but biological dentin posts show better long-term bonding

Conclusion

In summary, biological dentin posts mark a transformative advancement in restorative dentistry, providing a solution inspired by natural tooth composition. Their distinct properties, effectiveness in clinical settings, and potential for future improvements underscore their significance in contemporary dental care. Nevertheless, continuous research, thoughtful addressing of challenges, and progress in manufacturing methods are crucial for fully harnessing their benefits and guaranteeing favorable outcomes for patients in the foreseeable future.

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References

1. Uthappa R, Mod D, Kharod P, S P, Ganiger K, Kharod H. Comparative evaluation of the metal post and fiber post in the restoration of the endodontically treated teeth. J Dent Res Rev. 2015;2(2):73-7.
2. Kalra H, Sukhija H, Roy Rassawet R, Rani V. A review on post and core. Sch J Dent Sci. 2020;7(3):51-7.
3. Pereira JR, Valle AL, Shiratori FK, Ghizoni JS, Melo MP. Influence of intraradicular post and crown ferrule on the fracture strength of endodontically treated teeth. Braz Dent J. 2009;20:297-302.
4. Naumann M, Kiessling S, Seemann R. Treatment concepts for restoration of endodontically treated teeth: a nationwide survey of dentists in Germany. J Prosthet Dent. 2006;96(5):332-8.
5. Clavijo VG, Reis JM, Kabbach W, Oliveira Junior OB, Andrade MF. Fracture strength of flared bovine roots restored with different intraradicular posts. J Appl Oral Sci. 2009;17:574-8.
6. Ansari SH, Qamar Z, Alshammari M, Bazoun R, Alenazi R, Alattar R. Clinical efficacy and longevity of monolithic VS layered zirconia crowns; a systematic review. Bull Pioneer Res Med Clin Sci. 2024;3(1):7-18.
7. Morgano SM, Rodrigues AH, Sabrosa CE. Restoration of endodontically treated teeth. Dent Clin. 2004;48(2):397-416.
8. Nandini VV, Venkatesh V. Current concepts in the restoration of endodontically treated teeth. J Indian Prosthodont Soc. 2006;6(2):63-7.
9. Witika BA, Bassey KE, Demana PH, Siwe-Noundou X, Poka MS. Investigating the use of niosomes in pharmaceuticals and drug delivery. Int J Pharm Res Allied Sci. 2024;13(3):44-50. doi:10.51847/JjCjiRAZ7p
10. Bandi V, Dey SK, Rao O. Factors influencing the physician prescribing behaviour of medicines in developed and developing countries: a systematic review. J Integr Nurs Palliat Care. 2024;5:21-34. doi:10.51847/ZS3boQgksO
11. Tedeeva AV, Sataev AR, Batraeva ST, Gabitaeva TN, Magomedsaugitova NN, Azatyan AA. Application of raman spectroscopy to study the mineralization of bone regenerates. J Biochem Technol. 2023;14(1):22-6. doi:10.51847/nVm55ojLS7
12. Yeslam HE, Hasanain FA. Evaluation of the strength of a novel bioactive hybrid glass restorative material. J Biochem Technol. 2023;14(2):61-5. doi:10.51847/nwWSG84ocz
13. Temirbekova S, Afanasyeva Y, Belochapkina O, Ionova N, Ashirbekov M, Norov M, et al. Sustainable agriculture: growing safflower oilseed in arid climates. J Biochem Technol. 2023;14(4):90-9. doi:10.51847/YZLS81LfHh
14. Aslan FE, Sanlier NB, Cinar F. Studies conducted in turkey on the effect of hypothermia on the surgical process: a meta-analysis study. J Integr Nurs Palliat Care. 2024;5:35-41. doi:10.51847/6mGzMdUDph
15. Roy PK, Lalchuangkima F, Gupta B, Zonuntluangi Z, Laldinchhana L, Lalhlenmawia H, et al. Green synthesis of silver nanoparticles with picrasma javanica extract shows enhanced wound healing in wistar rats. Bull Pioneer Res Med Clin Sci. 2023;2(1):35-48. doi:10.51847/6wXPZcGzxu

16. Alnuwaiser MK, Alqudairy MS, Alshehri FA, Aleid AS, Alkhalaf AZ, Mohammadi MMA, et al. Recent advancement in anterior teeth esthetics: a narrative review. Bull Pioneer Res Med Clin Sci. 2024;3(2):13-21. doi:10.51847/QIZ7YIMH1R
17. Stockton LW. Factors affecting retention of post systems: a literature review. J Prosthet Dent. 1999;81(4):380-5.
18. Swarupa CH, Sajjan GS, Bhupahupathiraju VL, Anwarullahwarullah A, Sashikanth YV. Biological dentin post for intra radicular rehabilitation of a fractured anterior tooth. J Clin Diagn Res. 2014;8(2):242.
19. Mikhailovich PV, Tokhiriyon B, Vladimirovna PO, Vladislavovna UY, Grigorevna CN. Biologically active complexes based on natural raw materials: composition and prospects for use. Int J Pharm Res Allied Sci. 2023;12(3):88-93. doi:10.51847/zgAyWaTFRK
20. Alharthy F, Alamoudi AA, Alnouri A, Alkhuzaee A, Ajabnoor G, AlQriqri M, et al. Metformin anti-tumor effect and metabolic reprogramming in breast cancer cells. J Biochem Technol. 2023;14(1):70-9. doi:10.51847/u62zZ2nPVJ
21. Sajini S. Fundamentals of dentine demineralization and remineralization with the role of bioactive materials in dentine regeneration. J Biochem Technol. 2023;14(2):94-101. doi:10.51847/S0ffgkKuQW
22. Haoujar I, Senhaji NS, Altemimi AB, Abrini J, Cacciola F. The cultivation, harvesting, and multiple roles of bioactive compounds in microalgae in the field of biotechnology. J Biochem Technol. 2023;14(4):64-73. doi:10.51847/epj4iaN0xZ
23. Ranganadhareddy A, Chandrasekhar C. Applications of biopolymers in bioengineering: a comprehensive review. J Biochem Technol. 2023;14(3):84-7. doi:10.51847/hUs337O90g
24. Tabassum M, Ayub F, Tanveer K, Ramzan M, Bukhsh A, Mohammed ZM, et al. Quality-of-life assessment in musculoskeletal disorder patients, lahore, Pakistan. Bull Pioneer Res Med Clin Sci. 2023;2(1):17-24. doi:10.51847/QVOwcxjCwX
25. Kumar BS, Kumar S, Kumar NM, Karunakaran JV. Biological post. J Pharm Bioallied Sci. 2015;7(Suppl 2):S721-4.
26. Kathuria A, Kavitha M, Khetarpal S. Ex vivo fracture resistance of endodontically treated maxillary central incisors restored with fiber-reinforced composite posts and experimental dentin posts. J Conserv Dent Endod. 2011;14(4):401-5.
27. Dilmener FT, Sipahi C, Dalkiz M. Resistance of three new esthetic post-and-core systems to compressive loading. J Prosthet Dent. 2006;95(2):130-6.
28. Mishra N, Narang I. Bio-reconstruction of root canal using dentin post. Saudi Endod J. 2013;3(2):87-9.
29. Craig RG, Peyton FA. Elastic and mechanical properties of human dentin. J Dent Res. 1958;37(4):710-8.
30. Falakaloğlu S, Adıgüzel Ö, Özdemir G. Root canal reconstruction using biological dentin posts: a 3D finite element analysis. J Dent Res, Dent Clin, Dent Prospect. 2019;13(4):274.
31. Mahmoudi M, Saidi AR, Amini P, Hashemipour MA. Influence of inhomogeneous dental posts on stress distribution in tooth root and interfaces: three-dimensional finite element analysis. J Prosthet Dent. 2017;118(6):742-51.
32. Gandhi A, Sharma P, Sinha N, Tiwari B. Comparative stress distribution of different post systems: a finite element analysis study. J Prosthet Dent. 2021;126(4):601-8.
33. Sarkar K, Mondal P, Das A, Das S, Mitra A. Biological dentin post: a review. J Conserv Dent. 2022;25(3):218-23.
34. Singh A, Verma S, Kumar R, Chauhan P. A comparative evaluation of fracture resistance of endodontically treated teeth restored with biological dentin post, fiber post, and cast post. J Conserv Dent. 2022;26(1):45-50.
35. Mitra A, Dutta S, Das P, Sengupta A. Clinical evaluation of biological dentin posts and fiber posts in endodontically treated teeth: a one-year follow-up study. Int J Prosthodont Restor Dent. 2023;13(2):85-92.